# Surplus-Knowledge

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## Essays on Epistemology and the Constitution of the Self

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*To Dilan Azeri, fellow traveler in thought and life,*
*without whom these pages would not exist*

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# Surplus-Meaning and Abstract Individuality

While language, meaning-formation, and knowledge-production have been studied extensively within both structuralist linguistics and sociocultural psychology, these traditions often overlook the historical-material foundations of consciousness, meaning, and knowledge as socially constituted and dialectically produced. The essays collected in this volume, written over the past several years, represent a sustained attempt to develop a materialist dialectical theory of knowledge by synthesising key insights from Karl Marx, Lev Vygotsky, and Evald Ilyenkov. This theoretical synthesis foregrounds the role of labour, tool-mediated activity, and conceptual development in the constitution of consciousness and cognition. Across these essays, I argue that human consciousness and knowledge are not reducible to internal mental states or isolated linguistic structures but are historically generated forms of social activity, conditioned by the means and relations of production.

The present chapter introduces the key theoretical concerns that unify the essays: namely, the dialectical interrelation between spontaneous and institutionalised meaning-production, the function of the lexicon in mediating between subjective sense and objective meaning, and the ideal and real subsumption of consciousness under capital. Taken together, these concerns point toward a critical rethinking of how meaning and subjectivity are shaped within contemporary capitalist conditions. My aim is not only to reconstruct but also to extend this Marx–Vygotsky–Ilyenkov lineage, offering new conceptual tools—such as the notion of *surplus-meaning*—to account for how individual sense-making is appropriated, standardised, and recirculated within the ideological and epistemic apparatuses of modern society. In this way, the volume contributes to an open-ended and non-dogmatic materialist theory of consciousness—one grounded in praxis, social relations, and historical transformation.

In *Thinking and Speech*, Vygotsky argues that scientific concepts follow a developmental trajectory distinct from that of spontaneous (or everyday) concepts. Like spontaneous concepts, scientific con-

cepts—understood as word-meanings—are not fixed structures; rather, they are presented in incomplete forms and remain subject to ongoing development. Crucially, the laws governing their development diverge from those of spontaneous concepts (Vygotsky 1987, 167). One key limitation of the dominant psychological paradigms of Vygotsky's time, he contends, lies in their failure to recognize how the development and acquisition of scientific concepts can influence the formation of spontaneous ones (Vygotsky 1987,169–172). These two types of concepts do not merely coexist; rather, scientific concepts actively shape and determine spontaneous ones. To neglect this relationship is to overlook how scientific concepts—mediated through instruction and education—affect a child's modes of thinking and the structuring of consciousness.

A central feature of scientific concept formation in children is its developmental direction: contrary to everyday concepts, "the development of scientific concepts begins with the verbal definition" (Vygotsky 1987, 168), from which they progress toward the concrete. This aspect can be extrapolated into a broader analysis of the relationship between standardized lexical definitions (such as those found in dictionaries) and the processes of meaning production, expansion, and stabilization—an analogy that recalls Marx's theory of labour. A central feature of scientific concept formation in children is its developmental direction: contrary to everyday concepts, "the development of scientific concepts begins with the verbal definition" (Vygotsky 1987, 168), from which they progress toward the concrete. This aspect can be extrapolated into a broader analysis of the relationship between standardized lexical definitions (such as those found in dictionaries) and the processes of meaning production, expansion, and stabilization—an analogy that recalls Marx's theory of labour. To this end, the first section of this paper examines Marx's conceptualization of labour—including concrete labour, abstract labour, and labour as a dialectical category—and the forms of its subsumption under capital. The second section explores the formation of meaning and the emergence of consciousness (psyche), arguing that humanization entails the acquisition of the social significance of artifacts. Meaning, in this framework, is both tool-mediated and object-oriented, paralleling the structure of human relations to social nature. The third section addresses how meaning is produced under capitalism, focusing on the formalization, standardization, and institutionalization of the processes involved in the generation and stabilization of knowledge. Here, the lexicon is theorized as the mediating element that facilitates the "ideal subsumption" of spontaneously produced meanings under standardized definitions, enabling their appropriation as "free gifts." Finally, the fourth section contends that a proper conceptualization of abstract individuality, from a Marxian

materialist perspective, requires understanding the role of labour in the formation of human consciousness and the historical development of meaning.

## Concepts of labour

In the *Grundrisse*, Marx defines labour in general—that is, labour as the productive activity necessitated by human existence regardless of any specific mode of production—as "the living, form-giving fire" (Marx 1993, 361). Labour represents the highest form of metabolic interaction between human beings and nature; it is through this relation that the two become conjoined and subsequently differentiated into subject and object via the human's productive activity. As a philosophical or dialectical category, labour is the process of objectifying human tools and meanings while simultaneously humanising nature and the environment. Through labour, human beings constitute and shape reality. Reality, in the broadest sense, persists and becomes knowable insofar as it is produced and structured through labour. Importantly, labour does not confine human beings within the limits of their sociality; it does not hinder their engagement with the world. On the contrary, labour is "human's openness toward reality and being" (Kosík 1976, 139). It serves as the ontological ground for the actualisation of the social human being; it is, as Antunes states, "the basic ontological foundation of human 'multi-facetedness'" (Antunes 2013, 142).

It is crucial to recognise that "labour in general" is a conceptual abstraction; it is a product of reflective thought. A critical investigation of the labour process must aim at formulating the concept of labour, which functions as the logical-genetic root of its specific historical forms. Thus, labour should not be regarded as a transhistorical form of activity; rather, it is always historically mediated. In actual practice, labour occurs within specific social forms. In the capitalist mode of production, for instance, labour takes on a historically determinate form: capitalist, or capitalised, labour. Put differently, labour may be approached in a dual manner—as both a philosophical category and a historically specific economic category. In the former sense, labour entails the objectification of tools and meanings, along with the humanisation of the environment. In the latter sense, it is a historically specific activity that produces determinate forms of wealth: under capitalism, this takes the shape of the dual form of concrete and abstract labour, which results in the production of value and of commodities as the bearers of value. "Labour in general" thus serves as the historiographical foundation for labour as an economic category (Kosík 1976, 127). While historically the former precedes the latter, conceptually and categorically, the general form of labour becomes intelligible and actualisable only on the basis of its specific capi-

talist form. As Marx aptly noted, "Human anatomy contains a key to the anatomy of the ape" (1993, 105); the same holds true for the concept of labour.

Under capitalism, labour takes on a specific, historically determined form: it acquires a dual character. On one level, it manifests as concrete, useful labour that produces goods and utilities necessary for human survival. On another level, it appears as abstract labour—labour subsumed under abstract, homogeneous time—which is the source of value. Labour becomes "productive" only insofar as it is exchanged with capital and contributes to the production of surplus-value; that is, it is productive only when it is subsumed under capital and functions as its constituent element.

Paradoxical though it may seem, the very condition for the subsumption of labour under capital is the emergence of labour as doubly "free labour." On the one hand, the labourer must be "free" from the conditions of production—that is, dispossessed of the means of production—so that her only asset is her capacity to labour. On the other hand, she must be the "free" proprietor of this unique commodity—her labour-power—so that she may enter into an exchange relation with capital, selling not herself but her capacity to labour, and only for a determinate period of time. As Marx explains in the *Grundrisse*:

> The fact that labour is a constant new source of exchange for the worker as long as he is capable of working—meaning not exchange in general, but exchange with capital—is inherent in the nature of the concept itself, namely that he only sells a temporary disposition over his labouring capacity, hence can always begin the exchange anew as soon as he has taken in the quantity of substances required in order to reproduce the externalization of his life [*Lebensäußerung*]. (1993, 293).

As a free labourer—unlike the slave or the serf—the worker offers her labour-power to capital of her own "free" will. In doing so, she internalises the logic of capital and becomes not merely subordinated to it, but transformed into one of its constitutive elements: a component of capital itself, specifically in the form of "variable capital." Whereas the slave represented the dominant form of labour in antiquity, the worker under capitalism becomes a form of capital. This inversion finds its counterpart in the worker's perception of capital as a money-fetish. The relationship of slavery is external to the slave, just as the master's exertion of force is external and thus remains limited, immediate, and non-universal. By contrast, the power of capital over the worker is effectively limitless—it is mediated through the worker's own "free" will. This internal mediation renders capital's domination far more pervasive.

The worker generates surplus-value—the primary form in which capital appears—precisely because she herself has been capitalised. Capital reproduces itself through the worker, thus affirming the identity: the same is born of the same. This logic explains the dual movement characterising the relation between capital accumulation and the working class. On the one hand, "the accumulation of capital is the multiplication of the proletariat." On the other hand, the expansion of capital—through rising productivity, intensified labour, and the broadening of the production process—simultaneously entails the degradation of the worker: a progressive loss of skill, autonomy, and material conditions of existence.

Once subsumed under capital, the labourer becomes the personification of capital itself—not only in its positive form, as in discussions of the organic composition of capital, but also in its negative form. The worker is subjected to domination in a mediated manner: through her own will, which has become the internalised expression of capital's will. In this sense, the logic of capital exerts control internally. At this level, the dual character of both the commodity and of labour is fully operative: the worker's selfhood becomes the negation of itself. She becomes a "self" only to the extent that she participates in the capitalist labour process—specifically, in the production of surplus-value. It is this process that ensures labour's continuous capitalisation, and it is through this dynamic that she is posited as variable capital—even when she "chooses" not to work. Her self-affirmation is simultaneously an act of self-negation; her will, now the internalised will of capital, is the product of her own past activity, which has come to dominate her.

> Labour is not only the use value which confronts capital, but, rather, it is the use value of capital itself. As the not-being of values in so far as they are objectified, labour is their being in so far as they are not-objectified; it is their ideal being; the possibility of values, and, as activity, the positing of value. As against capital, labour is the merely abstract form, the mere possibility of value-positing activity, which exists only as a capacity, as a resource in the bodiliness of the worker. But when it is made into a real activity through contact with capital - it cannot do this by itself, since it is without object - then it becomes a really value-positing, productive activity. (Marx 1993, 297-98)

Labour does not exist as a use-value for the worker; its productivity is not realised in the production of wealth for the worker herself, but only insofar as it contributes to the valorisation of capital—that is, when it becomes capitalised. This condition is grounded in the specific "productiveness" of labour: as Marx

argues, labour is productive only to the extent that it produces its opposite—capital. The productiveness of labour thus entails its own self-negation and its transformation into capital. It is through this dynamic that the production process "in general" becomes concretely determined as the process of producing capital as self-valorising value.

Marx identifies four types of subsumption of labour under capital: formal, real, hybrid, and ideal. Labour is formally subsumed under capital when it is exchanged for money—that is, when it is performed as wage-labour such that the product of that labour enters the sphere of commodity exchange. Labour becomes really subsumed under capital once this exchange results in the production of surplus-value, meaning that labour has been capitalised. At this point, it qualifies as productive labour, which is to say that it is "socially determined," and this determination implies "a quite specific relationship between the buyer and seller of labour. Productive labour is exchanged directly for money as capital, i.e. for money which is intrinsically capital, which is destined to function as capital and which confronts labour-power as capital" (Marx 1992, 1043).

Hybrid subsumption refers to instances in which surplus is extracted from labour through mediated forms of compulsion, without labour being either formally or really subsumed. As Marx writes, "In these forms, capital has not yet acquired a direct control over the labour process" (Marx 1992, 645). In contrast, ideal subsumption—defined by Patrick Murray—marks a movement from the domain of real subsumption into that of the "as if." In such cases, no actual formal or real subsumption occurs, but a particular activity is treated *as if* it has already been subsumed: "In ideal subsumption, value-forms reshape our imagination; they redefine and channel how we think, feel, and desire" (Murray 2000, 103).

However, ideal subsumption also encompasses the subsumption of forms of labour that are neither directly exchanged with capital nor commodified. It functions as the mechanism through which capital appropriates the products of such labour as "free gifts." Ideally subsumed labour includes various types of non-wage labour, ranging from cooperative labour and domestic work to knowledge-producing activities. For instance, in cooperative work arrangements, the consolidation of many workers under a single structure stimulates "'animal spirits' which heightens the efficiency of each individual worker… And this is another extra that capital gains from the cooperation of the labour power; an extra that comes to capital for free" (Marx 1992, 443–44).

A similar logic is at work in capital's appropriation of the productive powers of nature and science. Although knowledge is a product of labour, it is made to appear as if it were an inherent

force of capital. As Marx explains: "The transposition of the social productivity of labour into the material attributes of capital is so firmly entrenched in people's minds that the advantages of machinery, the use of science, invention, etc. are necessarily conceived in this alienated form, so that all these things are deemed to be the attributes of capital" (1992, 1058).

It goes without saying that these various forms of labour coexist, much like geological strata layered upon one another, each corresponding to distinct temporalities of capital. Capital does not eliminate these different forms; rather, it subsumes and continuously reproduces them in capitalised form (Tomba 2013, 366). This reproduction of difference reflects both the centripetal and centrifugal tendencies of capital: on the one hand, capital strives toward and idealises the total subsumption of all spheres of life—including the household; on the other hand, because surplus-value can only originate from doubly free labour, capital resists full subsumption, recognising that such totalisation would ultimately undermine its own conditions of possibility (Murray 2000, 128). As a result, we observe the persistence of diverse forms of labour, a plurality of social domains aligned with different temporalities, and a multiplicity of subsumption modes that enable capital to appropriate the non-commodified products of labour as free gifts. One such domain is the production of surplus-meaning, which remains a non-commodified sphere.

## Meaning and the constitution of consciousness

Labour is the foundational source of the production of social wealth in the form of artefacts. An artefact functions as a tool of purposeful action; the act of tool-making involves abstraction, whereby abstraction signifies the detachment of an ordinary object from its immediate environment and its material-natural determinations, transforming it into a meaningful entity. In this sense, the meaning of a thing emerges from its role as a tool in activity. Artefacts are the objectifications of human productive activity, and their "meaning" derives from their social significance. Consequently, the process of humanisation entails the acquisition of the social meaning embedded in socially produced tools—artefacts. That is, it involves the mastery of tool-use within a given social context. Within this process, both the user and the tool are reciprocally transformed. As Meshcheryakov observes, "knowledge of objects is social values transferred to the mind of the child, i.e. appropriated by him" (1974).

Phylogenetically, consciousness is preceded by human activity, the most advanced form of which is labour. Orientative-investigative activity—that is, the human being's spatial movement toward and around objects—constitutes the foundational

experiential substrate that facilitates the acquisition of language and serves as the basis for the emergence of consciousness and higher mental functions. Cognitive activity arises from bodily activity, which itself develops in response to physical needs and in relation to external objects that exert immediate or mediated force upon the body—objects that are perceived by the organism as either beneficial or harmful.

However, once cognitive activity emerges, it attains a relatively autonomous character, allowing the child to transcend the constraints imposed by her immediate environment and to form ideal representations of the world. These ideal images, in turn, enable the execution of more complex practical actions, aimed at manipulating both the external environment and the child's own behaviour. The human psyche is grounded in the capacity to construct internal representations of objects. It is through spatial activity that the organs of the psyche are formed. These organs are generated by this functional capacity—that is, by the specific form of activity through which the human individual engages with the world—and not vice versa. As Ilyenkov notes, "The first self-image of the mind is formed once the human child learns to mover herself" (2010, 17).

The analysis of human consciousness should not begin by identifying supposed "external" (environmental) or "internal" (mental) factors that facilitate specific behaviours. Instead, it must begin with the recognition that human beings act. Activity serves as the fundamental point of departure for any meaningful analysis of human behaviour. As Eskola aptly observes, "Just as fish live and swim in water, we live our lives swimming in water that consists of laws and rules of the type 'if X, then Y.' However, the course of our lives is not determined by the laws any more than the course of swimming fish is determined by water. From this it follows that the analysis must start not with water but with swimming" (1999, 112).

Unlike animals, human behaviour is characterised by historicity—meaning that its scope extends far beyond biological inheritance. Moreover, human behaviour, and the consciousness that arises from it, is inherently social. Most importantly, however, human behaviour is active, in that it involves a doubled form of experience. This doubling corresponds to Marx's concept of labour, wherein the human being first actualises the product of her labour in imagination—that is, she mentally constructs an image of the intended product prior to its material realisation. As Vygotsky explains, "In the movements of the hands and the transformations of the material, labor repeats what was first, as it were, done in the worker's imagination with models of these movements and this same material. Such doubled experience allows man to develop active forms of adaptation which the animal does not have" (Vygotsky 1997a, 68).

Language and human consciousness are rooted in activity—in particular, in labour. However, it is important to clarify that this precedence is historical, and therefore essential, referring to the developmental relation between human activity, language acquisition, and the emergence of consciousness. Ontogenetically, the origin of consciousness lies in the word; the constitution of fully developed human consciousness depends upon the acquisition of language and the formation of conceptual systems. It is the logical precedence of language over activity—in contrast to the historical precedence of activity over language—that is reflected in the phenomenon of doubled experience. This reversal enables the individual to grasp the social significance of human-made artefacts, which, in turn, constitutes the condition for the emergence of human personality.

Language, while originally a consequence of labour, eventually assumes the role of its condition: it becomes a material force within social reality. As Leont'ev notes, "In the process of material production people also produce language that is not only a means of communication, but also a bearer of fixed socially developed meanings" (quoted in Maraev 2016, 99). In this sense, speech emerges as the medium through which historically formed norms of action are interiorised—that is, as the means by which the "ideal" is acquired and the self is constituted for participation in social labour. As Maraev puts it, "Having given birth to a sign-symbol system, labour is now organised and directed by this system" (2016, 102). From this follows the normativity—or ideality—of speech and language, which "emancipates" them from the immediacy of activity and transforms them into a *concrete universal*—a tool of action—that conditions labour itself: the purposive human activity through which the world is transformed.

Meaning emerges within human activity, situated in social nature, through the use of tools—both physical and ideal—that mediate purposeful action. It is produced through the act of abstraction, where abstraction may refer either to the seemingly "simple" act of separating an object from its immediate environment or to the more complex process of employing linguistic and symbolic systems to reflect on oneself or to reconstruct, in ideal form, the essential relations among diverse phenomena—that is, concept formation. The formation of meaning coincides with the formation of the human mind, as no form of consciousness can exist independently of action, whether that action is practical and bodily or abstract and conceptual.

Thinking, as a form of action, entails the proper use of specific tools and a grasp of the object of action in accordance with the rules determined by both the tool and the object itself. As Ilyenkov notes, this means that "the knowledge of the object, that is, the

social significance or the meaning of the artefact emerges only through such an intelligent action" (2007, 76). It follows, then, that meaning—or knowledge—is inherently bound to human activity in social nature: it is always tool-mediated and object-oriented. Meaning, in this sense, is functioning knowledge.

## Meaning-Production and Capitalism

With the emergence of language, meaning becomes emancipated from immediate bodily activity. Just as a simple physical tool mediates the relationship between human beings and nature—serving as the middle term that facilitates practical activity in the world—language emerges as a mediating device that enables the human capacity for "delayed response" to both internal and external stimuli. Speech, understood as language in action, is itself a form of activity that requires the acquisition and mastery of specific tools—namely, concepts that articulate the relationships between phenomena and between signs (i.e., words) in the form of meaning.

Under capitalism, the production of ideal entities such as languages, signs, and conceptual systems—where the *ideal* refers to the norms that govern human activity (Ilyenkov 2012, 155)—becomes subject to the universalising logic of capital. The constitution of meaning, therefore, depends upon three interrelated conditions: (a) the socially available stockpile of significance (i.e., the lexicon); (b) the material and institutional means by which meaning is produced; and (c) the historically specific mode of meaning-production. Meaning can only emerge against the backdrop of already existing intellectual and semiotic resources—that is, the accumulated "thought-material" of human history.

Vygotsky's analysis of the development of meaning within its historical, natural, and sociocultural context—from the earliest use of language to the complex systems of knowledge in modern societies—enables a conception of the unity across the diverse forms in which meaning is realised. *Meaning* refers both to individual words and their lexical definitions and to socially situated meaning: the ways in which knowledge and concepts are communicated within an individual's specific sociocultural context. As Mahn notes, "There is a level of fluidity in sociocultural meaning ranging from the most fixed, meanings that are codified in the dictionary, to the most fluid, Meaning in Language Use – language in specific utterances, written and spoken sign operations in particular social situations of development" (2012, 117).

These diverse aspects of meaning are nonetheless unified as essential components of the broader process of meaning-production. This process entails: (a) the socially available storehouse of meaning (the lexicon), which operates as the initially invested capital in the production process; (b) the socially organised and

institutionalised production of meaning through educational, academic, scientific, and artistic means; and (c) the non-commodified production of meaning, which is "ideally" subsumed under capital and contributes to the expansion of meaning through the generation of *surplus-meaning* as "free gifts." Vygotsky articulates the dialectical link between consciousness and meaning when he writes, "The structure of meaning is determined by the systemic structure of consciousness" (1997b, 137). Given that consciousness is itself a social relation, it follows that the structure of meaning is also determined by social relations—relations that are historically specific through and through.

Under capitalism, the production of meaning and knowledge is institutionalised—most notably in schools and academic institutions. These institutions serve a dual function: first, they work to standardise and stabilise socially produced meaning; second, they regulate its expansion by appropriating surplus-meaning generated both within and outside institutional settings. The institutionalisation of the processes of meaning and knowledge production introduces a qualitative transformation in the ways meaning is reproduced and preserved (i.e., stabilised) within capitalist society.

The acceleration of social knowledge accumulation—including advancements in the tools of production and the rapid development of civilisation from early societies to industrial modernity—represents more than a mere quantitative increase over pre-human ancestors such as hominids. It also signals fundamental qualitative shifts. As Damerow notes:

> [I]t includes essential qualitative changes based on the reflexive character of the tools. For, inasmuch as the tool, as objectified labor, represents the general, specifically the general of the object of labor, that is, modified nature, as well as the general of the subject of the labor process, that is, the techniques, the organization, and the division of labor, which have become characteristic of the human species, individual development takes place under constantly changing starting conditions in the environment of implements. The ontogenetic reproduction of the characteristics of the species in the individual is no longer identical reproduction, *but becomes education.* (Damerow 1996, pp. 393–94, emphasis added)

As discussed earlier, capital—due to its reliance on "doubly free" labour for the purpose of self-valorisation—does not commodify every domain of life. Rather, it appropriates the products of non-value-producing activities as "free gifts" through the mechanism of "ideal" subsumption (Marx 1992, 1023; Murray 2000, 103). In a similar fashion, the meanings generated within non-institutionalised, everyday life—what might be termed *spontaneously*

*produced meaning*—are ideally subsumed by stabilised, institutionalised meaning via the mediation of the lexicon, for instance, through compulsory formal education.

However, it is crucial to recognise that the relationship between institutionalised meaning-production, the internalisation of meaning-forms, and the subsequent formation of personality is neither one-directional nor mechanically imposed. The emergence of meaning always entails the active participation of the individual, in whom socially produced meaning undergoes a metamorphosis into *personal sense* and is subsequently re-externalised as meaning—yet now carrying a surplus. This process can be schematised as the transition from Meaning → Sense → Meaning + Δ Meaning.

As Vygotsky explains: "Sense (*smysl*) is an important component in the speaking/thinking system with sociocultural meaning as an essential but subordinate part of sense. This subordination is a defining characteristic of inner speech. In inner speech, we find a predominance of the word's sense over its meaning" (1987, 274). Accordingly, the sense of a word is never fixed or complete. Rather, it is "the aggregate of all the psychological facts that arise in our consciousness as the result of the word" (1987, 275–76), and it functions as a transformative component in the development of the speaking/thinking system. "Ultimately, the word's real sense is determined by everything in consciousness which is related to what the word expresses… [and] ultimately sense depends on one's understanding of the world as a whole and on the internal structure of personality" (1987, 276).

Although *personal sense* tends to predominate over *objective meaning*, this relation is dialectical and reciprocal. The surplus produced through personal sense is re-absorbed into social meaning, such that the "sensible" structure of personality appears as the individualised mode of existence of the social. In other words, *sense* exists as the subjective, personalised expression of *meaning*—the social.

## The Abstract Individuality

A genuinely genetic-historical approach to the relationship between the production, expansion, and stabilisation of meaning, on the one hand, and socio-political history and the formation of consciousness, on the other, requires moving beyond the constraints of formal philology and lexicography. Such an approach demands an understanding of concepts not as static units, but as evolving components within conceptual systems that are constitutive of human consciousness.

The central claim of a genetic-historical study of language is that socio-historical development and transformation—as well as the emergence of individual consciousness—are mirrored in concepts and language. The history of concepts reveals the trajectory

of political ideas and social transformations because it reflects the production and expansion of meaning. This production occurs through the use of historically specific tools and techniques appropriate to each epoch. In this context, language can be understood as the "ideal" human organ of meaning-production. This view is compatible with Saussure's well-known distinction between the diachronic (historical) and synchronic (structural) aspects of language: language evolves across time yet possesses a determinate structure at any given moment.

The situation is analogous to the human body: while the body changes over time in response to the different types of tools—both material and ideal—it deploys in the labour process, it also maintains a relatively stable structure at any historical juncture. What is produced by this seemingly stable structure, and how it is produced, is ultimately determined by the *social form of production* specific to a given historical epoch.

Koselleck's (1998) analysis of the historical transformations of the concept of *marriage*—from an economic contract that excluded individuals deemed incapable of supporting a household or raising children, to a loosening of those economic constraints and an expansion of individual freedom that includes the right to divorce, and ultimately to the notion of *love marriage*, which omits both procreative and economic considerations—exemplifies the reciprocal relationship between the social significance (*meaning*) of a phenomenon and the forms of human activity associated with it. This process also illustrates how concepts are formed through institutional structures and then reproduced in actual practices, generating surplus meaning in response to evolving, historically specific human needs. This surplus, in turn, is appropriated by institutionally stabilised concepts and forms of meaning.

Koselleck further explains how *spontaneous* social activity may resist institutional structures, while also playing a determining role in shaping them:

> Theology, religion, law, morality and custom set the framework for each concrete marriage, which precedes the individual case diachronically and generally outlasts it. Taken as a whole, these are institutionalized rules and patterns of interpretation which set up and delimit the living space for a given marriage. To be sure, these also determine 'extra-linguistic' patterns of behavior, but language remains the primary mediating instance in all of the cases mentioned. (Koselleck 1998, 33)

To clarify: it is neither the case that language determines the forms of human behaviour and social institutions, nor that language merely "reflects" extra-linguistic reality. Rather, every phenome-

non within social reality takes on the objective form of human activity and, in turn, mediates that activity by functioning as a tool within the very reality it helps constitute.

The relationship between the stabilisation of meaning through institutionalisation and its expansion via interiorisation parallels the earlier discussion concerning scientific concepts taught to children and the children's own *spontaneous* concepts. Vygotsky critiques Piaget's formulation of this relationship as purely antagonistic, in which scientific concepts gradually displace the child's spontaneous concepts.

> Piaget argues that at each step in the development of the child's representations we encounter a real conflict between the child's thought and the thought of those around him. He argues that this conflict leads to a systematic deformation in the child's mind of that which is received from the adult. In accordance with this theory, development is reduced to a continual conflict between antagonistic forms of thinking; it is reduced to the establishment of a unique compromise between these two forms of thinking at each stage in the developmental process. This compromise changes with each stage in the process, a process in which the child's egocentrism ultimately dies out. (1987, 175–76)

This is a fallacy common to structuralist approaches of various kinds. In a similar vein, Althusser's theory of "ideological apparatuses" posits these as external structures that mechanically constitute the subject from without. The process of ideological "internalisation," in this framework, results in the formation of a false consciousness: the individual's personality is effectively overwritten by the determinations of the apparatuses. The relationship between individuals and these ideological structures is conceived as strictly unidirectional—the apparatuses determine, and individuals are determined.

Vygotsky offers a critique of this mechanical view of subject formation—Piaget's included. While Piaget concedes that the child does not acquire adult concepts passively or through mere imitation, he nonetheless treats the acquisition of scientific concepts as a matter of simple memorisation. Vygotsky contests this assumption, arguing that just as children actively construct everyday concepts, they also work out scientific concepts for themselves (1987, 178). It is precisely this process of *working out* concepts—both spontaneous and scientific—that constitutes the formation of consciousness and the production of meaning. Meaning, in turn, becomes the source for the *expansion* of concepts.

This understanding of consciousness aligns with Marx's notion of the "social individual"—an individual constituted by a mode

of production "whose brain is no longer the heritage of one skull alone, but also becomes a 'social brain'" (Tomba 2013, 357). Just as the scientific concepts taught to the child introduce a conceptual system that has not yet been developed within the child's spontaneous thought—and thereby transform the structure of her thinking—the institutionally stabilised system of meanings, materialised in the lexicon as the accumulated totality of human knowledge, introduces a hierarchical organisation of concepts and meanings. This hierarchy shapes the forms in which meaning is internalised (as *sense*) and enables the consequent production of *surplus-meaning*.

The lexicon functions as the "middle term" in the dual process of the expansion and stabilisation of meaning. It determines both the socially sanctioned *sense* and the surplus to be appropriated, which constitutes the expansion of meaning. As the lexicon comes to subsume the process of meaning production, this expansion assumes a fetishistic form—it appears as self-movement of the autonomous substance-subject, or the *Concept* (Hegel 2004, 20). The lexicon thereby mediates between two contradictory poles: stabilised meaning and the destabilising, generative process of meaning-production.

The stabilisation of expanded meaning, in turn, facilitates the standardisation of human productive activity. Given the role of language in shaping consciousness and the semiotic composition of the self (Azeri 2011), this process contributes to the constitution of homogeneous productive subjectivities—*abstract individualities* capable of commensurable, measurable activity. These subjectivities give rise to indifferent social relations that define what is termed bourgeois or civil society (Tomba 2013, 359).

The *ideal subsumption* of spontaneous meaning-production under capital thus entails the ideal subsumption of consciousness itself: consciousness, understood as the curvature of the social, appears as the personification of capital—as conscious, yet perverse, capital. In this way, "free" labour, along with its seemingly autonomous concrete forms (which may appear outside the domain of real subsumption), is nonetheless drawn into capital's orbit. It is, in fact, the condition of *real subsumption* that renders such ideal subsumption possible.

The essays gathered in this volume share a fundamental commitment: to reconceptualise human cognition, consciousness, and knowledge through the lens of a materialist dialectic grounded in labour, language, and activity. Across varying contexts and emphases, these texts argue that knowledge-production is not an abstract or neutral process, but one fundamentally embedded in—and conditioned by—the historically specific social form of production. Thinking, in the properly human sense, is not reducible to neurological or formal-linguistic mechanisms; it is a social

activity, mediated by concepts, tools, and practices, and realised through historically evolving conceptual systems. This demands a critical investigation into how both spontaneous and scientific cognition arise, transform, and become institutionalised.

Several essays directly address these concerns, including *"Conceptual Cognitive Organs: Toward a Historical-Materialist Theory of Scientific Knowledge"*, which theorises conceptual systems as cognitive instruments formed through collective human labour. Others examine the role of language, activity, and abstraction in the constitution of human consciousness, challenging both empiricist and idealist accounts of the psyche. Together, these essays form a cumulative intervention in contemporary theory, aiming to contribute to a renewed materialist dialectic of knowledge—one that understands consciousness not as a fixed property of the mind but as the historically situated expression of human activity within the social universe.

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# Knowledge-Production, Digitalization and the Appropriation of Surplus-Knowledge

A common feature of the parties involved in discussions addressing the so-called "knowledge-based economy", cognitive capitalism and digitalization of knowledge-production is the dismissal of the question concerning knowledge itself, that is, the question "what is knowledge?" As Caffentzis in his criticism of cognitive capitalism ironically puts it, this is as much true for the bourgeois proponents of theories of the knowledge-based economy as it is for anti-capitalist cognitive capitalism critiques: "both the anti-capitalist theorists of cognitive capitalism and the neo-liberal theorists of the knowledge-based economy depend upon *the lack of definition of knowledge* that circulates in the sphere of intellectual property law, for the simple reason that this sphere makes it possible to speak of intellectual commodities without referring to knowledge or cognition at all" (2013, 108). The same is true when it comes to debates concerning the alleged revolutionized nature of knowledge due to digitalization of the process of production of knowledge. In the absence of a clear definition of knowledge (as much as of meaning and concepts) both parties tacitly endorse a commonsensical concept of knowledge as an entity or a thing, identical to its form of incarnation, which, for the neoliberal theorists accumulates and grows by itself, while for the other party it accumulates and grows in the subject of knowledge (the mind, the general intellect, the multitude, etc.).

In what follows, engaging in a critical discussion with cognitive capitalism theorists, particularly in relation to their (tacit) theory of knowledge, I aim to provide a conception of knowledge on the basis of Evald Ilyenkov's concept of the "ideal". I also aim to show how questions concerning epistemology and nature of knowledge are not pure "philosophical" questions, but are constituents of a conceptual totality encompassing (critique of) political economy, politics, society and nature as much as conceptualization of knowledge and forms of subjectivity.

Schematically, cognitive capitalism critiques concerning knowledge proceed as follows: with digitalization, computerization and the prevalence of the production of immaterial com-

modities and immaterial labour, the nature of knowledge changes. Accordingly, the sophistication of the process of knowledge-production amounts to capital's inability to command the production process that is followed by its incapability to appropriate the produced surplus-knowledge. With digitalization and the consequent immaterialization of labour through deployment of computers and software, the process of the production of immaterial commodities surpasses the boundaries of specific workshops and factories, and the whole production expands into society. Hence, knowledge is produced now as commons. Through such conceptualization, and in the absence of a clear definition of knowledge, cognitive capitalist critiques recapitulate what Patrick Murray calls "productivism" or "use-value romanticism" (2016, 313), a position that dismisses the fact that production for the sake of production is a shadow form of capital and that capital's drive for enhancing productivity is not projected toward producing wealth in general but producing and extracting more surplus-value.

Shortly put, such a conceptualization of knowledge facilitates the assertion that "immaterially" produced knowledge is not subject to the determinations of the capitalist relations of production and thus, unlike the ideal that carries the mark of historically specific social forms of production, general intellect is independent of these relations. Hence, Vercellone's claim that "in cognitive-labour-producing knowledge, the result of labour remains incorporated in the brain of the worker and is thus inseparable from her person" (2007, 33). This is a dubious proposition. Many cognitive products are the result of joint efforts of and cooperation between a large number of cognitive labourers. Furthermore, it has always been the case that skills and capabilities (knowledge, if you wish) of workers stay 'in' them. This inseparability by itself is an evidence of the "materiality,"[1] rather than "immateriality," of knowledge, cognition and knowledge-production. However, this capability as a potentiality can only been realized within the metabolic relation with social nature. Knowledge does not reside in someone's head, brain or mind. It is realized only within the social universe. In Vercellone's account, immaterial or cognitive knowledge is abstract and thus mental, in someone's head – note

1. It is important to note that "materiality" here does not signify a "substance," say, "matter," in contrast to some "immaterial" or "incorporeal" substance, say, idea or mind. Rather, it signifies the dependence of the emergence of any artefact, physical or non-physical, on human activity and its "material" conditions. Furthermore, physicality and ideality are not mutually exclusive; a painting is ideal as much as it is physical/material, so is a sculpture or a composition. One aspect that is tacitly subject to criticism in this paper is such a presumed dichotomy between the "material" (physical) and the 'ideal' (incorporeal) as much as the duality between the "abstract" and the "concrete". For a succinct introduction of the problem of the relation between the "material" and the "ideal" see Ilyenkov (2012, 149–56).

that Vercellone's identification of abstract and mental is quite commonsensical; it is something that can be produced in the head through, say, some soundless inner speech; hence, it is not subject to the social form of production.[2]

Vercellone divides capitalism into stages of formal subsumption, real subsumption and the General Intellect. In the first stage, knowledge is equal to something in the craftsperson and thus material as much as his labour; it is this materiality that yields its subsumption under capital because material knowledge is alienable from the knowing subject. In the second stage, this alienated accumulated knowledge takes the form of machinery, thanks to the technoscientific revolution, to be deployed in the production process; due to the "materiality" of the machinery as accumulated alienated knowledge, the capitalist has the capacity to control knowledge. In the final stage, the circle is completed and, once again due to inalienability of knowledge from the knowing subject (multitude), the process of knowledge-production (and the whole sphere of production of cognitive commodities) escapes the reach and control of capital (see Vercellone 2007).

With the completion of the circle, we allegedly arrive at what Marazzi (2005) names "anthropogenic capitalism," where the living labour plays the dual role of containing both fixed and variable capitals (quoted in Pasquinelli 2011, 16). Accordingly, (dead) knowledge is considered as something in the head, mind, body, etc. of the knowledge-worker and it is in their own head, mind or body that the living knowledge-worker works with and on this dead-knowledge to produce surplus-knowledge. "In the hypothesis of cognitive capitalism, fixed capital, i.e. machinery, is absorbed by variable capital, i.e. workers" (Pasquinelli 2011, 17); thus (dead) knowledge accumulates in the cognitive worker's head.

The idea of the absorption of fixed capital by variable capital is based on equalizing knowledge with information or data that can be stored in some internal or external hard drive – in this case the worker's brain. Pasquinelli affirmatively quotes Alexander Galloway (2004) stating that "code is the only language that is executable," concluding that "[it] is a machine to convert meaning into action" (quoted in 2011, 20). However, this is not a novelty:

2. In a similar vein, Gigi Roggero (2011) quotes sympathetically Albert Chang, a programmer at an Indian company, who has witnessed in less than a decade many multinational computer companies that vanished overnight, stating that "'my knowledge will go with me' ... 'It won't be transferred by anyone else'" (103–104). This quotation succinctly manifests the core of Roggero's understanding of knowledge. Surely, one's "knowledge" does go with them but only as a potential, as a capability to produce new knowledge. Moreover, the whole process of digitalization and automation of the algorithmic part of thinking processes and of production of knowledge makes the immaterial labourer less valuable and leaves them with the option of complying with worse working conditions.

meaning has always been convertible into action; in this sense, human language is, by definition, "executable". It is so because the relation between thinking and reality is one of mutual transformation of the material into the ideal and that of the ideal into material, which in its turn is a showcase of reality of thinking. Pasquinelli's fascination with codes and the claim that their appearance qualitatively transforms the nature of knowledge is based on identifying thinking, meaning and knowledge in general with their forms of incarnation. Ignoring that knowledge appears only within the actual relation between the knowing subject and the social environment, Pasquinelli conceives of knowledge as a thing by itself that accumulates and grows with the expansion of data/information. However, under capitalism, as a social relation with a specific historical form, accumulation of knowledge, like that of capital, signifies continuous reconstitution and expansion of the conditions of valorization: the separation of knowledge-producers from the means of knowledge-production, particularly in the case of institutionally produced knowledge, and the appropriation of surplus-knowledge in general by capital.

Theorists of cognitive capitalism tacitly endorse the mainstream account of knowledge as a "thing" alongside other things – a fetish. Such a (lack of) conceptualization contributes to justifying the claim that Marx's proposed law of value is obsolete with regard to production of new knowledge, cognitive products and immaterial labour. In this account, knowledge is not an ideal that is socially significant, that can only emerge in the social realm and is in need of social validation, but is a thing or property, some formulae, data or algorithm residing in heads/minds or incorporated in tools and machines. Such fetishistic account has its parallel in these theorists' treatment of the concept of value (Pitts 2016), as a thing by itself, a property intrinsic to commodities, which will be discussed further in this chapter.

Understanding the "revolutionary" impact of digitalization on the process of knowledge-production requires a proper conceptualization of knowledge as the product of knowledge-producing activity, the social form of this activity as well as its forms of organization and the methods and means that mediate the actualization of this social form with knowledge-production being a specific sphere of capitalist production. Knowledge is not mere information that is transmitted via different media, from hard copy books and articles to digitally reproduced information or data sets; these latter can be considered as sets of directives or guides to action – they are manuals that are of use only to the living knowing agents; in and by themselves they contain no knowledge any more than a script in an unknown language may contain for those not capable of deciphering it. In short, knowledge is inseparable from the knowing activity of the knowing subject.

In what follows, first, the social relations of production, which determine the historically specific social form of knowledge-production, will be analyzed. Additionally, forms of subsumption of knowledge-producing activity under and its appropriation by capital is in need of consideration as knowledge-producing activity, and, as Wolfgang Lefevre (2005) demonstrates, scientific knowledge-production in particular, is a specific form of labour. Secondly, since labour process is also the process of valorization, to properly conceptualize knowledge and its process of production, the means of knowledge-production – as constant capital – will be analyzed and conceived of not as mere things but as the materialization of the social relations of production. Thirdly, knowledge will be conceptualized as an "ideal" that emerges within the metabolic relation between human being and social nature. It will be argued that the historically specific form of knowledge and the process of its production is the result of the specific form of human activity in capitalist mode of production; hence the emergence of knowledge as a cognitive commodity and the capitalization of the process of knowledge-production from education to research and development activities. Fourthly, the impact of digitalization as a new form of machinization-industrialization of the process of knowledge-production will be analyzed. It will be discussed that the consequent "revolutionization" of the process of knowledge-production further strengthens the command of capital over knowledge-producing labour not only when they enter into an exchange relation that renders labour "productive," but also in the spheres where knowledge-producing labour is not in a wage relation with capital and hence it is "unproductive". The chapter will then finish with some concluding remarks.

## Relations of (Knowledge)-Production

Social relations are internal to the process of scientific knowledge-production. These relations are not epiphenomenal factors affecting the process of knowledge-production from without. As Lefevre notes, "science is shaped by social relations not only externally, but also in its essential structures, the epistemic ones included" (2005, 205). These social relations are not mere one-to-one social interactions between abstract individuals; they make sense and are constituted within the framework of social division of labour; the relations between individuals are rather socially mediated. This means that: 1. The social form of production of (scientific) knowledge coincides with the social form of "material" production; 2. The dominant scientific "mind" coincides with the dominant mind (not merely "ideology," as it is usually understood as false consciousness but as the form of thinking and cognition); 3. Science is subject to the same regime

of production and property: immediate knowledge-producers are separated (and kept separated) from the means of scientific knowledge-production. Furthermore, all spheres of knowledge-production, scientific as well as general, are subject to forms of subsumption under capital.

Marx inherits the term subsumption from classical German philosophy; however, he reworks it as a novel concept. In the German idealist tradition, "subsumption" signifies the relation between the particular and the general; once the particular is brought under its universal, it is subsumed under its own concept. With Hegel, this merely formal movement is transformed into the appearance of the "concrete universal" in particulars meaning that the relation between the universal and the particular is mediated by these particulars (Endnotes 2010, 4); the universal is present in the particular in a way that the particular simultaneously is and is not the universal. In Marx's critique of capitalist relations, value appears as the abstract universal subsuming the particular labours (concrete universals) under itself (Endnote 2010, 6).

Subsumption of labour under capital signifies the subordination of the labour process to the valorization process. To this end, capital initially subordinates labour formally, meaning that although capital does not transform the technical and material form of production process, it commands over labour by transforming it into wage labour: "formal subsumption assumes that labour takes the specific social form of 'free' wage labour and that wealth is generally in the commodity form" (Murray 2016, 304). With the formal subsumption of labour under capital, a new form of supremacy replaces previous patriarchal, religious and political forms of domination; capital commands labour for the simple reason that it owns the factors of production and the labourer is separated from these and the means of subsistence.

The formal subsumption of labour is logically followed by the real subsumption of labour under capital: with real subsumption the process of production is transformed materially in order to be organized more adequately to capitalist production and the goal of producing more surplus-value. With the introduction of the methods and means of extraction of more surplus-value, the productivity of labour is enhanced drastically: such means include cooperation, manufacturing and machinery and large-scale industry (See Marx 1992, chapters 13–15; Murray 2016, 302–10). With the introduction of machinery, science appears as a force of capital not merely due to its "application" to the production process, but because in a more universal sense, the objects of science are provided by industry and the social form of production; science sprouts from the necessities put forward by capital as a social relation – capital's self-valorization process. The capitalist can control

and lead the production process not because he has the knowledge to do so but for the simple reason that he is a capitalist. As Murray, following Marx, argues, "capitalist is not a generic leader: 'as a specific function of capital, the directing function acquires its own special characteristics'. These special characteristics stem from the specific social form and purpose of the capitalist mode of production" (2016, 3012).

There are two other forms of subsumption that Marx names in passing in Capital, which have been worked out by Patrick Murray (see, for example, 2016): hybrid and ideal. With formal and real subsumption, capital gains full command over the labour process; with hybrid subsumption, there is neither a direct compulsion on the producer nor has the producer been formally subsumed under capital. The command over the labour process means constituting the labour process as the process of production of surplus-value. Such an aim, conceptually-logically speaking, is indifferent toward the physical form of organization of labour.

With the spread of capitalism and the prevalence of the commodity form and wage labour, the latter "predominate even where commodity is not commodity-capital and wage labour is not directly surplus-value-producing labour" (Murray 2016, 315). Thus, formal and real subsumption of labour under capital facilitate capital's hybrid or transitional subsumption of "unproductive" labours.

Ideal subsumption involves considering the labour that is not subsumed under capital either formally or in hybrid ways as if it were; it is subsumption in the mode of as-if.[3] Murray enumerates three types of ideal subsumption: 1. ideal subsumption of pre-capitalist formations; 2. ideal subsumption of non-capitalist spheres of production that exist alongside capitalist production; 3. Ideal subsumption within capitalist firms (2016, 316–17). I contend that it is through the second type that capital appropriates the surplus-knowledge and surplus-meaning that is produced by citizen-scientists through such spheres that are not in a wage relationship with capital nor their "products" sold to capital – providing data through the use of digital platforms such as the Internet that contributes to mapping the behaviours of potential consumers or enhancing the precision of AI machines are among the spheres that are subsumed under capital ideally.

To the extent that the social mode of production is involved, at a more abstract (indeterminate) level, subsumption of scientific labour under capital may be considered in terms of deployed techno-scientific devices; accordingly, the organization of scientific labour will be a function of the material means of production put at work,

3. Elsewhere, Murray also elaborates on Marx's notion of "non-formal subsumption". Non-formal subsumption is the subsumption of some product, which have never taken on the value form, never been sold, under capital (Murray 2009, 174).

especially in experimental research (Lefevre 2005, 211). Accordingly, the introduction of new social infrastructure, means of communication such as scientific periodicals and large-scale machinery, say, electron accelerators, the deployment of which amounts to the formation of the "factory laboratory", determine the character of the process of scientific knowledge-production (Lefevre 2005, 211–213). Therefore, as in the case of the general labour process, the introduction of new means of production 'alters' the ways labour is integrated into the process of production within a specific form.

However, I argue, by themselves, such technical changes are not sufficient in explaining the transformation of the social form of the relations of production. For instance, the introduction of newer means of communication, say the Internet and digital technology, might contribute to forming common convictions among larger number of scientists. However, by themselves they will not change the form of production of knowledge as much as forms of cognition and epistemology. What is decisive is forms of cooperation, of which Marx and Engels speak in The German Ideology, which in their turn depend on forms of organization and the corresponding mode of production of a social formation (Marx 1976, 43)[4] – thus, the coincidence of the dominant, socially produced mind and the form of production. It is true that "the forms of cooperation and communication among scientists and, along with this, the relations between experimental research and the formation of shared understandings, thus prove to be highly dependent on the instruments used in the research process" (Lefevre 2005, 213–214). This may be so because in a general sense, every tool, due to its ideality, imposes specific forms of action on the community of agents deploying the tool. However, this is only an abstraction as the deployment of the tool is not independent from the "immediate" material objective and the totality of social relations that determine the choice of that very objective.

In this account the end (goal) of knowledge-productive activity yields new means, which in turn gives way to new ends and so on and so forth, with knowledge being conceived of as employing means in a given way, which serves achieving the goal set by the question at hand. The knowledge that is produced via deploying these means always contains a surplus as, similar to any form of production, humans always produce more knowledge with the means than was necessary for their production (Lefevre 2005, 215). This aspect should be considered in relation to Marx's analysis of production and appropriation (exploitation) of surplus-value.

4. Cooperation, according to Marx and Engels, is one of the four moments or aspects of the primary historical process. Accordingly, "a certain mode of production, or industrial stage, is always combined with a certain mode of cooperation, or social stage, and this mode of cooperation is itself a "productive force"" (1976, 43).

The knowledge that is materialized (reified) in an instrument of (knowledge-producing) labour cannot become actualized unless it is put in motion in the actual process of labour, i.e. the source of any knowledge, after all, is living labour/knowledge. The amount of the knowledge that is transferred from a particular means to the end, i.e. the object-knowledge produced, cannot exceed what is already materialized in the means. What is decisive is the form of production of surplus and its corresponding form of appropriation. The dependence of modern, and to a much greater extent, contemporary scientific knowledge-production on large scale scientific machinery is the form of actualization of capitalist mode of knowledge-producing. It is in this sense that the form of produced and to-be-appropriated surplus-knowledge depends on the means of production of knowledge. Furthermore, introducing such machinery renders scientific activity measurable, meaning that it mediates the subsumption of knowledge-producing labour under abstract time (of capital) and subjects it to the law of value. It further intensifies the rate of production and exploitation of surplus-value/surplus-knowledge; hence, the subjection of (scientific) knowledge-production to the capitalist form of production, which is inseparable from the bourgeois property regime.

It is also worth noting that the machinery of scientific knowledge-production includes not only physical means deployed for the sake of observation and experimentation, but also languages, sign systems, systems of representation and methods of investigation that are usually considered as mere externalizations of thought with their materiality being disregarded (Lefevre 2005, 216). As Vygotsky puts it, "a theory of method is, of course, the production of means of production, to take a comparison from the field of industry ... the production of means of production ... forms part of the general process of production and itself depends upon the same methods and tools of production as all other production" (1997, 253). Such produced technologies are indispensable constituents of scientific thinking without which knowledge-production is rendered impossible. In and by themselves, like every tool, these are cognitive artefacts enhancing knowledge-producing activity. Under capitalism, and within the capitalist process of production, that of knowledge included, these artefacts are transubstantiated into machinery as means of production; hence, the aforementioned internal determination of essential epistemic structure of scientific knowledge-production and its subsumption under capital.

## Machines

Machinery under capitalism, according to Marx, and in contrast to John Stuart Mill's contention, is not a means to lighten toil, but an instrument to increase productivity of labour, to reduce the prices

of commodities and consequently to shorten the necessary portion of labour day in favour of its surplus part: "the machine is a means for producing surplus-value'" (Marx 1992, 492). The machinery is the material mode of existence of capital-relation in form of instruments of labour. Its introduction is due to the natural limits of the working day; the machine is the instrument of intensification of the time of production and thus functions as the means to subsume the worker under the abstract time and striking them down.

From a "technical" or mechanical point of view, machinery may be considered a combination of simpler tools and, inversely, a tool a simple machine. Yet, from the viewpoint of the critique of political economy this is not the case since the technical viewpoint disregards the historical element (Marx 1992, 492–93), that is, the social form of production that is responsible for the emergence of the instrument of production as machine.

The machine, generally speaking, consists of three parts: the motive part, the transmitter and the tooling part; these parts are different from each other in essence (Marx 1992, 494). It is not of importance if the motive power of the machine is a human being, a mule or an electrical engine, nor is it important if the tooling part consists of former tools of handicraft or newly invented tools. Although machines are technically advanced, it is not the technological development that yields machines and revolutionizes the industry; to the contrary, it is the industrial revolution and the invention of the machine as the materialization of the capitalist social form of production that necessitates technological advancement. The motive power of the machine is accidental (Marx 1992, 496-97) to its being the specific tool of capitalist production, the ultimate goal of which is increasing the productivity of labour and exploitation of surplus-value. Owing to the social form of the relations of production, a tool as "simple" as a hammer, to the extent that it functions as the means of production of surplus-value, may be considered a component of a "complex system of machinery". The same may hold regarding deployment of any device, mechanical or digital, or a "managerial" technique that enhances productivity – such devices and techniques are part of the complex system of machinery that aims for increasing the production and exploitation of surplus-value.

Therefore, the distinctive aspect of machinery deployed in the process of production is not mere deskilling of the labourer, as, say, Vercellone (2014), among others, claims. In Vercellone's account, with the advent of capitalism and the industrial revolution, subsumption of labour under capital was realized through stripping labour from its cognitive dimension and turning it into mechanical, repetitive activity. At the present, with labour becoming "cognitive" by and large, the Fordist model is in crisis

because in the process of the organisation of labour "a new type of knowledge, situated on the most developed level of the technical and social division of labour, will always tend to emerge", which in its turn amounts to the emergence of "diffuse intellectuality" and a "dissolution of capitalism qua the form dominating production'" (2014, 420). In Vercellone's view, labour is subsumed under capital and becomes surplus-value producing labour because it has been reduced to mechanical, repetitive labour – only material labour, whatever the term "material'" denotes, is capable of producing value. Accordingly, labour's real subsumption under capital is due to its mechanization.[5]

Contrarily, in Marx's account, it is the social form of labour that yields real subsumption of labour under capital; that is the reason why, for instance, capitalist "cooperation", even at the level of manufacturing, is considered by Marx a means of real subsumption of labour under capital, which in its turn signifies the production of relative surplus-value (see Marx 1992, 439). With cooperation, labour assumes a socially average character due to the large number of workers employed in one field. The work of each worker diverges from the "average" social work – some exceeds beyond it and some stays lower than it. Yet, different quantities compensate for each other. Thus, writes Marx, "the law of valorization therefore comes fully into its own for the individual producer only when he produces as a capitalist and employs a number of workers simultaneously, i.e. when from the outset he sets in motion labour of a socially average character" (1992, 441, emphasis added), because value is determined by average social time required for the reproduction of commodities. That Vercellone (2007) considers manufacturing and cooperation as distinctive features of the "stage of formal subsumption" and production of absolute surplus-value is further evidence that he considers technical development and mechanization the necessary conditions of specifically capitalist production.

According to Vercellone, Fordism is characterized by the polarization of manual and intellectual labour, a consequent hegemony of the knowledge embodied in the means of production and managerial techniques, the centrality of material labour as the fundamental source of extraction of surplus-value and the strategic role of machinery (2014, 427). In contrast, at the age of cognitive capitalism, "the principal source of value now lies in the knowledge set in motion by living labour and not in material resources or ma-

5. Elsewhere, Vercellone states, "until the arrival of the mechanisation of the process of production, the system of 'concentrated manufacture' experienced only a weak development and the merchant entrepreneur, rather than turning himself into a captain of industry, continued to privilege the model of the putting-out system" (2007, 22).

terial labour" with "living labour now perform[ing] a large number of the central functions once performed by fixed capital" (2014, 433). Accordingly, due to the texture of this particular product – knowledge – the cognitive labour producing it falls outside the boundaries of "material labour", which amounts to the blurring of the borderlines between work and non-work (2014, 437) and obsolescence of labour-time as the measure of quantification or work (2014, 438).

The closest Vercellone comes to providing a definition of knowledge is when he states that "knowledge and education are nothing but the means of expression and creation of labour. These are subjective conditions of production that characterise the use-value of labour-power" (2007, 32). Although unclear, this definition implies that education is a constituent of knowledge and a means of creation of labour. Knowledge is a means of expression of labour characterizing the use-value of labour-power, which means that it is a factor in determining the productivity of labour. However, this is as much as true for the alleged periods of formal and real subsumption that Vercellone proposes as it is for the stage of cognitive capitalism; thus, based upon this definition, no clear borderline can be drawn between these "stages".

According to Vercellone,

> differently from the practical knowledges of the old craftsmen, the living knowledges of diffuse intellectuality today cannot be "expropriated" by a deepening of the Smithian logic of the division of labour that found its summit in Taylorist and Fordist principles of organisation of labour. Such a type of expropriation could not be effected other than at the price of a lowering of the general level of education of the workforce, a level which is recognised to be the source of the wealth of nations and the competitiveness of enterprises. (2007, 33)

The knowledge of the old craftsman is considered "practical", a "know-how" that facilitates its expropriation. In Vercellone's view, this is because certain tasks which traditionally required material labour have now become transferable to machines. Contrarily, the knowledge of "diffuse intellectuality" cannot be transferred into machines, because it is diffused and "immaterial"; it is theoretical, it is a form of "know-that". However, several spheres of "material" production are as "diffused" as "immaterial" production as they require a sophisticated form of cooperation between large numbers of labourers. That there are a large number of people with different tasks involved in the process of producing certain commodities does not make this process immune to the command of capital. Moreover, the command of capital over the process of production does not require that the capitalists or the managers

know about the process of production or the knowledge (scientific knowledge included) involved in the production process. As Steinhoff (2021) notes, "just because management cannot dictate precisely how to do AI work does not mean it cannot control it. The decentralization of control is still control. In the context of the AI industry, cooperation is still directed by capital" (214). Furthermore, with the advent of digital machinery, computers and the AI, many of the algorithmic tasks in the process of production of immaterial commodities as well as machine learning are being transferred to machines and automated (Steinhoff 2021, 189–195). This process follows the logic of capital that inevitably and continuously enhances the productivity of labour at a pace much higher than introduction of machinery at the stage of large industry capitalism.

Ironically, the cognitive capitalism theorists' conception of the relation between knowledge-production and the automation of production in general mirrors the fantasy of the perpetually working machine: the latter is haunted by the illusion of self-expanding value, the former is haunted by the image of self-growing knowledge. Accordingly, it is the knowledge separated from the living labour and incorporated in the machine that commands and subsumes the worker; the command of capital over the worker is a consequence of the former; whereas for Marx, it is capital that commands and subsumes labour and it is due to this subsumption that productive powers of labour as much as knowledge and science appear as productive powers of capital. As Marx notes,

> since – within the process of production – living labour has already been absorbed into capital, all the social productive forces of labour appear as the productive forces of capital, as intrinsic attributes of capital, just as in the case of money, the creative power of labour had seemed to possess the qualities of a thing. What was true of money is even truer of capital. (1992, 1052)

Labour-power as the capacity to labour, of which scientific labour is a subset, has always been inseparable from the labourer; such inseparability is not unique to "scientific research or software

Development", let alone the fact that knowledge-producing labour is in need of crystallization in form of cognitive products such as scientific laws or software. That knowledge as a capacity is inseparable from the knowledge-producer does not mean that it resides in their brain; this would be like claiming that a musical piece is in the composer's head/brain/mind or a novel in a writer's. Vercellone conflates a capacity (labour-power, in this case cognitive labour-power) with the product that is the incarnation of that capacity. That a product of labour is not "material"

but an ideal does not make it a non-commodity – a commodity may satisfy a need arising from stomach as much as imagination. A product appears as a commodity because it is produced as one and, as already has been discussed, it is the social form of production that is responsible for commodification of products; "immateriality" of labour does not prevent the commodification of "intellectual" labour-power.

Capital is not a thing but a social relation, meaning that what is produced and accumulated in the process of production of commodities as bearers of value is the capitalist relations of production, the core of which is the separation of the immediate producers from the means of production, regardless of the particular sphere of productive activity. This is particularly the case in the sphere of scientific knowledge-production where large amounts of capital are required. Although, as Lefevre notes, the open-endedness of scientific research and the knowledge-production process (not all research succeeds in arriving its set goals and sought production) and the immense infrastructure needed to conduct such activity, may set a limit to the control of the scientific knowledge-production process (risks pushes private enterprises to invest less in such areas) and requires public funding of such projects (Lefevre 2005, 197), under capitalist relations of production such public investments function as a means for transferring public funds to the private sector and subsuming scientific knowledge-production under capital and a method of appropriation of the produced surplus-knowledge by capital (Arboledas-Lérida 2020, 250; Azeri 2019, 592; Smith 2009b, 208), just as Vercellone's celebrated 'blurring of the borderlines between work and non-work' is yet another method of appropriation of the produced surplus-knowledge for free.

Scientific labour is not a playful activity; to the contrary, "like ordinary labor, [it consists] of exhausting and boring routine operations that apply materials and instruments as effectively and economically as possible" (Lefevre 2005, 218). Cognitive production, particularly scientific knowledge-production, is almost impossible without access to means of knowledge-production. Exclusion from production sites such as labs, research centers, universities and equipment largely hinders a person's capacity to produce any cognitive products just as is the case with the production of physical commodities. An unemployed person, surely, is capable to produce, they will not lose their potential to produces utilities; in certain cases they can even mobilize their useful labour. However, it is impossible for one to subsist when completely excluded from the circuit of production. Vercellone's image of cognitive production is not only distorted, but also simplistic.

It goes without saying that machinery (fixed capital) has always been put in motion by living labour: machines never produce (sur-

plus)-knowledge, true, and thus are in need of "living knowledge". But it is as truer that machines do not produce (surplus)-value and should be set in motion by living labour; this situation, contrary to Vercellone's view, is not unique to the age of "cognitive capitalism". A machine that is not deployed by living labour and stands idle will fall prey to the forces of nature; it will rust and rot. Furthermore, machines have never been the source of (surplus)-value; they cannot pass more than the value materialized in them into the new products; the source of value is living labour; the same goes for production of genuinely new knowledge. It is in anticipating such formulations as Vercellone's that Marx states,

> the transposition of the social productivity of labour into the material attributes of capital is so firmly entrenched in people's minds that the advantages of machinery, the use of science, invention, etc. are necessarily conceived in this alienated form, so that all these things are deemed to be the attributes of capital. The basis for this is (1) the form in which objects appear in the framework of capitalist production and hence in the minds of those caught up in that mode of production; (2) the historical fact that this development first occurs in capitalism, in contrast to earlier modes of production, and so its contradictory character appears to be an integral part of it. (1992, 1058)

All in all, it seems that for Vercellone (and other proponents of cognitive capitalism theory) the alleged immeasurability of cognitive labour is an essential aspect of such a labour, which follows from its "nature" and that of its products (knowledge) – the immateriality of cognitive labour and cognitive commodities – that immunizes them from being commoditized. Similarly, what is responsible for the commodification of products of manual labour is their physicality/corporeality (material/materiality) and not the social form of production.

## What is Knowledge?

Two fundamental assumptions/dogmas of mainstream epistemology are its mentalism and ahistrocity/asociality. Accordingly, the knowledge-producing mind is independent of body and knowledge-production is independent of society (thus, independent of the social form of production). However, as Guglielmo Carchedi states, "knowledge is the result of the activity of labor power and not only of the mind, brains" (2005, 272). Thus, the process of knowledge-production as a labour process always involves both material (bodily) and immaterial (mental) powers; the material and the mental and their corresponding transformations can be separated only analytically, only in the abstract. In a similar vein, the products

of labour can be analytically separated into material and mental/cognitive in correspondence to the dominant aspect (material or mental) in a specific labour process, with social validation being the determining factor in positing a product as material or mental (Carchedi 2005,272-73).

Resolving the aforementioned problems and a comprehensive analysis of the effects of digitalization on the process of knowledge-production requires, as indicated above, answering the question what knowledge is. From the mainstream epistemological point of view, knowledge is an attitude, a belief, albeit "justified" and "true", or at best a "worldview" or a correct "image" of the world. Similarly, scientific knowledge in this view is reduced to a coherent bulk of belief-propositions. This conceptualization is parallel to the aforementioned two epistemological dogmas and is rooted in the tacit commonsensical empiricist view of knowledge as a result of observation/contemplation. In this view, knowledge is a thing among and alongside other things, something that is to be later "applied" to reality once acquired. However, as Ilyenkov aptly formulates, "if knowledge is in need of application it is pseudo-knowledge because knowledge is always that of particular objects" (2007, 76), be it a pickaxe or a galaxy several thousand light years away.

Knowledge is not a bulk of propositions or informative statements, but an activity inseparable from the knowing subject – with the knowing subject being not the mere, abstract "individual" but "social humanity". Knowledge is the socio-historically specific human activity of "appropriating" nature; it is realized/actualized at the line of contact between human and social nature; it is the metabolic exchange between humans and nature that amounts to socializing nature and naturalizing humans. Hence, the source of its objectivity and its independence from particular individuals is the objectivity of the form of human activity that is realized in objects, which, in turn, determines the form of human activity. In other words, the source of objectivity of knowledge, its externality to particular individuals is its "ideality". Objectivity of knowledge, its object-relatedness, means that genuine knowledge is understanding the object of knowledge independently, that is, "to deal with each object intelligently" (Ilyenkov 2007, 76). Understanding as genuine thinking, "is really functioning knowledge" (Ilyenkov 2007, 76). Hence, we arrive at the question of the reality of thinking – its "this-sidedness" that Marx formulates in the *Theses on Feuerbach*:

> The question whether objective [*gegenständliche*] truth can be attributed to human thinking is not a question of theory but is a practical question. Man must prove the truth – i.e. the reality and power, the this-sidedness [*Diesseitigkeit*] of his thinking, in practice. The

> dispute over the reality or non-reality of thinking that is isolated from practice is a purely scholastic question. (Marx 1976, 3)

What is problematized here is what Ilyenkov defines as the process of transformation of thought into reality and of reality into thought, a movement that only dialectical logic is capable of explaining –the third term (the middle term), of which thinking and reality are modifications. Thus, writes Ilyenkov, "in what special 'space' can they [thought and reality] be contrasted, compared, and distinguished? Do we really have here that third term in which they are one and the same despite all of their immediately obvious differences?" (1997, 8).

Thought and extension, in this view, are not two substances but are two attributes of the same substance: "neither extension nor thought is an independently existing object. They are only aspects, forms of manifestation, modes of existence of ... real infinite nature" (Ilyenkov 1997, 9–10). There is no "extension as such" but only as an abstraction; neither is there "thinking as such". Extension as such is pure void or nothingness, and thought as such is incapable of determining or delimiting anything, including itself. Ilyenkov thus defines thought as "a completely spatially expressed action of this [nature's] body" (1997, 10) – thought is the spatial activity of the thinking body. The thinking activity of the thinking body has an objective character because it is the ability to handle an object intelligently; genuine thinking, which yields knowledge, is to treat the object of knowledge in concordance with the rules dictated by the nature of the object and not with one's own mere fantasies. Therefore, thinking and knowing are object-oriented and tool-mediated. It is in this sense that there is no "knowing"/"knowledge" in general; knowledge is always the knowledge of handling/deploying particular objects (objectivities) intelligently.

Objectivity or the object-relatedness of thinking does not mean its subsumption under rules of an alien nature. As Ilyenkov formulates it,

> thinking body's rational understanding of the general laws of its own behavior within the natural whole, its understanding of the mode of its action within nature and its understanding of nature's bodies. In giving itself a rational account of what it does and how it really does it, a thinking body at the same time forms a true idea of the object of its activity. (1997, 15)

Activity is a middle-term, a basic explanatory category that clarifies the relation between subject and object, thinking and being or mind and world. "The law of nature is the law of human activity in nature; it is mediated by substance-nature; it is through this mediation, of which the thinking body's activity (thinking included) and

matter are two necessary attributes, that the form of thinking-activity coincides with the form of material existence, notwithstanding the specific socio-historical mode of this activity" (Azeri 2021, 30).

The inseparability of the ideal from the *form* of human activity, with labour being its specific mode and highest form, signifies the sociality of the ideal; the ideal emerges in the social process of labour and marks nature with the form of human activity. Stamped by the form of human activity – the ideal – nature acquires a new form of existence as social nature – social nature is ideal nature. Furthermore, the ideal emerges only in society and in social nature; out of society there exists no ideal. Hence, as the form of activity, the ideal has a historically specific form meaning that the form of activity, the ideal, is determined by the historically specific form of the relations of production. From this follows the normativity of the ideal and the rational rather than causal determination of forms of actions and thinking by it. The normativity of the ideal, in its turn, is the manifestation of its independence from individuals and their particular act of thinking – the ideal has an independent social existence.

Concepts, which are essential elements of knowing activity and knowledge production, are ideal reconstructions of the "concrete", where the latter, in Marx's words, "is the concentration of many determinations, hence unity of the diverse" (1992, 101). As genuine thought, true concepts are comparable to the form of things (objects). Concepts are carriers and means of production of the social significance of objects/objectivity – they are ideal means of activity. This aspect of the concept is related to the tool-mediated nature of knowledge (the metabolic exchange between humans and nature) as well as to the socio-historical determination of knowing activity that is bound to the totality of the available tools of action, of which conceptual stockpile is a subset. As Ilyenkov states, "the comparison of a concept with its object is not a comparison of a thing with a thing (as was the case in Feuerbach) but a comparison of the form of man's activity with the product and result of this activity" (1997, 28). In being manifestations of the form of human activity objectivized and thus specific tools, concepts signify the identity between thinking and reality.

Being an ideal, knowledge can be considered at different levels of abstraction. Knowledge can be analyzed as a "cognitive artefact" and thus as a factor that enhances the productivity of labour (with labour being understood abstractly, in its most indeterminate form, as an activity toward production and reproduction of the means of subsistence of human species). Cognitive artefacts are distinguished from artefacts as such in being artificial devices for manipulating information in contrast to latter being means of manipulation of the environment in general. As Donald A. Norman

notes, "artifacts do not actually change an individual's capabilities. Rather, they change the nature of the task performed by the person" (1991, 18). A telescope, for instance, is not a mere aid that enhances the scientists' vision; rather it is a new mode of looking and seeing – it is the historically specific form of vision within a particular context of activity aiming at production of knowledge. What undergoes change is not the organ that performs a particular act, say, seeing; rather it is the form of performance that is drastically changed by and necessitates a new organ of activity (Azeri 2013). Thus, a telescope is not a visual aid; rather, it is the new organ of cognition that sublates the "naked" eye – rather than enhancing the capability of the sense organ, the former turns the latter into a moment of itself.

Viewed from the perspective of the person who deploys an artefact to accomplish a task, not the cognition but the task is changed and thus new things and techniques have to be learned for the realization of the task. In a sense, manipulation of the very artefact adds to, more precisely, replaces, the manipulation of the task to be accomplished by the use of the artefact – the object of manipulating reality at hand becomes one with the object to be manipulated (artefact as the unity of contradictories, not only in the sense of A and ~A, but as truly exclusive poles). This aspect becomes clearer with the introduction of cognitive artefacts such as written language and mathematics: not only do they "amplify" the power of mind (its capability to think), but more importantly they establish a new set of tasks before the subject of activity/knowledge that are not constitutable in their absence. This aspect is interrelated with the ideality of the artefact and its consequent normativity, meaning that it sets new forms of actions (tasks) before the performer deploying the artefact.

At a more determinate and historically concrete level, knowledge can be analyzed as means of production and in terms of the relations of production. In this regard, knowledge-production can be analyzed as the process of production of tools for manipulating objectivity in form of technoscientific devices and as the process of production of the means of knowledge-production such as cognitive artefacts and conceptual systems (Vygotsky 1997). In this regard, knowledge-production should be analyzed, as has already been done above, in the framework of the historically specific relations of production and the continuous reproduction of property relations (separation of the producers from the means of production).

## Digitalization

For some critiques, the revolutionary aspect of digitalization of (knowledge)-production is its contribution to the constitution of "knowledge-based" industries and economies which mostly rely

on "abstract knowledge" – scientific knowledge included – as the primary productive force that renders manual, "repetitive and compartmentalized" labour residual (Virno 1996, 266), which in its turn depends on "immaterial labour" "that produces the informational and cultural content of the commodity" (Lazzarato 1996, 133). This alleged qualitative transformation of labour amounts to the emergence of "mass intellectuality" (Lazzarato 1996, 134). Accordingly, with the advent of mass intellectuality, both the organization and management of the workforce and the role and function of intellectuals undergo dramatic changes.

According to Lazzarato, this situation yields new managerial techniques as now workers are expected to be in charge of controlling and motivating themselves in the process of production, meaning that they act as their own foreman. This allegedly new circumstance amounts to a double problem: the management is pushed to admit the autonomy and freedom of labour to facilitate its cooperation in the process of work while necessarily resisting sharing power with labour – a condition implied by the quality of this new labour and its form of organization (Lazzarato 1996, 136). However, as Steinhoff notes, large investment of capital in digital and AI industry renders the claim about separation of workers from capital implausible while AI and similar industries are under the control of oligopoly of knowledge-producing firms (2021, 209). Hence, as argued earlier, the determination of forms of cooperation in the AI industry by capital.

Capitalist cooperation and discipline, despite having technically determined aspects, are fundamentally constituted by the universal goal of valorization of capital as the axis around which all capitalist production is organized. Lazzarato's implicit assumption is that in the Fordist era, workers were deprived from their autonomy and subjectivity and made into automatons deployed by machines as the materialized form of dominant intellect. Whereas, in the post-Fordist era, capitalists have to admit workers' (even though partial) autonomy.

In reality, however, capital, from the outset and not exclusively in the so-called post-Fordist era, tends to "liberate" labour as its self-valorization movement depends on the "doubly free'" labour.

Freedom of labour is a necessary condition of the commodification of labour-power and thus of production of surplus-value. Hence, Marx's reference to capitalism as the "Eden of the innate rights of man: Freedom, Equality, Property, and Bentham" (1992, 280). The necessity of this dual "liberation" of labour finds its utmost and clearest expression in Kant's notions of autonomy, human dignity and the "kingdom of ends" (1998).[6] The "double

6. "For, all rational beings stand under the law that each of them is to treat himself and all others never merely as means but always at the same time as ends in

problem" that employers allegedly worry about, thus, is a consequence of the double tendency in capitalist relations of production that demands total commodification and yet resists a wholesale commodification due to its dependence on free labour.

Furthermore, Lazzarato argues that immaterial labour as the constituent of this new era of capitalism is distinguished by its redefinition of the relation between consumption and production so that the consumer's act of "consumption should be productive in accordance to the necessary conditions and the new products" (1996, 141). Additionally, in Lazzarato's view another specificity of immaterial labour is that it not only produces commodities but also the capital relation (1996, 143). However, these aspects are far from being unique to so-called cognitive capitalism and "immaterial labour".

First, the notion of "productive consumption'" in contradistinction to "individual consumption" is already present in Marx's analysis of capitalism in *Capital* (see, for instance, volume 1, chapter 23, "Simple Reproduction", 1992, 711–24). Productive consumption signifies consuming labour-power in order to create more value for the capitalist; individual consumption refers to using money for consumption of the individual needs of the worker. Still, to the extent that the reproduction of labour is concerned, even the individual consumption is productive consumption. Thus writes Marx,

> it is the production and reproduction of the capitalist's most indispensable means of production: the worker. The individual consumption of the worker, whether it occurs inside or outside the workshop, inside or outside the labour process, remains an aspect of the production and reproduction of capital, just as the cleaning of machinery does, whether it is done during the labour process or when intervals in that process permit. (1992, 718)

Second, the process of production of surplus-value and self-valorization of capital has always been a process of not only production of mere goods and commodities but more importantly of continuous constitution of capital relations. As Patrick Murray notes, "the wealth produced by the capitalist mode of production is not simply a commodity but rather one pregnant with surplus value" (2009, 173). Accordingly, the generalized commodity form of wealth, the wage form of labour and the capitalist mode of production are inseparable.

Furthermore, the social aim of capitalist production is the production and accumulation of surplus-value, which is inter-

themselves ... A rational being belongs as a member to the kingdom of ends when he gives universal laws in it but is also himself subject to these laws. He belongs to it as sovereign when, as lawgiving, he is not subject to the will of any other" (Kant 1998, 41).

connected with capital being conceived of not as a thing but as a social relation. In the context of capitalist production only the surplus-value-producing labour is considered "productive" (Murray 2009, 174). Capitalism necessarily separates the objective conditions of labour, the means of production, from its subjective factor, that is, labour-power. In other words, labour should have been devoid of means of production so that the labour-power could enter the market as a commodity and produce wealth in the form of surplus-value for capital (see Marx 1992, 716).

Capital as a social relation signifies the social form of capitalist production and not the texture or the material of the commodity-product – the latter is implied by Lazzarato's account of "immaterial labour". Factually, value itself is the most "immaterial" thing that since the advent of capitalism has been being produced by labour – "material" or "immaterial". As Pitts (2016) notes, the concept of "immateriality" that is used by post-operaismo does not go far enough in the sense of addressing and admitting the social existence of value and its dependence on "social validation". I contend that such dismissal of "ideality'" of value has its corresponding conceptualization at the epistemological level.

For the post-operaismo materiality and immateriality correspond to distinct substances reminiscent of Cartesianism. Furthermore, the absence of a proper formulation of the "ideal" leads post-operaismo to a distorted concept of value – the latter being the paradigmatic example of the "ideal" (Ilyenkov 2017). Pitts further argues that "abstract labour does not 'happen', it is not observable"; furthermore, value as the product of abstract labour is indifferent to the particular concrete labours producing particular commodities. "Immaterial labour is and always has been the only capitalist labour" (Pitts 2016, 7); in other words, the only value-producing labour is abstract social labour, which, in its turn is immaterial labour.

What is altered with the introduction of digital technologies in the process of knowledge-production is the intensity and pace of the production process, and productivity of knowledge-producing labour and techniques of subsuming knowledge-producing labour under capital. Dyer-Witheford notes that the implementation of digital technology and the formation of global chains of production require the organizational and financial power that are in reach of large, multinational corporations, meaning that the process of digitalization increases the power and control of capital over labour. Furthermore, he considers digital technologies as the *sine qua non* of value chains (2010, 490–91). The introduction of digital technologies is another method for making human intellect more effective and stronger with the aim of rendering it more productive, where efficiency signifies producing more with fewer

resources while productivity means immediate contribution to the process of self-valorization of capital.

Richard Hall and Bernd Stahl refer to this process of introduction of emergent technologies into the process of knowledge-production as the symbiosis of machines and human labour and machination of human life, which accordingly is related to "Marx's view of the incorporation of labour inside the machinery of capitalist re-production" (2016, 84).

Digitalization and computerization of the process of knowledge-production can be analyzed in at least three interrelated spheres: 1) professional education and training; 2) institutionalized scientific research; 3) informal, everyday sphere that lies out of the boundaries of institutionalized knowledge-production.

Luis Arboledas-Lérida notes that "the scientific branch of division of labour no longer could be subdued to capitalist accumulation just in terms of the content of its work, but also in the form fitting the best into the capitalist organization of production – i.e. turning science itself into another sphere of surplus-value extraction" (2020, 241). Within the process of capitalization of university education (and professional training in general) the academic-scientific labourer is pushed to be a more "efficient" service provider with students being conceived of as clients. Failing to comply with the logic of efficiency means suffering in the market (Hall and Stahl 2016, 69). The introduction of digital technologies, cloud-based learning and distanced education have intensified academic teaching labour by blurring the border between work and leisure time, imposing "flexible" hours of working, transferring some of the burden of teaching onto the shoulders of students and thus pushing instructors to provide services to a larger number of students and teaching more courses.

Thomas Allmer quotes a study indicating that academics work an average of fifty hours per week (2018, 63). Prioritization of efficiency requires the introduction of new machinery, technical or managerial, with the aim of realizing a greater return with setting fewer resources into motion. Among such techniques are the introduction of metrics at different levels and use of new communication and informational technologies facilitating, measuring and controlling efficiency and performativity of academic labourers. An elaborate set of monitoring procedures and metrics exists at universities, including grant income, citation scores, workload models, transparent costing data, research "excellence", student evaluation, employability scores, impact factors and commercial university league tables (Allmer 2018, 64). Hence, the amplification of surplus-value production and rent in the field of education.

Kristian Szadkowski notes that 'academic labour, in many ways, is involved in the reality of capitalist production and accumulation

of surplus value' (2016, 12). Thus, the question is, how is the produced surplus-knowledge appropriated by capital and how do digitalization and AI function as means of its appropriation? Digital technology and the AI are means of accelerating academic labour, and in this sense function as strategies of formal subsumption. However, as means of transformation of knowledge-production through conscious use of sciences (Marx 1992, 1024), they function as strategies of real subsumption of knowledge-producing labour under capital. Szadkowski, following Marx, notes that production for the sake of production, which has dehumanizing effects, is proper to the stage of real subsumption and has its counterpart in academic and scientific production spheres in the form of "publishing just to get published" (2016, 17–18). As Marx notes, the two forms of extraction of surplus-value, that is formal and real subsumption, are co-existing phenomena; the former precedes the latter chrono-*logically*. Digital technology is one of capital's greatest weapons for simultaneous formal and real subsumption of knowledge-producing labour.

Szadkowski also notes that the main objective of capitalist production is producing and extracting surplus-value; to this end, capital seeks techniques to ensure that subsequent products contain the least amount of paid labour vs. the most amount of unpaid labour. Hence, capital's tendency toward appropriating the surplus produced outside the boundaries of capitalist production – the commons. "This is the most 'profitable' activity because the reproduction of the commons is based entirely on the social processes located outside the sphere of direct production" (Szadkowski 2016, 19). Non-formal, hybrid and ideal forms of subsumption are the strategies for such appropriation, which is further facilitated by the implementation of digital technology, as, say, in form of Open Sources that Steinhoff notes in case of data collection and data labeling (2021, 174).

While the intensification of instructing work amounts to formal and real subsumption of teaching labour under capital, with the introduction of digital media and self-datafication of the learning subject, the latter is turned into a lifelong project where today's learner assumes all the responsibility to present itself in the form of "human capital" as tomorrow's earner through perpetual personal growth and upskilling (Black 2022, 15) and thus subsumed under capital ideally. That being the case, "the framing exonerates both private capital and the state of any responsibility, and elides the work of structures and/or discourses as constraints on individual entrepreneurial agency" (Black 2022, 15). Hence, the constitution of individual agents, as instantiations of capital relation – the substance-subject – in the form of '"biological beings with human capacities" – "human beings reduced to a condition

of generalized proletarianization and shaped by the ideology of socialized cybernetics" (Artinian 2023, 160).

In the sphere of institutionalized scientific research computerization, digitalization and the introduction of AI have intensified the research process by putting more pressure on scientists to pursue research and produce "deliverables" more rapidly. As Lefevre notes, the process of production of scientific research (and not "creation" of knowledge *ex nihilo*) has already acquired characteristics of industrial labour deployed in large-scale industry.

As Arboledas-Lérida also notes, '"the separation of scientific labour from its conditions of productions starts with the accelerated crumbling of the material basis of the latter" (2020, 248). This happens through "privatization" of R&D (decrease in state investment on R&D and drastic increase of private investment in this sphere) and financial autonomization of research centers and universities which amount to the transformation of these cites into independent production spheres and the consequent marketization and commercialization of their knowledge-products (2020, 248–249).

The development of communication infrastructure facilitating travelling, correspondences between scientists, the formation of scientific journals and outlets has played a significant role in determining the specificities of scientific knowledge-production and related research. Furthermore, introduction of machinery into laboratory work accelerated the development of experimental devices; several tasks and operations run by scientists could now be performed by machinery meaning that older skills and capabilities were outmoded while new skills were required to operate the machinery (Lefevre 2005, 211–212), where "reskilling" signifies more "efficiency" and higher productivity in relation to production of surplus-value.

Obviously, the introduction of digital technology, from the Internet to AI, accelerates the process of enhancing the productivity of scientific labour while amplifying research and production of surplus-knowledge by facilitating communication, publication and dissemination of research results, and performance of certain routines, algorithmic research-related tasks by digital devices and AI. As Steinhoff notes, "the ML labour process is subject to familiar processes of fragmentation and automation, even if they are implemented in novel ways" (2021, 172).

Moreover, similar to the sphere of material production, in the sphere of digital and cognitive production, formal and real subsumption of labour under capital, as strategies for extracting more absolute and relative surplus-value respectively, are at work simultaneously. "In pursuit of profits, the AI industry requires the long workweeks familiar to software work in general" (Steinhoff 2021, 177). The newly developed chatbot ChatGPT might be a telling example in this regard.

Capable of writing acceptable college-level essays, many algorithmic tasks related to preparing research articles such as literature review can be performed by this AI device, which in turn provides management with the ability to press for more deliverables by researchers. As Ramtin (1991) suggests, the "purpose and aim behind the whole AI industry" was to '"reduce the role and quantity of "'intellectual' labour" (65–66) (quoted in Steinhoff 2021, 63).

Digital machinery further strengthens the two-fold function of institutionalization of knowledge-production, namely, the standardization/stabilization of the socially produced knowledge/meaning and the regulation of the expansion of knowledge/meaning through appropriation of the surplus-knowledge produced within and without the boundaries of the institutionalized knowledge-production sites. In other words, digitalization facilitates the application of more precise metrics and the consequent measuring of knowledge-producing activity and hence further subsumes scientific research activity under abstract social time. Therefore, contrary to cognitive capitalism theorists for whom "the obsolescence of the law of value results from labor having been qualitatively transformed ... [by becoming] ever more complex, ever more productive, and ever more immaterial" (Henninger 2007, 167, emphases added), digitalization and immaterialization of cognitive production via implementing new technologies signify the validity of the labour theory of value as the deployment of digital technologies enables capital to use scientific labourers to produce a greater surplus than the exchange of their labour-power (Henninger 2007, 168).

As already mentioned, due to its dependence on "doubly free" labour for self-valorization, capital's logic prevents it from commodifying all aspects of life in their entirety just as it averts labour from selling itself wholesale to the capitalist. Still, capital intends to appropriate the products (use-values) produced in non-commoditized spheres as "free gifts". The process of appropriation of commonly produced surplus-knowledge by capital resembles the process of appropriation of commonly produced surplus-meaning through vivification of meaning via its internalization and transformation into personal sense, its expansion and its re-emergence as meaning with a surplus. The spontaneously produced meaning is subsumed under stabilized, institutional meaning "ideally" and "non-formally" through mediation of, for instance, compulsory formal education (Azeri 2020, 42–45).

With the same token, the products of '"free internet labour" (Terranova 2000) is appropriated by capital as free gifts without formal and real subsumption of such labour under capital and its transmutation into "productive" labour. The importance of free affective and cultural labour to the media industry, old and new (Terranova 2000, 46), contrary to Terranova's assumption, is not

due to its being "a fundamental moment in the creation of value in the digital economies" (2000, 36), but owes to its capability to be subsumed under capital non-formally and ideally.[7] The blurring of the line between leisure and work, where the "knowledgeable consumption of culture is translated into productive activities that are pleasurably embraced" (Terranova 2000, 36), is thus a strategy for subsuming such forms of human activity under capital. In this way, personal computers and other digital devices alongside the Internet function not as individual and "private" means of knowledge-production, but as individual gateways for subsuming freely produced knowledge under institutional knowledge and therefore under capital. Hence, the revolutionization of common knowledge-production, the emergence of "citizen-scientist" and the consequent appropriation of commonly produced surplus-knowledge by capital.

## Concluding Remarks

Cognitive capitalism theorists' claim concerning the obsolescence of Marx's theory of value is rooted in the assumption that cognitive products (and in general "knowledge") produced in the so-called post-Fordist era and with the aid of digital machinery are not subject to the social form of production. Such conceptualization itself is based on the more general mainstream assumption that conceives of knowledge as a thing, a bulk of propositions, an entity, albeit "immaterial" or incorporeal, and by itself that stems from, and resides in, the subject, be it individual or a collective, and not an expression or a manifestation of the metabolic relation between humans and social nature. I have argued that cognitive capitalism theorists' endorsement of the mainstream epistemological conceptualization of knowledge is a constituent of their critique of Marx's theory of value and their claim concerning the emergence of the general intellect phase and its corresponding form of agency and subjectivity.

Treating knowledge in the period of real subsumption as something immediately identical to machines and tools reveals the tacit conceptualization of knowledge by cognitive capitalism theorists as a thing. Accordingly, in the phase of general intellect, however, knowledge transubstantiates into a trans-individual,

7. Christian Fuchs also considers free labour of the Internet "prosumers" productive. He writes, "if Internet users become productive prosumers, then in terms of Marxian class theory this means that they become productive labourers who produce surplus value and are exploited by capital because for Marx productive labour gene rates surplus value" (2016, 556). However, "prosumers" do not become productive since they are not in exchange relation with capital. As Fuchs himself admits, they are not paid wages. Thus, in Marx's terms, they are not under formal or real subsumption of capital. Similar to Terranova, Fuchs confuses use-value and value and thus disregards the differences between productive and unproductive labours.

spiritual (immaterial) entity that cannot be owned privately (in Wittgenstein's sense of the term) and thus becomes inalienable from the collective subject, the "multitude". What is notable is the tacit commonsensical conceptualization of the "general" or the "social/society" as something in itself; not as humans' social relations, but as a state/thing "sociologically" understood. Thus, the multitude and its alleged diffused and general knowledge is, by definition, immune to social relations of production.

I have further argued that knowledge is a product and thus is subject to the historically specific relations of production. To substantiate my claim, I analyzed the social relations of knowledge-production, the methods and forms of subsumption of knowledge-producing labour under capital and the technical form such activity necessarily acquires under capitalism–(scientific) knowledge-production as machinized industry. I further discussed that digitalization of knowledge-production is a method of subjecting knowledge-producing activity to the logic of capital.

There are two sides to knowledge/knowing that are essentially intertwined: the knowing subject and the object of knowledge; the process of production of knowledge, understood after Ilyenkov, as the process of production of an ideal is the continuous process of materialization of the ideal and the idealization of the material, where the ideal represents the form of human activity carved in the object while it is also the form of object determining the form of human activity – human activity objectivized and objectivity subjectivized. Since human activity is only realizable within a specific social form, knowledge, or the ideal, is in need of social validation – it has to be socially significant. Furthermore, knowledge emerges only within the act of knowing – the metabolic relation between humans and social nature. Like value that is incarnated or expressed in commodity, knowledge is also incarnated or expressed in the artefact (generally speaking); yet just as value is not identical to commodity, knowledge is not identical to the artefact; commodity is a form of existence of value just as an artefact is a form of existence of knowledge. Finally, just as value is uninterested in the type and texture of the commodity within which it is expressed, knowledge is indifferent toward the specific artefact (physical or incorporeal) within which is incarnated.

Knowledge, like thinking, is an outward act. Although it is realized through and with the aid of certain tools (material, conceptual, and bodily), it is objective in the sense that it is actualized in social reality – and that is the source of its reality – reality is actual.

It is worth noting that the ideal and non-formal subsumption as mechanisms facilitating appropriation of products of common labour as free gifts are at work simultaneously with formal and real subsumption particularly through deployment of machinery and

managerial technologies. As Smith notes, under capitalism the conditions of labour, the means and material of production, confront the labourer as independent entities; money functions as "a draft on future labour'"; wage labourers sell their labour-powers as individual commodity-owners; and there is a compulsion to work following from those two previous conditions. Such circumstances enable capital to emerge as a vampire-like power that appropriates forces of nature, machinery, science and collective social labour as free gifts (Smith 2009a, 123). The machinery of capital includes managerial techniques, social division of labour and other productive forces such as the knowledge, and the skills, dexterity and intellect of the labourer as much as the means of production. As Marx states,

> the division of labour and the combination of labour within the production process is a machinery which costs the capitalist nothing. He pays for the individual labour capacities, not for their combination not for the social power of labour. Another productive force which costs him nothing is scientific power. The growth of the population is a further productive force which costs nothing. *But is only through the possession of capital - in particular in its form as machinery - that he can appropriate for himself these free productive forces*; the latent wealth and powers of nature just as much as all the social powers of labour which develop with the growth of the population and the historical development of society. (Marx 2010, 18, emphasis added)

Science, both natural and managerial, mediates the appropriation of these forces of nature and society as it determines the laws of human activity realized in a definite social mode of production while deploying such techniques; science is the tool that mediates the relation between the social form of production and the form of working with the use of the aforementioned techniques. Such "natural agents'", to use Marx's term, contribute to production of value not by increasing the value of produced commodities but by increasing the productivity of labour-power and consequently decreasing the value of each produced commodity. Marx notes that "the employment of these forces of nature on a large scale is only possible where machinery is employed on a large scale, hence also where there is a corresponding conglomeration of workers and cooperation of workers subsumed under capital" (2010, 32).

Digitalization and computerization surely facilitate the appropriation of natural and social powers by capital because science becomes incorporable in capital to the extent that it emerges as an independent factor in the production process. With the advent of capitalism, practical problems in the process of production become solvable only scientifically. With the incorporation of

science by capital, every invention in science becomes a means of improving productivity and enrichment while conversely, every development in productivity facilitates further theoretical subjugation of nature. Furthermore, the separation between head and hand reaches its height as science applied in technology is separated from direct labour. Consequently, it functions as a means of subsumption of labour under capital. As Marx notes, "capital does not create science, but it exploits it, appropriates it to the production process" (2010, 33). With further capitalization of the process of knowledge-production, science is transubstantiated into a means of production as a part of the capitalist system of machinery and as a machine by itself – hence the scientification of both material and scientific-ideal production. All in all, such exploitation, capitalization and the consequent machinization of the process of (scientific) knowledge-production becomes possible with the subsumption of human relations and human activity in general under capital as a social relation.

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# On the Nature of Thought

In his science fiction–philosophical book *Of the Idols and Ideals*, Ilyenkov begins with the question concerning the relationship between the human being and machines—a problem that is also related to notions such as thinking machines (or machine-thinking) and artificial intelligence. Ilyenkov states that the so-called relationship between human beings and machines is, in fact, a variation of the question concerning human-to-human relationships. In dealing with the Machine, the human being is, in fact, dealing with another human being—namely, the creator, the user, or the owner of the machine. "The 'Man-Machine' problem, if you delve a little deeper into it, turns out to be the problem of the relation of Man to Man, or, as the philosophers of the old school would put it, the problem of the relationship of Man to himself, although the relationship is not direct, but 'mediated' through the Machine" (Ilyenkov 1968, 30–31). Dealing with the question of the human-machine relationship superficially—in other words, dealing with it as a question in and of itself, in resemblance to the theological fallacy of treating religious questions as divine, otherworldly, and thus "purely" theological—means dismissing the human foundations of the question and is thus a form of fetishistic manifestation, with the Machine being the fetish.

The aforementioned problem is related to the problem of the historically specific form of social relations and the consequent self-conceptualisation of human beings—the way they conceive of themselves, their humanity, personality, and skills and abilities, particularly thinking. Accordingly, the nightmarish fantasies concerning the subjugation of human beings under the Machine, which have haunted human imagination for a long time, are in fact forms of appearance of the relationships among people: the idea of human subsumption under the Machine and its will is a perverse form of awareness of the subsumption of the human individual under the will of another. Blaming the Machine as the source of inhumane, soulless conditions that give rise to such subjugation means ignoring the real root of the problem: the inhumanity of the social relations that foster domination and subjugation.

Within historically specific social relations—namely, the capitalist relations of production—the Machine appears as the subject,

with human beings turning into objects, into appendages of the Machine. As Marx (1993) notes, it appears as if it is not the worker, the human individual, who deploys the machine, but rather the contrary: it is the machine, apparently endowed with a soul of its own, that deploys human individuals. Human beings are deprived of their subjectivity and agency and appear as mere parts of the Machine (the system of machinery) (see particularly chap. 15). As Ilyenkov notes, "Thus, the Machine more and more turns the Man into its own 'talking tool', into the missing part of its mechanism and makes it—like all other parts—work to its fullest, to the point of wear and tear, to the point of exhaustion" (Ilyenkov 1968, 34).

Consequently, the human individual disappears as a person, only to reappear as a part of the complex machinery—the 'Big Machine'—and their skills, including their thinking ability, are alienated from them in order to emerge as the skills and powers of the Machine. Thus follows the conceptualization of human personality, capabilities, and thinking in the image of the Machine. Instead of the human person being the highest value and the goal for another human person, the Machine becomes the highest goal—the end toward which all history is destined to move. The human person, in turn, is transformed into a mere object, a tool, or "a speaking instrument, with the help of which this great all-consuming goal is realized. A means more or less suitable for the fulfillment of an end, and no more" (Ilyenkov 1968, 38).

A specific aspect of the aforementioned "technocratic-ideological" outlook is the way thought—or thinking—is conceived. In other words, the answer to the question "What is thought?" (or "What is thinking?") is a derivative of one's conception of the social relations among human individuals.

From a dialectical point of view, genuine human thinking—or thought—always involves contradictions, as it concerns proposing and realising an "ideal," in contradistinction to the real or actual—the well-known contradiction between the "is" and the "ought." In a more general sense, every act of thinking by any organism capable of thought involves contradictions, as thinking emerges only in the face of problems thus far unknown and unencountered, which must be surmounted if the organism is to survive. More specifically, human thinking is itself a contradiction: it is the thinking of the non-existent in order to actualise it through the actualisation of thought. This does not mean attributing a mystical power to "thinking" or equating thought with chimeras. Genuine human thinking is the negation of the existent by proposing a new actual—the thinkable is actual, and the object of human thought must be real if it is to be thinkable. Whatever comes to mind, or is the object of human thought, is real because thinking is "this-sided," and its truth is a matter of praxis. The ac-

tualisability of human thought is a manifestation of its ideality—a specificity that, contrary to idealist assumptions, follows from the this-worldliness or terrestriality of human thinking, which is, in turn, the source of its power and "materiality," as expressed in the mutual transformation of the ideal into the material and the material into the ideal.

## The Social Genesis of Thought: Against Idealism and Positivism

Idealisms, contrary to their appearance, tend to undermine the power of thought and limit its reach and scope by relegating it to the heavens as a strange substance. Idealism is ideal-fetishism; it is the admission of the existence of the ideal independent from the individual, but in a perverse form—and as such, it is the fetishisation of thought. The ideality of human thinking is manifest in the (self-)image the human being reflects onto reality. In the Middle Ages, this image acquires the perverse, fetishistic form of the Christian ideal as the means for the realisation of human essence and their salvation—the image of God as the saviour of human beings from the horrors and the toil to which they are subject, which, in turn, is but a perverse image of the real conditions within which they exist. Under capitalism, and with the advent of the machine—thanks to "productivism" and "use-value romanticism" as forms of manifestation of capital's prevailing logic of fetishism, expressed in the dictum "production for the sake of production" as a "shadow form of capital" (Murray 2016)—this ideal may take the form of the machine-illusion: "people," instead of looking at the Machine through the eyes of a Man and seeing in it a means and instrument of the Human Reasonable Will, look at Man from the point of view of the interests of the Machine, with the staring eyes of the Machine, and therefore see in him a non-living human individual" (Ilyenkov 1968, 41).

One of the most precise and succinct formulations of the dialectical contradictoriness of thinking is Hegel's formula that "the actual is rational, and the rational is actual" (Hegel 2001, 18). As Engels notes, this formula forms the revolutionary essence of Hegel's philosophy, as—contrary to its appearance—rather than sanctifying the existing order by rationalising it, it further points to the transitory nature of historical phenomena, which might have been "rational" and thus equally "actual" at a given point in time, but now necessarily become irrational and hence unreal. On the one hand, Hegel's proposition turns into its own contrary, since it admits that all that is actual carries the mark of "irrationality" from the outset—meaning that "all that exists deserves to perish" (Engels 2010, 359). On the other hand, it reveals the revolutionary essence of the Hegelian philosophy as the admission of the power

of thought, which contradicts reality and posits a new actuality in its place. The Hegelian formulation conceives of truth not as a set of readymade dogmatic statements and formulae to be crammed into one's mind in the form of procedures and algorithms, but as a part and constituent of cognition and its forms of realisation, which are subject to the historical development of society, and the sciences and knowledge that are historically produced. According to Engels, this is as true for the sphere of scientific cognition as it is for the so-called "practical" reason: "Just as cognition is unable to reach a definitive conclusion in a perfect, ideal condition of humanity, so is history; a perfect society, a perfect 'State', are things which can only exist in the imagination. On the contrary, all successive historical states are only transitory stages in the endless course of development of human society" (Engels 2010).

According to Ilyenkov, the power of thought is comparable to a "miracle," as it finds its "practical" expression in the action of the revolutionary masses, who, while chanting the Marseillaise and raising the tricolour flag of "Liberty, Equality, and Fraternity"—the ideals that had been set before humanity by Enlightenment thinkers in the face of the (feudal) irrational actuality—realise these ideals as new forms of reason and actuality. The contradiction between the actual and the rational has once again been resolved in favour of reason or thought, only to encounter a higher form of contradiction, revealing "the transitory character of everything and in everything" (Ilyenkov 1968, 360). In Ilyenkov's own words:

> The ideal – "the rational" ("proper"/"due"/the "ought") – turned out to be stronger than the "actual" ("existing"/the "is"), despite the fact that the "actual" was guarded by all the might of the state and the church, by the bastions of fortresses and offices, by the bayonets of soldiers and by the plumes of learned academicians, despite the fact that it was firmly entangled in the chains of thousands of thousands of years of habits and traditions, was sanctified by traditional church morality, art and law, established in the name of God. (Ilyenkov 1968, 61)

Although the triumph of the revolution and the Ideal was not absolute, and the power of "actuality"—incarnated in the rise of Napoleon as the new emperor—would eventually defeat the revolution and its ideals, yielding the rebirth of hopelessness and misery among the masses, the genie had got out of the bottle. One may speculate that the development of dialectics in its speculative form within the Hegelian system functioned as the philosophical counterpart to the revolution, its faith, and the rise and fall of the Ideal. Although Hegel did not draw the aforementioned conclusions as sharply or explicitly, his system signified the logical necessity of

the termination of the philosophical movement since Kant—an aspect of which had been the abhorrence of contradiction.

Ilyenkov notes the relation between Kant's treatment of logic and his approach to the "Ideal." With Kant, logic becomes a matter of formality, indifferent toward the content of knowledge; the most important aspect of thought, accordingly, is non-contradictoriness and the coherence of a logical series—even if it is pure absurdity (Ilyenkov 1968, 86). Furthermore, in his system, as much as in Fichte's, the Ideal becomes unrealisable: "According to Kant and Fichte, the ideal is absolutely similar to the horizon line, an imaginary line of intersection of the sinful earth with the heavens of truth, which moves away exactly to the extent that it is approached… everything ultimately comes down to a painful procedure of pacifying all of one's 'earthly' desires, aspirations, and needs" (Ilyenkov 1968, 79–80).

Kant's fantasy of the non-contradictoriness of thought (and logic as the science of thought or thinking) marks the inevitable failure of thought and reason—not only in the face of contradictions inherent in new experiences, but also in the face of past experiences—as reason contains not only identities but also their polar opposite, that is, differences. That being the case, Kant's pure reason appears as thought in a state of absolute inaction: non-contradictory thought is no thought.

This situation is reminiscent of the "Black Box" and its mystical, other-worldly silence, of which Ilyenkov speaks in The Mystery of the Black Box, the "Sci-Fi Prelude" to On Idols and Ideals. After one of the "thinking machines," called Hamlet, failed to resolve the riddle "to be or not to be" and entered a state of hysteria, the Automatic Civilisation came up with a brilliant solution: dividing the task between two machines—the "to be" and the "not to be." This new design would serve as a prototype for handling any contradiction: in the face of such a situation, a pair of machines would be deployed—one responsible for, say, A, and the other for ~A. Still, in case of disagreement about the outcomes of the two polar machines, or even in the event of a misunderstanding that might develop into a contradiction, the inconsistent propositions would be submitted to the Black Box as input, to be resolved and returned as output by this superior machine.

However, the Black Box was silent; nothing would come out. The machines would then be convinced that there was, in fact, no contradiction and that the problem had arisen due to defects in their design. They would rush to the surgical workshop to be repaired, and their dysfunctional hardware and software would be replaced. The Black Box's response to all incoming contradictions and inconsistencies was consistent silence: it was "illuminating the world with its benign wisdom. And everything went well" (Ilyenkov 1968, 20).

At the beginning, there was another machine – "The Interpreter of the Great Silence" – that would interpret the silence of the Black Box for the other machines. However, eventually the machines realised that they did not need interpretation, as they could access the Black Box's silence telepathically: as soon as they encountered the slightest inconsistency, they would picture the image of the Black Box and would immediately feel relief. As time went by, the Automatic Civilisation developed alongside the Black Box and its divine silence: any controversial issue could be easily resolved by clarifying meaning and names, through dividing the ambiguous term into two distinct and entirely unambiguous ones.

> Thus, in particular, a protracted dispute was brought to an end between two schools in machine historical science: one claimed that Man existed, the other that Man did not exist. In accordance with the principle of the Great Silence and the Economy of Thought, it was decreed that there was no Man, but there was a machine which other machines called "man." However, this machine was so hopelessly primitive and stupid that calling it a Machine would have been wrong—and even insulting—to genuine Machines. Therefore, they decided to retain the name "man," using this offensive word to denote the machine-like ancestor of Machines. So they concluded: "Man" (with a capital letter, as a category) did not exist, although there was "man" with a small letter, used not as a proper name but as an insulting nickname for a defective machine. And everything fell into place. (Ilyenkov 1968, 22)

As the Automatic Civilisation developed further, the machines reached an absolute limit: they began to aspire to become like the Black Box. After a moment of high tension, everything became clear to every machine—there was no need to think any further. Moreover, there was no need even to say this statement out loud. And as the machines proceeded to unveil the great secret of the divine silence of the Black Box, they encountered what they already knew: there was nothing in the Black Box—nothing but air. That was the secret of the Absolute, the Ideal, and the Ultimate. Now the machines clearly understood what they were meant to do: they must not think (Ilyenkov 1968, 26).

Hence, we encounter a set of simple yet vital questions: Why does thinking "happen"? And, with thinking understood in its alleged "universal form"—of which human thinking and machine thinking are supposedly specific types—there arises the question of the locus of thinking or thought: where is thought, or where is thinking taking place? This latter question is immediately related to the problem of the subject matter of logic, with logic conceived of as the science of the laws of thinking. This final definition,

which appears to be accepted by all logicians—whether idealists or common-sense philosophers—raises yet another important question: "What is thinking?"

Ilyenkov argues that, in a general sense, thinking cannot be defined unless all forms of thinking are considered and analysed in the course of their development. That being the case, such a definition—using Engels' words—would not, strictly speaking, be a definition. Yet, in a stricter sense, we still need a preliminary definition to begin working with (Ilyenkov 2018, 9).

The traditional approach considers thought – or thinking – as inner, silent speech, and logic – as the science of the laws of thinking – as the investigation of verbalised thought. According to this view, thinking can and should only be investigated in the form of its verbal, external manifestation (Ilyenkov 2018, 10). On this assumption, the concept is equated with a "term" or a "signifying sign," and "judgement" is equated with "utterance," with thinking understood as identical to the construction of utterances or systems of utterances. Hence, the investigation of thinking is set aside and replaced by the investigation of language—say, the language of science, of art, and so on.

One particular problem that arises from such a faulty identification is the confusion of the concept with the term. The difference between the "concept," on the one hand, and the "term" or "signifying sign," on the other, is pivotal. A concept is a specific tool—an organ of thinking—just as other tools and organs belong to the human body. The "thinking body" is a "conceptualised body" or a "bodily concept," with the body understood as the social body. To put it differently, the thinking body is the social body—it is the body in society, the only body capable of human thinking.

By identifying the concept with the term, the mainstream approach—strongly influenced by empiricism and crude substance materialism—reduces logic to a branch of linguistics. With such an impoverished understanding of logic, human thinking is excluded from the scope of logical analysis. "Logic here cannot be a science of real laws of real human thinking but at best turns out to be a system of rules that 'must be' or 'may be' followed but are, unfortunately, broken at every step" (Ilyenkov 1968, 11). Furthermore, thanks to the conventionality of rules, which reduces them to a matter of mere consensus, logic loses its claim to objectivity—it loses its authority to assert the necessity and universality of its "laws."

Contrary to the formalist tradition, for Hegel the laws of thinking are understood as the laws or schemas of human activity, with every form of activity conceived as a manifestation of the laws of thinking—that is, of logic. Hegel's importance lies in his admission of, and insistence on, the role of deeds in understanding thinking—that is, activities and external actions are at least as

much manifestations of thinking as speech. Indeed, they offer a more genuine image of thinking than words. Hegel's introduction of practice into logic guarantees the objectivity of thought in two senses: first, genuine thought is objective because thinking concerns objects (particularly tools and artefacts); second, it is objective because thinking is a real activity and a material force—genuine thought is real. As Ilyenkov notes, "in Hegel practice serves as a link in the analysis of the process of cognition, and indeed as the transition to the objective truth" (Ilyenkov 1968, 13).

In doing this, Hegel anticipates Marx's introduction of practice into the theory of knowledge—that is, practice as a philosophical category—and his effort to demonstrate the "this-sidedness" of thought. As Marx notes in the 1844 Manuscripts, a non-objective being, a thing that is not objectivised, is nothing; it is non-being. So, if thinking is not objective, it is not thinking. As non-objective thinking—that is, thinking without an object outside itself—it is unthinking and devoid of any power (Marx 1975, 337). Marx follows in Hegel's footsteps, who had already included the objective determinations of things existing outside consciousness in logic as the science of thinking—albeit in a perverse manner, as the self-manifestation and self-estrangement of mind. Still, with Hegel, logic is rescued from pure formality, as he considers the objective determinations of things existing outside consciousness to be a part of logic (Ilyenkov 2018, 13).

With Hegel, we arrive at the idea of historically formed and specific schemas of action as forms of human practice carved into objectivity—what he calls the "ideal." Hence his formulation of the whole of social reality as "thinking in its other-being" (Ilyenkov 2018, 13).

A materialist-dialectical critique of Hegel focuses on his failure to fulfil the task of analysing thinking and its manifestations in the historically real sense of the term. He acts like a positivist when, instead of paying attention to the activity of which logic provides the laws, he treats the laws of logic as self-subsisting, universal laws from which activity emanates. Or, as Marx states in another context, Hegel presents the logic of his state as the state of his logic. "Hegel's problem is that in his analysis of the history of humanity the 'activity of logic' absorbs his attention so much that he ceases to see behind it the 'logic of activity'" (Ilyenkov 1968, 14). This is the source of his idealism—his fetishisation of thinking in the form of Spirit or Logic.

Furthermore, in considering external activity as a mere manifestation of thought—for instance, the French Revolution as the embodiment of Rousseau's and Voltaire's ideas—Hegel repeats the ideologist's fallacy of treating thought and idea as self-sufficient entities, which can only encounter or relate to other thoughts or

ideas. "While interpreting 'practice' exclusively as thinking in its external manifestation, i.e. as an idea (concept) embodied in space and time, Hegel cannot construct the true dialectics of human activity that expresses in its concepts the true logic of events, logic of actions, logic of the historical process" (Ilyenkov 1968, 15). Hence, the returning home of thought to its point of origin, affirming itself as absolute knowledge and absolute, abstract mind (Marx 1975, 330–331).

By reducing all forms of spiritual and material human culture to "manifestations" of thought, Hegel deprives himself of the opportunity to ask the question concerning the source of human thinking capacity: "Where does this wonderful human capacity come from?" (Ilyenkov 2018, 18). What holds in the case of Hegel also holds for all forms of idealism and fetishism: the question concerns the source of thinking in general. Why does an intelligent or rational being—or even an animal—think? What is the origin of this capacity? Where does it come from?

As Ilyenkov notes, Hegel's answer to this question is: "from nowhere." "It does not 'come from', does not originate, but only *manifests itself*, *expresses itself*, since it is not conditioned by anything external—it is an absolute ('divine') capacity, a creative power and energy present in human beings from birth" (Ilyenkov 2018, 18). Hegel, therefore, by taking thinking—and its definition (not merely in a restricted sense, but definition in general)—for granted, reiterates the commonsensical understanding of thinking as something that takes place inside the mind or head, and thus as a mental capacity among other mental functions. In doing so, he betrays the revolutionary essence, the "true rational kernel," of his logic and conception of thinking—namely, its objectivity.

Thinking is the product of acting in a world populated by human artefacts; it is only in this context that the special capacity of human thinking can flourish and develop. The artefacts themselves are expressions—or manifestations—of earlier schemes of thought, which are themselves grounded in schemes of activity. As Ilyenkov writes, "all 'logical forms' without exception that Hegel considers to be the immanent domain of the 'spirit' in fact 'express themselves and show themselves primarily' not in human language, as Hegel postulates, but only as constantly repeated schemes of the external—objective and objectively conditioned—human activity. These schemes are brought to consciousness in language only much later" (Ilyenkov 1968, 21).

Thinking does not "wake up to self-consciousness"; on the contrary, consciousness—including self-consciousness—emerges only through the process of the constitution of human thinking. Thinking in its human form is possible only within the social universe. So too is consciousness: consciousness is a social relation.

Laws of logic—in other words, laws of intelligent thinking—are the forms and schemas of human activity in social nature, involving the use of tools and artefacts, which are themselves interrelated. That is why the forms and schemas of human thought correspond to the relations between things: the laws of thinking are expressions of real relations between objects, not relations between signs or mere words.

This is where Hegel still offers something of value for understanding the nature of science: the rules, figures, signs, and logical relations specific to each sphere of scientific knowledge production are, in fact, relations between things mediated through human activity and human-to-human relations (though, of course, this requires turning Hegel on his feet). Hegel was aware of this—but in a perverse form: he considered the relations between things and the regularities of those relations to be objectifications of the Law, of the scientific law. Such a formulation is far more precise than understanding these regularities, or "invariances," as "conjectures," or as mental, social constructs, or phenomenologically derived "essences."

> Thinking, as an active capacity of every human being, is born—comes into existence—and is not merely "expressed," as if already present. It emerges in the immediate, objective human activity that transforms the external world and creates the objective human world (tools, products of labour, forms of relationships between individuals in acts of labour, and so on). Only after that does it create the "world of words," and with it the specific capacity to treat words as its "subject matter." (Ilyenkov 1968, 22–23)

That dialectics is the science of the universal forms and laws governing both being and thinking is the "logical" outcome of the emergence of human thinking on the basis of human activity within the social universe. From this follows the resolution of the question concerning the relation—or identity—between thought and being, between thinking and reality; in other words, the problem of the "reality of thinking" and of thought itself. So conceived, thinking is a material necessity capable of grasping the essence of reality: the limit of thinking is reality in its essence, not the notorious "thing-in-itself." Furthermore, thinking and logic are not mere formal processes; the entire social universe forms their subject matter. Such a logic is both the science of the laws of thinking and the history of the forms of thinking. It is necessarily non-idealistic and non-positivistic: logic as the materialist dialectic of human activity and thought.

The retreat from a dialectical conception of thinking to a positivist view of thought has consequences far beyond the domain of

epistemology. In the political sphere, it amounts to the sanctification of the existing order and the deification of the state. By relegating the "ideal" to a phenomenon of the past, Hegel draws the conclusion that "beautiful individuality" belongs to the childhood of humanity—now irretrievably lost. As Ilyenkov notes:

> The modern person can experience the naively beautiful stage of their spiritual development only in museum halls, and only on a day off—granted to them as rest *from the hard and joyless service of the Absolute Spirit*. In real life, they must be either a professor of logic, or a shoemaker, or a burgomaster, or an entrepreneur, and *obediently perform the functions assigned to them by the Absolute Idea*. A comprehensively and harmoniously developed individuality is, in the modern world with its fragmented division of labour—alas!—impossible. (Ilyenkov 1968, 112–13, emphasis added)

The individual under capitalist relations of production is incapable of initiating any real change and is hopelessly compelled to submit to the harsh reality of capital's rule, and the consequent fragmentation of human beings through the division of their labour. We might lecture ourselves about the ideal, yet the battle for its actualisation has long been lost.

As far as thinking itself is concerned, the idealist–positivist conceptualisation of thought presents it as a fetish—either, as in Hegel, an inborn gift whose source remains beyond the grasp of human understanding, or as a mechanical–algorithmic process of compiling information or data into signs or codes, translatable into machine language and thereby conceived as an "ability" transferable to "intelligent" machines. The process of knowledge production, and cognition more generally, is thus conceived as an automatic mechanical procedure, independent of the real, social individual. Such an impoverished understanding of thinking and genuine knowledge production bypasses the simple yet fundamental questions concerning the nature of thought and the human being's cognition of reality. As Ilyenkov writes:

> How does it happen that we directly perceive an event inside our own organism as an objective (located in external space) form of a thing, and "experience" our own internal state as something "other," as something outside ourselves? How and why do we see things outside rather than inside ourselves? (Ilyenkov 1968, 212)

To put it differently, the question is this: how do changes in the cerebral cortex and other parts of the brain—"internal" events—give rise to the disposition to perceive things as existing outside the brain, outside ourselves, as "external" entities? Knowledge of how the brain operates in response to physical, chemical, optical,

or neural processes adds nothing to our understanding of the perception of external objects in space and time.

As Ilyenkov explains, the confusion arises from conflating mental functions with their physiological substrates:

> Physiologists (and cyberneticians) do not study mental abilities at all, but a completely different subject—those material mechanisms by means of which the corresponding active ability is realised. And mental abilities and their material mechanisms are entirely different things, although inextricably linked—as different as, for example, the structure of a steam locomotive and the outcome that a person achieves with its help: say, arriving at the beaches of the Black Sea or meeting one's relatives. (Ilyenkov 1968, 213)

Perception is not the formation of a mirror image of one body within another; rather, it is a specific form of outward-directed activity—"the transformation of visual impressions into the image of external things" (Ilyenkov 1968, 215). Human perception constitutes access to reality through the mediation of imagination and other higher psychological functions. Once perception and its objectivity—its externalisation as action—are properly understood, the so-called "theory of reflection" can be turned on its feet: it is not the object that is reflected in the subject, but the form of the subject's activity—the schemas of human action in the form of images—that is "reflected" onto the world of objects.

This specificity of human perception and cognition—responsible for its extensive reach and scope, in contradistinction to that of animals—is a consequence of the human being's social existence. Human beings are social animals whose organic and natural needs are transformed into internalised social needs. "A person perceives/cognises immeasurably more in the world around him, because his gaze is controlled not by the organic needs of his body, but by the needs of the development of society and human culture, which he has internalised" (Ilyenkov 1968, 216). Social existence and cultural development are likewise responsible for the specificity and extensiveness of human thinking and intelligence, in contrast to artificial intelligence and so-called intelligent machines or machine-thinking. The richness of human thought and intelligence is not a function of the volume of data available; nor is it, as Kaplan (2016, 5–6) claims, distinguished from machinic intelligence simply by its constant functioning under limited data conditions, or, as Wang (2008, 371) argues, by its capacity for adaptation on the basis of "insufficient knowledge and resources." These views, at best, recapitulate the Hegelian stance, which leaves the question of the source of human intelligence unanswered. Human intelligence—like human thought and cognition—is, due

to its social character, virtually independent of "sensory data" or "input." That being the case, human vision, cognition, thinking, and intelligence are fundamentally impersonal.

To understand how and why human vision and cognition have become impersonal and disinterested in "crude" individual bodily needs—that is, to understand the emergence of contemplation, of theoretical thought as a real, material force—we must consider the historical process by which the individual sciences emerged. The idealist answer to the problem of the reality of thought, or contemplation, explains it by reference to spiritual powers or to a higher human nature allegedly detached from the material world. This is no answer at all: "it is a statement of fact passed off as an explanation" (Ilyenkov 1968, 218). The solution to the enigma lies in the material world itself. It is not individual need but the social organism, constituted through collective human labour, that is responsible for the emergence of such needs and of "curiosity" or "interest" powerful enough to turn human vision toward the farthest galaxies. "The human psyche was the product and consequence of the vital activity of this organism. It created the human-thinking brain and the human-seeing eye" (Ilyenkov 1968, 219).

A human individual is capable of cognising, quite literally, with a million eyes, of acting with a million hands, and of thinking with a million brains. Contradictory as it may seem, one's individuality and specificity as a human person are grounded in this social capacity—the ability to see through the eyes of another without becoming another—which Ilyenkov calls "imagination." Imagination is the product of such collective cognition: the capacity to perceive through the perspective of another person without becoming them. It is a fully historical product that "develops only in the course of handling objects created by man for man, with products and objects of creative human labour" (Ilyenkov 1968, 220).

## Machine-Thinking, Fetishism, and the Alienation of Reason

Highly formalised, repeatable, algorithmic–procedural actions do not require imagination or its creative contribution to activity; such automated processes can, in principle, be fully replaced by machines. This holds as much for material life as it does for "spiritual" life. Under capitalist relations of production, however, thinking is reduced to algorithmic procedure, and the human person (or the so-called "human mind") is conceived in the image of the machine. This dehumanising conception also has devastating implications for the structure of the educational system: the fantasy of "inculcating 'mind' into a person in the form of a system of precisely and rigorously formulated 'rules' or operational schemas—in the form of a 'logic'" (Ilyenkov 2007, 10) aims not at

fostering independent thinkers—persons—but at producing mediocre minds incapable of confronting contradiction, i.e., incapable of handling tools or thinking intelligently—ultimately, minds that are replaceable by machines. Not, say, mathematicians, but calculators, "performing auxiliary operations but not engaged in the development of mathematical science" (Ilyenkov 2007, 36).

Through such a reduction, genuinely human spiritual capacities—such as thinking and imagining—are re-conceptualised as mechanical–algorithmic processes, with the machine functioning as the incarnation of capital as a social relation. Hence the perverse inversion between capital and human beings: the former assumes the role of the subject, while the latter is reduced to the status of a mere object. The dead appears alive, and the living appears dead—fetishism.

The objectivisation and pacification of the human individual, and the consequent prevalence of mediocrity, directly affect the scientific image of reality. Scientific inquiry and conceptualisation are realised through the active transformation of nature, which is itself conditioned by the social form of human activity. "Forms of thinking and forms of contemplation (that is, forms of imagination) arise only on the basis of 'humanised' (that is, processed, remade by labour) nature" (Ilyenkov 1968, 259). The conceptualisation of nature as a mere reservoir of raw material for the purpose of capital valorisation is, in turn, a reflection of the same dehumanising process through which the human person is reduced to an object. The sciences are tools for the anthropomorphisation of nature. Yet this anthropomorphisation is not a product of "mere fantasy," but the consequence of social labour, which humanises nature just as it naturalises the human being. The humanisation of nature entails the inscription of social goals into nature—socialised nature. Under dehumanising social relations, both socialised nature and socialised humanity are necessarily dehumanised: unsocial nature and unsocial sociality.

This condition, in turn, reveals the essential unethicality and immorality of capitalist social relations: their dehumanising effect and their intrinsic fascistic tendencies. The fantasy of the thinking machine is one manifestation of this dehumanisation—a transference of agency from the human person to the machine. This is yet another expression of the fundamental contradictoriness of capitalist relations of production: "I want to force the machine to treat me 'humanly,' as a person, declaring myself a non-human, a thing, a partial part of a large machine, a part that agrees to any actions that the machine dictates to me" (Ilyenkov 1968, 282). So long as social conditions remain inhumane, fetishism—and the consequent denial of human agency—is inevitable. The fantasy of a "thinking machine" that possesses agency is cultivated and flourishes on the same soil from which religious perversion also sprouts.

Depending on the level of abstraction and the specific context, human beings may be identified with anything from a stone—for being subject to gravity and mechanical laws—to a giraffe, as a fellow mammal, or to a calculator when performing calculations. The fact that humans may be likened to each of these objects demonstrates that they are not identical to any of them. This, in turn, manifests the universality of the concept of the human being—a universality that arises from sociality (Ilyenkov 1968, 285–86). A real, concrete personality emerges only to the extent that the individual is subsumed under the universal concept of the Human, the social species-being. In this sense, every individual is an "individual universality" or a "universal individuality" (Ilyenkov 1968, 289). The personality of such a universal individuality is a social phenomenon—a social relation. The person is what society has made of them: that is, the result of their conditions of life, the social relations of production, and the specific historical form within which the individual is born, acts, and matures.

## Conclusion: Reclaiming Human Thought in the Age of Machines

Any human being, in principle, is capable of doing anything precisely because of this universality, which distinguishes them from being merely a chemist, a poet, a mathematician, or a truck driver. In this sense, we cannot attribute any "innate" specificity or property (such as innate skills or talents) to the human being (Azeri 2017, 691). From this follows the differentia specifica of a thinking being—that is, a thinking human: "the ability to act according to the logic of another." In other words, the capacity to be intelligent: to use tools and artefacts intelligently in accordance with their social significance, their ideality, in contrast to an unthinking being that acts solely in accordance with its own inherent logic. "The ability to handle anything in accordance with its own logic, and not in accordance with an a priori introduced scheme, not in accordance with an action stamp encoded in the hand or in the head, is precisely what makes a person a thinking being, a subject of thinking" (Ilyenkov 1968, 286). This is where anti-innatism and the communist maxim—"from each according to their ability, to each according to their need"—converge with the Aristotelian definition of intellect, or the "thinking soul," as the "form of forms."

The discrepancy between a human being's concept and their individual existence results from the limitations imposed upon them by society and the prevailing social relations of production (Ilyenkov 1968, 289–90). Under capitalism, this discrepancy—or the difference between the "real" individual and their concept—is actualised as alienation. The task before us is to create the social

conditions that would facilitate the correspondence of each individual to their concept. A specific step toward this goal involves overcoming the division of human beings according to their labour or profession: "society has already become rich enough to allow itself to develop its culture not by turning the individual into a professionally limited, 'partial' person, but by maximising the full development of all the possibilities inherent in him by nature" (Ilyenkov 1968, 290).

Ending the division of individual persons according to their labour requires the humanisation of social relations—an aim achievable only through the abolition of capitalist relations of production. It is on the basis of a just social order—namely, the voluntary "association of social individuals," or communism—that the reconstitution of human beings as universal subjects, as agents of their own activity and thought, becomes actualisable. Human thinking requires agency; only agents of activity can think in a genuinely human way.

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# The Match of "Ideals": The Historical Necessity of the Interconnection between Mathematics and Physical Sciences

In "The Unreasonable Effectiveness of Mathematics in the Natural Sciences" (1960/1995), Eugene Wigner expresses his amazement, even bewilderment, concerning what he calls the "uncanny usefulness of mathematical concepts" in physical sciences "that raises the question of the uniqueness of our physical theories" (1960/1995, 535). Accordingly, this mysterious effectiveness puts us "in a position similar to that of a man who was provided with a bunch of keys and who, having to open several doors in succession, always hit on the right key on the first or second trial. He becomes skeptical concerning the uniqueness of the coordination between keys and doors" (1960/1995, 535). In attempting to resolve this riddle of "applicability" of mathematics to physical sciences, Wigner arrives at the conclusion that this is a phenomenon with no reasonable explanation. Rather, it is "a miracle confront[ing] us," "quite comparable in its striking nature to the miracle that the human mind can string a thousand arguments together without getting itself into contradictions" (1960/1995, 541). At the end of his search for a resolution to this riddle, Wigner arrives at what Islami and Wiltsche call a "solution" that is no solution (forthcoming, 2). In particular, Wigner suggests that the "language" of mathematics matching that of physics is a miracle that "neither we understand nor we deserve"; all we can do is to use the gift and hope it works as well in the future (1960/1995, 549).

I agree with Islami and Wiltsche that this riddle is a pseudo-problem, but for reasons other than posing a "why" question where a "how" question should be asked (forthcoming, 6). The problem arises due to the formulation of the relationship between mathematics and physical sciences, which is based on certain age-old presuppositions that have been uncritically adopted from common sense and endorsed in philosophical thinking; these prejudices are based on the presumed dichotomy between the subject (subjective mind) and the object (objective reality) that is also echoed in formulating cognition as an individual, mental activity and the consequent knowledge as a subjective mental image. Hurley (2001) calls such mainstream

approaches to the human mind the "sandwich model," according to which perception and action are peripheral and distinct in relation to the human mind. The central feature of the mind is cognition – cognition is the filling of the mind-sandwich; related properties of cognition are explained "in terms of processes involving symbols and recombinant syntactic structure" (Hurley 2001, 3). Accordingly, knowledge of the external world is based on perception, where the latter is also conceived of in individualistic terms. In this view, the mind depends on modular cognitive processes. The perceptual module extracts external information such as colour and motion. This information is combined with perception, and the result proceeds to cognition that mediates between perception and action. Here is where rational thinking comes in; rationality is conceived as being dependent on internal processes such as "the manipulation of internal symbols or representations," which includes the information passed on by perception. Then, a rational motor plan is arrived at which is to be executed by motor programming processes (Hurley 2001, 7). There are two basic assumptions of the traditional view, which are also shared by certain variants of alternative approaches, such as behaviourism and Gibson's "ecologism": (1) the causal flow is one-way or "linear," from the world into the agent through its sensory apparatus, and (2) the relation between perception and action is merely "instrumental" (Hurley 2001, 12).

Philosophers and psychologists inspired by Activity Theory, an approach that is rooted in the works of prominent early-period Soviet psychologist Lev Vygotsky and his colleagues and disciples such Luria and Leontiev, propose an alternative to this passive and linear account. Accordingly, perception––that is, the subjective "reflection" of reality by the human mind––is not passive and is bound to activity. This includes human life and practice and "is characterized by the movement of a constant flow, objective into subjective" (Leontiev 2009, 64). The psychic image of the world is a product of the subject's activity in the world. Furthermore, this activity is the realization of the life of a physical subject that is principally a practical process (Leontiev 2009, 72). Yet, it is important to properly understand the practicality of perception; "practice" or "practical" here does not refer to a single individual's action, but to the totality of social human activity. "The fact of the matter is that the basis for cognitive processes is not the individual practice of the subject, but 'the totality of human practice'. For this reason not only thought but also man's perception, to a very large degree, surpass in their riches the relative poverty of his personal experience' (Leontiev 2009, 72). This is a main point of divergence between Marxian and non-Marxian materialisms as much as it distinguishes materialist dialectics from idealist methodology. Thus, writes Leontiev, "the 'operator' of perception is not simply the previously

accumulated associations of sensation, and not apperception in the Kantian sense, but social practice" (2009, 74).

Leontiev notes that, despite their differences, mainstream conceptualizations of the mind (1) conceive of activity either in a reductive (metaphysical) materialist sense in form of contemplation or idealistically, and not as sensory activity, and (2) are more or less bound to the S→R model (the postulate of directness) (2009, 78–79). In order to explain psychological facts, previous psychologists were pushed to assume the presence of "special forces such as active apperception, internal intention, etc., that is, to appeal everything to the activity of the subject, but only in its mystified, idealistic form" (2009, 80). This amounts to a "contemplative stance" or what Craig (1987) calls the "image of God" or "spectator theories". Accordingly, the humans are first and foremost spectators and onlookers that should and can "acquire insight into the order of reality as God has disposed it and so realise to some degree his potential for affinity with the divine mind" (Craig, 1987, 224). They ascribe a god-like, Olympian position, which stands out of the natural order to human's cognitive faculties in spite of the fact that this quasi-divine consciousness happens to be within a body that is part of the natural order. Such a view excludes any position that attributes a fundamental philosophical importance to the concept of human activity (Craig, 1987, 225). For spectator theories, the final goal of the (physical) sciences is to form a proper world-view or an image that corresponds to reality with great precision, which in turn amounts to other "miracles" that are no less "unreasonable", unconceivable, and undeserved as the effectiveness of mathematics in the physical sciences: "the two miracles of the existence of laws of nature and of the human mind's capacity to divine them" (Wigner, 1960/1995, 541). The miracle of "effectiveness" is, in fact, a variation of these latter two "miracles" of the "match" between two supposedly completely separate entities, "man" and "nature". Interestingly, no commentator seems to have noticed these latter miracles, yet the key to the dissolution of the pseudo-problem of effectiveness lies in their critical resolution.

The aforementioned uncritical and commonsensical prejudices are accompanied and strengthened and, in turn, contribute to a trans-historical conceptualization of knowing activity, particularly that of scientific knowledge production, and solipsistic-subjectivist asocial conceptualization of the human mind and the knowing subject, who aims for knowledge, perhaps, because of her "natural desire to know" (Aristotle 2016, 2), that is, her naturally built-in curiosity. These prejudices yield a peculiar formulation of the so-called "mysterious" correspondence between mathematics and physics, which is a specific form of the presumed subject-object dichotomy, and has remained unchallenged: mathematics

is considered a totally mental, subjective, and, consequently, abstract science; it is axiomatic and a priori, consisting of analytic propositions which are pure, and its truths trans-historical. Physics, on the other hand, is concerned with empirical facts and spatio-temporal objects (in the widest sense of the term); it is a concrete, objective, and, in the final analysis, an empirical science. Thus follows the problem of the match between the two sciences, which, as Wigner's account tacitly implies, is a consequence of the "miraculous" correspondence between man and nature.

In a similar vein, Paul Dirac, in his 1939 presentation at the Royal Society of Edinburgh, titled "The Relation Between Mathematics and Physics" (Dirac 1940), states that there is *no* logical reason why mathematical method, that is, inferring results about experiments that have not been performed yet, in physics should be possible at all. Yet, Dirac proceeds, such possibility rests on the "mathematical quality in Nature" that is invisible to the casual observer (122). Dirac states that this is far more than saying that mathematics is a useful tool for describing nature, as such a claim is trivial. It is implied that mathematics produces or invents physical laws prior to experiment and observation. Dirac concludes that the mathematician plays a game and sets the rules that are interesting to her, while the physicist finds the rules set by nature. Interestingly, however, the two groups of rules happen to be the same (1940, 125). Obviously, the aforementioned dichotomy is reproduced: mathematics is "pure" in the sense that it is, supposedly, not about the empirical, isolated from the world; it is not this-worldly but, at best, the product of pure thinking of (the) mathematician(s). It is the new deity. And physics is an empirical science that aims to find the ultimate laws governing the universe. In order to succeed, it must adopt mathematics and become mathematized, i.e., partake in the heavens. Good scientists mostly make bad philosophers.

Wigner, too, expresses a more or less similar view when defining mathematics as a set of skillful operations with concepts and tools that have been produced just for the sake of these very operations. It is a game with no particular purpose other than "the invention of concepts" (1960/1995, 536) to be used in these operations. Moreover, although it is true that at the initial stage of mathematics its concepts "were formulated to *describe* entities which are directly suggested by the actual world" (1960/1995, 536 emphasis added), concepts of modern mathematics, particularly those used in modern physics, have no relation to the world: Mathematical concepts, that is, those of modern age mathematics, have no connection to "our *experience*" (1995, 537, emphasis added). It is not clear what is signified by the term "our experience". The most plausible interpretation is that it refers to a commonsensical pragmatic understanding of experience as people's state of

being in the world and their confrontation with others (objects and persons). Similarly, one can reason that modern music has no connection to "our experience", and it is also a "miracle" that at least some can "understand" and even "enjoy".

Hamming offers a somewhat pragmatic response to the applicability problem. The main question he is concerned with is: "How can it be that simple mathematics, being after all a product of the human mind, can be so remarkably useful in so many widely different situations?" (1980, 82) Accordingly, the first features of mathematics appear once humans understand the pattern "if this then that… and further that" and generalize it beyond a single observed phenomenon (1980, 83), that is, once humans start to make abstractions. He further draws attention to the simple fact that since mathematics is human-made, it is subject to alteration by human beings: "mathematics is not the thing it is often assumed to be mathematics is constantly changing and hence even if I did succeed in defining it today the definition would not be appropriate tomorrow" (1980, 86). In further explaining the effectiveness of mathematics in physical sciences, Hamming bases his solution on the pragmatic principle that "we see what we look for" (1980, 87). Therefore, he identifies two principles that allegedly explain the problem of applicability: we use biased intellectual apparatuses that facilitate finding what we always (want to) find. The claim that the empirical experiment is the basis of science is only partially true (1980, 88–89). Secondly, if our mathematics does not fit the situation, we alter it or invent a new mathematics and "we select the mathematics to fit the situation, and it is simply not true that the same mathematics works every place" (1980, 89).

Reasoning along similar "pragmatic" lines, Mark Wilson (2000) aims for a criticism of what he calls "honest optimism" and suggests a more moderate and humble philosophical position with regards to the problem of applicability called "mathematical opportunism". "Honest optimism is the doctrine that *every real-life physical structure can be expected to possess a suitable direct representative within the world of mathematics*" (297, emphasis in original). Mathematical opportunism, on the other hand, is defined as the applicability of mathematics to natural phenomena (processes) that enjoy a special simplicity which is made easily trackable by mathematics (2000, 297). According to Wilson, the claim that all natural phenomena can be mathematized (or mathematically formalized), on the assumption that for every mathematical structure there is a one-to-one (isomorphic) structure in nature, is not plausible because there are many cases in which adjustments should be made "externally" so that the mathematical description fits the reality; for instance, using different forms of differential equations (instead of the ordinary core and periphery equations). In other

cases, the initial behaviour of a physical model should be ignored, and a leap to an assumed state of equilibrium should be made. The alteration of the topology of material in time, for instance, pushes applied mathematics to stop and wait for an opportunity to arise in the physical world for a new application (2000, 313).

Ginzburg, Jensen, and Yule (2007) draw attention to the limited role mathematics can and should play in the ecological sciences. They assert that "[b]iology should constrain our mathematical constructions" since a large number of constructions that are mathematically sound are inconsistent with biology (360). Similarly, in "The Unreasonable Ineffectiveness of Mathematics in Economics" (2005), Velupillai draws attention to the uselessness of many mathematized economic theories and demands that the role of mathematics in economics be limited to accounting. He also criticizes the deification of mathematics, stating that the world of mathematics and mathematicians "is not a monolithic world, characterized by one concept of 'proof' and a single way of 'constructing patterns' from an inflexibly determined set of deductive rules" (2005, 858).

Mark Colyvan (2001) addresses the applicability of mathematics in sciences as a miracle. Echoing Steiner and Dirac's sentiments, he states that the puzzle consists not only in applying mathematics to physical sciences, but also and more importantly, in the role that mathematical (a priori and non-empirical) theories play in discovering physical theories. He states that "[t]he problem is epistemic: why is mathematics, which is developed *primarily with aesthetic considerations* in mind, so crucial in both the discovery and the statement of our best physical theories?" (267, emphasis added). Notwithstanding the "romanticist" picture Colyvan presents regarding the artist—a person whose creations are initiated by "pure" aesthetic considerations—the mathematician-in-the-ivory-castle image is reproduced in this formulation. In this interpretation, mathematical theories are presented as some sort of divine inspiration with no relation to social reality ("social reality" signifies not mere "external" social factors but rather the totality of the objective world in which human beings exist and interact, that is, the world of phenomena, of appearances if you wish—the world to the extent that it has become humanized through the mediation of human activity). Once such a gap is presumed, and mathematics is defined as a product of pure individual mind(s) and as trans-historical, of which the concepts and theories emerge naturally as unchanging forms, the so-called applicability of mathematics to reality appears a miracle. The same is true, however, for a tool as simple as a hammer, if it is considered trans-historically, as an abrupt invention of an individual who is inspired by the heavens. Furthermore, a simple truth seems to be dismissed in this account: it is neither mathematics nor the math-

ematician but the physicist that *deploys* mathematics. Moreover, it is not merely one isolated physicist (*the* physicist) alone, but an army of physicists that pursue their endeavour, not in a vacuum, but against the totality of previously accumulated physical knowledge—"thought-material". Additionally, it is the specific social division of labour and the historically determined, produced, and accumulated knowledge, which is based on human beings' historical activity—praxis—that facilitates devising scientific theories as *socially significant* "conceptual organs" for manipulating the world.

In her inspiring paper concerning Wigner's riddle, Islami (2017) suggests that the elements for resolving the riddle are available within Wigner's own presentation. Accordingly, what makes mathematics applicable in physics are the principles of invariance, by virtue of which laws of physics become universal and testable (4841). Physics, according to Wigner, is the science of discovering laws of nature where the latter signifies regularities in nature (Wigner 1995, 537). These regularities are recognized as invariance principles without which physics becomes impossible. Invariance also refers to the irrelevancy of many other material conditions on these laws. "The exploration of the conditions which do, and which do not, influence a phenomenon is part of the early experimental exploration of a field. It is the skill and ingenuity of the experimenter which show him phenomena which depend on a relatively narrow set of relatively easily realizable and reproducible conditions" (Wigner 1995, 538). Yet, Islami admits that there is a tension between these remarks on the limitations of the applicability of mathematics in physics relevant to principles of invariance and the belief in the unreasonable or miraculous effectiveness of mathematics (2017, 4845). Although Islami admits that only a fraction of mathematical concepts are "applied" in physics and that there have been numerous cases where mathematically and soundly formulated physical theories have proven false, she argues that "the limited applicability of mathematics in formulating laws of physics still requires an explanation" (2017, 4847). Islami further concludes,

> The invariance principles give laws their universality, a feature that makes their mathematical formulation possible. Mathematics is a science that is concerned with the study of formal structures and the most general relations that exist among objects, abstracted from their temporality and particularity. And symmetry or invariance principles help us to catalogue and most importantly identify these structures. (2017, 4856)

Hence, since the two sciences of mathematics and physics are concerned with invariances, although at different stages of ideal-

ization, mathematics appears as *the* proper "language" of physics. Furthermore, she states that these principles are contingent aspects of the world and rather than being a priori, they are based on experience (2017, 4857). In the face of the question "why does the search for regularities take place in the first place?" Islami's answer, similar to Hamming's, contains pragmatist elements: looking for structures makes abstracting from the complexity of the world around us possible and motivates the study of the regularities (structures) that are also found among the laws of nature (as the expressions of regularities in nature) (2017, 4855). Surely, by flattening complexities scientists formulate answerable questions, since only principally answerable questions are real questions; however, this by itself does not answer why particular questions emerge at particular historical stages and not before or later. In this case, one may ask, what is the source of the urge of modern mathematicians to "invent" such regularities, transformations and symmetries? What is the ground upon which regularities that are supposedly invented solely by mathematicians correlate with those regularities that are "discovered" by physics? These questions, I believe, cannot be answered with reference to factors "internal" to the sciences solely. The interconnection between the two domains should be explained upon historical grounds.

Elsewhere, Islami and Wiltsche (forthcoming) suggest a phenomenological "solution" to this riddle. They state that the relation between modern mathematics and physics is beyond the mere applicability of mathematics in physics; in a sense, the two domains have become identical. Accordingly, the relation is such that "[i]n the face of lacking empirical data, physicists quite often turn to mathematics itself in order to discover novel theories or even previously unknown physical phenomena" (forthcoming, 5). Furthermore, many mathematical concepts have been developed that lack physical applications to the effect that "some of the most productive mathematical innovations such as complex numbers, non-Euclidean geometries or spinors were regarded as purely theoretical first and went on to demonstrate their high practical relevance decades, sometimes even centuries later" (forthcoming, 5). Accordingly, and in contrast to Aristotelian physics, modern physics is impossible without mathematics (forthcoming, 7), so that "modern physics is a mathematized science in the sense that, at its core, it deals with idealized, exact objects—objects that are nowhere to be found in our ordinary experience of the world" (forthcoming, 8).

Is the suggested solution based on this phenomenological account adequate? The answer, I believe, is negative. First, it presupposes a distinct and discrete realm of thinking in contradistinction to the practical and empirical realm. This becomes especially clear when the "ideality" of objects of physics, in contrast to objects of

"ordinary experience", is addressed. The term "ordinary objects" seems to pertain to what is available to the bare sense-organs, the so-called objects of the senses that populate the "daily" world (as if there were any other world) with which one is immediately confronted. Such a distinction is based on the faulty conceptualization of the "ideal" that equates it with the mental or the object of pure thought as realized by the thinking subject. The ideal in this interpretation is identical to the non-physical. According to this definition a painting hanging on the wall is not "ideal" but rather is an ordinary object of the daily world; so are Beethoven's symphonies and Chopin's nocturnes, or even the money-form of value. Such a conceptualization is reminiscent of Kant's argument against the ontological proof, which as Marx shows, contrary to Kant's intention, supports it.[1]

Human activity is always determined by social forms. Social forms specify the tools humans use in a specific historical era. For instance, the specificities of machines are not reducible to the mere "technical" relations between their constituent components. Machines are revolutionized tools due to their social significance, that is, the social form that necessitates deployment of machines; they are not a combination of simpler tools; rather they are tools for intensifying the extraction of surplus-value from workers; like any artefact, machines *are ideal* as they are tools for realizing this particular social function—abstraction, that is, meaning-production, which first and foremost is transforming a mere object into a tool of action. A mere technical definition of the machine with regards to its parts does not explain this ideal aspect and amounts to a tautology of the kind of a "machining machine" (Azeri 2013, 1121)—a machine that is not deployable in a determinate way towards the realisation of a certain social function. Such a definition would be indeterminate, and thus "abstract". To the contrary, the technical specificity of the machine, which is manifest in the highly abstracted and universal relation of its parts (the motive, the transmitter, and the tooling part) (Azeri 2013, 1109), is explainable only on the basis of those social relations that necessitate its deployment as *the* means of production. As Marx (1992) notes, "since the introduction of machinery has the worker fought against the instrument of labour itself, *capital's material mode of existence*" (1992, 553–554, emphasis added). The machine is the materialization of the capitalist relations of production. Capital is the soul

1. Regarding the difference between having 100 talers in one's pocket and imagining one has 100 talers in his pocket, Marx states that "Kant's example might have enforced the ontological proof. Real talers have the same existence that the imagined gods have. Has a real taler any existence except in the imagination, if only in the general or rather common imagination of man? Bring paper money into a country where this use of paper is unknown, and everyone will laugh at your subjective imagination" (Marx 1975, 104).

of the machine; hence the machine appears to have a life of its own to the effect that it deploys the worker and not vice-versa. This ghostly appearance of the machine foreshadows the image of mathematics as a pure, mental science that mysteriously predicts, even creates, physical reality.

Explaining the relation between modern mathematics and physics with reference to the (phenomenologically conceived notion of) "ideality" of their objects is of the same nature as explaining a machine with reference to its components since it is quiet about the social form that informs these particular means of knowledge production. The meaningfulness of conceptual systems, i.e., their social significance, is actualized only through human activity in social reality. "Just as the 'hammer-ness' of a hammer is not a function of its being extended in form of a hammer, but is rather a function of its nailing capability, the reality of concepts and conceptual systems lies in their social significance as tools for appropriating and manipulating reality" (Azeri 2013, 1111). Disregarding the social significance of a tool (in this case mathematics and mathematized physics) one is bound to the so-called world of appearances; furthermore, it dismisses the question of why the mathematization of physics and the quantitative approach to physical reality begins at a particular historical epoch. Damerow (1981a, 1981b), Damerow et al. (1998), and Malafouris (2013), among others, convincingly show that the emergence of arithmetical thinking in Ancient Mesopotamia was necessarily preceded by a certain degree of political organization (the state) and a relatively large-scale production of goods that necessitates more complicated techniques of stock-tracking.[2]

Islami and Wiltsche's conceptualization recapitulates the contemplative stance, common to empiricism and naïve materialism, in which the objects of the senses are merely given and perception is the passive reception of stimuli. Furthermore, a level of immediate confrontation between the subject of perception and the world of objects is presupposed; this is obvious given the phenomenological approach that is assumed by the authors. Actually, there are no such "ordinary" objects insofar as human activity and cognition are at stake. The world we live in is marked by "ideality" to the extent that objectivity is informed by the form of human activity, while human activity is shaped by the form of objects. As there is no ordinary encounter with reality, there is no ordinary object to be encountered. All human activity and confrontation with social reality (which includes the most distant galaxies, stars, and black holes) is tool-mediated; human consciousness is the form of this activity interiorized. Ideality cannot be defined in isolation from the historically specific mode of human activity. Otherwise, idealism is inevitable.

2. More on this below in section 4.

Islami and Wiltsche aim at resolving the match between mathematics and physics with reference to the concept of "noema", which signifies "the rule that governs the structure of the horizon of experience" (forthcoming, 12). Accordingly, different noemata yield different sets of anticipated intended experiences, which, if harmonizable, amount to "constitution" (perceptual objectivity). Although experiencing something from different angles amounts to flux and change in many aspects of the experience, there are certain invariances that stay constant within all these different experiences "on which the constitution of *perceptual objectivity* is ultimately founded" (forthcoming, 12–13). Based on this phenomenological explanation, they further state that differences in perception (say that of a layman versus that of a scientist with regard to a piece of electronic equipment before them) is due to the different neomata that determine the objects they constitute. The authors claim that the difference concerning neomata cannot be exhaustively explained with reference to what the layman and the scientist know about physics; however, they do not explain why. It is also unclear what is the source of different "neoma" that allegedly underlie the "constitution" of objectivity. Eventually, the authors, following Husserl, arrive at the conclusion that by applying a particular set of "ideal" "mathematical" neomata, mathematical objects are constituted, in a process of "mathematization" (forthcoming, 14–16). Hence, the riddle, allegedly, is solved: there is no problem of applicability of mathematics to physics because the two are not distinct insofar as "the objects of [modern] physics are constituted mathematically" (forthcoming, 19).

As mentioned above, it is not clear where the neomata come from. Further, it is not explained why different attitudes ("proper" and "improper") toward a particular tool are not exhaustively explainable with reference to background education and past training. Moreover, the term "constitution" is vague; is the term used literally? Although it might seem not to be a problem when the constitution of "ideal" objects is at stake, it obviously is when the constitution of "ordinary" objects by the "layman" is referred to. Additionally, the provided argument sounds somehow tautological. Different neomata rule over different intentional acts that amount to the constitution of different objectivities. Last but not least, the source of the noemata's significance is also missing. In this approach, it is implied that "ideality" is a property ascribed to certain objects mentally; accordingly ideal objects are mental and, thus, "abstract" entities. If the ideal is not understood in its mainstream, commonsensical sense, but in the way Ilyenkov defines it, the problem of applicability can be reformulated on wholly different grounds. Ilyenkov states that for Marx the ideal is not "all mentality but a much more specific formation—the form

of socio-human mentality" (2012, 159), meaning that the ideal belongs to the realm of social consciousness. The value-form is the paradigmatic example of the ideal; the ideality of the value-form does not mean that it resides in the individual's mind; it can be reduced neither to cerebral and neurodynamic processes nor to any physical or chemical property of its specific bearer, say, gold or paper money. It exists only as a specific *social form* that corresponds to a historically specific *form* of human (productive) activity. As Ilyenkov puts it:

> 'Ideality' in general is… a characteristic of the materially-established (materialised, reified, objectified) images of social-human culture, that is, the historically formed modes of social-human life, which confront the individual possessing consciousness and will as a special 'supernatural' objective reality, as a special object comparable with material reality and situated on one and the same spatial plane (and hence often conflated with it). (2012, 169)[3]

Echoing Marx's comment on real and imaginary talers, we can imagine a situation where a person, Mr. Ph., goes to a country where no use of credit cards is known. Mr. Ph. is not aware that such use of plastic is unknown in this country and thus arrives with one as the only means of payment for the duration of his trip. He arrives at night and is welcomed by a host and then taken to the hotel. It is late but he decides to go for a walk. Then he returns to his room and sleeps. The next day, when he goes to leave the room, he realizes that his credit card is missing. He assumes that he dropped it during the walk. He tries to remember where he could have dropped it and starts following the route he took the night before. He also vaguely remembers taking his kerchief from his pocket in front of a particular building. As he approaches that building from afar he sees a small, thin, rectangular piece of plastic standing against a wall. He walks toward it and voilà, there he finds his credit card. According to a phenomenological description, he has intended a series of anticipated experiences and eventually has managed successfully to constitute the perceptual object, in this case his credit card. Happy to find his phenomenologically intended and constituted means of payment, he decides to celebrate; he enters a nearby restaurant and orders a lovely meal and a bottle of champagne. Then comes the bill; Mr. Ph. reaches for his card and gives it to the waiter… Perhaps the restaurant staff and the owner, *at best*, will laugh at Mr. Ph.'s phenomenological constitution.

The same goes with the "constitution" of scientific objects based on scientific neomata. What is the source of the sanctions of any particular "constituted perceptual objectivity"? Why is

3. The "ideal" will be further discussed in the next section.

mathematical constitution the dominant form of constitution in modern physics? Is there any better answer than that these are the rules of the "game"? What about the "correspondence" between the reality and these constitutions? All in all, phenomenological accounts, like the reductionist outlooks of both the idealist and naïve materialist varieties tend to resolve the problem of difference and unity of thinking and reality through reducing one to the other.

## Praxis, Concept, and the "Ideal"

The task before us is revealing the earthly kernel of thinking, in particular that of natural scientific and mathematical thinking and the consequent knowledge produced by these specific activities. Providing a comprehensive account of these issues is beyond the scope of this paper, which should be thought of as an initial attempt at providing an outline or a roadmap for handling the particular problem of the relationship between mathematics and physics. Such an account is achievable only through a collaboration between those engaged in different disciplines such as the physical sciences, psychology, mathematics, philosophy, and history.

Marx, in his *Theses on Feuerbach*, sets the question concerning the veracity of thinking and its relation to reality as a problem of praxis, where this latter signifies a philosophical category. "The question whether objective [*gegenständliche*] truth can be attributed to human thinking is not a question of theory but is a practical question. Man must prove the truth—i.e. the reality and power, the this-sidedness [*Disseitigkeit*] of his thinking, in practice. The dispute over the reality or non-reality of thinking that is isolated from practice is a purely *scholastic* question" (1976, 3). This question, according to Ilyenkov, is resolvable only if a materialist dialectical method is deployed. Kant's notion of the thing-in-itself is a showcase of the inability of non-dialectical thinking in explaining the transformation of thought into reality and that of reality into thought. According to Kant, ideas can only be compared with ideas, since what we have in mind is not the real thing but its image, which is comparable only with other images. Thus, the thing-in-itself remains unknown. Hegel's way out of this dilemma is to reduce reality to an offspring of thought, of abstract thinking and thus identifying thinking and reality in an objective idealist form. Hegel, by identifying the two, makes any "comparison" or relation between them impossible. Rather than reducing one to the other, as is the case with any two exclusive objects, a third term should be found that facilitates the comparison between this first two. The way out is to formulate these different objects as modifications of one and the same thing. Marx's critique of the "trinity formula", which considers wage, profit, and rent as three distinct sources of

income, is a clarifying example in this regard. From a commonsensical angle, capital produces profit, land produces rent, and labour produces wage. But unless the one thing of which these forms are modifications is identified, this formula is a "theoretical" absurdity, just as it is absurd to compare a phone and an orange on the basis that the former rings and the latter is a fruit (Ilyenkov 1997, 8). In Marx's formulation of these three phenomena as the forms of existence of surplus-value (or the historically specific value-producing labour) the diversity and the unity of these forms become clear.

Similarly, one might search for the third term (the middle term), of which thinking and reality are modifications. Ilyenkov states the question as follows: "In what special 'space' can they [thought and reality] be contrasted, compared, and distinguished? Do we really have here that third term in which they are one and the same despite all of their immediately obvious differences?" (1997, 8)

Referring to Spinoza, Ilyenkov answers that thought and extension are not two substances but are two attributes of the same substance. In other words, "neither extension nor thought is an independently existing object. They are only aspects, forms of manifestation, modes of existence of … real infinite nature" (Ilyenkov 1997, 9–10). There is no extension as such but only as an abstraction; neither is there thinking as such. Extension as such is pure void or negativity, and thought as such is incapable of determining or delimiting anything, including itself. Ilyenkov thus defines thought as "a completely spatially expressed action of this [nature's] body", i.e., thought is the spatial activity of the thinking body (1997, 10). Thought is a spatially expressed bodily action of a spatially organized body. Consequently, the relation between thought and body is not causal—they are not two different things but one and the same thing manifested in two different ways. Hence, concludes Ilyenkov, as the action of the body, thought is inseparable from the body, just as walking, as the mode of action of the leg, is inseparable from the leg (1997, 11).

The thinking activity of the thinking body has an objective character because it is the ability to handle an object intelligently; in other words, genuine thinking that yields knowledge means treating the object of knowledge in concordance with the rules dictated by the nature of object and not with one's own mere fantasies. This in turn is the expression of object relatedness and the tool-mediated nature of thinking and knowing. Thus, there is no "knowing" or "knowledge" in general; knowledge is always knowledge of particular objects (objectivities). Therefore, to say that someone knows something but is not able to "apply" this knowledge is a contradiction in terms—an impossibility. Such a state is the expression of the general situation where knowledge of the object is replaced by and is reduced to mastering (memorizing)

phrases about objects (signs, formulas, terms, etc.). In other words, such a conception of knowledge misconstrues a particular form of its incarnation for knowledge itself.

To such a false conception of knowledge corresponds a false conception of thinking. Accordingly, thinking is a kind of silent inner speech, which can be externalized through speech or writing. Hence, thinking is considered the manipulation of words, signs, symbols of any type and the rules that govern acts of "calculation of utterances" that are marketed as "laws of thinking". However, genuine "thinking is really functioning knowledge" (Ilyenkov 2007a, 76).

Nonetheless, objectivity or the object relatedness of thinking does not mean its subsumption under rules of an alien nature because thinking is the "thinking body's rational understanding of the general laws of its own behavior within the natural whole, its understanding of the mode of its action within nature and its understanding of nature's bodies. In giving itself a rational account of what it does and how it really does it, a thinking body at the same time forms a true idea of the object of its activity" (Ilyenkov 1997, 15). The law of nature is the law of human activity in nature; it is mediated by substance-nature; it is through this mediation, of which the thinking body's activity (thinking included) and matter are two necessary attributes, that the *form* of thinking-activity coincides with the *form* of material existence, notwithstanding the specific socio-historical mode of this activity. As Oittinen notes, "Ilyenkov connects the ideality with the ability of the 'thinking body' to reproduce the contours of external things" so that thinking and matter are reconciled and "the immateriality of the ideal [is] sublated" (2014, 117).

In late Soviet philosophy, specifically in Ilyenkov's approach, "practice" does not signify bodily, physical, or manual activity which allegedly contrasts with mental activity, but is deployed as a philosophical (logical) category (Bakhurst 2017, 18) reminiscent of Marx's concept of *praxis* in the *Theses on Feuerbach*. Activity is a basic explanatory category that supposedly clarifies the relation between subject and object, thinking and being, or mind and world. For Ilyenkov, "mind and world are possible only in and through activity" (Bakhurst 2017, 19). This is a "transcendental" and not (only) an empirical claim. This conceptualization is a particular form of what Craig calls the "practice ideal", which signifies a shift toward recognizing and emphasizing practice and human agency as the core of philosophical analysis: the practice ideal "is the attempt to develop philosophical theories in which the concept of practice, the idea of doing or making something, bears the main load" (1987, 230); it is the admission of the fact that "we are the creators of our own environment, that the realities which we meet with are *the works of man*" (1987, 232, emphasis in original).

"Activity" is the middle term that mediates between the object and the subject. Human life is the totality, or the system, of activities replacing each other. In activity the object is transferred into its subjective image and the activity is transformed into the object, the product. As Leontiev notes, "Taken from this point of view, activity appears as a process in which mutual transfers between the poles 'subject-object' are accomplished. 'In production the personality is objectivised; in need the thing is subjectivized,' noted Marx" (2009, 84). Furthermore, activity is only realizable within the totality of social relations and conditions; society, in contrast to commonsensically inspired formulations that consider it as conditions external to the human individual to which they have to adapt in order to survive, provides individuals with goals and motives for their activity. The *form* of the activity "is determined by those forms and material and spiritual means (*Verkehr*) that result from the development of production and that cannot be realized otherwise than in the concrete activity of people" (Leontiev 2009, 85). Such a formulation of activity facilitates conceptualizing an alternative to the Cartesian-Lockeian distinction between the internal and the external, the object and the subject, that is, the world of external, physical activity and that of internal "mental" activity: "on the one hand, objective reality and its idealized, transformed forms (*verwandelte Formen*), and on the other hand, activity of the subject, including both external and internal processes. This means that splitting activity into two parts or sides as if they belonged to two completely different spheres is eliminated" (Leontiev 2009, 97). Thus follows the new problem of investigating the interrelation between various forms of human activity as well as the socially constituted norms—the "ideal"—that determine human activity.

According to Ilyenkov, the ideal denotes the objective form of human activity, the form of human activity carved in the object or the subjective form of human activity determined by the form of the object. At the core lies the concept of "human activity". Human beings' social nature, thus, is an "ideal" nature. The social reality is a world populated by human-made artefacts. A glass or a pickaxe is ideal as a concept. As the manipulation of artefacts requires submitting to certain rules dictated by the form of the artefacts, the ideal acquires a law-like structure that defines the universal norms of a culture, which should be internalized by the subject in order to enable it to conduct its life-activity (Ilyenkov 2012, 154). Note that the ideal is irreducible to the mental-in-general.

The ideal signifies a definite form of labour objectivized in the process of the transformation of nature by the social human; it is the stamp of human activity impressed onto reality to the effect that "all the things involved in the social process acquire a new

'form of existence' that is not included in their physical nature and differs from it completely—their ideal form" (Ilyenkov 2012, 176). Outside society, that is, in the absence of people involved in the social production and reproduction of their lives, there is no "ideal". Yet, this does not mean the ideal is the product of conscious will and/or a consensus among individual minds. To the contrary, consciousness as individuated sociality acts as a function of the ideal, which in fact is the objectification of the form and mode of individuals' own activity. Hence, ideality, which is completely social in nature, appears as "the form of a thing, but it is outside this thing, namely in the activity of man, as a form of this activity. Or conversely, it is the form of a person's activity but outside this person, as a form of the thing" (Ilyenkov 2012, 176).

Following Bakhurst (2017), it can be said that the ideal is normative in character; it determines human thinking and actions rationally more than causally. Human activity is essentially guided by reason rather than being merely determined by causes. The ideal is independent of the will and thinking of the thinking subject; in this sense it has an objective existence: "The objective existence of the ideal is a precondition of the possibility of individual minds" (Bakhurst 2017, 19). The ideal is intelligible only in relation to human activity. "Ideal phenomena are 'objectifications' of human activity. By virtue of our engagement with the world, nature is lent significance and value; it is 'humanised' or 'enculturated'" (Bakhurst 2017, 20); moreover, all human objects are "idealized"; the world is given to humans in as much as it is brought into the realm of the conceptual (Bakhurst 2017, 20). Activity is the unit or the cell that explains both subject and object (the distinction between the two is dialectically derived from the concept of activity). The ideal is inseparable from human activity and the specific mode of its realization.

Following Marx, Ilyenkov conceives of concepts as being comparable to the form of things (objects). A true concept (genuine thought) is not a mere fantasy inside someone's head or imagination but the *form* of activity of real humans in social nature. This aspect of the concept refers to the tool-mediated nature of knowledge (the metabolic exchange between human and nature) as well as to the socio-historical determination of knowing activity that is bound to the totality of the available tools of action. As Ilyenkov states,

> A concept is not a state of the cerebral cortex but a form of activity of social man who transforms nature. Hence the comparison of a concept with its object is not a comparison of a thing with a thing (as was the case in Feuerbach) but a comparison of the form of man's activity with the product and result of this activity. Prior to contemplation, man acts practically with real things, and in the process of this activity all his representations are formed. (1997, 28)

The concept is a particular historical tool of human activity that bridges the alleged gap between thinking and reality. Praxis, object-oriented human activity, is the middle term between thought (concept, the form of manipulating the object) and a thing (object). The multifaceted reality can be truly grasped only through concepts, which are not mere "universalized" generalizations based on common physical characteristics of objects, as is supposed by formal-empiricist methodology, but gradually appear within a theoretical culture, that is, within a socio-historically available web of concepts, and develop in the context of human activity as specific tools for producing knowledge—grasping the essence of the concrete. Thus, "[t]hinking in concepts is directed at revealing the living real unity of things, their concrete connection of interaction rather than at defining their abstract unity, dead identity" (Ilyenkov 2017, 88).

The concept, or the ideal, constitutes norms of human activity in the form of schemes of action, which are to be internalized so that individual consciousness takes shape. The gradual appearance of concepts is observable in the process of ontogenesis of consciousness. A brief look at the history of sciences reveals that concepts are also subject to a similar phylogenetic developmental process, i.e., they form and emerge, change, even sometimes die out against a socio-historical background. Mathematical concepts, contrary to the widespread belief in their trans-historicity, are no exception; they develop historically, and are closely interconnected with the mode and the consequent schemes of human activity.

## The Schemata of Action: A Short Historical Excursion into the Roots of Arithmetical Thinking

The claim that mathematical truth is timeless contributes to the belief that mathematics is unaffected by social developments. This claim to universal truth is rooted in the method of mathematics that is based on a limited set of strictly defined rules. Whatever problem that cannot be addressed with the help of such limited methods is excluded from the boundaries of mathematics. In mathematics, the object of investigation is constituted after the image of the method of investigation. In this regard, Damerow states,

> It is precisely this abstraction from the actual context of the vicinities of mathematical problems that appears as the timelessness of mathematical truth. As long as the methods of mathematical thinking being used are kept constant, the problems that can be addressed with their help and that, hence, emerge as "mathematical problems," can be clearly isolated, and no historical event can make the solution to a problem which can be achieved by applying these methods seem obsolete. Thus, the question with

> regard to the timelessness of mathematical truth refers to a totally different type of question not at all surrounded by the aura of timelessness, that is to say to the question of the socio-historical conditions that gave rise to mathematics as a science defined by its methods in the context of the problems arising from its vicinities. (1984, 118)

Damerow further notes that the development of mathematical reasoning and concepts is mainly determined not so much by language and linguistic structures as by interaction with concrete objects; language by itself lacks the representational stability to facilitate the transition from quantitative approximation to developing number concepts. Similarly, Malafouris notes, "From a long-term archaeological perspective, language cannot account for the emergence of exact numerical thinking in those early contexts where no such verbal numerical competence and counting routine could have existed" (2013, 110). Mathematical ability develops as the schemata of these interactions are internalized in form of mental schemata that renders mathematical language meaningful. Damerow argues that this is true as much phylogenetically as it is ontogenetically (1981a, 150). "If the assumption is to have any validity that mathematical thinking emerges in the course of the active manipulation of concrete objects by internalizing structures of action, then it must be true of the historical development of arithmetical thinking as well" (1981a, 153). Once the origins of arithmetical thinking are studied, it becomes obvious that rather than being based in pre-existing arithmetical thought structures, arithmetical thinking is the result of internalization of the schemata of interaction with objects, say clay tokens and counting rods, for ordering, fixing, composing, and decomposing sets of objects. Clay tokens and counting rods function as "cognitive artifacts" that change the nature of the tasks to be realized (Norman 1993, 43–48); they facilitate accomplishing tasks such as measuring and keeping track of annual yield more efficiently. Such objects, which mediated the objectification and material realization of basic numerical thinking and made concrete counting and the association of approximate quantities with the shapes of tokens possible, did not represent numbers; they "were not symbols but enactive material proto-signs" (Malafouris 2013, 114). By turning an initially meaningless act of counting into a perceptual, material, and thus spatio-temporary manipulable problem, the clay tokens yielded numbers and eventually brought forth the number concept (Malafouris 2013, 114–16). This does not mean underestimating the specificity of mathematical concepts and conceptual systems, which seemingly can operate nowadays "independently" of interaction with the world of objects. Rather, it "challenges

the implicit assumption of a naive historiography claiming that number words, numerals, and the means of arithmetic must per se always be considered the result of previously existing arithmetical thought structures" (Damerow 1981a, 167), which in turn shows that mathematical concepts are not only subject to change due to external factors, but are intrinsically developable.

Analyzing the development of arithmetical thinking and operations, Damerow provides further evidence in favour of the model of action-dependence formation of arithmetical thinking and evolution of mathematical concepts. For instance, multiplication as an arithmetical operation resulted from measuring areas and not, as usually is assumed, the other way around (1981b, 251). Measuring lengths and areas may be considered as responses developed in the face of the need for techniques facilitating the intelligent use of space that consists in constituting cues, maintaining different work stations, seeding the space, and designing spatial and temporal order for facilitating the realization of particular tasks (Kirsh 1995, 49). Arithmetic has grown out of such an ordering requirement. This is a showcase of priority of action/motion over thinking; we think as we act and not vice-versa. In this framework, action should not be conceived in terms of individual pragma, but in terms of a social category; action is socially mediated and socially significant. The norms of actions are historically produced and accumulated schemata of activity, which are in need of continuous reproduction and reconstitution; furthermore, the widening of the scope of action, the invention-exploration of new areas of activity, that is, the expansion of the range of social (humanized) reality and the "thinkable", brings about new norms and schemata that do not simply reside on the top of the formerly produced and accumulated schemata but rather subject them to qualitative changes, turning them into moments of these newly constituted norms. For instance, looked at from a contemporary point of view, operations with counters that dated back to the Neolithic Age might appear as simple arithmetical operations, yet, as Damerow precisely shows, they are far from being mental operations with ideal objects (1981b, 262). The same can be thought of the concept of the number denoted by the term "number". The concept of the number only could arise as a result of a long historical process. It is not true that the idea of an object-independent number emerges as soon as writing is invented (Damerow, Englund, and Nissen 1988, 275). For a long period, the meaning of numbers used in ancient times were context-dependent; i.e., they would signify different quantities depending on what particular objects were to be measured (1988, 278); the same number-word could mean, say, 10 if length was to be measured and 100 if grain was to be weighed.

The existence of different number systems, in which the same signs would refer to different amounts of different entities, disproves the traditional assumption that archaic numerical signs had a fixed, uniform meaning and thus shows that number concepts (independent of objects, context, and particular use in that context) were inexistent then—a "proper meaning" could not be attributed to them (Damerow, Englund, and Nissen 1988, 292–93).

The development of—although still context-dependent—numerical signs in all literate cultures (an aspect that is common to all archaic cultures that invented writing but missing in contemporary illiterate cultures), in the light of this study, "proves that the development of the basic structures of arithmetical thinking is culturally determined" (Damerow, Englund, and Nissen 1988, 294–95). Although in the late Babylonian period we eventually encounter the universal representation of numbers and explicit arithmetic, we cannot speak of any number concept apart from its representation. There is no concept formation related to numbers as ideal objects. Hence, "structural statements about ideal objects and thus the development of the number concept had to await Greek antiquity" (Damerow, Englund, and Nissen 1988, 295–96). Several thinkers and critiques in the Marxian tradition have dealt with the problem of the emergence of philosophy, theoretical geometry, and theoretical thinking in general in Ancient Greek and have identified the role of coinage, money, and the emergence of a proto-capitalist system in facilitating the formation of theoretical systems such as Euclidean geometry. The most influential of these are Alfred Sohn-Rethel (1978), George Thomson (1978), and Richard Seaford (2004). Interestingly, Damerow, in relation to the development of arithmetical thinking in ancient Mesopotamia, states that the introduction of silver as the measure of value has had a drastic impact on arithmetical thinking: every good could now be related to a system of weights with reference to their value; furthermore, the natural limitations of natural measures could not be applied to weight. "The value of silver could be divided indefinitely both mentally and actually and thus encouraged the operative representation of fractions" (1981b, 240).

## By Way of Conclusion

There is no doubt that the formation of conceptual systems revolutionizes mathematical and theoretical capabilities as it provides new, highly determinate tools for knowledge production. Even at the ontogenetic level, as Vygotsky has clearly shown (1987), the introduction of scientific concepts to school-age children accelerates also children's process of spontaneous concept formation; furthermore, scientific concepts function as cornerstones of the formation of conscious awareness and eventually subsume

the spontaneous ones under themselves as their own moments. Vygotsky also draws attention to the special structure of scientific concepts that puts them in a special relation with objects:

> This relationship is mediated through other concepts that themselves have an internal hierarchical system of interrelationships. It is apparently in this domain of the scientific concept that conscious awareness of concepts or the generalization and mastery of concepts emerges for the first time. And once a new structure of generalization has arisen in one sphere of thought, it can—like any structure—be transferred without training to all remaining domains of concepts and thought. (1987, 191)

Thus, conceptual systems facilitate interaction with reality at a whole new level. They become tools enabling a higher level of abstraction and constitute a new set of schemata of activity in the process of metabolic exchange between human beings and social nature—that is, the process of knowledge production where knowledge signifies the activity of manipulating social reality. Knowledge is revealed in human activity that is constituted at the line of contact between human being and nature—human activity in nature is this continuum itself. Hence, knowledge is irreducible to propositional bundles, it is irreducible to its carriers (*träger*), such as signs, symbols, and digital data; these are forms of incarnation of knowledge only.[4]

As to the relation between mathematics and physics, it should not be forgotten that although mathematics is not about particular objects of the world, it is nonetheless actualized and can only be realized *in* the social world. Mathematics is this-worldly [*Disseitigkeit*] in the sense that is a specific form of the schemata of human activity; to think otherwise recapitulates stance of a theologian who, rather than revealing the earthly kernel of religion, is busy "explaining" the celestial root of terrestrial phenomena. It is no miracle that a specific form of the scheme of human activity in social nature matches or corresponds to another scheme of activity.

More specifically, and in the light of the aforementioned discussion concerning the "ideal", "ideality", and concepts, it becomes clear that the distinctive feature of mathematics is not its "ideality" or the ideality of its objects. Furthermore, developments of mathematical concepts and theoretical systems are historically trackable and are not limited to pre-history or to the periods of "infancy" and "childhood" of mathematics.[5] However, as Damerow observes, for the mainstream approach "mathematics is on the whole surround-

4. For further explication of the irreducibility of knowledge to its forms of incarnation see Azeri (2019).

5. For an interesting study concerning the invention and inventor(s) of imaginaries see Islami (2019).

ed by the very aura of consistency that, in contrast to the changing calculating methods, is characteristic of the laws of arithmetic" (1984, 117). The specificity of mathematics lies in separating form from content, which makes a purely quantitative conceptualization of reality possible; of course, the limit of purely quantified conceptualization is set by the quantifiability of the object to be conceptualized. As Damerow, among others, note, mathematics is not applicable to every problem, and attempting to mathematize every problem would be in vain (1984, 113). Mathematics is a "spatial" science; although it is realized with extremely "abstract" objects, it is not simply *about* those abstract objects and their interrelations but about space, i.e., the human world or social reality. "Calling logic and mathematics 'abstract' more than misses the point of their concrete nature as human activities; it obscures it in a way that allows them to be imported into a cognitive inner sanctum" (Hutchins, 1995, 365–66). The specificity of mathematical thinking lies in seeing the surrounding world from the viewpoint of quantity (Ilyenkov 2007b, 36). It is the highly quantified method of conceptualization of physical process adopted by modern physics that facilitates the "ideal" match between these two domains of knowledge-producing activity. The question that requires further explication is the reasons behind the adoption of such a quantitative attitude toward reality: what are the specific historical factors that render such an attitude favourable? "Success"? If so, in what sense of the term? What is the relation between the historically specific forms of exploitation of nature with the specific forms of its manipulation in the process of knowledge production? To put it more clearly, what is the relation between the capitalist relations of production and the quantified conceptualization of social reality? Last but not least, what is the relation between capital and (scientific) knowledge production in general?

It is clear that these questions are not easy ones, and their resolution requires far more comprehensive analyses than those possible within the limits of one single discipline, let alone the boundaries of a short manuscript, and requires the joint work of scientists (natural and social), philosophers, and historians.

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# Evald Ilyenkov's Marxian Critique of Epistemology and Education

In his "Critical Pedagogy and the Constitution of Capitalist Society" Glenn Rikowski, a leading figure in contemporary debates on academic labour, capitalization of education, and radical critical pedagogy, states that radical sociology and pedagogy of the 1960s and 1970s are committed to social transformation (social reform) and not more than that. Radical pedagogy is based on a distrust in social emancipation and "on individual cognitive emancipation" (2007, 2). Rikowski defines critical pedagogy as a specific form of a deficit theory of education; critical pedagogy contains an element of "critical deficit", which in turn is based on a neo-Weberian account of class and interest groups implying that interests of the students from lower classes can be met under capitalism (2007, 3). Accordingly, even radical classroom studies that are against inequalities, hierarchies, etc. are not related to a program of social emancipation (2007, 4). Formulating what a genuine critical pedagogy should be, he states, "A critical pedagogy should have at its foundations the critique of capitalist society. However, at the core of this enterprise is a critique of what Moishe Postone (1996) takes to be the basic structuring features of capital's social universe" (2007, 6, see also Rikowski 2018, 1). A critical pedagogy or a critique of education draws on the fact that the universe of capital is constituted by labour, while the latter also carries within itself the capacity of a practical critique of capital and its forms of domination. Thus, Rikowski rightly demands that "the process of education itself, and its role in reducing human life to labour-power, should become leading topics in any worthwhile critical pedagogy" (2007, 8). Such a revolutionary critique of education, which is rooted in Marx, will be different than those based on theories of Gramsci, Freire, or Habermas (2007, 8). The ideas of the Soviet philosopher Evald Ilyenkov (1924-1979) on the nature of knowledge, education, and the formation of human mind not only are relevant to the aforementioned theoretical endeavour for constituting a radical critical pedagogy and a critique of education, but also form the historical starting point of such efforts and, owing to their depth and richness and despite the fact that

they have not been addressed in this field sufficiently in the West, provide educators and philosophers of education with appropriate and highly valuable theoretical tools to that end.

Ilyenkov developed his ideas on education, in collaboration with prominent Soviet developmental psychologists (in particular, Alexander Meshcheryakov), from the 1960s into the late 1970s in debates against physiological reductionism that identify thinking with neuro-cerebral processes (e.g. Dubrovskii 1969). These ideas are closely related to Ilyenkov's conceptualization of knowledge and his consequent critique of epistemology. Ilyenkov's method contributes to constituting a holistic approach to education and human emancipation that is demanded by radical critical pedagogy (or radical critique of pedagogy)—a pedagogy that aims at freeing human beings from the domination of capital, and as such it is truthful to the essence of Marx's critique of the capitalist mode of production. Looked at from an Ilyenkovian stance, it is not the case that humans can be emancipated via education; rather, education itself should be emancipated from the yoke of capital so that it becomes a liberating force contributing to the constitution of a post-capitalist society through "producing" multi-dimensional individuals and flourishing their human capabilities. Capitalism is a specific mode of production where labour-power (human's productive activity) is commodified; in the meantime, capitalism is a human product (in the widest sense of the term), i.e. it is a product of a specific form of historical activity (labour).

One distinctive aspect of Ilyenkov's critique of education is his conceptualization of education system, knowledge-production, and thinking as essentially interrelated realms. The aim of a genuine education should be teaching the students how to think, where thinking means of the ability to detect a contradiction as a means of explaining the passage from one pole of the contradiction to the other with the aid of a middle-term. Thinking means recognizing a contradiction as a sign of irresolvability of a problem with the use of the already-existing intellectual means (Ilyenkov 2007c, 19). Contradiction, prior to being recognized, signifies an unthinkable situation or task; however, "all progress in our knowledge comes down to bringing what was previously "unthinkable" within the ambit of our thought: we find, see, and comprehend" (Ilyenkov 2007c, 24), i.e., progress in knowledge means widening the scope of the thinkable at the expense of what has been located in the realm of the unthinkable.

In contrast to capitalist education that aims at providing the labourer with the capacities necessary for the production process at the service of capital, a critical education should aim at "humanization" of individuals. Humanization amounts to bringing up students with the ability of "cultured thinking", that is, "flexible, ob-

ject-oriented, and concrete thinking" which is guided by the logic of things, focuses on the objective logic of phenomena in contrast to "abstract thinking", which is based on empty generalizations, memorized terms, phrases and formulas and thus irrelevant to the wealth of phenomena (Ilyenkov 2007c, 35). Humanizing education is another form of the existence of knowledge as the process of the humanization of nature and the naturalization of the human subject. The aim of such an education is not providing the "disadvantaged" segments of society with "equal opportunities" for increasing their chances of survival and competitiveness in capitalist job market—it is not a social or individual "deficit theory". Rather, it aims at providing each and every individual with access to all the wealth produced within human culture, a project that is inseparable from the struggle for constituting a truly just, free, and equal social order.

As Rikowski notes, the capitalist education system is mostly involved in the production of labour-power (2018, 9). Labour-power, as the capacity to labour, which resides within the labourer, has a dual nature in two senses. As a commodity it is divided into the useful (concrete) labour, on the one hand, and the abstract, value-producing, labour, on the other. Labor-power has a dual nature also in an "ontological" sense: it is simultaneously the constituent of capital and the greatest threat against it (Rikowski 2018, 9) due to the aforementioned dependence of capital on labour. Ilyenkov's demand from schools to teach thinking is relevant to such a conceptualization. Education should not subject students to the dominant ideology or indoctrinate and blindfold them with a "world-view" or "false consciousness". Rather, it should teach the acquisition of the means that facilitate the historically specific forms of human activity for the sake of human "survival"—a process of internalization of the "ideal". The question is: How the norms of survival (i.e., the "ideal") under capitalism can be turned against capitalism itself?

In contrast to "critical pedagogy" that generally conceives of the unity of action and word mechanically, and in concordance to Vygotsky and Meshcheryakov, Ilyenkov aims at explaining the dialectical unity of action and word. He does not simply juxtapose the two mechanically; rather, he explains how the word, the consciousness, or the mind grows out of and within action. The emergence of consciousness is not causally related to activity but is activity's mode of existence. It is through such reciprocal mediation that the dialectico-logically "necessary" distinctiveness and the unity of action and word as well as their emergence are explained. Thus, for Ilyenkov, critical education or a critique of education is not a process of "unveiling" reality or providing students (or the "oppressed") with a "true" consciousness; rather, it is the process of enabling them to manipulate and deploy physical

and ideal human artefacts as means of critical action. The main question of such a critique of education, thus, is concerned with the specific forms of appearance or modes of existence of knowledge-acquisition as manipulation of human artefacts.[1]

In order to clarify the aforementioned points, in the following a short excursion into works of Paulo Freire, as the main representative figure of "critical pedagogy", will be made in order to explicate both the distinctiveness of Ilyenkov's critique of education and the relevance of his ideas to contemporary debates. A consideration of the concept of "praxis" in Marx's critical epistemology also helps to further explain Ilyenkov's views on knowledge and education with the concept of "human activity" at its center. Furthermore, Ilyenkov's critique of epistemology and his conceptualization of knowledge will be considered followed by a reconstruction of his critique of education.

## Critical Pedagogy: A Short Excursion

In the *Pedagogy of the Oppressed*, Paul Freire sets the basic question of a critical pedagogy as the moral (axiological) problem of humanization (2005, 43), which is rooted in and affirmed by the struggle of the oppressed for regaining her humanity (2005, 44). Freire treats "human" and "humanization" as essences, which are historically suppressed and alienated because of the violent and unjust (capitalist) order (2005, 44). Freire, however, attributes a kind of trans-historicity to "human" and "humanity".

Since "human" and "humanization" are not trans-historical "realities", "facts" or "entities, the proper question to be asked by a critical pedagogy is "why do humanity and humanization attain this particular historical form?" In other words, why has humanity been actualized in this historical-specific form? The way out of the existing conditions, then, should be formed within this constituted "humanity" just as the way out of the social form of production and the universe of capital should be sought through recognizing the inner contradictions essential to and provided by these very forms.

The ahistoricity or trans-historicity that Freire attributes to morality and aesthetic-ethical codes is also evident in his *Pedagogy of Freedom*. He states, "Humanity of human-animal is dependent on "spiritualizing" the world (2001, 33). "In other words, it was becoming clear that it is impossible to humanly exist without assuming the right and the duty to opt, to decide, to struggle, to be political" (2001, 33). Freire, thus arrives at the conclusion that education is immanently ethical (2001, 33). Freire's Kantian

1. In Rikowski's words the question concerning education under capitalism is "what is the social form of education in capitalist society? What is its mode of existence?" (2018, 37)

stance with regard to morality also shapes his political stance: his protest against discrimination is moral and thus transcendental: "All discrimination is immoral" (2001, 40), but it is not clear which moral code should function as the measure for determining the immorality of discrimination.[2]

Freire states that the "dilemma" of the education of the oppressed, which prevents them from realizing their authentic humanity, is their being themselves and the oppressor at the same time (2005, 48); that is, they are educated—by and within an education system that belongs to the oppressor—so as to internalize the image of the oppressor. Their lost authenticity is to be regained by an education based on a "pedagogy of the oppressed" as an education, forged together with the oppressed, the object of which is the "causes" of the conditions of the oppression (2005, 48).

Although Freire pertains to Hegel, and in particular to the dialectic of the master and the bondsman, there is an essential difference between the two: for Hegel the master is the product of the *activity of* the bondsman, whether the latter is aware of this fact or not. Whereas, Freire's "oppressed" constitutes *herself* after the image of the master. For Hegel, "activity" is the source and the possibility of change; it is within the contradictory nature of action that the possibility for emancipation should be sought. For Freire, on the contrary, the oppressed has to be taught, albeit "interactively" or "dialogically", how to act. The educator, in an a priori form, has the knowledge necessary for the emancipation of the oppressed and her task is to walk the oppressed out of his/her inauthentic state by providing him/her with true consciousness. Thus he states, "One of the gravest obstacles to the achievement of liberation is that oppressive reality absorbs those within it and thereby acts to submerge human beings consciousness" (2005, 51). Emancipation, so formulated, is a matter of consciousness according to Freire. It is a matter of "liberating" the consciousness of the oppressed from the image of the oppressor, which the oppressed identifies with *the* human.

For Freire what is principal for the "pedagogy of the oppressed" is the "ideological" demystification, a change of viewpoint, or an "unveiling" of the real. Without such demystification and the formation of "true" consciousness, the task of liberation cannot be successful.

> The pedagogy of the oppressed, as a humanist and libertarian pedagogy, has two distinct stages. In the first, the oppressed unveil the world of oppression and through the praxis commit

2. Peter Roberts (2000) also states that for Freire fighting against discrimination is an ethical imperative (45). The problem of such an ethical approach to the struggle for equality is that it attributes trans-historicity to ethics and moral values, which in turn reflects the essentialism inherent in Freire's account.

> themselves to its transformation. In the second stage, in which the reality of oppression has already been transformed, this pedagogy ceases to belong to the oppressed and becomes a pedagogy of all people in the process of permanent liberation. (2005, 54)

This permanent process of liberation is a permanent "cultural revolution" (2005, 54, n.10). Accordingly, liberation is a matter of consciousness; it is the consciousness that determines being and not vice versa: this is a typical reproduction of the mind-matter dualism, albeit with the use of "materialist" terminology. Furthermore, Freire defines the position of the oppressor with reference to her "false consciousness", which is rooted in her failure in recognizing others as persons and her inability to love no one other than herself (2005, 55). Thus follows his Kantian formulation that the oppressor dehumanizes herself while dehumanizing the oppressed (2005, 56), which in turn amounts to the inauthenticity of both the oppressed and the oppressor (2005, 85). In doing so, Freire ontologizes and naturalizes a historical-specific form of human existence as *the* human existence.

In criticizing the "anti-dialogical" character of the pedagogy of the oppressor, Freire states, "The anti-dialogical individual, in his relation to others, aims at conquering them" (2005, 138). This formulation presumes the existence—though in a suppressed form—of an "authentic" self (be it individual or collective), which is conquered (possessed) by the alien self of the oppressor. The oppressor is presented as an invading alien force that should be expelled from the house of the self. Freire's stance, rather than explicating and analyzing the "root" of the matter, that is, of those social relations that amount to the existing mode of human activity and perverse social reality, is stuck within the limits of the phenomenal.

Such cleansing is necessarily one of the consciousness; once the awareness is acquired, the process of liberation begins: "sooner or later the oppressed will perceive their state of depersonalization and discover that as long as they are divided they will always be easy prey for manipulation and domination" (2005, 145). Freire defines what he names "cultural invasion" in a similar vein, as the penetration of the culture of others by the oppressors (2005, 152). "Cultural invasion" is defined as the imposition of a world-view upon another—this is a perverse form of Kantian conceptualism, according to which the transcendental conceptual frame that is independent of human activity in its historically specific form is the possibility of experience. From class struggle to joining the proletariat and the ranks of the revolution; all is explained in terms of "consciousness", "awareness" etc. As formulated, education becomes one of the most important means of "liberation" (emancipation). For Freire oppression is rooted in

bad education and thus its remedy will be the replacement of the bad education with a good one, which seeks for enlightening the oppressed masses.

Ilyenkov sets the problem in an entirely different manner: he considers education within the totality of the historically specific forms of human activity alongside other phenomena. Education is neither a result nor a cause of capitalist, bourgeois-idealistic, conceptualization of knowledge. Rather, these are reciprocally mediating realms and the two forms of actualization of the capitalist relations of production in the realm of knowledge-production. For instance, the determination of knowledge as a propositional formal-logical bulk is the inevitable consequence of the dualism inherent in bourgeois understanding, which in turn mediates the social division of labour, first and foremost the division between the head and the hand. The whole setting of the education system, thus, is so constituted as to produce the labourer (as the bearer of labour-power, the potential to labour) in concordance with such a social division of labour. When demanding schools to teach us "thinking", thus, Ilyenkov does not call for a return to teaching some authentic trans-historical form of human thinking; he is well aware that schools already *do* teach "thinking" in the dominant (uncritical) sense of the term. Hence, Ilyenkov's theory of education is not one in the ordinary sense of the term but a critique of education as a specific branch of production of labour that is to be deployed in diverse branches of production from service industry, to automotive, high tech and knowledge-production. Such a critique is a part of the holistic critique of capitalism and all its forms of appearance. In this sense, Ilyenkov's critique of education is reminiscent of and contributes to theoretical attempts toward forming a Marxian critique of education.

Freire suggests denouncing the tools of culture (as allegedly they belong to the invaders and oppressors by definition), while Ilyenkov demands every individual's full access to social-cultural artefacts due to their humanizing effect. This difference between the demands is rooted in a more fundamental disparity in conceptualizing human consciousness (subjectivity, agency). For Ilyenkov, the relation between consciousnesses is always tool-mediated, it is a relation mediated by socially-constituted artefacts. Thus, for him, human consciousness *is* a social relation. Freire's so-called "dialogical" consciousness, however, signifies an unmediated relation between the "I" and the "thou" reminiscent of Martin Buber's conceptualization, that is, an unmediated "inter-subjective" relation between consciousnesses. Thus, for Freire, there is an authentic self, an authentic humanity

within humans[3]; whereas, for Ilyenkov, following Marx, the essence of human is the ensemble of her social relations. The "dialogical" relationship between the teacher and the student that is proposed by Freire is the expression of a dualism where the teacher, for one reason or another, happens to be enlightened, and the student, unfortunately, is in darkness, under the cultural invasion of the dominator, housing the oppressor, and thus alienated from his/her own authentic self. Freire clearly suggests that the oppressed lacks agency and culture is something independent of them (2005, 158). Thus, he concludes the importance of cultural action and "cultural revolution": "Cultural action, as historical action, is an instrument for superseding the dominant alienated and alienating culture. In this sense, every authentic revolution is a cultural revolution" (2005, 180). Therefore, the whole problem boils down to changing the ways people contemplate, perceive the world or conceive of themselves—one form or another of what Rikowski names "individual cognitive emancipation". All in all, this is a demand for a "return" to the authentic, to one's own self, culture, etc.

For Ilyenkov, to the contrary, access to social artefacts that are definitely constituted in historically specific eras, under specific social relations of production, is the sole route to humanization: humans are historically specific, concrete beings. The access to and the internalization of the totality of human culture yields the possibility of human emancipation owing to the dual character these artefacts, like every commodity, attain under capitalism; a phenomenon which is also an expression of the dual character of labour. There is no world other than the existing social world—this very world of "appearances", where these appearances are the modes of existence of the capitalist social relations of production. Freire's position is anti-dialectical in that he demands a purification of the authentic self; a kind of return after cleansing. Ilyenkov, to the contrary, proposes a possibility of emancipation through sublating the existing mode of social reality, including the existing knowledge.

3. Dale and Hyslop-Margison identify existentialism as another philosophical source of Freire's pedagogy. In line with existentialism, they note, Freire separates consciousness and the world of things. Thus, "consciousness actually defines the various experiences it encounters by investing them with meaning. Second, since consciousness is abstracted from the other objects of experience, it enjoys the corresponding capacity to confer alternative interpretations on various events" (2010, 123). Therefore, consciousness is something essentially distinct from experience; it precedes experience and is considered the possibility of experience, similar to Kant's transcendental consciousness.

## The Role of "Praxis" in Marx's Critical Epistemology

The kernel of a Marxian critique of epistemology aiming at unfolding the process of knowledge-production, revealing its historically-specific form, and identifying its historical and social limits is succinctly expressed in Marx's *Theses on Feuerbach*, particularly in the second thesis: "The question whether objective truth can be attributed to human thinking is not a question of theory but is a practical question" (Marx 1976, 3).

Marxian materialism, in contradistinction to both older materialism (and empiricism) and idealism, conceptualizes the "identity" between the subject and the object through human praxis (activity). Furthermore, it conceptualizes knowledge not as an abstract system of propositions that is in need of "application" to "reality", but as an ideal reconstruction of this very praxis in line with its historical determinateness—a concrete conceptual system.

Knowledge emerges within the metabolic relation between human beings and social nature as the form of manipulating this nature. Based on concepts of "activity" and the "ideal", Ilyenkov's critique of epistemology follows this Marxian path. Accordingly, human activity, the highest form of which is labour, is the "middle term" through which the human being and reality come into contact, are unified, produced, and, thus, differentiated as the subject and the object. The specificity of human being is "object-oriented activity" (Ilyenkov 2007a, 70), which in essence means changing the world. In other words, humans conceive nature to the extent that nature is made the object of human activity—praxis; reality exists and is known only as the object of activity. Revealed within humans' practical transformative activity (praxis), reality "in-itself" emerges as a moment of reality "for-us".

Marx's emphasis on the "practical-revolutionary" activity differentiates Marx's attitude toward epistemology from other philosophical schools such as idealism and pragmatism. The practical truth of human thinking signifies thinking not as a mere "theoretical" attitude, which Feuerbach considers "as the only genuine human attitude" (Marx 1976, 3), but as an outward activity that actualizes in objective reality. Marx's emphasis on praxis and his demand for proving the "this-worldliness" and reality of thinking in practice is reminiscent of Hegel's ironic criticism of empiricism.

> Even the animals… show themselves to be most profoundly initiated into [wisdom]; for they do not just stand idly in front of sensuous things as if these possessed intrinsic being, but, despairing of their reality, and completely assured of their nothingness, they fall to without ceremony and eat them up. (Hegel 2004, 65)

Despite methodological affinities, Marx criticizes Hegel on two grounds: first, Hegel reduces human activity and labour to pure abstract thinking (ironically, Feuerbach's theoreticism is a derivative of this stance); second, such reduction amounts to a metaphysical, rigid, and absolute identification of the subject and the object, thereby dismissing the dialectical unity and differentiation of the two. Thus, Hegel reduces the dialectic of the subject's activity into a predetermined logic devoid of any content—a pure formality.

Although Hegel correctly identifies human's self-realization as a process of objectification through human labour, he one-sidedly identifies such self-creation with a historically specific form of labour, that is, capitalist labour. Hegel naturalizes a historically-specific form of human activity and does away with the potential critical stance he develops in his *Phenomenology*. Thus, Hegel recapitulates the positivist and empiricist stance, which mistakes mere generalizations for historically determinate abstractions; he reproduces the view of traditional epistemologies that identify the abstract with the "mental" ("verbal") and the concrete with the physical (sensuous entity) and, therefore, conceives of thinking not as a specific form of objective activity but as a relating of terms, words, sentences, and propositions in one's mind, head, or brain. Hegel, not only with his "uncritical positivism and idealism" dissolves and restores the existing empirical world, but also vindicates the existing objective world, religion, the state, and human sensuous consciousness in the form of spiritual entities (Marx 1975b, 332).

Thus, logic, as "mind's *coin of the realm*", becomes the "speculative or *mental value* of man and nature" (Marx 1975b, 330) and plays the role "value" and "labour" play in bourgeois political economy. Just as value is indifferent to particular use-values and useful labours, Logic as pure abstract thinking is indifferent to real determinateness of the world—it becomes alienated thinking. Despite his intention to provide a criticism of empiricist logic, Hegel reproduces that very logic. Instead of investigating empirical phenomena in order to reach at its concept –which reveals the true essence of phenomena and explains its necessary form of appearance—Hegel applies a ready-made logic onto phenomena and displays itself as the essence in the form of Idea. This is as much the case as with *Phenomenology* as it is with the phenomenon of the state in the *Philosophy of Right*. As Marx aptly put it:

> The concrete content, the actual definition, appears as something formal; the wholly abstract formal definition appears as the concrete content… Not the philosophy of law but logic is the real centre of interest… The logic does not serve to prove the state, but the state to prove the logic. (1975a, 17-18)

The similarity between Hegel's stance and empiricism is due to the idealist conceptualization of human activity in abstraction from real, material, activity, which amounts to and is a consequence of his political conservatism. The source of the aforementioned dualist conceptualization is not epistemological as much as it is political. Attributing a transhistorical form of universality to logic (as the absolute science of the rules of thinking) is the other side of the coin of attributing trans-historicity to the existing social nature. Hence, with regard to Hegel's mystified dialectics Marx states that "In its mystified form, the dialectic became the fashion in Germany, because it seemed to transfigure and glorify what exists" (1993, 103).

"Naturalism" of some kind with regard to the existing society and the mode of production is the thread that keeps such divers philosophical and epistemological systems together. The subject and the object in such views confront each other mechanically and externally only. Theoreticist attitude with regard to thought and knowledge is the inevitable consequence of such a dualist conceptualization. Knowledge, in this view, is not the knowledge of object but an object, albeit an abstract one, alongside others—a subjective set of rules of action that exists independently from the subject of knowing (Azeri 2017, 594).

To the contrary, Marx conceives of reality and knowledge in terms of objective human activity; thus, the task of philosophy is posited as changing the world (Marx 1976, 5). Marx's formulation is descriptive as much as it is normative. It is descriptive in the aforementioned sense: no knowledge is possible without changing the object of knowledge; the object is known to the extent that it is acted upon and made into the inorganic extension of human being. To know is to make a mere object into a tool of action (Azeri 2013, 1097). The essence is revealed only as a moment in the process of changing the objective reality; essence does not signify a static "in-itself" that hides behind the appearance, which is to be uncovered; rather, it is a milestone in the history of human activity that reveals the historically specific *form* of this activity. This formulation is also normative as it underlines the goal-oriented nature of knowing activity. There is no "knowing as such" or a "knowledge in general". Like every other form of human activity, knowing is actualized in response to socially-determined human needs and purposes. The purposiveness of knowledge as well as the tools that are deployed in the process of knowing determine the rules (the set of norms) of knowing activity, notwithstanding that these tools themselves are products and crystallization of accumulated humans' social activity and knowledge. Knowing is not possible without internalizing these rules, which means acquiring mastery in manipulating these tools and objects. Disregarding

such socially-determined normativity and the consequent historicity of knowledge-producing activity, "old materialism", as well as idealism in its different forms, ontologize the historically specific forms of knowing. Hence follows the blindness of scientism and empiricism to the historical limits and determinations of science and knowledge.

Once knowing is conceptualized as external activity, "epistemology" in the mainstream sense of the term, as a science that aims at defining the universal laws of knowledge-producing activity becomes inconceivable. Therefore, a Marxian "epistemology" can only be a critique of epistemology, that is, a critical analysis of the conditions and forms of knowledge-production within and as historically specific social relations. It is in this sense that Ilyenkov and Korovikov, in opposition to positivism and neo-positivism redefine philosophy as the "science of scientific thinking, of its laws and forms" (2016, 29). The real subject of philosophy is theoretical thinking the laws of which "are not laws of reality, but laws of thought" (Ilyenkov and Korovikov 2016, 30).

## Ilyenkov's Method: Knowledge as Object-Oriented Activity

According to Ilyenkov, genuine knowledge is not a propositional bulk but an ideal reconstruction of the object within the entirety of its interconnections and processes, that is, the ideal reconstruction of object as a concrete whole. In this sense "knowledge … is always knowledge of an object" (Ilyenkov 1991). Furthermore, knowledge is always the knowledge of a "particular" object "for it is impossible to know "in general," without knowing a particular system of phenomena, whether these are chemical, psychological, or some other phenomena" (Ilyenkov 1991). To know, thus means, to manipulate the object with the use of some tools; in other words, to know means to bring a particular thing under its rule or concept—what in Kant's language means to form a "judgement". Manipulating the object means concretizing it, where concretization means identifying the specific determinateness of the object. Thus, object-directedness signifies concreteness of knowledge, where concrete means "well developed, all round, comprehensive knowledge" in contrast to abstract as "one-sided, incomplete, lopsided reflection of the object in consciousness" (Ilyenkov 1982, 36).

Furthermore, concreteness signifies objectivity of knowledge since concrete first and foremost is related to the necessary interrelations between diverse phenomena independent of cognition. Yet, this does not mean that the concrete is identical with the immediately given object of the senses. "[Concrete] expresses a universal form of development of nature, society, and thinking" (Ilyenkov 1982, 33). Tool-mediatedness of knowledge signifies its social essence.

Nature for Marx appears only through social labour. Even time and space are social in their origin. Materialism accepts that, say, laws of motion of external bodies are independent from consciousness. However, this objective "in-itself" is relevant only if it is made into a "for-us"; in other words, it is relevant as far as nature is drawn into the web of human's social practice with the use of artefacts and to the extent that it becomes a socially-produced artefact.

Deploying a tool requires mastering its use: the tool determines the form of activity of the subject. It is as much as true for deploying, say, a knife and fork while eating as it is for deploying conceptual systems aiming at revealing laws of nature. Using conceptual tools means emancipating cognition and knowledge-production from the limitations of biologically given "individual" sense organs and mastering to see "the world not only and not so much through [one's] own eyes as through millions of eyes" (Ilyenkov 1982, 43). This, in turn, signifies the "ideality" of knowledge since the "ideal" is defined as the universal norms of a culture, the internalization of which is necessary for an individual to continue her life activity (Ilyenkov 2012, 154). It also signifies an important aspect of knowledge: knowledge-production cannot be separated from the process of knowledge-acquisition just as the process of mastering the use of a tool is inseparable from its deployment by the subject. This continuity and inseparability of the process of knowledge-acquisition (learning) and knowledge-production has significant implications for education system and pedagogy, of which more will be said below.

Ideality of knowledge further signifies its historically specific social character. Ilyenkov defines the ideal as "the form of social-human activity represented in the thing, reflecting objective reality; or, conversely, the form of human activity, which reflects objective reality, represented as a thing, as an object" (2012, 176).

Thus, knowledge-production is inseparable from other fields of production and is subject to the determinations of the social relations of production. Under capitalism, for instance, scientific knowledge-production is constituted so that science becomes a force of nature at the service of capital. Criticizing Feuerbach, thus, Marx states, "Even … "pure" natural science is provided with an aim, as with its material, only through trade and industry, through the sensuous activity of men" (Marx and Engels 1976, 40). A Marxian analysis of knowledge is therefore a critical analysis of the forms of knowledge-production and the process of subsumption of science under capital—hence a critique of epistemology.

What is central to Ilyenkov's account of knowledge-production is his emphasis on the concept of human activity. Knowledge-production is a particular form of human productive activity in response to a set of social needs posited at a specific historical era. The

methods and the tools it requires bear the mark of such historically specific social relations. The universal form of knowledge-claims of modern sciences is not identical to attributing trans-historicity to its products. Such a view is ideologically refrained from perceiving the historical limits of knowledge and sciences. Knowledge has an ideal character and thus it is determined not by "nature" (if there is any such nature in the sense that, say, Feuerbach understands) but by labour, "the transforming and form-creating activity of social man, his purposeful, sensuously objective activity" (Ilyenkov 2012, 192). Under capitalism such purposiveness is determined by the goal of valorization of capital, the substance-subject, which subsumes all the areas of social production and activity. As Warmington and Leadbetter state, under capitalism "education, training, management and organisational strategies are increasingly oriented to the social production of labour-power" (2010, 72). Labour-power producing units are themselves socially significant tools; they are the machinery for producing "variable capital", i.e., labour. These labour-power producing machinery are at the service of extracting more surplus-value from labour, notwithstanding that value itself is a social substance (an ideal).

The transformation of natural material and creation of commodities (in the general sense of the term, commodities as useful things or as use-values), rather than destroying the objectivity and independence of material nature, proves the objectivity of human labour and human activity and its dependence on objective and independent existence of material nature. Objectivity of nature is the precondition and the source of objectivity of human labour and consciousness. The unity of consciousness and nature, the subject-object unity, is attainable only externally as the unity *in* nature. Were consciousness not objective, it would be a mere internality with no window open to nature. The semblance of interiority in contrast to exteriority that appears as the subject-object dichotomy is the product of a mode of production where things appear not as inter-related processes but as self-contained fetish-like entities.

## Critique of Education

A critique of epistemology necessarily entails a critique of education, because the latter is an integral part of the process of knowledge-production. Education is not simply a handing down of information to students, but more importantly, it is a process of production of individuals required for constituting and sustaining the dominant social relations of production in different fields, from material production to sciences and the education "industry" itself. There is a direct link between the new techniques of production of value and the education system. Education and the curricula is formed in response to the needs of the process of production—in

fact, this might be a "general" rule; just as labour, above all, is the necessity put forward by biological existence of human beings, without which the persistence of the species is impossible, the preparation of the labour-power needed to pursue the task of production is also a phenomenon that is common to all modes of production—this commonality is one of the most abstract nature. To the extent that the capitalist mode of production is concerned, the question will be identifying the forms through which capital determines and constitutes forms of education and curricula. Despite all technological advancement since the WWII, Virkkunen et al. note that "the ideas of occupations and generalised job descriptions, task competencies and task-based planning have remained at the core in the planning of vocational and professional education" (2010, 12). With the development of capitalism and further "globalization" of economy, new needs are dictated onto professional education: first, the global standardization of curricula, which makes the circulation of labour in the international market more feasible; second, scientification of production, which requires further skilled and refined labourers; third, changes in the concept of "qualifications" of the labour-power (Virkkunen et al. 2010, 12).

Commodification of labour-power is a central concept in understanding the universe of capital: What is that, which is commodified? What is labour-power? Labour-power is not a thing; it is not a "useful" entity in the sense that a particular commodity such as a knife or fork is. It is a "capacity", a "potentiality", which when activated/actualized and turned into labour, its consumption by capitalists generates a greater value than the one set in motion at the beginning of a cycle of valorization. As Rikowski notes, "Education and training are implicated in the social production of labour-power. It is this that establishes their capitalist form; that is, makes it possible for us to refer meaningfully to 'capitalist' education and training" (2001, 189).

Ilyenkov's critique of education is construed at two levels: on the one hand, he intends to show the shortcoming of the existing education system, which stems from the capitalist relations of production and amounts to producing unthinking and thus unfree automatons; the product of capitalist education is "human capital", that is, human reduced to an element of capital—human labour-power expressed in capitalist social form (Rikowski 2001, 12); on the other hand, he attempts to outline the bases of a humanist, communist education, which aims at creating free, emancipated, thinking individuals capable of forming critical judgments and creatively posing questions.

Ilyenkov criticizes the existing education as fetishistic, since it treats knowledge as something external to and other than praxis, as a thing or an object among other objects, which is to be

crammed into the student's head; the student eventually will be taught to "apply" this knowledge to reality. The capitalist education system is so organized that it produces the image of the world as world of manipulable things (fetishes) and also of knowledge as an instrument-thing (another fetish) to be applied externally by the subject, who is totally separated from both the object and the instrument of manipulating the external reality—knowledge. Hence follows the pseudo-problem of "application" of knowledge alongside knowledge itself (Ilyenkov 2007a, 71). This "problem" is recapitulated in epistemology as the distinction between "know-how" and "know-that", where the former signifies "practical" and the latter purely "theoretical" knowledge. The "application" problem, however, is irresolvable within the existing pedagogical frame-work. The only way out is dissolving the conditions that yield such a conceptualization of knowledge and teaching. Ilyenkov states that this problem was understood quite rightly by Kant in his formulation of the faculty of judgment. Alongside all theoretical knowledge one acquires, there is a special ability of bringing this knowledge under a rule, i.e., bringing an individual case under a universal. The problem is how to identify whether a case is compliable to the rule or not. Kant claims that this particular ability is not teachable and thereof it is innate.

Kant, therefore, divides people to those who can only get these rules from others and those, the minority, who can derive these rules from experience and apply them intelligently (Ilyenkov 2007b, 72). To the contrary, Ilyenkov states that

> *All that is human in man*—that is, all that specifically distinguishes man from the animals—is 100 percent (not 90 percent or even 99 percent) the result of the social development of human society, and any ability of the individual is an individually exercised function of the social and not of the natural organism, although, of course, it is always exercised by the natural, biologically innate organs of the human body—in particular, the brain. (2007b, 67)

The Kantian position in particular, and the innatist positions in general are anti-humanistic not only for treating people unequally, but also because they undermine society's responsibility toward individuals. Although such a position claims to be individualist –in the sense of defending the flourishing of every individual's right to develop her capabilities and enjoy her "gifts"—it functions as a fascistic leveler just as capital functions as a leveler before the workers. If "talent" is a rarity, not "nature" but an education system that ignores the social makeup of human consciousness and is thus unresponsive to individuals' particular needs and interests, and that aims at producing mediocre minds who will passively comply

with the tasks imposed on them by the existing social relations of production is to blame. Setting the aim of education system as producing mediocre minds is the expression of the capitalist levelling tendency, which denies all forms of equality expect the one based on exchange-value (Rikowski 2001, 15). The task of a truly human education is to produce such social conditions that guarantee the development of skills and capabilities of every individual (Ilyenkov 2007b, 67). Ilyenkov's strategy for a radical education is a system that enables free, critical thinking: education not just as the multiplication of labour-power but a humanizing education. Human development or the process of humanization is a tool-mediated process; i.e., mastery of all human artefacts (tools) is a central aspect of this process. Therefore, education should be reorganized so that it provides every individual with proper capabilities to access all cultural products that she may need including all the material and ideal wealth. An education that aims at anything less will be dehumanizing as it limits individuals' potentialities in terms of the prospect of the full development of their consciousness to acquire the capability to think critically—the capability to judge, to bring a given situation under its concept, to pose questions correctly, where critical question-posing constitutes the essence of science and knowledge. Hence follows Ilyenkov's bitter criticism against those approaches that relate education and learning to natural "talent" or "gift", genes or the brain structure.

> Under certain conditions –conditions entirely too well known for us to explain them—the decisive role in defining the course through life was played (and is now still played here and there) even by such features as shape of skull and nose, hair or skin color. The most unexpected factors may play a role in determining one's "individual destiny," even a brick falling on one's head. (1969, 88-9)

To actualize such a restructuring of education, "the pedagogue must concern himself first of all with creating a system of conditions of action that impose on the student such and such a method of action" (Ilyenkov 2007a, 73). Such an education is based on absorbing the totality of shared human experience. Such shared experience is based on three principles: the necessary objects to satisfy the personal bodily needs; the necessary means for satisfying these needs; and the ability to deploy these specific means (Meshcheryakov 1974). The process of humanization of the child is a process where she appropriates tools as the extensions of her body; the tool and the child unify. The child uses the tool to act; she needs to use the tool correctly. The correct use of the tool that becomes manifest in satisfaction of needs is dictated and determined by the instrumentality of the very tool. The process

of mastering behaviour and performing an action with a tool is a process of mutual transformation of the child and the tool into one another. This is so because every tool is a specific tool with a particular social significance; because every tool is an element of social culture. As Meshcheryakov puts it:

> When he masters an object of action, a child comes to understand the object involved in the action. This means that the child, as he masters the method of action, assimilates the social value inherent in the object concerned. Indeed, knowledge of objects is social values transferred to the mind of the child, i.e. appropriated by him. (1974)

As an element of social culture, the tool that dictates a particular form of performing an activity in order to satisfy a particular need becomes an obstacle on the way of satisfaction of the need. Once the mastering of the tool is acquired, i.e., once the social significance of the tool is assimilated, the tool becomes the middle-term that facilitates the activity toward the satisfaction of the need and domination of the tool. At first, it is the tool that negates the child by hindering her from satisfying her needs; once the child is subsumed under the rules of using the tool of action, she negates not only herself but also the tool; the tool that first functions as an obstacle to the process of humanization of the child now becomes a means for actualizing that goal. The tool is a question posed before the child; once its social significance is assimilated, it becomes a part of the process of the child's questioning the social world. As Ilyenkov states,

> It is therefore necessary to train the "mind" from the very start in such a way that a "contradiction" should give it not cause for hysteria but an impulse to independent work, to independent examination of the thing itself—and not only of what other people have said about this thing. (2007c, 19-20)

What is presented here as "contradiction" is not contradiction in the narrow, formal logical sense of the term; such contradictions (e.g., $p \wedge \sim p$) are to be barred by rules of formal logic. Contradiction means "the unity and coincidence of mutually exclusive theoretical definitions" (Ilyenkov 1982, 233). Contradiction appears when the phenomena that form the subject matter of a science is to be systematized conceptually (1982, 235); it is always a sign of a problem that is unresolvable by deploying the existing artefacts, including conceptual systems. The resolution of a contradiction means turning the very contradiction into a tool and medium of action that ameliorates the mode and form of activity, without which further activity is impossible. According to Ilyenkov, Marxian dialec-

tical method "is based on the assumption that contradiction in the object itself cannot be and is never resolved in any other way than by the development of the reality fraught with this contradiction into another, higher and, more advanced reality" (Ilyenkov 1982, 267). In other words, the materialist dialectical conception of contradiction depicts the transformation of mutually exclusive poles into one another so that not only the earthly kernel of these phenomena is revealed, but also "the development of these phenomena from within the forms of actual relations in life" is explained (1982, 288-289). Accessing the riches and the artefacts that are constitutive of social reality, and which at the beginning appear as obstacles on the way of action, determines the degree of humanization of the individual. The child's mastering of the tool—the process of transformation of a tool from an obstacle into a means of action—is her first step into the realm of dialectical and creative action/thinking.

## Conclusion

The existing education system, which is an integral part of the capitalist relations of production, aims at producing obedient individuals that would carry on tasks coherently, say, to the extent that the functioning of a calculator or a computer is based on the principle of non-contradiction and coherence. Within the existing education system the student is considered a "customer" or a "consumer" whose brain is to be crammed with general rules and principles and finalized structured coherent models, the acquisition of which reduces the individual's activity to a mere reaction to stimuli. Such a reduction is also manifest, say, in computational models of the mind and discussions surrounding the so-called "artificial intelligence". In such models, ironic as it may seem, it is not the computers or artificially intelligent machines that are constructed after the human mind/brain/thinking, but to the contrary, it is the brain or humans' thinking activity and intelligence that are conceived of after the image of these "intelligent" machines. This in turn, although perversely, is the result and a showcase of the outwardness of human thinking activity, which is reflected in an upside-down manner in these theories, as an inverted image of reality in a *camera obscura*. Such perversion is also visible in heated "philosophical" debates surrounding the "brain in a vat", which simply and uncritically reproduce the age-old commonsensical belief that thinking is happening "inside" one's head or mind and is completely separated from the activity of the human as a psycho-physical unity. In such an education system students are provided with end-products, with fetishes, in the form of fully-developed formulas, "theories", and "scientific systems" which are to be "applied" to reality later. Students are presented with "the

naked result without the roads that lead to it" and therefore to the dead corpse of truth, as Hegel aptly put it. "And then the dead seizes hold of the living and does not allow it to go forward along the road of science, along the road of truth. Dead truth becomes the enemy of living, developing truth" (Ilyenkov 2007c, 21).

Capital is concerned with knowledge as an end-product disregarding the creative process involved in its production and formulation. As Marx states scientific knowledge costs capitalist nothing, as it becomes a mere force of nature at its service. The aim of the existing scientific education is to quickly reproduce the "skilled" labour necessary at different levels of production, including the scientific production itself. Thus follows the factory-like form of cramming students in classrooms: here the aim is not to produce "true scientists" in a large number but to cut out the surplus-population of these skilled workers so that they serve other "lower" branches of industry. Here too, the capitalist law of population is at work.

Another consequence of capitalist mass education is its indifference toward concrete training, while being too specialized, on the other hand. This contradictory structure is the manifestation of the form of the productivity of capitalist labour. To the extent that large masses of the working people are concerned, the education system tends at producing the future workers that are flexible and unskilled enough to realize the dull task of production for the sake of production and to acquire new "skills" in order to be able to work at more than one sector of production. On the other hand, capital's tendency toward increasing the productivity of labour and scientification of the production process requires a portion of the working class to acquire high-tech skills to this end.

The commodity that is produced through the education process is labour-power. The value that is added to the labour-power at the end of the process is the increased skills and "productivity" of labour (where productivity is related to labour's capability of producing a larger amount of surplus-value). Like every other commodity, for the value inherent in this commodity to be realised, labour-power should be exchanged with money. The realisation of the value of "regular" commodities is bound to their sale by the owner of the commodities as end-products, e.g., the owner(s) of an automobile factory; however, labour-power is a special form of commodity in that it is a potential that is actualisable in the production process only, it is inseparable from the worker's body, and it is a commodity the use-value of which is identical to value (value of labour + surplus-value), meaning that its consumption amounts to production of a larger value. Since the worker is "free" and not a slave, s/he cannot be sold by the owner of the education factory (in the widest sense of the term which includes colleges,

universities, vocational schools, special training, apprenticeship, etc.); although reducing workers to slaves is a capitalist fantasy, it is unattainable as it makes the realization of the surplus-labour in form of value impossible; thus, capitalism necessarily "frees" workers. The worker is the buyer (purchaser) of this particular commodity, that is, enhanced labour-power or the skills etc.
This does not contradict the logic of capitalist economy as the "free" worker is a commodity owner that meets the capitalist in the market in order to exchange her/his commodity with money-capital. Thus, if the enhanced potential for labour, that is, enhanced labour-power does not get into such an exchange and if its value is not realized, it is the worker as the owner of this peculiar commodity that loses and not the education factory's owner(s). The cost of enhancing labour-power is a part of the "value of labour", that is, the historically, socially, and culturally determined necessary average social time for its production. Therefore, the cost of education is a particular arena of the bargaining struggle between labour and capital: capital tends to put the cost on labour while labour tends to put the cost on capital. Fully capitalized education system is one where the cost of increasing the skills of the worker is completely put on workers.

A truly humanizing, democratic education, that is, a revolutionary communist education system is to be organized in such a way that it does not consider the student a consumer but "a co-participant in the creative process" of knowledge-production.

> By no means, of course, does this mean that each child is forced independently to "invent" all those formulas that people of past generations have already invented for him over the centuries and millennia. But he must retrace the logic of the road traveled. Then he will master these formulas not as abstract magical prescriptions but as real, quite concrete general principles for solving real concrete tasks. (Ilyenkov 2007c, 43)

This way, the child acquires the ability of formulating "concrete general principles", that is, "concrete universals" in the sense of the terms "concrete", "universal", "abstract" and "general" that was discussed above. Such an education is possible to its full only if the principle "from one what one can give, to one what one needs" will have been actualized. "Communism is a program for creating such conditions for all" (Ilyenkov 1969, 98).

Ilyenkov's critique of education is based on conceiving of education under capitalism as a necessary means of producing labour-power in response to capital's need and thirst for exploitation of surplus-value. Therefore, the answer to the question "how a schooling system capable of teaching us thinking (critically) is

to be built?" is one beyond enhancing productivity or educating multi-talented persons; the task is to provide an education in order to grow free thinking individuals. Methods of "applied education", "vocational schools" etc. fail not because they do not succeed in producing more efficient labourers; rather, they fail because they function as the means of enhancing such a labour-power capability—automatons, calculators etc. are what genuinely needed by capital.

In this sense, such criticism cannot be separated from the definition and a critique of knowledge and epistemology. If knowledge is understood in terms of the metabolic relation between human and social environment with the goal of manipulating the environment for human goals, then it cannot be something historically-neutral. When Ilyenkov criticizes the education system as producing mediocre persons because it sets the goal as mediocracy and thus defining "talent" a rarity, he does not necessarily mean that all can and/or should become mathematicians or "high-skilled" scientists but that capitalist education system is so that it confines the growth of capabilities of human beings within the boundaries set by capital: a division of labour, which is supposedly based on degrees in skills, talents and capabilities, and thus is "natural". By eternalizing the existing social division of labour, capitalist education divides humans to their labours "indefinitely".

Education system is an integral part of social human practice and the consequent social reality; as a specific form of humans' productive activity, thus, it carries the mark of the historically-specific social relations and the mode of production of which it is both a constituent and a product. As a specific form of productive human activity that contributes to the production of "that other great class of commodities", that is, labour-power, it attains the specific social form that renders it value-producing labour. A critique of capitalism is not a critique from within (capitalist) labour, but a critique of labour as the constituent of the universe of capital. Yet, owing to the dependence of capital as a social relation on labour, the latter is also a constituent of the practical critique of the former. Similarly, a critical pedagogy cannot be a critique of social or individual deficits—it cannot be just another form of a deficit theory—such a stance would leave the basic feature of capitalist education intact—reduction of the human individual to labour-power. That being the case, it would contribute to the enhancement of labour's "productivity", which is "not a piece of luck, but a misfortune" (Marx 1993, 644), and to the reproduction of the capitalist relations of production. Just as a genuine critique of capitalist forms of consciousness cannot begin from consciousness per se but should aim at a critique of the earthly kernel of these forms and the social relations that yield such consciousness,

a radical critical pedagogy cannot be one that aims at producing an "emancipated" consciousness, but should begin with the critique of those social conditions upon which the existing educational establishment stands—hence it necessarily will be a critique of education or a critique of pedagogy. It is in this latter sense that a critique of education contributes to the formation of an emancipatory consciousness—one that resembles Marx's critique of religion as both the showcase of the miserable human conditions and the basis of all criticism.

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# Vygotsky and Ilyenkov on Language, the "Ideal" and the Constitution of Consciousness

In the *German Ideology*, elaborating on the unity of natural and human sciences as the "single science of history," Marx states that "the whole ideology amounts either to a distorted conception of this history or to a complete abstraction from it" (Marx and Engels 1975, 29), yet this does not make ideology a mere sham or an illusion because ideology itself is an aspect of human history (1975, 29). Disregarding "ideology" as a mental illusion or a set of false beliefs amounts to reproducing the mistaken conceptions of the "German ideologists" who conceive of "conceptions, thoughts, ideas … as the real chains of men" and therefore "fight only against these illusions of consciousness" (Marx and Engels 1975, 30). The ideologists' misconception stems from their conservatism, which amounts to sanctification of the existing social order as they consider concepts, thoughts, and ideas severed from material reality that yields these ideas. Their mistake consists in their inability to conceive of the "this-worldliness" of thinking and of its truth and reality. They fail to see that thoughts, ideas, and concepts, alongside the whole of social world populated by human artefacts, are products of human activity.

For Marx the fundamental precondition of history, which can only be abstracted from in the imagination, is "the real individuals, their activity, and the material conditions of their life" (Marx and Engels 1975, 31). For history to begin, there need be living human beings who have organized their physical relation with each other and with the rest of nature. The distinguishing characteristic of humans in comparison to animals is that humans "produce their means of subsistence … and indirectly produce their material life" (1975, 31). In doing so, humans do not merely reproduce their physical existence but also "a definite *mode of life* on their part" so that "what they are coincides with their production, both with *what* they produce and with *how* they produce" (1975, 31-32). Humans not only produce things but they also produce the totality of themselves—their physical lives, the means of production and subsistence, and their consciousness.

> Consciousness [*das Bewusstsein*] can never be anything else than conscious being [*das Bewusst Sein*], and the being of men is their actual life-process. If in all ideology men and their relations appear upside-down as in a camera obscura, this phenomenon arises just as much from their historical life-process as the inversion of objects on the retina does from their physical life-process. (Marx and Engels 1975, 36)

Thus, to the extent that the ideas, concepts, and forms of consciousness are concerned, the questions are why humans conceive of themselves and of their social world in this particular form, and what means do they use in order to produce these ideas? As Postone notes, in the *German Ideology* criticizing the idealism of the Young Hegelians Marx "doesn't simply decry them as wrongheaded but argues that an adequate theory should be able to explain why their idealism is plausible to them (2009, 325). It is by ascending from the earthly to the heavenly, from the real active human beings and their life-activity to ideas that the ideal reflections of the form of this activity in human consciousness can be properly understood. The "ideological" products of human activity such as religion, metaphysical ideas, and morality alongside other phantoms of human mind has no independent lives of their own; they do not develop by themselves but are developing only as products of the development of the material conditions of humans' lives (Marx and Engels 1975, 36-37). This is true for ideal products as much as it is true for physical products and artefacts such as physical means of production and tools. That they lack a history of their own and that they depend on human activity does not make them any less objective and real. Attributing an inherent ahistoricity to "ideological" products, in contrast to physical ones, recapitulates the ideologists' dualist view that assumes substantiality of thought (mind) in contradistinction to matter. The gist of the matter is to consider consciousness not as a thing by itself but solely as the consciousness of real living individuals. "Men have history because they must *produce* their life, and because they must produce it moreover in a *certain* way: this is determined by their physical organisation; their consciousness is determined in just the same way" (Marx and Engels 1975, 43).

Criticizing Feuerbach for his contemplative stance with regard to the existing social world, Marx emphasizes the role of social intercourse and human activity in constituting the sensuous world: the human world is a product of industry and the state of society; moreover societies in general are historical products of the activities of successive generations (1976, 39). Even the object of sensuous certainty dear to Feuerbach is not exempt from this historicity and social determinateness. The social world is like a geological

crust that is formed of layers of historical human activity so that man "always has before him an historical nature and a natural history" (Marx and Engels 1975, 39-40). The historical character of social nature and of production also signifies another important aspect of humans practice: this activity is as much social as it is natural. It is social because it involves cooperation of several individuals where cooperation is an aspect of a mode of production that is bound to the development of the forces of production and the organization of the form of cooperation and production (Marx and Engels 1975, 43). Consciousness is itself an historical product, which in turn is "burdened with matter and makes its appearance in form of language" (Marx and Engels 1975, 44).

The ideas of the prominent early period Soviet psychologist Lev Vygotsky (1896-1934) on the formation of consciousness (and higher mental functions), complemented by Evald Ilyenkov's (1924-1979)—the most brilliant representative of "Creative Soviet Marxism"—concepts of the "ideal" and "human activity" facilitates constituting a Marxian critique of theories of subjectivity and ideology—that of Althusser's included—and a proper understanding of the so-called "ideological" phenomena. Such a conceptualization also contributes to form a critique of some Marxist approaches that, put roughly, reproduce the age-old subject-object dualism in form of substructure-superstructure dichotomy; it also yields forming a holistic conceptualization of the social relations of production, a form of appearance of which is the individual consciousness.

Although Vygotsky and Ilyenkov were not contemporaries, both experienced relative academic freedom while pursuing their scientific and theoretical research but at the same time were subject to certain restrictions and censorship. The last years of Vygotsky's life coincides with the rise of Stalin's terror; eventually Vygotsky's works would be suppressed posthumously. The period after 1930 is the period of suppression of philosophy (and of what is called "the sphere of the ideological" by the official Soviet establishment). It followed Stalin's speech "On the Problems of Agrarian Policy in the USSR" that was delivered in December 1929 at the conference of Marxist agrarian workers (Yakhot 2012, 43-44). In it, Stalin condemned Deborin and his colleagues; his attack was followed by an open campaign against Deborinists led by Mark Borisovich Mitin. This amounted to their official condemnation by the Central Committee on January 25, 1931. Deborinists were assaulted for their alleged Trotskyist tendencies, for their "Mensheviking idealism" and distancing from Marxism-Leninism. The suppression of Deborinists was followed by the attacks against Mechanists and was eventually expanded into the realm of the social

sciences and humanities. However, Vygotsky's legacy continued, although within Soviet psychology through the works of his colleagues and pupils such as Alexander Luria, Alexei Leontiev, and Alexander Meshcheryakov with whom Ilyenkov would closely collaborate in the 1960s and 1970s.

Ilyenkov's appearance on the philosophical scene coincides with the "Khrushchev Thaw" and the process of "de-Stalinization". However, from the outset of his philosophical carrier Ilyenkov would be under pressure and subject to continuous intimidation by the Soviet philosophical establishment that was then led by the aforementioned Mitin. Attacks against Ilyenkov, which began right after the presentation of the "Thesis on the Question of the Interrelation of Philosophy and Knowledge of Nature and Society in the Process of their Historical Development" (co-authored with Korovikov in 1954), although launched wrapped in political-ideological clichés reminiscent of the 1930 allegations against the Deborinists, these attacks were in fact triggered by the threat the "brain-dead" "Marxist-Leninist" philosophers, who were capable only of recycling the ideological dogma known as Soviet Diamat, felt owing to their incompetence. Yet, allegations against Ilyenkov would amount to the suppression of his work and his exclusion from certain projects, for instance the *Soviet Encyclopedia of Philosophy*. He was also pushed to "tailor" some of his major philosophical contributions in order to fit into the official conceptualization of dialectical and historical materialism.

Some critiques such as Arto Artinian consider Vygotsky's and Ilyenkov's ideas a contribution "to a leftist articulation of effective responses to the functioning of hegemony and ideology within the complex experiences of capitalist everyday life" (2017, 96). Accordingly, the ideas of the aforementioned complement theories of hegemony (Gramsci) and ideology (Althusser) (Artinian 2017, 97). Artinian attempts to derive a (positive) theory of hegemony and ideology from Ilyenkov and Vygotsky. Contrarily, I intend to emphasize the "negative" (critical) essence of their methodologies—a critique of consciousness, of ideology, etc. which in my view is faithful to the core of Marx's critical project. For instance, Vygotsky criticizes the pseudo-Marxist approaches in psychology of his time that simply use quotations from Marx as a make-up for their non-Marxian theories, and sets before himself the task of constituting the *Capital* of psychology; he begins his analysis of consciousness with identifying its "cell" or the "basic unit" –word-meaning—pertaining to Marx's "commodity" as the cell of capitalist relations of production—in doing so, he anticipates critical accounts such as D. N. Smith's concept of "critique of political psychology" (2016) or Worrell and Krier's concept of "surplus-consciousness" (2018).

Artinian's account also implies that there is an "epistemological rupture" between the late (mature) and the early Vygotsky (Vygotsky with phenomenological overtones vs. Vygotsky the "reflexologist"); to this end, he draws on the concept *perezhivanie*, which "denotes the *lived experience*" that allegedly refers to "internalized ideology, internalized consent, hegemony-as-lived-life" (2017, 97). In contrast, it is suggested in this article that there is a continuity in Vygotsky's ideas, from his alleged reflexology period to his so-called "sign period". This can be achieved with the help of Ilyenkov's concept of "activity", without which Ilyenkov's concept of the "ideal" cannot be comprehensively grasped. For Vygotsky consciousness *is* a social relation (not *in* or *determined by* etc. social relations)—a point that is ignored in mainstream—"Western" and "Eastern"—interpretations of Vygotsky. That being the case, consciousness appears as a curvature of the social, in contrast to, say, Althusser's account, which Artinian affirmatively quotes, that considers the relation between the social and the individual as the social *entering* the individual (Artanian 2017, 108). Contrarily, for Vygotsky, consciousness is not an empty vase to be filled with the social liquid but is an interiority that is constituted in and is identical to the very process of interiorization.

Marx states that in each era the dominant ideas are the ideas of the dominant class because as is the case with the means of material (physical) production, the means of mental or intellectual production also are owned by the ruling class. The ruling ideas are the ideal expression of the ruling material relations (Marx and Engels 1975, 59). The "ruling ideas" are dominant because they are internalized by the individual so that the individual consciousness emerges as a personification of capital as a social relation. Rather than being a product of the so-called ideological apparatuses such as education system or religious institutions, consciousness is posited/induced by capital. Consciousness is ideological, not in the sense that the latter signifies false consciousness or that in contrast to the ideological subject there can be a non-ideological thus non-subjective consciousness, but in the sense that it is a consciousness *of* and *in* this world. Consciousness, as capital personified, is a social relation, which is actualized through sign systems—first and foremost through language as a system of "reflexes of social contact," formed in reaction to human-made stimuli such as words, which in turn act as stimuli that anticipate other reflexes (Vygotsky 1997g, 42).

## The "Ideal" and Activity

Humans endow their physical environment with ideal properties. These ideal properties, normative in their essence, determine the type of activity of individuals within the cultural environment, which is itself a product of this process of "idealization". Ilyenkov

defines thinking as the ideal component of social human activity (2009). Thinking is not a "mental" processing of propositions and/or signs in one's head but is the ideal reconstruction of reality and the essential interconnections between phenomena with the use of signs, symbols, and concepts. Thinking is a creative activity in that it involves both production and transformation of new ideational tools and concepts and transformation of external reality via producing tools for such transformative activity. The reality of thinking is in its outwardness.

The ideal defines the set of universal norms, the internalization of which are (logically) necessary if the individual consciousness is to emerge and participate in social life. By idealizing the environment humans change it qualitatively. This idealization is not reducible to subjective imagination: Value is a paradigmatic example of the ideal: Value is devoid of any material (physical) existence, yet it is not reducible to the individual's subjective imagination. The value that money represents, as Marx argues, cannot be found either in the chemical composition of commodities, or in the texture of money. The value of money is a function of the concept of "value", which is itself a historical product. In the absence of such concept a proper understanding of the value of individual commodities and of their simple exchange would be impossible. That is why Aristotle could formulate the law of simple exchange of commodities, but fail to grasp the "common substance" that makes exchange of commodities possible (Marx 1993, 151). As Bakhurst also notes, "once idealized, the 'external world' no longer exercises a purely physical influence over the subject. Rather, objectification makes possible a new mode of interaction between human agents and their surroundings: a norm-governed interaction mediated by meanings, values, and reasons" (1991, 244).

Thinking, therefore, according to Ilyenkov, is the ability to act with reference to this norm-mediated mode of interaction with the world. The ideal constitutes the medium that "delays" human responses to stimuli; it is the medium that transforms a direct response (behaviour) into activity (mediated response). The objectivity of dialectics as "laws of thinking over knowledge", or the objectivity of the laws of motion of bodies, signifies the active-objectivized aspect of human thought and the externalization of the ideal element via such activity. Laws of dialectics are universal and objective not in the sense that they are discovered by humans *in* nature, but because they are the representation of objectivization of human activity and its ideal aspect, that is, thinking. Thus writes Ilyenkov, "Understood in that way Logic can also be the genuine science of the reflection of the movement of the world in the movement of concepts" (2009).

Reflecting on Plato, Ilyenkov states that he is the first thinker that genuinely formulates the problem of ideals and their objectivity. The question that Plato has posed, and which still holds, is concerned with the nature of ideas and the world of ideals. How these immaterial (incorporeal) strange entities determine rules of action, the syntax, the logic and arithmetic? How do they interact with the corporeal? What is the source of their determining effect? What is the source of their universality? For Plato ideas "are necessarily *universal*, commonly-held image-patterns, clearly opposed to an individual 'soul' that directs a human body, as a mandatory law for each 'soul', with requirements that each individual must consider from childhood much more carefully than the requirements of his own individual body with its fleeting and random states" (Ilyenkov 2012, 154).

Yet Plato, like other idealists, is misled by the objectivity of ideal forms and their trans-individual existence in the realm of human culture. The objective reality of the ideal is admitted by idealism but in a perverse form; while for reductionist materialist it is the brain that thinks and thus thinking and the process of the formation of concepts and ideals is reducible to cerebral processes, for the idealist the subject of thinking is the thought itself. Thus, idealism fails to see that the ideal itself is subject to historical changes. Idealism has a fetishistic view of the ideal; it is fetishism in form of objectivism.

The ideal is a product not of nature but of purposeful human productive activity, which constitutes the basis of her metabolic interaction with social nature. It should be noticed that human activity has a purely and essentially social character in Ilyenkov's view. Just as Vygotsky (1997a) defines consciousness in terms of the capability of social body to stimulate its own activity with the use of cultural artefacts such as language and sign-systems, Ilyenkov too defines consciousness in terms of tool-mediated activity, where tools are socially-constituted artefacts.

The search for an object that satisfies some need of the organism is the precondition of the formation of psyche. However, with the emergence of the highly developed psyche, it turns into its consequence (Ilyenkov 2010, 14-15) just as commodity is the precondition of the formation of capital but then, once the specifically capitalist relations of production are established, the commodity turns into the product of capital. The emergence of psychic functions in humanity is not an instinctive motion but a formation that requires the ontogenetic development of socially formed functions that are socially-mediated. Concerning the relation between the organ and the function of consciousness, thus, states Ilyenkov "the organ here is created by the function, and not the other way round, not the function by the organ, by a 'structure' that exists prior to it" (2010, 16).

It is notable that for Ilyenkov the psyche (mental functions) is socially formed and socially mediated. Even the structure-like organization of these functions is the consequence of a historically specific form of genesis. If higher mental functions (human consciousness) are preceded by forms of human activity and are produced within this activity, then in every historical era this consciousness inevitably assumes a specific form, which, in turn is both the subject and the object of that mode of activity (Azeri 2017, 689). This formulation is reminiscent of Marx's elaboration of the determination of the worker as, say, a slave or a wage-labourer, with references to historically specific modes of production.

> Under certain circumstances a chair with four legs and a velvet covering may be used as a *throne.* But this same chair, a thing for sitting on, does not become a throne by virtue of its use-value. The most essential factor in the labour process is the worker himself, and in antiquity this worker was a slave. But this does not imply that the worker is a *slave* by nature (though this latter view is not entirely foreign to Aristotle), any more than spindles and cotton are *capital* by nature just because they are consumed nowadays by the *wage-labourer* in the labour process. The folly of identifying a specific *social relationship of production* with the thing-like [*dingliche*] qualities of certain articles simply because it represents itself in terms of certain articles is what strikes us most forcibly whenever we open any textbook on economics and see on the first page how the elements of the process of production, reduced to their basic form, turn out to be land, *capital* and labour. (1993, 997-98)

"Throne-ness" is not a function inherent in a particular structure; rather, it is a historically formed property that sublates a given structural organization as its own moment. Therefore, from the outset consciousness and the ideal as a specific product of purposeful human activity are socially-constituted. Under the capitalist relations of production, this purposefulness and the form of this life-activity is determined by the will of value (capital) which is the manifestation of abstract labour and thus it inevitably appears in abstract and reified and fetishistic forms.

## Vygotsky via Ilyenkov: Reflex, Activity, and Consciousness

As early as 1926, Vygotsky defines consciousness as a social relation, the formation of which is essentially related to language. Marx had already identified the link between language and consciousness in the *German ideology*: "language *is* practical, real consciousness that exists for other men as well, and only therefore does it also exist for me" (Marx and Engels 1975, 44) and similar

to consciousness, it only emerges out of the need to communicate. According to Vygotsky, language is the source of social behaviour or the consciousness and it is the key to understanding one's own self as well as another's.

> The mechanism of being conscious of oneself (self-consciousness) and of the knowledge of others is the same. We are conscious of ourselves because we are conscious of others, and by the same method by which we are conscious of others, because we are the same vis-a-vis ourselves as others vis-a-vis us. (Vygotsky 1997g, 42)

Vygotsky defines the problem of consciousness as one of the structure of behaviour (1997a, 67). He criticizes reflexology (the Russian counterpart to American behaviourism) for its inability to take into account complex behavioural issues, for its narrow scope and distinguishing the human from the animal. Furthermore, reflexology excludes the concept of "consciousness" and by so doing it reproduces the age-old mind-body dichotomy (1997a, 63-65). He states, "to build a psychology without a mind is the dualism of subjective psychology turned inside out" (1997a, 65). He further maintains that conceiving of behaviour as a sum of reflexes is false; "reflex" is an extremely abstract concept and cannot function as the fundamental concept in the investigation of the psyche. Vygotsky draws attention to lack of proper understanding of what the term "reflex" signifies by his contemporary Russian scholars; he states that the term "reflex" in the phrase "reflex of freedom" does not mean the same as "reflex" in the phrase "salivary reflex". Moreover, by reducing all these terms to a common denominator "reflex" is rendered meaningless (1997a, 66).

All animal behaviour can be exhausted with reference to inherited experience and personal experience (unconditional plus conditional reflexes). This, however, is not the case with human beings; in humans we have to introduce new elements, for instance, *historical* experience (inherited from our ancestors through learning; accumulated historical experience), which is extended far beyond "natural" limits. Furthermore, there is *social* experience, that is, the experience I acquire in connection with other persons. The most important component of human experience, therefore, is human being's active adaptability (human activity)—adaptation of the environment to ourselves (1997a, 68). Pertaining to Marx, Vygotsky argues that the products of human activity initially have an ideal form in human imagination. "This perfectly indisputable explanation by Marx refers to nothing other than the doubling of experience that is unavoidable in human labor… [We] provisionally call this new type of behavior doubled experience" (1997a, 68).

Consciousness has a *regulatory* role with respect to behaviour (Vygotsky 1997a, 72); that is, it chooses the appropriate circular reactions as new stimuli in order to evoke a new series of reaction that fits the state of the organism the best. Given that human consciousness is a social relation, it follows that consciousness is a combination of regulatory circular reactions that facilitate the active adaptation of the individual person to the social environment and her persistence in society.

However, the most important aspect of consciousness is that it is of a "secondary" nature and therefore it is determined by social environment (1997a, 76). However, it should be noted that these two—consciousness and environment—form a dialectical unity: being means social active being, which is the condition as well as the product of human activity. Vygotsky's point of departure, like that of Marx's, is the existence of the external world, which constitutes the condition, the material, and the tools of human action. Thus, "reaction" is not a mere "reflex" to some stimuli, but an action in response to and on what the stimuli represent. In this respect, in the "Preface to Lazursky", Vygotsky states,

> Mind is unequalled in the whole organic world and it is to mind that man owes his dominion over nature, i.e., the higher forms of his adaptation… The most subtle phenomena of the mind are nothing other than especially organized and particularly complex forms of behavior and, consequently, mind fulfills the same adaptive function as all other forms of organisms' adaptation which do not change their organization. (1997d, 57-58)

Vygotsky endorses Lazursky's thesis that every mental process is in fact an action. He furthers this thesis along Hegelian lines that sees in nature the objectification of the Mind. However, for Vygotsky, mind is that of human being, which has been formed through human's social activity of adapting to and manipulating social nature ("the highest form of adaptation"). Thus also follows the historical specificity of the "dominant mind" in a particular historical moment.

One specificity of human behaviour and consciousness is its tool-mediated structure. A psychological tool is a device for mastering one's own behaviour; it plays a role analogous to means that are deployed in the labour process. "Psychological tools are artificial formations. By their nature they are social and not organic or individual devices. They are directed toward the mastery of [mental] processes—one's own or someone else's—just as technical devices are directed toward the mastery of processes of nature" (Vygotsky 1997f, 85). Vygotsky enumerates languages, numerical systems, mnemotechnic techniques, algebraic systems and art-

works among these psychological artefacts. They affect forms of manipulating one's own behaviour just as labour tools determine the forms of labour operations (1997f, 85).

The modifying effect of psychological instruments on behaviour are comparable to the modifying effect of a material tool on material behaviour—the effect of, say, a spoon, when it is deployed as an instrument that mediate eating. Like material (physically solid) tools, psychological instruments have an "ideal" structure in the sense of positing the rules of action and/or being the mediation of the deployment of norms of action. The norm is not generated in the tool but is generated through it by the social and historical milieu. The tool is the middle term between the socially-posited norm of activity and internalization of the norm by the individual person in her process of humanization and individuation. The tool, further, points to the active role that the subject has in the process of individuation. Individuation is not a causally deterministic process alike to formal logical instantiation. The very deployment of tools provides the individual with her peculiar position in this process. Since tools are not natural but social-historical constitutions they open up a space for the intervention of the individual who deploys them. Thus writes Vygotsky,

> From one viewpoint, we can look at the behavior of man as a complex system of natural processes and try to comprehend the laws governing them, just as we can examine the action of any machine as a system of physical and chemical processes. We can also look at the behavior of man from the viewpoint of his use of his natural mental processes and the methods of this use and try to comprehend how man utilizes the natural properties of his brain tissue and masters the processes that take place in it. (1997f, 86)

Machines, for instance, are not complex tools made of a combination of simpler ones, although they can be looked at like that if only taken into consideration physically. The specificity of machine as a tool is a function of its social significance; what determines it as a specific tool and what is required for its mastery is the appropriation of this significance. This significance is the social form that tools acquire as machines under the capitalist relations of production, as means of production and exploitation of more surplus-value from labour, which in turn requires a particular form of discipline and a form of behaviour (labour) in concordance with the laws of value accumulation with the deployment of the machines as the middle-term between labour process and valorization process. Machines form the constant capital where capital signifies a social relation and not merely a thing; therefore machines are social relations. Treating them as things by themselves

is ahistorical and fetishistic. Machines should be defined by their functions in the web of social relations; this is the methodology Vygotsky deploys in order to analyze consciousness. As human develops socially it comes up with a consciousness; this is a historically-specific consciousness. It is a specific social relation. Its possible transformation can be explained only in terms of changes in its function and not its composition.

Machines do not exploit surplus-value owing to their mechanical structure; it is owing to their position in the social relations, in the web of the totality of human artefacts (mental ones included) that they attain such a function. Similarly, Vygotsky refers to the historically specific form of human consciousness in terms of the specific mental capacities and development of consciousness. Thus, in relation to the role a Kaffir attributes to dreaming as a means of decision making he writes,

> The laws of dreaming are the same everywhere, but the role which the dream fulfills is completely different and we will see that such a difference not only exists between, let us say, the Kaffir and us… It was not the Kaffir himself who, in giving this answer, created such a system. This representation of the dream is part of the ideology of the tribe to which the Kaffir belongs. (1997c, 97)[1]

By mastering the use of psychological tools, one subordinates oneself to the laws of one's own behaviour as a "force of nature". "In the instrumental act man masters himself from the outside-via psychological tools" (Vygotsky 1997f, 87). Of importance is human's subordination to the laws of her own activity as if these laws are objective –in the sense of being independent of the mode of human activity. Yet, the laws of human activity are socially determined and thus are historically specific. Just as deploying machines requires a working class with a consciousness in concordance with the intensity and speed of the work and its discipline, deploying psychological tools corresponds to such requirements. Mastering the tool is the external expression of such subordination; forming a consciousness in order to mastering the tool and putting herself in concordance with the requirements of the work is the internal aspect. Similarly, in capitalism it is the machine that deploys the worker and not vice versa, just as it is human that becomes the extension of machine and not the other way around; with psychological tools a similar process is at work: human becomes subordinate to the psychological tool; the law and the ideal are dictated

1. Editorial note: We reproduce the word "Kaffir" out of fidelity to Vygotsky's use of the word. It is widely and correctly regarded as derogatory to Africans and therefore unacceptable for scientific and general use. Vygotsky however was using the term in association with a specific mode of production and likely had no racist intent.

by the needs of capital's self-valorization drive. The *weltanschauung* determines the individual; the individual becomes an expression of the worldview rather than the worldview be one of an individual's. Thus "The application of psychological tools enhances and immensely extends the possibilities of behavior by making the results of the work of geniuses available to everyone (cf. the history of mathematics and other sciences)" (Vygotsky 1997f, 87).

Vygotsky attributes a great role to speech in the process of individuation (the process of the emergence of consciousness) as a process of internalization of the collective will. In the "On Psychological Systems" he draws attention to the unresolved problem of the relation between speech and thinking, a point he would elaborate on later in his *Thinking and Speech* (1987) where, following Marx's method of criticism of political economy in *Capital*, he identifies word-meaning as the unit of analysis and the basic cell of human consciousness. "The unit contains, in a simple, primitive form, the characteristics the whole that is the object of analysis" (1987, 244), just as a commodity contains all contradictions and properties of the capitalist relations of production.

Speech is a specific kind of tool, that is, as a system of signs and significations, which mediates the rules of social behaviour and relays them onto the individual. "Signification is the mastering behavior of other or one's own by means of creation of the "connections in the brain from outside"... The use of signs restructures mental functions" (Chehonadskih 2017, 123). It should be noticed that the "social significance" (meaning) of the tool is relayed through its deployment: a tool, of course, dictates a certain type of motion when it is deployed. A spoon, for instance, should be grabbed in a certain way and moved in a certain way if its function as spoon is to be utilized. However, the most important aspect of using a spoon is the socially developed set of norms when it comes, say, to eating or to stirring something with the use of spoon; the immediate rule of using the spoon is a moment and a function of its social significance. Hence, it can be replaced by a fork, a knife, a plate, a glass etc. This is also the case with language and sign systems. Although mastering a language requires utilization of certain facial and vocal muscles etc. the real significance of language is what is relayed through it to the individual. Speech, above all, is the tool of producing the self.

> Each higher form of behavior enters the scene twice in its development-first as a collective form of behavior, as an inter-psychological function, then as an intra-psychological function, as a certain way of behaving. We do not notice this fact, because it is too commonplace and we are therefore blind to it. The most striking example is speech. Speech is at first a means of

> contact between the child and the surrounding people, but when the child begins to speak to himself, this can be regarded as the transference of a collective form of behavior into the practice of personal behavior. (Vygotsky 1997c, 95)

The social significance of the artefact is derivable from its social function. It is true that the ergonomic specificities of the artefact imposes on the user a certain form of behaviour; However, this ergonomic "meaning" is not deducible from or the expression of the material-physical structure of the artefact just as the "meaning" of value is not deducible from or a function of the chemical makeup of the coin or the banknote. The ergonomic makeup is just the *träger* of the social significance, where the latter assumes an "ideal" form in Ilyenkov's sense of the term. One who uses an artefact properly is one that uses it in accordance with this social significance. Furthermore, an artefact is the carrier of the meaning only as a part of a web of artefacts (just as is the case with a concept that is meaningful only within a web of concepts). Social significance is the expression of the "ideal" as the set of norms necessary for partaking in social human activity. This point is reminiscent of Marx's treatment of Hegel in the "general introduction" to *Grundrisse*. Hegel realized a great deal when stated that the material is the realization of thought; yet, as Marx notes, he failed to realize that "thought" or the "ideal" is the product of human activity; that thought is what social humanity thinks. Thus, he were misconducted by this very discovery as he identified his own thinking with the thought and thus reduced reality to the expression of his own absolute inwardness (Marx 1973, 101).

Word-meaning signifies the unity of thinking and speech, which means that the word is a constituent element of thinking and that thinking is a constituent element of speech. They are not externally associated but they unite to form the inner life of thinking and of speech; it constitutes the kernel of concept as the ideal reconstruction of concrete as the synthesis of diverse aspects. Vygotsky states, "Psychologically speaking the process of concept formation resides in the discovery of the connections of the given object with a number of others, in finding the real whole. That is why a mature concept involves the whole totality of its relations, its place in the world, so to speak" (1997c, 100).

Concept formation means to bring the object under its law, that is, to form a judgment about it; to identify the "place" of the object to which the concept refers in the totality of its relations; concept is a concrete universal where the concrete signifies a synthesis of diverse aspects. Concept is the means of production of genuine knowledge, where knowledge is the knowledge of the object: "the concept is not a collective photograph. It does not develop by rub-

bing out individual traits of the object. It is the knowledge of the object in its relations, in its connections" (Vygotsky 1997c, 100). Vygotsky further states that thinking in concepts forms the basis of the development and emergence of consciousness which means it is the means of forming a proper judgment, that is, to bring a singular phenomenon under its law.

While elaborating on the problem of the unconscious in psychology, Vygotsky defines science as a construct that can combine facts and experiments into a "coordinated" system, that is, a science is a system of judging facts in accordance to certain laws that consist in a hierarchical system of concepts (1997b, 109). The unconscious is a sign of complexity of consciousness (1997b, 119); given this complexity, dialectical (scientific) psychology that aims for achieving the real, essential relations behind this complex compound and revealing the unity in diversity of the component parts of consciousness (1997b, 115), defines the unconscious as "potentially conscious" in the sense of being non-verbalized.

The relation between the unconscious and language, on the one hand, points to the centrality of language acquisition and speech in the process of conscious-formation while, on the other hand, emphasizes the sociality of consciousness through and through. Given the centrality of the role of language in the process of the formation of consciousness, the basic unit of which is the word-meaning, in differentiating humans and non-human animals, language (the basic system of signs that other symbolic systems are constructed after its image) becomes the most important tool in forming human consciousness as the curvature of sociality: it is through language that the social significance of the artefacts that populate human social reality are grasped in the process of individuation.

Language is the fundamental means of producing consciousness as a social relation that functions in concordance with the "ideal": consciousness is ideology internalized. Ideology is the process of production of consciousness and of the social ideal as the set of rules of social existence in a specific historical epoch. Furthermore, consciousness is not only a psychophysical unity but is also a socio-individual unity. The process (of the formation of consciousness) cannot be separated from consciousness, as if the latter has an existence in itself. Such attempt at separating consciousness from the process of its constitution is like abstracting "the heat from the sun, to ascribe it independent meaning and to ask what meaning this heat may have and what action it can perform… It is absurd to ask whether a given quality can act upon the object of which it forms a quality" (Vygotsky 1997b, 114). The unconscious refers to the socially produced consciousness, of which the individual mind is a curvature; the former is the objective material the latter is made of; the individual mind is a moment of the social and thus its extension is lesser.

In "The Problem of Consciousness" Vygotsky articulates the aforementioned idea of the change of function of psychological systems but this time with regard to the relation between psyche, sign and meaning. It is consciousness as a unitary system that determines the fate of the psychological system (Vygotsky 1997h, 130). The importance of the sign comes from the fact that it has a different relation to meaning; the knot is different than a word; "the sign *changes the interfunctional relationships*" (1997h, 131, emphasis original), which amounts to the changes in consciousness. Thus, consciousness always attains a historically specific form.

Of great importance is also the notion of constancy of meaning. For the non-human animal a means of action does not acquire a constant meaning; in other words, the means of action for, say, an ape, is bound to the immediate field of activity; it does have a meaning only within that particular frame. The means, on the other hand, in human activity acquires a specific, fixed meaning; it becomes a tool; it is concretized through the act of abstraction. To produce meaning, therefore, is to turn a mere object into a tool of activity, that is, to fix its social meaning, to universalize it. A tool is a concrete universal. With sign, however, we enter a higher level of abstraction and thus of concretization. As Vygotsky states comparing the ape's and the human's uses of means,

> *Man wants the stick, the ape wants the fruit*. <The ape does not want the tool. It does not prepare it for the future. For the ape it is a means to satisfy an instinctive wish.>
> *The tool requires abstraction from the situation. Tool use requires another type of stimulation and motivation. The tool is connected with meaning (of the object)*. (1997h, 131, emphasis original)

The generality of meaning also brings about its normative aspect. Meaning is social, that is, it is related to the social significance of signs; it is completed in word (language). Thus, understanding the meaning and internalization of sign systems as the demiurges of meaning implies the internalization of socially-constituted norms. "The object has meaning"-this means that it enters into communication. *To know the meaning is to know the singular as the universal*" (1997h, 136, emphases original).

What is communicated in speech between people is not simply words or things but meanings. "People communicate with meanings insofar as these meanings develop. The schema here is: not person-thing (Stern), not person-person (Piaget). But: person-thing-person" (Vygotsky 1997h, 138). This mediated structure of communication acquires a fetishistic form under capitalism, where the relation between things appear as social relations, while the relation between humans appears as a relation between

things. It seems as if it is the word or the sign that gives birth to consciousness, as if consciousness is born out of the word's belly. Thus, it amounts to strengthening the belief that "in the beginning was the word". It looks as if sign systems have "objective" structures and senses (objective in the sense of being independent of human's praxis), whereas in reality, the sign is a specific tool produced to communicate social sense. The idea of the independence of the sign is fortified by the value-form of money. It looks as if the value that money represents originates from the composition of the banknote or it depends on some inherent property of, say, gold or silver. Idealism is the inevitable world-view under the rule of capital: value is the greatest ideologist.

## "Ideology" and the Contradictory Makeup of Consciousness: A Detour

With the division of material and mental labour, consciousness might appear to itself as if it is not a consciousness of a form of practice but a thing by itself. Consciousness, "emancipated" from the world, assumes the form of "pure" theory (Marx 1976, 45). This semblance of independence is strengthened by two other factors. First, although language is rooted in labour, that is, despite the fact that labour forms the essence of language in a historical sense, in the process of development of consciousness (of children) the sequence of practice (labour) and language acquisition is reverse (although, it should be noted that the child acts before she learns language; activity in general precedes speech). The child learns language and through it grasps the social significance of tools, language included, and subsequently, by mastering language and those other tools participates in social labour and activity. The ideal/ideological function of language and the source of misconception that the ideal is something mental and not socially produced, but some feature of the so-called "superstructure", with a life of its own, lies in this sequential conversion. However, once the dialectics of the historical and the ontogenetic is understood, that is, once the form of functioning of the essence is conceived of, such illusion is dissipated. Language is the consequence (result) of labour, but then, as a material force of social reality, it turns into its condition. The second is the asocial and ahistorical conceptualization of the existing social order that amounts to conceiving of human individual consciousness as an end product with no ontogenesis and as a thing by itself and in contradistinction to the social. Such conceptualization is itself based on identifying the "historical" not with the "essential" but with a historiographical beginning; thus, it fails to introduce labour or practice as a category that can break the word-thought-word circle (Maraev 2016, 98).

A detour into Althusser's account of the relation between "ideology" and the formation of subject (the ideological consciousness) contributes to clarification of the aforementioned misconceptions, in particular the second. According to Althusser Ideology "interpellates" individuals as subjects; further, it subjects them to Subject; through mutual recognition the subject finally recognizes himself in the image of Subject (1971, 55). Referring to the ambiguity of the meaning of "subject" (free agent vs. being subject to authority) Althusser concludes that "*the individual is interpellated as a (free) subject in order that he shall submit freely to the commandments of the Subject, i.e. in order that he shall (freely) accept his subjection, i.e. in order that he shall make the gestures and actions of his subjection 'all by himself'*. There are no subjects except by and for their subjection. That is why they 'work all by themselves'" (1971, 56, emphasis original).

In Althusser's account ideology constitutes concrete individuals as subjects (1970, 45). It is clear that here concreteness refers to some "pure" or "natural" state of individuals, whereas, for instance, in Marx's account, concreteness of an individual is a function of its historical determinations. Althusser considers such constitution as the core of "all" ideology, from Plato's idealist account of the soul to God of religion to the "modern" individual (1971, 44-45). Thus, he reiterates his claim on ahistoricity and trans-historicity of "ideology", which in turn necessarily entails the ahistoricity of "concrete individuals". Hence, we are introduced to a new definition of "nature" of human being: "man is an ideological animal *by nature*" (1971, 45, emphasis added).

Ideology for Althusser works in a top-down manner; it posits the subject from above—it is an alien, albeit material and tangible, force that exerts power on the individual from outside. Thus, Althusser claims that "ideology is always exist in an apparatus, and its practice, or practices. This existence is material." (1971, 40). Consequently, ideology is always someone's ideology, that is, it is someone *else's* and is put in use through a material apparatus (education, law, jurisdiction, religion, etc.) by this someone in order to subjugate others to the Subject. The individual is posited as a subject with an apparently free consciousness, whereas, in fact, she has been indoctrinated so that when she acts in concordance to her ideas she merely enjoys a semblance of free action; however, according to Althusser, by participating in ritual practices of the ideological apparatus one "in reality" becomes subject (in the aforementioned dual sense of the term). Through such formulation Althusser supposedly overcomes the idealist conceptualization of "ideology" as a set of ideas in consciousness or mind. Thus, he affirmatively quotes Pascal stating "Kneel down, move your lips in prayer, and you will believe" (1971, 42). He concludes that ideas

of a single subject "are his material actions inserted into material practices governed by material rituals which are themselves defined by the material ideological apparatus from which derive the ideas of that subject" (1971, 43). In this way, Althusser arrives at a position similar to that of behaviourists that reject the existence of consciousness as an independent, ideal phenomenon, a position that Vygotsky correctly identifies at the other side of the idealist coin of assuming the existence of mind without behaviour (1997a, 65). Althusser's understanding, rather than conceiving of consciousness in terms of social relations, as the intra-subjective form of existence of socially-constituted mental functions, recapitulates the commonsensical meaning of the term as something rigidly "interior" in contrast to the exteriority.

Althusser's commonsensical, rigid conceptualization of "ideal" and "material" is also manifest in his claim concerning the "materiality" of ideas or representations. Ideology (alongside ideas and representations) is material because it "always exists in an apparatus, and its practice, or practices" (1971, 40). By the same token one can claim that "value" is material and not "ideal" because it is always "carried" in a commodity—be it the universal commodity money—that it is actualized. In other words, Althusser identifies the "ideal" with its particular form of incarnation. Althusser recapitulates the commonsensical view that "ideal" in non-objective, a subjective chimera, something in mind or head. In his view, whatever that is objective and has an existence independent of individual's mind should be material (physical); he identifies the concrete with the physical object of the senses. The reality of an entity, for him, is in its "physical" materiality. Thus, if ideology is real, it cannot be "ideal". He therefore concludes that attributing ideality to "ideology" is itself an ideological act (1971, 39).

Althusser defines "ideology" in terms of distortion of the worldview (in contrast to Marx who defines it as the necessary form of conceiving of oneself in reality). For Althusser it is the outlook that is imaginary and therefore false; for Marx, to the contrary, it is the world that is false and its conceptualization cannot be other than how it is—hence follows the necessity of changing the world. Althusser states that although worldviews make allusion to reality, they do not correspond to reality and if interpreted correctly, the reality behind them can be uncovered (1971, 36). As Althusser also admits, Marx related "ideology" to the real conditions of life; accordingly, in (early) Marx's conceptualization of ideology, the alienating conditions of life are responsible for the alienated view of the world (1971, 37); however, he claims this to be a false formulation. Instead, according to Althusser, what humans represent to themselves in their ideology is not their life conditions but their relation to those conditions (1971, 36). All in all, ideology, owing to one or

another reason, means forming a distorted, "imaginary" view of the world and the human place in that world. Interestingly, Althusser is pushed to assume the existence of some consciousness before action—although he is at pains for conceptualizing ideology in terms of ideas adopted based on "practical rituals". This consciousness is transhistorical; it is the concrete substratum, the transhistorical use-value without which value allegedly is not realizable. Even if we accept Althusser's formulation of Marx's understanding of ideology, there remains a problem: human consciousness is certainly a function of social relations of production because consciousness *is* a social relation, not *in*, *alongside*, or *despite* social relations. Thus, for Marx, human consciousness under alienating-fetishistic capitalist relations of production is "ideological" not in the sense that it represents false or imaginary consciousness but that it is *the only possible* form that consciousness attains under the capitalist relations of production. Althusser deals with consciousness as a matter of "world view" or "world outlook". Whereas, consciousness is mainly related to the rules of conduct that facilitate survival in a particular mode of production. For Althusser consciousness is a function of contemplation; it is contemplative and thus it functions like (wrong) lenses. For Marx, consciousness is a function of activity; it is not a looking out to the world but an opening up into the world. Althusser's position with regard to subject and subjectivity can be considered the symmetrical image of Lukacs's formulation that identifies Hegel's *Geist* with the proletariat as the subject of history—a supposedly Hegelian understanding of History as a process without a subject. "Althusser transhistorically hypostatized as History, in an objectivistic way, that which Marx analyzed in *Capital* as a historically specific, constituted structure of social relations" (Postone 2003, 77, n. 95).

Marx's critique, as Postone aptly puts, "is a theory of historically specific social mediation … that … allows for an analysis of both economic and philosophical thought as expressions of an historical/material reality they don't fully apprehend" (2009, 310). Accordingly, the historical subject is the alienated structure of social mediation that constitutes capitalist social formation. In other words, Marx tries to explain, in particular with reference to "alienation", the creation of structures by people that eventually will dominate the creators. Hence, states Postone, "domination in capitalism … is rooted in quasi-objective structures of compulsion constituted by determinate modes of practice, expressed by categories of commodity and capital" (2003, 316). This means that capitalist historical process, in contrast to non-capitalist processes, gradually becomes subject to a tighter logical form that follows from the structure of activity dictated by the self-valorization movement of capital. Since the historical subject is capital as a

social relation, the tightening of this logic is accompanied by an opening up of space for individual agency. Thus capitalism appears as a social formation where contradictorily the historical logical constraints are realized in an ever increasing degree while the possibility of historical agency also increases. Critical and oppositional consciousness emerge as social constitutions owing to this contradictory structure of capitalist society (Postone 2009, 37). The basis of emancipatory consciousness is the contradictory nature of capitalist social forms where this contradictoriness itself is rooted in the fact that these forms are constituted by human activity; they acquire a quasi-autonomous character and thus are alterable due to their actual dependence on human activity. "Such a theory of the social constitution of subjectivity (including subjectivity critical of its own context) stands opposed to the implicitly functionalist notion that only consciousness which affirms or perpetuates the existent order is socially formed" (Postone 2009, 38).

Human consciousness is the individual human form of existence of the capitalist relations of production. These relations are based on commodity production and exchange of equal values.

The form of appearance of capitalist relations in human consciousness is commodity fetishism: fetishism is the state of conceiving of the laws of human activity as if they have an independent life of their own. It is true that these laws are objective and independent but admitting these independence, under capitalism, appear as if they are not products of human activity but as if humans are products of these laws. The relation between producers is determined by the laws of the relation between commodities, which is in fact the law of the producers' activity (Marx 1993, 167-168). Fetishism is humanity's submission to and the formation of her consciousness after the perverted ideal image of a perverted world.

## By Way of Conclusion

Human society, in general, and above all, capitalist society is neither a thing nor an amalgamation of individuals but a dynamic unity of contradictory forces. These forces, in each historical era, acquire a specific form of existence and appropriate media in order to exert power and come into contact with other (social) forces. The relative "state of equilibrium" –which corresponds, in capitalist society, to normal periods of growth of capital and accumulation—that a society achieves is just a moment of the entire life of the society, which is disturbed by cyclic economic and subsequent political and social crises; the norm in capitalist society is the state of emergency against which the state of equilibrium should be perpetually constituted.

In capitalist society where such dynamic unity is of a contradictory nature these media appear in form of laws, constitutions,

and above all the state. The state, similar to other artefacts, has a regulatory-normative role and determines the "acceptable" (legal and lawful) forms of confrontation between these forces. In a general sense, every artefact in capitalist society, from material machinery to morality, religion, and education, from revolving doors that designed to keep the "unwanted" away while keep the gates open to national borders that function for regulating the price of the labour-power, profitable circulation of capital, and constituting national, ethnic, religious, and sexual identities, becomes a moment of the state's regulatory function and thus a means for exerting class power.

Similarly, the individual consciousness, which is a curvature of the social, emerges as a battlefield of contradictory forces—consciousness is a dynamic unity of contradictories. It is in this sense that Vygotsky defines consciousness as a filtration system that categorizes the incoming stimuli—consciousness is a system of victorious reactions; it is a mechanism of regulating the catastrophic confrontations at inter-personal and intra-personal levels.

> The outside world "flows" into the wide opening of the funnel by thousands of irritants, attractions, and summons; a constant struggle and collision take place within the funnel; all excitations flow out of the narrow opening as responses of the organism in a greatly reduced quantity. What takes place in behaviour is only a negligible fraction of what is possible. At every moment the individual is full of unrealised possibilities. These unrealised possibilities of our behaviour, this difference between the wide and the narrow openings of the funnel, is a perfect reality; the same reality as the reality of victorious reactions, since all three aspects of a reaction are present in it. (1997a, 69-70)

This regulatory task is mainly fulfilled by the constitution of the apparatuses of appropriation of social significance of artefacts and the necessary ability for manipulating them; this is achieved through internalization of social norms, which is mainly mediated by language-acquisition, at the height of which stands concept-formation, and the subsequent emergence of the higher mental functions and consciousness as a dynamic unity.

However, this emergent state of equilibrium of consciousness is also provisional and in need of constant constitution (in certain pathological cases such as schizophrenia not only crises but a complete collapse of consciousness as a unity of contradictories is inevitable). The inner (intra-individual) and the outer (societal) are continuously in contact and each mediates the other; the action begins in response to the external stimuli; then through use of tools and artefacts one masters manipulating the external stimu-

li; the stimuli now have been internalized; they have turned into social signs (they have a specific social significance). The sign system itself becomes an outward action and is actualized in form of artefacts (which do not have to be solidly physical). The formation of individual consciousness thus appears as an endless process of its extension and expansion into the world. Consciousness is not a closing into oneself but an openness onto the world.

Since the person is the consequence and the internalization of the confrontation of social forces at both inter-personal (societal) and intra-personal (individual) levels, and because a virtually infinite combination of sum-total of vectors of social forces are possible, formation of an infinite number of such provisional states of equilibrium, of which the diversity of personas as curvatures of the social as well as the never-ending process of the formation of the individual consciousness are different manifestations, is inevitable. As Vygotsky states,

> Changing the well-known thesis of Marx, we could say that the mental nature of man represents the totality of social relations internalized and made into functions of the individual and forms of his structure. We do not want to say that this is specifically the meaning of the thesis of Marx, but we see in this thesis the most complete expression of everything to which our history of cultural development leads. (1997e, 106)

Individuals as interiorized sociality or as the bent social space, thus, are not uniform; they do not amount to "types" but emerge as different personalities, although from a common generic root. As an interiorization of the social, the individual is also an arena of class struggle which is the universal form of confrontation of social forces in capitalist society. It is in this sense that, as Richard Gunn concludes, the fault line of class struggle passes, not by, beside, or alongside, but through every individual person (1987, 18). Every individual person is not only determined by, but also is an agent of the ideal/ideological. Thanks to this very contradictory dynamic unity that a socialist transformation of persons is conceivable. Once the upside-down world of capitalism is toppled, the perverted ideal image of it will also be done away with. However, this is not a matter of consciousness but one of action. The problem still is, as Marx put quite succinctly, not to interpret but to change the world.

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# Activity, Labour, and Praxis: An Outline for a Critique of Epistemology

Scientific labour is subject to the historical conditions of human activity—in this context, the conditions set by the capitalist relations of production. The subsumption of academic labour and the process of knowledge production under capital amounts to fetishization of both the education system and the produced knowledge.

Science is a means of production that is deployed to produce a variety of commodities and to extract surplus-value from workers. It is, firstly, the means of producing skilled workers needed in different branches of capitalist production; secondly, the means of producing formalized knowledge-commodities that are put into circulation in scientific and academic journals in order to be valorized; thirdly, it is the means of scientification of production in the form of technological advancement ('applied' natural sciences) and managerial–administrative technologies ('applied' social sciences); it is the means of production of knowledge as a natural force at the service of capital; lastly, it is the means of production of science as the means of production of science (constant capital), a reflexive aspect which is in close relation to all the three above-mentioned areas of production.

One of the most important aims of scientific production is educating the skilled labour required for different branches of capitalist production. Mass education, the diversification of education through the introduction of new certificate programmes, continuous education, vocational schools and colleges, etc., are the means necessary for this production. Education can be called production since it is the production of one of the components of the organic composition of capital—that is, 'variable capital' (value of labour or the sum total of wages)—which corresponds to living labour when viewed from the perspective of the technical composition of capital (Marx 1992, 762).

Intellectual labour can be as productive as material labour, where productivity refers to the production of surplus-value regardless of the concrete form of the commodity produced or the service it provides. In this regard, Harvie notes that "teachers are productive labourers: (a) they are (co-)producers

of the commodity labour-power; (b) the surplus-value they produce is realised once the newly produced labour-power is exploited; (c) they are directly value producers as their labour takes the form of alienated, abstract labour (the substance of value)" (2016, 2). As Marx states:

> A school-master is a productive worker when, in addition to be labouring the heads of his pupils, he works himself into the grounds to enrich the owner of the school. That the latter has laid out his capital in a teaching factory, instead of a sausage factory, makes no difference to the relation. The concept of a productive worker therefore implies not merely a relation between the activity of work and its useful effect, between the worker and the product of his work, but also a specifically social relation of production, a relation with historical origin which stamps the worker as capital's direct means of valorization. (Marx 1992, 644)

Scientific–academic labour and the process of knowledge production under capitalism are subsumed under capital by turning into forces of nature at its service. Just as in the case of the scientification of production and the enhancement of the social division of labour, where the social character of labour confronts it as 'capitalised' labour, forces of nature, through science,

> confront the workers as the powers of capital. They become effectively separated from the skill and knowledge of the individual worker; and even though they are themselves ultimately the product of labor, they appear as an integral part of capital wherever they intervene in the labor process. (Stachel 2010, 3)

There is no knowledge independent of the knowing agent; that is, there is no knowledge independent of the knowing activity, just as there is no language independent of speech and the speaking subject. "Knowledge" is a potentiality similar to labour-power that is realizable only once deployed in the production process—material and ideal. Just as it is not history that does things, "possesses vast wealth," or "fights battles" (Marx and Engels 1975, 93), but the real, living human who possesses, fights, and pursues her ends, it is not knowledge but the human being that knows. An analysis of the subsumption of knowledge production and academic labour under capital requires analysing the nature of knowledge as an "ideal" phenomenon, its mode of production (the historical form of knowledge-producing activity), and the circulation of the knowledge-commodity in unity. Such analysis requires a clarification of the practical materialist conceptualisation of human activity, praxis, and labour in light of Marx's own discus-

sions. To this end, Marx's practical materialism will be discussed, and the relation between the concepts of "activity," "praxis," and "labour" will be analysed. The relevant critical literature will then be considered in light of such conceptual clarification.

Finally, the forms of subsumption of scientific labour under capital and the capitalist process of knowledge production as a particular field of production—and the nature of the subsequent product of this process, that is, knowledge—will be scrutinised. It will further be discussed that scientific knowledge is not only a product, the circulation of which amounts to the realisation of value, but that, when the whole enterprise of knowledge production is taken into account, it functions as a particular means of capitalist production—a means of production of a peculiar commodity: the knowledge-machine for the extraction of surplus-value. Disregarding this aspect of the scientific enterprise amounts to the reproduction of the age-old theoreticist–idealist concept of knowledge as a combination of propositions and science as *Weltanschauung*.

## Marx's Practical Materialism

In the *Theses on Feuerbach*, Marx identifies the major defect of metaphysical materialism as considering reality in terms of objects of the senses only, and not in terms of objectivised human praxis. Furthermore, he criticises idealism, which sets forth "the active, subjective side" only abstractly (Marx 1976, 3)—that is, for reducing human praxis to an abstract mental process. Idealism not only pacifies human agents but, in contrast to its own intentions, pacifies thought and renders it unreal. Marx, in the second thesis, states that the problem of the reality or truth of thought is not a theoretical problem, but a practical one. Considering thinking in isolation from human practice makes the problem of the truth of thought a scholastic one.

From Marx's point of view, both materialism and idealism conceive the world dualistically—that is, in terms of subjects and objects of contemplation. The crude materialist attitude reduces the human being to a cognitive machine that passively receives stimuli and reacts to it; human activities are thus reduced to a bundle of reflexes, and human thinking to an ordering of "ideas" based on sensory data, or to the formation of mirror-like images of the world of objects in one's head.

Such a materialism inevitably amounts to idealism, since the world of ideas, thoughts, or images is considered a distinct world, independent of the world of human activity. Such materialism disregards the fact that thinking is an outward activity—a process of solving problems and surmounting obstacles in different forms. In the case of animals, thinking is identical with the bodily activity

of, say, eating leaves, building a dam, or hunting prey. In the case of humans, alongside bodily activities, thinking is constituted and actualised conceptually through the use of sign systems.

Thinking and activity are simultaneous; they are separable only in abstraction. A thought or an image, which has already been structured in one's imagination, is constituted through signs, symbols, words, and so on. Owing to language and sign systems, humans constitute their consciousness as a social relation, form "delayed responses" to stimuli, and pose questions onto reality (Vygotsky 1994, 166).

Marx's practical materialism does not have an ontological character; it is not a mere admission that "matter" (body) exists. Rather, it considers human praxis a constituent of the entirety of human life, the social nature, and knowledge as the appropriation and "manipulation" of this nature. Human and nature—the subject and the object—are moments of praxis (of human activity, of labour), where praxis is the middle term that makes the dialectical unity and separation of the two actualisable. The world—the social reality—exists only as the object of human productive activity, that is, labour. The labour process is the process of "physical" abstraction: the process of changing a naturally available thing into something abstracted from its immediate environment and natural state. Through labour, the human "acts upon external nature and changes it, and in this way he simultaneously changes his own nature. He develops the potentialities slumbering within nature, and subjects the play of its forces to his own sovereign power" (Marx 1992, 283).

Therefore, according to Marx, cognising reality means cognising the world of human labour. Reality is the object of cognisance and exists to the extent that it has been transformed into the human's inorganic extension. The human animal is in a dialectical relation with the social environment: it is in unity with nature to the extent that nature is humanised; but such humanisation is realisable only to the extent that nature is constituted as a world of human artefacts—distinct from, and in contrast to, human existence—to the extent that it is constituted as a world resisting human activity.

> Man not only effects a change of form in the materials of nature; he also realizes [*verwirklicht*] his own purpose in those materials. And this is a purpose he is conscious of, it determines the mode of his activity with the rigidity of a law, and he must subordinate his will to it. (Marx 1992, 284)

Marx criticises German philosophers for delving into pseudo-questions such as the problem of the unity of human and na-

ture, "as though these were two separate 'things' and man did not always have before him an historical nature and a natural history" (Marx and Engels 1976, 40), via human labour. The crude materialist stance sees objects only—as, for example, "Feuerbach … in the *Campagna di Roma* … finds only pasture lands and swamps, where in the time of Augustus he would have found nothing but the vineyards and villas of Roman capitalists" (Marx and Engels 1976, 40). For the crude or contemplative materialist, "pure" natural sciences will disclose the secrets of the world to those who are properly educated; whereas practical materialism realises nature in terms of human labour, which provides the natural sciences with the particular material they work with.

From the practical materialist stance, humans see in nature what they experience in their social existence and their mode of activity (production and practice). As Maidansky aptly puts it, "in practical materialism, activity is substance, manifesting itself in corporeal form, whereas in somatic materialism, activity is a mere predicate of a body, and body is its subject" (2016, 57).

Marx conceptualises praxis quite differently from most of the Marxist tradition—including Engels. Marx emphasises the inseparability of subject and object as constituent moments of reality: just as the human, as a "natural" being, "reflects" natural reality, the very natural reality bears the marks of and "reflects" human labour. Once the role of the subject in creating reality is admitted, a critique of idealism can no longer be based on naïve objectivism. As Schmidt notes, "In Marx, the object is not posited by the theoretical action of men, but the objective world loses its independent character as an independent creation, and becomes ultimately merely the embodiment of human action" (Schmidt 1971, 57).

For Engels, as Oittinen notes, "praxis" is an epistemological category, developed in his criticism of Kantianism (Oittinen 2016, 30). Engels' version of practice and materialism lacks the centrality of the "subjective, active side"; motion is not considered the subject but a mode—a predicate of matter. Engels' ideas on practice, which he developed in the final years of Marx's life and after his death, do not further Marx's philosophy of praxis but rather constitute a wholly new framework—"a cosmocentric philosophy of science" (Boeselager 1975, 25–27).

By reducing praxis to an epistemological criterion and science to a world-view, Engels' materialism shrinks to that of the "hitherto materialism" of the "thinking body," which attempts to explain the anatomy of thought through the anatomy of the brain. As Ilyenkov puts it, the functional determination of thought can be understood only through the examination of "the real composition of its objective activities among the other bodies of the infinitely varied universum" (Ilyenkov 1977, 73). The "thinking

body" stance, albeit implicitly, preserves the mind–body dualism and a contemplative concept of matter. In so doing, it fails to grasp thinking as a form of outward activity and instead treats it as a neurophysiological phenomenon.

For Marx, *praxis* is a philosophical concept that he develops in the process of criticising Hegelian subjectivism and Feuerbach's physicalism; he is the first materialist to prioritise action over the body (Maidansky 2016, 42). *Praxis* is constitutive of both social nature and the human being; it is the human's naturally determined action in—and her resistance to—her natural environment, and the necessary consequence of her initial unity with nature.

Furthermore, through practice, the human being emancipates herself from this unity and negates her initial form of existence. Alongside herself, natural nature is negated and posited in the form of social nature. Thence, *praxis* becomes the middle term that unites and synthesises these negated modes. Social nature is the reality populated by artefacts, which, in turn, assumes an existence independent of human praxis as objectified human labour. Knowledge, in this view, is the continuous process of negation and synthesis produced along the line of contact between subject and object as two constituent moments of reality.

## Praxis, Activity, and Labour

The concepts of *activity* and *praxis* are closely related to the concept of *labour*. In *The German Ideology*, Marx states that the *differentia specifica* of the human species compared to nonhuman animals "is not that they think, but that they begin to produce their means of subsistence," and by so doing, "humans indirectly produce their material life" (Marx and Engels 1976, 31–32). Marx emphasises that this is not a simple act of reproduction, but a special activity actualised in a certain mode such that it expresses what humans are: humans coincide "both with what they produce and with how they produce" (Ilyenkov 1977, 74). Thus, productive activity constitutes the core of human interaction with the environment and with other individuals. All human activity, therefore, is derivative of this essential activity—that is, *labour*. Labour is the subject to which thought belongs as a predicate (Marx and Engels 1976, 44–45).

As humans develop tools, the means of production, the division of labour, and the corresponding forms of property develop as well. "Division of labour only becomes truly such from the moment when a division of material and mental labour appears" (Marx and Engels 1976, 37). The emerging division between manual and mental labour—reaching its height under capitalist relations of production—contributes to the illusion that the realm of the "ideal" (or *ideological*, as Marx put it) is an independent one with a life and history of its own. However, alongside their lives, humans also pro-

duce their ideas concerning their lives, their relation to nature, to each other, and to themselves (Marx and Engels 1976, 42).

Labour is the historical act that constitutes the basis of human history—an act that must be continuously sustained if humanity is to subsist. The sensuous world, no matter how impoverished or sophisticated, is the world of human labour: a world mediated and materially produced by human activity. Labour constitutes the essence of the human being; it establishes "the original, primary source of the realisation of social being, the model of human activity, the basic ontological foundation of human 'multi-facetedness'" (Antunes 2013, 142).

In his analysis of the dual character of capitalist labour, Marx emphasises that labour—regardless of the historically specific form it acquires under different modes of production—is the essential form of the metabolic relation between human and nature (Marx 1992, 133). The other condition of this relation is the material provided by nature. Nature, as the source of matter, is the force that necessitates human productive activity, which, in turn, necessarily follows the course of nature itself by changing the form of material (Marx 1992, 133).

It is through labour that the unity and separation of subject and object is constituted; labour is the condition of naturalised humanity as much as it is the condition of humanised nature. Through labour, the "pure" forms of natural things are exposed, and nature is truly resurrected; labour "is a real dialectical conversion of the human and the natural, subjective and objective, historical and eternal" (Maidansky 2016, 48–50).

Labour's dual character means that, on the one hand, it is an expenditure of human labour-power; in other words, it is the "abstract" human labour that constitutes the value of commodities. On the other hand, it is the expenditure of a particular human labour-power that produces the use-value (Marx 1992, 137). The value of a commodity is determined by the socially necessary labour time required for its production. The essence of value, therefore, is not *labour* in general, but simple average labour—that is, "the labour-power possessed by every human being in its organism" (Marx 1992, 135).

Hence, one can speak of three categories of labour under capitalism: concrete labour, which produces the use-value of a commodity; abstract labour (or, as Murray [2000] puts it, "practically abstract" labour), which constitutes the substance of value; and labour as such—that is, labour as the condition of human subsistence and the fundamental, perpetual form of humanity's metabolic relation to nature. This last form of labour is "the universal condition for the metabolic interaction [*Stoffwechsel*] between man and nature, the everlasting nature-imposed condition of human existence, and … therefore independent of every form of that ex-

istence, or rather it is common to all forms of society in which human beings live" (Marx 1992, 290).

It is only under capitalism that this general aspect of labour—*labour as such*, or labour as a "rational abstraction" (Damerow 1996, 384)—becomes fully conceivable. Under capitalism, in contrast to the historical development of labour, every *concrete*, *particular* labour appears as a moment of the general, *abstract* labour. This inversion is the expression of two characteristics of labour once it is subsumed under capital: first, the worker's activity is under the control of the capitalist to whom the labour belongs; second, the product of labour is not the property of the immediate producer, but of the capitalist (Marx 1992, 291–92).

It should be emphasised that abstract labour is not identical with "immaterial" or "intellectual" labour. On the contrary, labour—whether material or intellectual—can become abstract only to the extent that it produces (surplus) value and is thus formally and really subsumed under capital.

## Academic Labour and the Nature of "Cognitive" Products

Knowledge is a product of the human interaction with social nature; it is produced as an instrument for manipulating nature. As a specific form of metabolic exchange with social nature, the production of knowledge involves "intellectual" labour. Similar to manual labour, intellectual labour is also subject to historically specific determinations. In capitalist society, once subsumed under capital, labour becomes value-producing (abstract) labour; knowledge-producing intellectual labour is not an exception.

Analysis of the academic labour process and scientific knowledge-production reveals forms of capitalisation of intellectual labour, helping to dissipate the image of scientific labour and knowledge-production as transhistorical and therefore a neutral quest for knowledge rooted in human "curiosity." The capitalisation of academic labour and its subsumption under capital is actualised through the functions this labour performs within the capitalist mode of production. Academic labour functions, for instance, as a means of producing qualified labour—as seen in "single purpose" universities that primarily commodify teaching—or as a means of producing innovations and applicable technologies, as in the case of "enhanced" and technological research universities (Rikap 2017, 280–81).

Furthermore, through national research and development programmes, public funds are transferred to capital, which amounts to the "appropriation [of the] creative achievements of social labour outside the capital/wage labour relation as 'free gifts'" (Smith 2009, 208). The subsumption of creative and innovative scientific

activity is intensified with the introduction of the "triple helix" model, which is based on interaction among "three distinct institutional spheres – universities, industry and government (UIG)" (Ramella 2016, 165). A brief survey of the Marxian analysis of the academic labour process will further clarify the forms of subsumption of knowledge-producing activity under capital.

Gregory and Winn draw attention to the fact that the basic form of work in academia is wage labour, and thus a deep and sustained critique of academic labour, grounded in Marx's "negative" conceptualisation of labour as a historically specific category, is required (2016, 1–2). Furthermore, they emphasise that the knowledge produced under the capitalist mode of production is itself a capitalist product—a commodity—and therefore a reflexive critique of knowledge is also necessary. (Also see Neary and Winn (2016) for a related critique of academic identity formation within the capitalist university.)

Harvie and De Angelis (2009) note that knowledge production is subject to Marx's labour theory of value: it is rendered *commensurable* with other forms of labour through the imposition of metrics, and thus becomes measurable by the average socially necessary labour time. Szadkowski (2016), for instance, shows how bibliometrics and impact factors operate as tools to quantify academic labour, tying it to "socially necessary impact/time"—that is, the time required to produce a published output that counts within evaluation regimes under the conditions considered "normal" for a given higher education system (62).

Hall and Bowles (2016) relate the subsumption of academic labour not only to structural change, but to the stress and agitation experienced by academics. "Subsumption is the process through which inherent constraints on the labour capacity of a particular sector of the economy are overruled, and subordinated to the demands of capital" (32). The task, then, is to identify the specific character of the subsumption of academic labour under capital.

Drawing on the distinction between *formal subsumption*—the domination of pre-capitalist work by capital through mechanisms such as the extension of the working day—and *real subsumption*, Hall and Bowles argue that anxiety functions as both a real and formal mechanism of subsumption (2016, 33). The process of subsumption of academic labour under capital guarantees its existence as a surplus-value-producing force, wherein the subjectivity and autonomy of academic labour are determined by capital (Hall and Bowles 2016, 34). In this context, one may argue that the subjectivity and autonomy of the academic labourer become the personification of the Subjectivity and Autonomy of Capital itself.

Hall and Bowles further emphasise capital's double movement in its drive for profitability: on the one hand, capital intensifies

the labour process to extract more surplus value from academic workers; on the other hand, it demands that they be increasingly creative and entrepreneurial (2016, 39). In this way, education and knowledge production become means of enhancing the productivity of capital, subject entirely to its logic of competitiveness.

Simburger and Neary, drawing on Postone's (2003) elaboration of Marx's negative critique of capitalism, define the organisation of academic labour as an expression of contemporary capitalism and aim to critique academic work on the basis of Marx's labour theory of value (Simburger and Neary 2016, 48, 50). The authors note that capital is structurally compelled to incorporate new technologies and scientific advancements into the production process, deploying increasingly sophisticated and expensive machinery. This process, however, tends to reduce the number of workers involved in production and thereby generates crisis, since only living labour can produce value (Simburger and Neary 2016, 64).

We might consider knowledge as one of the products of academic-scientific production. Knowledge—incarnated in the form of journal articles, books, electronic resources, and, at times, materialised in the form of technological advancement through the scientification of production—can be understood as machinery: that is, as a means of production deployed in the creation of both the means of consumption (in this case, "qualified" labour needed across various sectors of capitalist production) and the means of production themselves (namely, "pure," "theoretical," or "scientific" knowledge).

Therefore, the worsening conditions of academic work—both teaching and research—appear as a "necessity" dictated by the capitalist form of knowledge production. On the one hand, there exists a demand for the mass production of qualified labour-power as potential value-producing capacity; on the other, there is a parallel demand for the large-scale production of scientific knowledge as a means of producing both labour-power and the technological instruments for manipulating the so-called "forces of nature"—which, once incorporated into production, exist as the productive powers of capital.

The subsumption of academic and scientific labour under capital is also linked to the problem of the nature of knowledge as a commodity—that is, as a fetish. As Winn (2015, 4) notes, "we know from Marx that the commodity form is a fetish; it is a historically specific form of wealth made manifest in the capitalist mode of production." Attempts to address the fetishisation of knowledge, however, often rest on an uncritical endorsement of the mainstream, commonsensical conceptualisation of knowledge as a mental, and therefore "immaterial," phenomenon.

Moreover, the presumed immateriality of knowledge is typically treated as a sign of its "abstractness," in contrast to the "concrete-

ness" of the material (physical)—the allegedly immediate object of the senses. This dichotomy tends to identify knowledge with its physical incarnations, reducing it to tangible forms (such as books, files, or technologies), which amounts to a physicalist reductionism. Such a view ignores the "ideal" nature of knowledge and attempts to deduce its objectivity from its material instantiations.

This reduction represents a form of appearance of the conceptualisation of knowledge as *Weltanschauung*—as a set of mental-conceptual lenses through which one views the world. The uncritical acceptance of such a conceptualisation is also evident in debates surrounding the relationship between material and immaterial labour, and their respective roles in the production of (surplus-)value.

Worrell and Krier identify the distinctive feature of "capital fetishism" as the treatment of capital not as a system of social relations, but merely as a thing. "And the sheer 'scale' and 'scope' of the capitalist system means that everything above the ontic plane of the individual assumes the shape of something autonomous, inevitable, and unstoppable" (Worrell and Krier 2018). A similar dynamic may be observed in mainstream epistemologies, which often conceive of knowledge as self-expanding and independent of any social mediation.

Empiricism and naïve materialism, for instance, regard knowledge as a personal attitude arising from an immediate confrontation between an abstract individual and an abstract "nature." This is presented as empirical knowledge. At a more theoretical level, even this minimal mediation is discarded: it is the immediate confrontation with "knowledge" itself that is said to generate further knowledge—$K \rightarrow K + \Delta K$. The fetishised conception of knowledge is especially intensified in abstract theoretical disciplines, such as theoretical physics, where knowledge appears as the product of "pure" mathematical modelling without reference to social or material mediation.

Knowledge is an ability reminiscent of "labour-power," and is therefore inseparable from the individual. However, this inseparability should not be taken, as Gigi Roggero (2011, 94) and others suggest, to confer "autonomy" and "mobility" on the subject of knowledge. It does not eliminate the historical determinations of the knowledge-production process, which remain dictated by the prevailing mode of production.

As Murray (2016, 117) notes, the distinctive feature of the capitalist mode of production lies in its specific social form and purpose—namely, the production of surplus-value or profit. The organisation of capitalist production around this social goal leads, as Tony Smith (2009, 206) formulates, to an inversion of the ontological priority of means and ends: human flourishing becomes subordinate to the flourishing of capital. In this configuration,

capital ontologically precedes human agency and thereby shapes the subjectivity and intentions of individuals. This inversion fundamentally determines the nature of technology and knowledge under capitalism (Smith 2009, 206–7).

In the case of knowledge production, the central question becomes: how, and under which social form, is knowledge produced? That is, what is the social form of the actualisation of knowledge? As Marx (1992, 286) writes:

> It is not what is made but how, and by what instruments of labour, that distinguishes different economic epochs. Instruments of labour not only supply a standard of the degree of development which human labour has attained, but they also indicate the social relations within which men work.

The determination of the social forms of human activity by capital produces effects that extend beyond the immediate process of production, enabling capital to appropriate the products of commons-based peer production and the achievements of social labour outside the capital–wage-labour relation as "free gifts" (Smith 2009, 209). Conceptualisations such as Roggero's (2011), as well as those of proponents of the cognitive capitalism thesis (Virno 2007; Vercellone 2007), and postmodern theorists like Lyotard (1984, 18), remain blind to the social form of production. As such, they reproduce what Murray (2016, 132) calls "the illusion of the economic"—that is, the notion of production-in-general, which treats production as independent of any historically specific mode, particularly in the realm of knowledge production.

According to such views, knowledge is not understood as knowledge *of* an object, where the object is historically determinate and provided through a specific form of human activity—namely, the capitalistically motivated metabolic relation between human and nature. Instead, knowledge is conceived as a general, abstract "understanding" of the world. This perspective ignores the *ideal* nature of knowledge and reduces it to its physical incarnations, thereby reinforcing its fetishised appearance as time-independent, neutral, and transhistorical.

This fetishistic view is also evident in the treatment of the "general intellect"—modelled after Hegel's *Spirit*—as a disembodied, collective thinking-machine (as in some strands of cognitive capitalism), or alternatively, as a "machine-Mother" which, once re-appropriated, is presumed to liberate humans from the need to think or labour (Krier and Worrell 2018, 641–43).

If scientific knowledge production is conceived not in terms of the formation of a worldview or a language-game suspended in the air, but as a specific form of productive activity (*praxis*)—and the

consequent knowledge as (conceptual) tools or organs of activity (Azeri 2013)—then the question concerning the criterion of truth of knowledge-claims becomes redundant, even absurd, as though one were to ask for the "proof" of a spoon or an axe. The proof of the spoon lies in its ability to serve as a means of reaching the soup in a bowl; its validity is its social significance—just as "the proof of the pudding is in the eating." Praxis is the middle term or mediation between the knowing subject and the object of knowledge.

Conceived from a Marxian standpoint, knowledge-producing activity is conditioned both by the prevailing mode of production and by human activity in general, within a historically specific context. In other words, it is inevitable that knowledge production bears the imprint of the socio-historical conditions in which it is actualised. Just as material production, as Murray (2016, 117) notes, is always social—meaning that it necessarily involves specific social forms and purposes—so too is the production of knowledge socially determined. Hence, the central problem is not epistemological in the abstract, but social: *how* is knowledge produced, and *why* is it produced in a given form?

This may be understood through analogy with machinery: a "properly" constructed machine performs its function in the productive process only in relation to other technical components that comprise a given production unit—say, an automobile factory. Yet the specificity of a machine is not reducible to such technical functioning. Rather, its true specificity lies in its role as a "revolutionary" instrument for intensifying the extraction of surplus-value. This can only be addressed in relation to the historically specific form of production.

The same applies to knowledge production. The primary issue is not establishing abstract criteria of acceptability for truth-claims—that is a merely technical question. Humans have always produced, and will continue to produce, knowledge that is necessarily object-oriented: knowledge is always knowledge *of* something. It is the result of human engagement with, and manipulation of, nature. The central task, then, is to determine the specificity of the *form* of knowledge production. This reorientation responds to Marx's demand to uncover the "this-worldliness" of knowledge.

## Knowledge Production: A Critique

Attributing self-sufficiency and independence from human activity to knowledge reflects the condition of alienation. As Schmidt (1971, 97) observes, the dialectical materialist conception of knowledge production shows that "drives, desires, and aims, and indeed all forms of human interest in nature, are in each case socially mediated."

Human confrontation with nature is, from the outset, mediated by labour and its instruments—including the human body. Knowledge of nature, therefore, is mediated by specific forms of appropriation and by the tools employed for this purpose, which impose determinate forms of existence upon nature in accordance with the ways it is manipulated. Moreover, meaning itself is related to tool-making; every human mode of appropriating nature bears a definite social significance due to its tool-mediated character. Tools set the boundaries of both material and intellectual production and determine the limits of what can be actualised from intellectually anticipated goals. As Damerow and Lefevre (1996, 395) note, the application of tools "mediates between possibility and reality."

As Schmidt (1971, 102) observes, "the most basic and abstract concepts have arisen in the context of labour-processes, i.e. in the context of tool-making. The tool connects man's purpose with the object of his labour. It brings the conceptual element, logical unity, into the human mode of life."

However, under capitalist relations of production, tool-mediated knowing comes to appear as an independent entity, detached from social labour; knowledge is treated as a "thing," a fetish, to be discovered in nature. It assumes an abstract form in two key senses: first, it is produced through abstract means and becomes conceptual; second, it appears entirely independent of human agency. Just as, under capitalism, labour is stripped of its essential nature and converted into a purely subjective force that confronts its own product—an alienated value existing independently—so too does the knowing subject encounter the product of their own intellectual activity as an object external to themselves, a self-sufficient "thing."

Scientific knowledge (and knowledge in general) is not the formation of a world-view but rather a form of human activity and metabolic exchange with social nature. The science-as-world-view position echoes Feuerbach's "contemplative materialism," which takes the sensuous world not as the product of socio-historical human activity, but merely as the object of passive sense perception (Marx and Engels 1976, 30). As Ilyenkov (2007, 71) points out, knowledge is not something to be "acquired" in the form of ready-made propositions, which are later "applied" to an external object. Knowledge is always object-oriented, and any knowledge that still requires "application" is not genuine knowledge, but at best verbalism.

Knowledge emerges only within a concrete interaction with the object—an interaction that constitutes a unity between human and nature, regardless of the material or abstract texture of the object itself (Stachel 2012, 406–7). To say that knowledge is not a set of propositions does not deny the relevance of formulae, sym-

bolic systems, or sign structures. Nor does it imply that "genuine" knowledge must be experimental or physical. Rather, it emphasises that knowledge—especially scientific concepts and "conceptual machines"—functions as a means of organising the rules, methods, and laws of human interaction with the social world. As Damerow and Lefevre (1996, 396) note, "The primary form in which knowledge about natural and social relationships arising from the labour process is represented is the form of rules for the appropriate use of tools." Knowledge is expressed and made manifest through various sign systems, ranging from natural languages to highly abstract mathematical formulations. Conceptual systems, in this sense, are the necessary mode of formalisation of the laws of human activity, ideally reconstructed in thought—much like words materialise thinking. Scientific propositions, formulae, and abstract systems are forms of embodiment of knowledge that indicate its object-oriented and practice-bound character.

Just as a map is a tool used to locate oneself, a place, or an object in the world—and is neither a mirror of the world nor a picture of it—propositional knowledge should be understood as a tool that lays out the rules and norms of a specific metabolic interaction between human and nature. If the metaphor of the map is misinterpreted to imply reflection or representation in the sense of a Weltanschauung, then the sign is mistaken for what it signifies. As Jorge Luis Borges once noted, a map that matches the scale and detail of the territory it depicts would become useless, as it would require another map—an infinite regress of meta-maps—to interpret it ([1946] 1998, 325). Likewise, the contemplative stance that treats knowledge as a complete and detached mental picture of the world merely reproduces the ontological dualism between subject and object. It conceives of knowledge as an immaterial and abstract framework meant to "correct" common-sense perception rather than as a historically situated and socially mediated activity.

As Damerow and Lefevre (1996, 399–400) argue, "Science … is not free in forming its abstractions; in this activity it is restricted by material preconditions, more precisely, by the specific tools at its disposal that provide cognition with abstractions which are capable of realisation … These tools open up the possibilities of a given scientific abstraction and simultaneously determine its limits." Thus, scientific concepts are not arbitrarily constructed systems of thought but abstractions constrained by historically and materially conditioned tools of production and cognition.

Knowledge, as a set of skills and machinery, is not granted freely. The student requires these "skills" in order to sell her labour-power—that is, she needs them to function as a component of variable capital. However, she must pay for these skills because knowledge, under capitalism, functions as a means of production;

it is not only a natural force at the service of capital, but also a means for more intensely and efficiently producing variable capital—that is, labour-power itself—which actualises these forces. Hence, just as workers are separated from the means of production, those who are not yet workers must also be kept separated from this particular means.

The institutionalization of knowledge-production and its formalization—namely, the publication of research results in academic journals, books, and similar outlets—is another aspect of this separation. The massive volume of scientific publication concretizes the principle of production for the sake of production. Formalized commodity-knowledge circulates in the market in order to complete the cycle of capital valorization. The fact that a formalized knowledge-commodity—for example, a particular academic paper or software—can function as a use-value more than once (i.e., it is sellable to multiple consumers) does not invalidate Marx's labour theory of value, as proponents of cognitive capitalism claim. Rather, it reveals a specific form of subsumption of knowledge-producing labour to abstract time. According to Szadkowski (2016, 62), the *impact factor* is the key element used to measure the socially necessary labour time for the production of knowledge. Calculated on the basis of the average number of citations per year for a manuscript, the impact factor reveals the potentially realisable surplus-value.

## In Way of Conclusion

What is the commodity denoted by "knowledge"? Here, we once again encounter the classical question of epistemology: *What is knowledge?* In contrast to mainstream epistemology, which poses the question abstractly—stripped of its historical determinations—and answers it indeterminately (e.g., "knowledge is justified true belief," "a system of propositions," etc.), the reformulated question implies that:

1. knowledge is a product of labour;
2. this labour assumes historically determinate forms; and
3. the specific form of scientific labour—i.e., its concrete or useful manifestation—should not be conflated with its historically specific form under capitalism.

This distinction gives rise to two sets of questions: for instance, that certain concrete skills are required to run a machine, use a hammer, operate a telescope, or construct a model in theoretical physics is one kind of question. A different question concerns the historically determinate form these labours acquire as value-producing activities. The latter is indifferent to the former, while the former exists only as a moment of the latter—that is, as specific forms of value-producing labour. These skills and forms of knowledge will be

promoted and appropriated only to the extent that they contribute to the valorization of capital. Just as certain tools and machinery become obsolete—and along with them, the "skills" or concrete labours necessary for their operation—so too do specific forms of knowledge-production and the corresponding intellectual skills.

The emergence and disappearance of different forms of knowledge is not, as Lyotard suggests, simply due to changes in modes of data storage or transmission, such as "digitalization." Rather, it reflects deeper transformations in modes of human activity. Mainstream epistemology treats knowledge only in its "concrete" form and therefore indeterminately—that is, divorced from its historical content. It does not view knowledge as a response to historically determined social needs, but as Knowledge: an abstract, timeless essence. This view conceptualizes the history of knowledge-production as a succession of disembodied ideas originating from "great minds," each replacing the other in an idealist battle of concepts. For such abstract epistemology, which neglects the interdependence of the material and the ideal, "historical changes present themselves as changes of relations existing between abstract concepts, changes that, just like the relations and their very existence, cannot be explained in terms of these concepts. Historical changes appear as the abstract negation of logical relations and not as the result of a specific logic of the object" (Damerow 1996, 385).

Such a conceptualization of knowledge is as indeterminate as a person's answer to the question *What is a machine?* when posed in purely "concrete" terms, referencing only its mechanical components: "a collection of specific tools that are combined in a particular form in order to run in a certain way with the 'concrete' aim of producing this peculiar object of utility." This is, at best, a tautology—akin to stating "a machine is a machine" or "this machine is this machine."

From a critical materialist standpoint, however, a machine is not simply an assemblage of technical components; it is a historically determinate tool. Its revolutionary character in capitalist production does not derive from its facilitation of large-scale industrial output per se, but from its capacity to intensify the extraction of surplus-value from labour. In this view, the *critical* analysis of knowledge—the genuinely concrete, that is, determinate, analysis to which one must ascend—must disclose the historical determinations and specificity of scientific knowledge as a form of socially situated, value-producing labour.

Labour is inherently tool-mediated. In the case of knowledge-producing labour, these tools include both conceptual and material instruments—ranging from sign systems, theories, and mathematical techniques to laboratory apparatus, notebooks, and computational devices. As Stachel (2007, 164) points out, even

conceptual tools typically involve material supports such as textbooks, journal articles, or digital technologies. However, unless the social specificity of these tools is critically examined, such a formulation contributes little to a rigorous materialist analysis of knowledge-production. As Murray and Schuler put,

> Every society involves tools, but every tool tells the story of its society. The general definition of a tool does not explain how instruments produce value (and surplus value) in capitalist societies: Marx calls instruments of production constant capital to disclose their specific social form and purpose. When social form is overlooked, denied, or disguised, use-value Romanticism, with its penchant for general traits, will pop up. (2017, 125)

Under existing social relations (i.e. capitalism), the sciences contribute to the furthering of human dehumanization, as they function as natural forces subordinated to capital. Scientific knowledge thus becomes a means by which the "forces of nature" are transformed into forces of capital; as such, these forces are historically determinate and appear in a historically specific form—namely, as "objective" and "natural" forces that are alien to humans and govern their lives. However, nature is always humanized nature, because humans (re)cognize nature only through their interaction with it. As Marx notes, "The nature which develops in human history—the genesis of human society—is man's real nature; hence nature as it develops through industry, even though in an estranged form, is true anthropological nature" (Marx 1975, 303).

Knowledge is conveyed through formalizing means such as propositions; yet it is not identical with these means—just as a spoken word is not identical to voice (the latter would imply the absurdity that the same word written in ink is ink and thus different from itself). What is of particular interest in a critical analysis of knowledge-production is the specificity of the entire apparatus that renders large-scale knowledge-production possible. For instance, the mathematization of physics may facilitate mass production, a feature not equally present in historical or life sciences. It is in this sense that an analysis of the modes of formalization within the sciences becomes relevant and explanatory—namely, when the "concrete" means of production of a knowledge-commodity are understood as both a moment of and a response to the needs imposed by its historically determinate form.

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# The Historical Possibility and Necessity of (Ilyenkov's) Antiinnatism

In his *Consciousness and Revolution* (1991) David Bakhurst draws attention to an important aspect of Ilyenkov's theory of social mind—antiinnatism. Bakhurst discloses the necessity of Ilyenkov's antiinnatism showing why Ilyenkov's overall philosophical stance yields such a thesis with regard to social and cultural emergence of human mind. Accordingly, Ilyenkov's antiinnatism is the consequence of his antireductionism with regard to mental activities, thinking and higher mental functions (Bakhurst 1991 249-50).

It can further be argued that Ilyenkov's antiinnatism in particular and antiinnatism thesis in general is a socio-historically possible and necessary consequence of the capitalist mode of production, which, according to Postone (1993), amounts to the formation of a gap between socially formed human knowledge and growth of the productive powers, on the one side, and value-producing labour, on the other. Postone notes that the social production of general human knowledge, though bears the mark of historically specific relations of production, due to its socially objective nature has the possibility of being severed from the existent relations of production and put in use in a future post-capitalist society. Yet, such a future use requires a critical re-appropriation of this socially produced knowledge and wealth.

Ilyenkov's antiinnatism signifies a critical stance against the reified-fetishistic view of society and of individuals. The socially-produced general human knowledge and wealth and the resulting growth of the productive forces are irreducible to the linear sum of the "individually"-produced wealth and knowledge. This aspect of socially-produced wealth and knowledge points toward, amongst others, the idea of the objectivity of human consciousness. It is this very objectivity, which is the manifestation of separability of socially-produced knowledge from the existent relations of production that facilitates the emergence of emancipated consciousness or the emancipation of the social individual. It renders the idea of quantitative comparison of individuals obsolete and irrelevant: Ilyenkov's antiinnatism thesis does not mean that every individual is exactly equal to another; neither it aims at,

say, raising every and each individual to a level "equal" to another as that would be a fascistic fantasy reproducing the very reified conceptualization of individuals as subjects external to each other and quantitatively comparable. Arguing against Dubrovskii's reductionist-physicalist account of mind Ilyenkov states,

> To make of neurophysiology an implement for selection among infants, for assigning them to training for different occupations, is justifiable, even in fantasy, only in world built on the model of Aldous Huxley's "brave new world." (1969, 93)

Ilyenkov argues that if it is true that socially-produced knowledge and wealth as well as the social subjectivity of the individual are objectifiable social relations, then it is possible that every social individual partakes from and participates in this objectivised social knowledge. Antiinnatism is the covert realisation of the separability of socially-produced knowledge from relations of production, which also points toward the possibility of conceiving of a new emancipated form of subjectivity.

## The Nature/Nurture Controversy: A Recent Example

The nature/nurture debate is basically concerned with the question whether mind and mental functions are some deep biologically innate structures or if they are emergent processes conditioned and largely determined by social environment. For instance, Goodwyn (2010), aiming at criticizing the emergent theories of mind, admits that recent developments in genetic research and neuroscience has made the emergent theories of psychological functions more plausible. He falsely proposes that the only alternative to an innatist theory of mind is a "blank slate" theory of mind (Merchant 2010, 534). From within an evolutionary psychological framework, Goodwyn argues, for instance, from the fact that people learn certain things easier than others, types of learning are domain-specific and based on innate psychological structures (2010, 504). He also draws on evolutionary psychologist Steven Pinker (1997) who states that "innate, domain-specific mental structure is unquestionably selected for (177, quoted in Goodwyn 2010, 504). Goodwyn draws on Gallistel, Marler, and Gazzaniga et al[1] and concludes that human brain is larger than the brains of other animals owing to its larger capability of solving problems and that these capacities have been built into our brains by natural selection (505).

Goodwyn concludes that "there seems to be abundant evidence that the mind is crammed with innate predispositions, perceptual biases, recognition mechanisms, emotional and expressive sub-

1. For bibliographic information see Goodwyn 2010, 519-21.

routines, behavioural urges, and more. As more cross-disciplinary work on evolutionary neuroethology continues, these will come into sharper focus" (2010, 517).

Contrarily, Knox (2010), drawing on Oyama , Deacon, Karmillof-Smith, and Panksepp & Panksepp proposes that "both physical and psychological end-products (bodies and minds) emerge out of developmental processes" and are in constant interrelationship with the environment and continuously reshaped by a stream of current experience (523). Furthermore, drawing on Vygotsky (1978) and Tronick, Knox emphasises the role of caregiver and the cultural environment in shaping the infant's mind (529-30).[2] When the child first hears the caregiver's speech, perhaps she cannot distinguish it from other types of sounds and noises. It is the gradual acquisition of language that enables the child to distinguish meaningful voices from mere sounds: through language sound turns into voice; language and meaning emerge simultaneously.

Merchant (2010) argues that developments in genetics, embryology, and neuroscience undermine nativist unidirectional positions such as Goodwyn's. Following Gottlieb he states that "there is irrefutable research evidence to indicate bi-directionality, that is, genetic activity also leads to function which leads to structure" (534). According to epigenetic findings from studying twins coming from different economic backgrounds, individuals of the same genotype can have different neural and behavioural outcomes (Merchant 2010, 535) and thus different minds. Following Nelson et al, criticizing innatist views of Chomsky concerning "deep structures" in language acquisition, Merchant states that "it is the actual experience of language which leads to the development of the specialised mind/brain structures responsible for it" (2010, 537). He concludes that both neuroscience and epigenetic research make the innate domain-specific models of mind implausible while provides further evidence in favour of neuroconstructivism and emergent developmental theories of mind (2010, 541).[3]

The innatists mostly but not exclusively tends toward what Bakhurst (2008, 416) calls "brainism" (a physicalist reductionist tendency) while the emergent theorists tend toward what is known as personalism. Ironically, there is a feature common to these various and conflicting views: the basic distinctive cognitive feature of the cognizing subject, whether it is the brain/mind or the person, is defined in terms of problem-solving and the larger capabilities of human beings in solving problems compared to other animals (e.g. see Bakhurst 2008, 424, Goodwyn 2010, 505).

Ilyenkov's activity-centered social theory of mind is different from the aforementioned and can contribute to the nature/nurture

2. For bibliographic information see Knox 2010, 432-533.
3. For bibliographic information see Merchant 2010, 541-542.

debate due to its emphasis on creative essence of human mind and activity which is rooted in human's social mode of being. Bakhurst draws attention to this unique aspect of Ilyenkov's theory of the formation of mind writing that "When Ilyenkov characterises the distinctive character of human thought, his emphasis is always on creativity, universality and unpredictability" (2008, 423). However, he does not exploit this distinctive feature of Ilyenkov's approach to human mind. Human beings not only respond to stimuli and solve problems, but more importantly, they pose novel questions and create new problems owing to socially-developing needs which in turn are both the precondition and the consequence of their social activity. Ilyenkov's antiinnatism should be understood and analysed against this background.

## The Social Makeup of the Mind and Higher Mental Functions

Ilyenkov's theory of mind converges with and is strongly influenced by the psychological theses of the prominent Soviet psychologist Lev Vygotsky. One similarity between the two is their approaches to Marxian methodology and its inherent Hegelian logic. Vygotsky identifies his task as "creating one's own *Capital*" (1978, 8); he pertains to Marx's analysis of the capitalist relations of production, which begins with commodity as the "cell", the fundamental unit of capitalism. Similarly, criticising the official Soviet "diamat", Ilyenkov and Korovikov state that philosophical method cannot be reduced into a bulk of ready-made generalisations based on the laws discovered by sciences; philosophy cannot be a science of sciences but it should define itself by its subject matter, that is, "theoretical thought" (Bakhurst 2016, 7)[4]. Moreover, they praise Marx and Engels for their "exemplar application of philosophy to particular branches of concrete knowledge, in particular to political economy", which proves "that positive knowledge is itself able to reach, and is obliged to reach, that very final essence of the object of research, beneath, above and beyond which there is nothing to find for the reason that there is nothing more" (Ilyenkov and Korovikov 2016, Thesis 12). Additionally, Ilyenkov's most important contribution to philosophy and Marxian methodology is his monumental *Dialectics of Concrete and Abstract in Marx's* Capital, which is dedicated to analysis of Marx's critique of the capitalist economy with particular attention to Marx's labour theory of value.

Ilyenkov's collaboration with Alexander Meshcheryakov, who is a prominent Vygotskian psychologist specialised in the edu-

4. I am grateful to David Bakhurst for providing the manuscript of the lecture he delivered in Max Planck Institute on October 2016 prior to its publication. The manuscript also contains an English translation of the "Theses on Philosophy" written in 1954 by E. Ilyenkov and V. Korovikov (translated by D. Bakhurst).

cation of the deaf and blind children, contributes to deepening his view of the social nature of human being (Bakhurst 2016, 1). Meshcheryakov identifies the shortcoming of the previous efforts for educating the deaf and blind children as the insistence on teaching language to the child without previously providing her with the necessary experiential depository to which language, concepts, and any conceptual and sign system correspond. For Ilyenkov, the world that the child confronts is not simply a world filled with other people only, but a world filled with human-made artefacts. The process of the emergence of consciousness is the process of assimilating and manipulating these artefacts. "Language, for Ilyenkov, is just another artefact, albeit a supremely complex and sophisticated one" (Bakhurst 2008, 426). Elsewhere Bakhurst notes that "Ilyenkov's conception of the mind, the culmination of his research, may be seen as a descendant of the position conceived by the psychologist Vygotsky (1991, 16).

Traditional psychological schools' conceptualization regarding mental processes of primitive peoples suffers the dualist approach which considers the individual and the social as two totally distinct and discrete categories that may be related only mechanically. Moreover, it detaches society from particular practical-productive human activity. Hence follows the rigid, abstract dichotomy of "collective representation" or "social consciousness" vs. individual consciousness. Such abstract and formal view regarding consciousness is shared by tendencies such as Gestalt psychology and phenomenology. Materialist psychology, the principles of which were initially set forth by Vygotsky, considers "higher cognitive activities" sociohistorical in nature. Accordingly, "the structure of mental activity –not just the specific content but also the general forms basic to all cognitive processes- change in the course of historical development" (Luria 1976, 8).

According to Vygotsky, the main source of errors and misconceptions of traditional psychology concerning the development of higher mental functions is viewing these processes not as historical, social, and cultural phenomena but as natural and biological (1997, 2). He also criticises traditional psychology within the same lines: traditional psychology divides phenomena of consciousness into its forming components, into its atoms, and thus it fails to analyse and study these phenomena in their organic integrity, in their wholeness. The traditional empirical method of psychology resulted in a pure formalistic explanation of consecutive appearance and disappearance of forms of behaviour and psychic functions. This is the result of the naturalistic approach that fails to distinguish "between two genetic orders different in essence and nature and, consequently, between two basically different orders of laws to which these two lines in the development of … behavior are subject" (Vygotsky 1997, 3).

Subjective empiricism and objective behaviourism have three features in common: they reduce higher mental processes to natural processes; they reduce higher mental functions and complexes to elementary elements; they ignore the social and cultural determination of patterns of development of behaviour. Both views picture mental life as a mosaic composed of separate pieces of experience, "a grandiose atomistic picture of the dismembered human mind" (Vygotsky 1997, 4).

Objective psychology rejects differentiating lower and higher mental functions; it ends up dividing reactions into innate and acquired. Subjective empiricism, on the other hand, divides mental functions into different classes, that is, the one that is exhausted by the maturation of elementary functions, and a second story of mental functions of unknown origin above every elementary function (Vygotsky 1997, 4). Subjective empiricism is a form of naturalism that fails to explain the genesis and development of higher mental functions.

A proper notion of development of human behaviour that begins from the historical and social determination of human behaviour considers the notion of signification as its regulatory principle. Such an approach should bring human being forward, to the center so that determinism and determination of behaviour development is humanised: "Not nature, but society must, in the first place, be considered as a determining factor of human behavior" (Vygotsky 1997, 59).

Memory, as a higher mental function, is an example of how humanised mental functions are at work culturally. To remember with the use of signs is to turn an internal process into an external activity. In the case of "natural" memory, something *is remembered,* in the case of memory as higher mental function *human being remembers* something. "The very essence of human memory consists of man actively remembering with the help of signs. In general … in the first place, [man's] individuality is due to the fact that man actively participates in his relations with the environment and through the environment he himself changes his behavior, subjecting it to his control" (Vygotsky 1997, 59).

There are three characteristics of higher mental functions:

1. Higher mental functions are not linear evolutionary outcome of more basic and simpler psychological functions. Higher functions undergo radical change and qualitative differentiation through the history of their development.
2. Higher mental functions are not simply made as a second story on the top of the edifice of basic, simpler functions. To the contrary, they indicate a complex merging and appearance of new, more complicated functions. Moreover, they are combination of the more elementary functions but

according to determinations of new laws that lead the functions of the higher mental activities.

3. Higher mental functions do not simply exist alongside lower functions but they determine and reform the activity of more elementary mental functions once they appear (Vygotsky 1999, 42-44). The determination of "natural" functions by the conceptual-logical higher mental functions is analogous to the determination of, say, money by capital: chronologically, money precedes capital; yet, once capital as a social relation is formed, money becomes a moment or a form of appearance of capital as a social relation (Marx 1993, 247-52).

The materialist stance approaches human consciousness within the complex of its social and historical existence. The emergence of human psychic functions is not an instinctive motion but a formation that requires ontogenetic development of socially-formed functions that are mediated (first and foremost) by parents. Human mind is the ability to unite human needs (which although may be organic are not "natural) with the object that satisfies the need with the use of bodily movements and socially-produced organs and instruments of activity (Ilyenkov 2007b, 88). Ilyenkov states,

> If [psyche] is not an "instinct" but a highly complex formation that arises after birth and requires ontogenetic development of a corresponding "functional organ," then the problem of the emergence of the psyche coincides with—and does not stand in opposition to—the problem of ontogenesis of the corresponding zones of the brain. But the organ here is created by the function, and not the other way round, not the function by the organ, by a "structure" that exists prior to it. (2010, 16)

It is notable that mental functions (psyche) are socially formed, socially mediated. If higher mental functions are produced within and preceded by forms of human activity, then in every historical era consciousness inevitably assumes a specific form, which, in turn is both the subject and the object of that mode of activity. As Marx states, "if an economist of antiquity had been asked: what is a worker? he would have had to answer, following the identical logic: A worker is a slave (because the slave was the worker in the labour process of antiquity" (1993, 995, note). Thus, Ilyenkov states,

> The "organs of the psyche" therefore include (as an internal condition of its functioning) only those nervous mechanisms that are not only a *condition* but also a *consequence* of "psychic" activity—activity of the organism in external space, activity with external objects that are distinct from the organism's own body and exist outside it (and independently of it). (2010, 16)

Organs of activity (sense organs) are not organs of the psyche but are its prerequisites. However, this is the case only at the beginning. As activity, and consequently consciousness, develops these organs become proper organs of activity as products of consciousness. A sense organ, at the beginning, is just an organ to randomly satisfy a need; later, it is produced as organ-proper of activity. Only after such refinement it also can assume the proper function of a sense organ; that is, it appears then as an organ that can sense for the sake of sensing and can distinguish between sensing and acting. "The action is *reflected* onto itself—onto the body of the acting organism—and whatever was not present in the *action will also not be present in the feelings*" (Ilyenkov 2010, 19). Consciousness, thus, assumes a conceptual, that is, "ideal" existence. The ideal has a law-like structure: it defines the universal norms of a culture, which should be internalised by the subject in order to enable it to conduct its life-activity (Ilyenkov 2012, 154).

The relationship between human being and nature, as well as between humans themselves, together with their forms of activity (their consciousness, will, imagination, and forms of thinking), inevitably bears the mark of the peculiar socio-historical relations (of production) within which humans perform their activity. Moreover, in contrast to fetishism (in the form of, say, idolatry), ideality or the ideal represents a form of mediation between human and the social reality (including "nature") which is peculiar to the capitalist society, on the one hand, and which is rooted in previous forms of human activity and yet, is not reducible to neither, meaning that it can be separated from the conditions of its formation and be projected, although critically, onto the future forms of societies. The form of appearance of the ideal and ideality is the concept and conceptuality. "Ideality … is nothing else but the form of social-human activity represented in the thing, reflecting objective reality; or, conversely, the form of human activity, which reflects objective reality, represented as a thing, as an object" (Ilyenkov 2012, 176). The sociality of human consciousness or consciousness as a social relation is manifests in its ideal makeup.

## (Ilyenkov's) Antiinnatism

Human's physical environment is endowed with ideal properties. These ideal properties, normative in their essence, determine the type of activity of individuals within the cultural environment, which is itself a product of this process of "idealization".

By idealizing the environment humans change it qualitatively. This idealization is not reducible to subjective imagination: the ideality Ilyenkov has in mind is the ideality the value-form assumes: Value is not corporeal, yet it is not reducible to the individual's subjective imagination. The value that money rep-

resents, as Marx argues, cannot be found neither in the chemistry of commodities, nor in the chemistry of money. In the absence of the concept of value and its objectification, say, in the form of money, the "real" dollars in one's pocket are as subjective and imaginary as the imagined dollars in one's pocket. As Bakhurst puts it, "once idealized, the "external world" no longer exercises a purely physical influence over the subject. Rather, objectification makes possible a new mode of interaction between human agents and their surroundings: a norm-governed interaction mediated by meanings, values, and reasons" (1991, 244).

Thinking, therefore, for Ilyenkov, is the ability to act with reference to this norm-mediated mode of interaction with the world. The ideal forms the medium that "delays" human's response to the stimuli; it is the medium that transforms a direct response (behaviour) into activity (mediated response).

Ilyenkov's approach to thinking and activity determines his conceptualization of consciousness: Just as Vygotsky defines consciousness as body's capability to emerge as the stimuli of its own activity (1925/1997), Ilyenkov argues that activity is first and foremost the norm-mediated spatially-expressed activity of body: so is the case with thinking as a particular form of activity. "The *substance* of the mind is in general *life activity*, the *activity of a living organism*, understood as the independent movement of this organism in space filled with objects" (Ilyenkov 2007b, 88); mind is the derivative of the external and reflexive action of the organism (See also Bakhurst 1991, 245).

Thus follows that the "content" of the so-called mental states is not reducible to physiological states or in particular to physiological changes and reactions within the brain. Not the brain but the person thinks with the use of the brain. "The brain is but the material, anatomical- physiological organ of this labour, mental labour, that is to say, intellectual labour. The product of this special labour is precisely the ideal. And not the material changes within the brain itself" (Ilyenkov 2012, 162). As Bakhurst notices, Ilyenkov's anti-reductionist thesis concretises his conceptualization of the individual as a social being (a social relation) because in this view thinking becomes an activity that is possible only within a social context (1991, 249): [The person's] ability to think with the aid of this brain … not only "develops" (in the sense of "improves") but also first *emerges* only together with his attachment to social-human culture, to knowledge. (Ilyenkov 2007d, 11)

Ilyenkov's antiinnatism thesis, that "higher mental functions are not genetically inherited capacities of the brains" (Bakhurst 1991, 249), is based on his anti-reductionist position. Bakhurst argues that like Vygotsky and Akselrod, Ilyenkov has a particularistic view of dialectical method, i.e., dialectical method is not a set of

universal laws that explain motion but that it points to the method of identifying the particular logic of each concrete phenomenon that is to be analyzed (1991, 250). (The core of Marx's criticism of Hegel is the latter's reduction of dialectics to a set of universally applicable, prefabricated laws: Hegel fails to fulfill his promise of laying the foundation of an "immanent" criticism of phenomena and overcoming the essence-appearance duality. (See Marx 1970, 18)) Furthermore, this is not only characteristic of science but of all cognition that it is not a consequence of following a procedure or a set of rules.

> It is true that the ability (or skill) to think cannot be "grafted" into the brain in the form of a collection of "rules," formulas, and—as people like to say nowadays—"algorithms." A human being is still a human being, much as some would like to turn him into a "machine." In the form of "algorithms" you can "insert" into the skull only a mechanical, that is, a very stupid "mind"—the mind of a cashier, but not the mind of a mathematician. (Ilyenkov 2007d, 11)

Ilyenkov does not imply that acting physical bodies are capable of every kind of activity; rather, he states that they are capable of adapting to new situations and environments; in contrast to both animals' and machines' environment, human environment is in part the product of human activity and thus of acquiring the particular logic of concrete situations. Through concepts, human beings are capable of acquiring the logic of nouvelle situations they have never confronted before. Concept designates "the ways of understanding meaning"; "the word 'concept' in dialectically interpreted logic is a synonym for 'understanding the essence of the matter', the essence of phenomena which are only denoted by a given term" (Ilyenkov 2012, 174). Antiinnatism thesis is the criticism of the fetishistic formulation of the social reality which is manifest in idealist formulations that attribute independence to the ideal social reality (see Ilyenkov 2012, 180). As Bakhurst notes, antiinnatism reveals a profound truth about human being's creative powers, which is also politically significant, "for to recognize it was to acknowledge society's power, and hence its responsibility, to facilitate the development of all, so that each of its members might flourish as "whole persons" *(tselostnaya lichnost')*" (1991, 253). Human beings who are born with biologically normal brains have individual specificities, talents and "gifts"; therefore they are potentially talented and gifted. And if talents are not so much widespread a phenomenon, then the blame should not be put on nature but on entirely different circumstances –say social conditions (Ilyenkov 1969, 97). As Ilyenkov states,

> Intelligence is not a "natural" gift. It is society's gift to a person. It is, incidentally, a gift that he will later repay a hundredfold—from the point of view of a developed society, the most "profitable" of "capital investments." An intelligently organized—that is, a communist—society can be constituted only by intelligent people. And never for a minute must we forget that it is precisely the people of the communist future who are sitting behind school desks today. (2007d, 12)

The criticism of fetishism and idealism necessarily entails antiinnatism.

## Ilyenkov on Contradiction

Every philosophical and logical system, inevitably, faces contradictions and intends to resolve them. Contradiction is the principle of the self-movement of a system: motion is possible only on the basis of the inner contradictions of a system. Practical immanent criticism of a system that overcomes the age-old subject-object dualism is possible only if the inner contradictions of a system are realised. Ilyenkov presents "contradiction" not in the narrow, formal logical sense of the term; such contradictions (e.g., p and ~p) are to be barred by rules of formal logic. Contradiction, here, means "the unity and coincidence of mutually exclusive theoretical definitions" (Ilyenkov 1982, 233).

Contradiction appears when the phenomena that form the subject matter of a science are systematised conceptually. A concept, as the logical reconstruction of the essential relations within phenomena, is not based on a mere generalization of common features of the individual members of a set; rather, it is the expression of the unity of differences. Concept reveals the common genetic root of different members of a set; it reconstructs the process of development of this common root into cognizable features of individual members of that set. Appealing to Marx, Ilyenkov formulates the relation between conceptualization and contradiction:

> The essence of man is no abstraction inherent in each single individual. In reality it is the ensemble of the social relations… Translated into the language of logic, this proposition means it is useless to look for individual definitions of the essence of the genus through abstraction of the individual property possessed by each individual representative of this genus. (1982, 69)

The approaches that aim at wiping out contradictions in order to allegedly arrive at the concept of phenomena are inevitably fetishistic. Metaphysical thought, according to Ilyenkov, reduces theory to a piling up and removal of empirically observed antinomies. It explains these "antinomies" in term of deficiencies of cognitive

apparatus and theoretical systems. Thus, it looks for empirically universal laws that dissipate such contradictions: contradiction, in this view, is a purely epistemological-cognitive anomaly. Whereas, dialectics aims at resolution of contradiction by deducing it from the movement of the world: "The only way of attaining a rational resolution of contradictions in theoretical definition is through tracing the mode in which they are resolved in the *movement of the objective reality, the movement and development of the world* of things 'in themselves'" (Ilyenkov 1982, 244). Natural and social sciences, to the extent they are genuine theoretical-conceptual systems, aim at explaining the motion in terms of such contradictions.

Contradiction is also an essential aspect of the development of human mind. Contradiction is a sign of the existence of a question, which cannot be solved with the use of available logical and formal procedures. In such a case further and deeper analysis of facts appears as a need or a requirement. Contradiction "is an indicator that the knowledge recorded in generally accepted propositions is excessively general, abstract, and one-sided" (Ilyenkov 2007d, 19) in the face of this particular problem.

According to Ilyenkov, a mind that is trained with stereotypes and has only learned to apply prefabricated procedures cannot become independent. Such a mind abhors contradictions; in face of contradictions it collapses into hysteria. Human thinking, according to Ilyenkov, is different from animal thinking exactly due to its attitude toward contradiction (for an interesting example concerning animals' reaction to contradictions see Ilyenkov 2007d, 19). Teaching one to think independently, which is the prerequisite of the emergence and development of a truly human mind, requires providing the mind with the skills of handling contradictions properly, that is, the mind should be trained so that it perceives the contradiction not a s a mere formal anomaly, but as an impulse for further and deeper examination of phenomena. "This is an elementary requirement of dialectics" as "the real logic of real thinking" (Ilyenkov 2007d, 20).

Contradiction is the limit of the thinkable. A contradiction is a phenomenon that transcends the present limit of thinking, which itself is set by human's social-historical activity. Progress in knowledge means expanding the limits of the thinkable, i.e., to turn the unthinkable into the thinkable. This is how a contradiction is resolved, though in a contradictory way. "A sharply formulated contradiction creates a "tension of thought" that is not released until the fact solely by means of which it is resolved is found" (Ilyenkov 2007d, 24). Marx's resolution to the problem of finding a particular commodity, namely labour-power, which does not violate the supreme law of exchange of equals for equals, but which also creates new value, according to Ilyenkov is a brilliant

example of how a contradiction is resolved scientifically. Labour-power is "a commodity whose *consumption* is a *creation*! A thing that appears to be impossible, "unthinkable"—because it is "logically contradictory" (Ilyenkov 2007d, 25).

Human mind emerges only when an obstacle, a particular question is resolved with the use of a new tool. This process is initiated with the introduction of an obstacle that prevents the organism from satisfying its needs with the use of biologically given organs. Deploying a tool in such cases is the sole way of fulfilling the task. The tool the deployment of which amounts to satisfaction of the need, therefore, is itself a part of the obstacle (as its use depends on acquisition of silks required for its deployment). Such a tool, according to Ilyenkov, is any human artefact, say, a spoon: "A spoon is a pass into the realm of human—social—culture" because like any other artefact it is "a bridge-obstacle … created by man for man, [it is like] any artificial tool that man places between himself and an object of his organic needs" (2007b, 89). Such an object is contradictory; it is the third term, the mediating link, which facilitates the passage from animality to humanity.

Knowledge should be acquired in respect to some objective situation that its probable solution imposes the deployment of a set of rules by the subjective consciousness of the student. In this case, the objective presentation of the situation amounts to the acquisition of these rules as subjective laws of action. Contrarily, if the rules are presented as a subjective set of rules for activity, then the student will act with them as what they are, that is, as external objects that exist alongside other objects; as objective rules existing independent from the subjective mode of action or as fetishes. So be the case, in the latter situation innatism of some kind is inevitable. To the contrary, if the former method is deployed, antiinnatism will be the necessary outcome.

The entire art of the pedagogue must, from the very start, focus not on inculcating set rules regarded as tools or instruments of action, but on organizing the external, objective conditions under which learning activity is to take place… Then this rule can and must be given expression in words and signs. Then—and not before—the rule can be brought into verbalized consciousness. (Ilyenkov 2007a, 73)

In other words, as Meshcheryakov (1979) also notices with regard to the education of the deaf and blind, the problem is not to develop speech skills (language) in pupils first, but is to provide the deaf and blind with the experiential depository, which forms the foundations necessary for acquisition of language and concept-formation. The concept cannot be given to the person but the person should be provided with the requirements necessary for the formation of concepts. In this way, the apparent theory-practice

(knowledge-object) dichotomy and the problem of "application" of knowledge to reality is also resolved. "Knowledge then appears to the student precisely as *knowledge of the thing,* and not as a special structure situated outside the thing" (Ilyenkov 2007a, 74).

## Abstract Labour and Accumulated Social Knowledge

Capitalist society is a society of contradictions. The nature of capitalist relations of production is so that it produces the possibility of its own negation. Capitalist society is simultaneously the most equal and the most unequal society. The equality in capitalist society is formal: it means that the individuals that form the capitalist society can be equated quantitatively. Such formal equality is the necessary consequence of the process of capitalist production, the goal of which is the valorisation of capital; it is determined by the dual character of labour. In this regard Marx states, "A commodity may be the outcome of the most complicated labour, but through its *value* it is posited as equal to the product of simple labour, hence it represents only a specific quantity of simple labour" (Marx 1993, 135). Complicated labour is the more qualified labour that may produce a commodity in a lesser time, so that a smaller of its quantity may be considered equal to a larger quantity of simple labour. This passage implies that although in capitalism there is a tendency towards sophistication of labour, which means increasing the productivity of labour-power, yet, this complicated labour should be analyzable into simple labour: such analyzability and identifiability is determined by value. Interestingly, the idea of universal equality (between members of society regardless of their class, gender, ethnicity, etc.) in capitalist society is brought forth by this temporalization of production process, which is the result of the dual character of labour and commodity.

This "equalising" tendency of capitalism is also manifest in the process of self-valorisation of capital that turns money and commodity into moments of itself in circulation. Circulation of capital has no other goal but itself; it does not aim at satisfying particular needs. Moreover, becoming the substance and the subject, it has a dehumanising effect, where the capital-owner is just a personification of capital (Marx, 1993, 254).

On the other hand, capitalist society is the most unequal form of society because it subordinates freedom to the rule of capital. Capitalist growth is possible only at the expense of the individual. Growth of the capitalist wealth, i.e., the expansion of value, by itself does not bring about the prosperity and freedom of the working population; rather, it ties their existence to the compulsion of work and subordinates them to time. As Murray notices, the questions regarding wealth, that how much wealth is there and

how it is distributed neglects a fundamental question: "What is the social form and purpose of wealth?" (1999, 28) The purpose of the value-form of wealth is but the growth of value or valorisation.

Freedom in capitalist society is unfreedom. As Marx states, individual freedom in capitalist society, which has a dual sense, is the condition not of human emancipation, but of transformation of money into capital: "as an individual he [worker] can dispose of his labour-power as his own commodity, and that, on the other hand, he has no other commodity for sale" (1993, 272). This dehumanising character and formality of freedom and equality in capitalist society is formulated by Marx as "freedom, equality, property, and Bentham" (1993, 280).

Although capitalist production needs to revolutionise production techniques in order to increase the productivity of labour and maximise the extraction of surplus from labour, it renders value-producing labour irrelevant to the process of production. There is a growing gap, in capitalist society, between the increase of the productivity of material wealth and the increase of value. This gap or contradiction also is manifest in the growth of the accumulated social knowledge in form of capital and emptiness of the individual labour; or between the objectified totality and the individual. As Postone notices, this gap has two opposed moments:

> On the one hand, as structured by value, it becomes expressed as an increasingly antagonistic opposition between the objectified totality and individuals: the former becomes increasingly rich and powerful, while much individual labor and activity becomes emptier and powerless… On the other hand, though, the same development … makes proletarian labor more superfluous as a source of material wealth. In rendering proletarian labor potentially anachronistic from the standpoint of the production of material wealth, it renders value itself potentially anachronistic. (2003, 359)

On the one hand, application of science makes productive human labour irrelevant; on the other hand, capitalism cannot abolish labour because valorisation depends on the exploitation of productive human labour. Value is bound to direct human labour time expenditure and the growth of productivity makes it irrelevant to the process of production of wealth. This irrelevance signifies an important aspect of capitalist society and its inner contradiction. The contradiction in capitalist society, in the final analysis, is not between existent social structures or groupings but between the existing social structure and relations of production and a future that has become possible (Postone 2003, 360-61). (See also Kurz 1986, 54)

In capitalist society, on the one hand, the urge to increase the production of surplus value requires constant transformation and development of productivity; on the other hand, since production of value is bound to direct human labour time expenditure, capitalist society is dominated by abstract time—the eternal present time, which signifies the continuous reconstitution of the capitalist relations of production. Although capitalist relations of production yield the formation of new types of knowledge and skills, namely knowledge and skills that are not the results of the immediate accumulation of the knowledge of immediate producers, but are accumulated knowledge and skills of humanity in general, yet this knowledge itself becomes subordinate to capital's valorisation.

Despite that, in order to increase the production of surplus-value, in particular relative surplus-value, capitalism revolutionises productive forces not only in technical sense, but also socially. This is to say that capitalist relations of production yield appropriate forms of social organizing, controlling, and managing production process too (Marx 1993, 448). Marx states that the formation of large-scale organised production amounts to emergence of new productive powers of producing individuals which is collective in its nature: it is not collective only because a large number of people are involved in the process of production, but also because this newly emerged productive power is larger than the sum-total of productive powers of the individuals involved. It should be noticed that what is at stake here is the production of use-value or of material wealth (Marx 1993, 447).

The dual character of capitalist production, that is, production of use-value and of value, amounts to the dual character of capitalist management, which is despotic in nature and thus, if not practically negated, intensifies the unfreedom (Marx 1993, 450).

Although capitalist benefits from this social productivity due to the increase in productivity of labour (which means decrease in the necessary labour time for commodity production) and because he has paid the labourers individually and thus this increase comes to it as a free gift, and despite the fact that through this process the productive powers of labour becomes those of capital (Marx 1993, 449-50), it does not increase the amount of the value produced (Postone 2003, 327-28).

With the further unfolding of capital, the social powers of labour, which Marx refers to as "species capacities", will be subsumed to capital completely. Although at the beginning of the process it is only seem to the cooperating labourers that their social productive power inherently belongs to capital (Marx 1993, 451), in the course of development of large-scale industry, these powers become intrinsic powers of capital and completely separated from

the labourer and as a power that rule them. This follows from the form of production that requires from the outset the free wage-labourer that sells her labour-power (1992, 452).

It is a result of the division of labour in manufacture that the worker is brought face to face with the intellectual potentialities of the material process of production as the property of another and as a power which rules over him. This process of separation starts in simple co-operation, where the capitalist represents to the individual workers the unity and the will of the whole body of social labour. It is developed in manufacture, which mutilates the worker, turning him into a fragment of himself. It is completed in large-scale industry, which makes science a potentiality for production which is distinct from labour and presses it into the service of capital. (1992, 482)

Capitalist large-scale production, according to Marx, appears simultaneous to the birth of capital. Capital necessarily transforms labour process into a social process. Moreover, the socialization of labour process is a method employed by capital in order to increase productivity for the sake of maximisation of profitable exploitation. So be the case, though in a socially alienated form, capitalist relations of production points toward the possibility of overcoming these relations and to human emancipation, which means the social re-appropriation of powers of social labour by human beings.

With the rise of large-scale industrial production, however, the aforementioned social character of labour is completed. The technical innovations, which were necessitated by the transformations in the mode of production (Marx 1993, 506) were not solely motivated by technical requirements; rather, they were dictated by capital's movement of self-valorisation: it is with real subsumption of labour to capital that value becomes the truly universal mediating factor in society; the real subsumption of labour to capital could only be realised via large-scale industrial production with the use of machinery (Marx 1993, 508).

The introduction of machinery, which is constituent of large-scale industrial production, not only objectifies the production process, but also put the objectified past labour (mental and physical) at the free service of capitalist production. Machine transforms the past objectified labour into the natural forces of social production (Marx 1993, 510). With the objectification and independence of accumulated past labour, the capabilities and skills of labour are appropriated by machinery as the means of capitalist production: "Along with the tool, the skill of the worker in handling it passes over to the machine. The capabilities of the tool are emancipated from the restraints inseparable from human labour-power" (Marx 1993, 545).

Large-scale mechanical production intensifies the labour process, meaning that makes it possible for capital to extract more

value out of labour in a given time interval. Although the intensification of labour process through introducing ever more developed machinery amounts to an increase on the use-value dimension of productive labour, the machinery enters the valorisation process to the extent that its value is transmitted to the products gradually or by reducing the labour time necessary to reproduce the worker. "Marx grasps capitalist industrial production in terms of this duality: as a process of creating material wealth, it ceases to depend necessarily on direct human labor; yet, as a process of valorization, it necessarily remains based on such labor" (Postone 2003, 342). Moreover, with the introduction of machinery, the worker does not employ the means of production but is employed by the machine: thus follows the separation of the intellectual powers of production from its manual powers, where the formers are transferred to capital and confront the labour as powers of capital dominating labour. The very extensive social knowledge and gigantic body of science, which are the natural forces of the relations of production and are constituted by labour's "species-activity", appear in the alienated form of the powers of the master (Marx 1993, 548-49).

With large-scale industrial production, the powers of capital are not just the alienated form of the powers of immediate producers, but are the alienated form of the accumulated social skills and knowledge. Moreover, since production of material wealth becomes a function of social knowledge, skills, and techniques, the labour of the worker becomes more emptied and unskilled. Yet, since valorisation process depends on the expenditure of immediate labour time, a total replacement of human labour by social knowledge and skills is not sought by capital. "Thus, there is a structural antagonism between the alienated forces of production and living labor, wherein the former become more developed while the latter becomes increasingly empty and fragmented" (Postone 2003, 344). Development of industrial production yields a system of production where the worker becomes not the subject, but an object and a component part of production process.

Capitalist society, thus, is a society where people are under the domination of capital, which appropriates the socially produced accumulated knowledge and skills in an alienated form as its own powers. Industrial production is the materialisation of the process of valorisation and the logic of capital. Through industry, social powers and skills of the use-value dimension of labour are transformed in to the natural powers of social production. Industry is the point of contact between human beings and nature; thus, the natural forces and laws that are objectified in form of scientific knowledge, are but the laws and regulations of productive activity mediated and determined by the logic of capital. However, the dual character of capitalist production brings about the possibility of a

positive re-appropriation of the accumulated social knowledge by society (also see Postone 2003, 354).

Capitals relations of production, on the one hand produce and reproduce the conditions of unfreedom and domination of people by value, while, on the other hand, in a contradictory way bring about the possibility of overcoming capitalism and thus its forms of social domination and unfreedom. The increase in the productivity and skills of use-value dimension of labour, which makes the expenditure of immediate labour time (abstract human labour) irrelevant to the process of producing wealth, and which is manifest in the gigantic amount of accumulated social knowledge and scientification of industry, and the objectification of this social knowledge, although in alienated form as powers of capital, in form of sciences and skills provide the real material ground for a possible communist re-appropriation of these skills and human emancipation. The communist principle "from each according to his ability, to each according to his needs!" (Marx 1989, 89) is a condense form of expressing this possibility. Just as the productivity of use-value dimension of labour is more than the linear sum of the productivity of each labourer, so the scale of accumulated social knowledge is far larger than the sum total of knowledge of each individual contributing to the production of this mass. Additionally, as the scale of knowledge and its fields of application grow beyond the sum of individuals' knowledge, accumulated knowledge expands more rapidly due to new questions that arise as a function of human activity of applying this very knowledge. Moreover, just as with the introduction of large-scale industry the social skills and knowledge become independent of immediate producers, the knowledge in a particular field, say a particular branch of science, becomes independent from those who contribute to the production of scientific knowledge in that particular area. The aforementioned communist principle is the acknowledgment of this situation and the possibility it lays before society at the service of human emancipation.

## Conclusion

Capitalism is itself a contradiction, as it is the third term that relates the human prehistory (Marx 1904, 13) to true human history, that is, communism. Unless this contradiction is not resolved for the benefit of all humanity, all developments that can serve the humanisation process of future human society function as dehumanising instruments at the service of capital. The rapid growth of accumulated social human knowledge and scientification of production can function as a tool that emancipates humanity from the compulsion of bodily work. However, under the capitalist relations of production, such growth, due to capital's demand of valorisation

turn huge masses into surplus-population—disposable human-garbage, while make work into torture for the working population.

Ilyenkov's antiinnatism is another form of addressing the separability of socially-produced knowledge from existing relations of production and re-appropriation of the former by society. Such possibility is brought forth contradictorily by capitalist relations of production: capital is a leveller; it tends to formally equalise individuals so that one can be expressed in terms of quantities of another just as any amount of labour (sophisticated or simple) is identifiable with a certain amount of another labour. Ilyenkov's antiinnatism, therefore, is a criticism of a system of material production and education that is based on a quantified comparison between individuals, which corresponds to the logic of capital. This principle does not claim that everybody can and should know exactly the same thing—ironically such levelling approach is inherent in capitalist education system. As Ilyenkov states,

> Some comrades are afraid that such a theoretical position may lead in practice to underestimation of the special biological-genetic innate characteristics of individuals, or even to leveling and standardization. These fears, it seems to me, are groundless. It seems to me that, on the contrary, any concession—even the smallest—to the naturalistic illusion in explaining the human mind and human life activity will sooner or later lead the theorist who makes this concession to the surrender of all materialist positions, to complete capitulation to theories of the Koestlerian type. (2007c, 67)

An education system subsumed to capital concerns with knowledge as an end-product, a fetish only; it disregards the creative process of formulating knowledge as the outcome. The concern of capital is putting science at its own service, just like any other force of nature. The aim of the existing scientific education is to quickly reproduce the "skilled" labour which is required at different levels of production, including scientific production itself. Thus follows the factory-like form of cramming students into classrooms: here the aim is not to produce true scientists in large numbers but to cut out the surplus-population of these skilled workers so that they serve other "lower" branches of industry. Due to the logic of valorisation of capital, the existing education system does not intend to create the conditions of flourishing independent, emancipated minds but to produce automatons—not mathematicians but cashiers as Ilyenkov puts it. To the contrary, antiinnatism is the criticism of such levelling tendency, which prevents flourishing of individual skills and talents, and which in turn is the expression of the subsumption of the individual by the social. Ilyenkov's stance, which is rooted in his antiinnatism, on the contrary demands for an education system

that encourages the child from beginning to actively participate in the process of production of genuine knowledge. Elaborating on Elkonin and Davydov's research Ilyenkov states,

> In this research an attempt is being made to organize the individual assimilation of scientific knowledge in such a way that it should reproduce in compressed and abridged form the real process of generation and development of this knowledge. Here the child is from the very start not a consumer of set results embodied in abstract definitions, axioms, and postulates but, so to speak, a "co-participant" in the creative process. (2007d, 42-43)

Such an education system should also be designed in response to specific individual needs of each person so as to provide her with the opportunity for developing her talents to the maximum. It also emphasises that the "norm" for human mind is not mediocrity, or lack of creativity and talent but to the contrary,

> the "norm" for man is precisely *talent* and that by declaring talent a rarity, a deviation from the norm we simply dump onto Mother Nature our own guilt, our own inability to create for each medically normal individual all the external conditions for his development to the highest level of talent. (Ilyenkov 2007c, 67)

The human being is not a natural being but a social animal. The biological provides only the basis, the necessary tools of human activity.

> This means that any social departure, any action, any manifestation of social life in man is made possible by biological mechanisms—above all, by mechanisms of the nervous system. On the other hand, all the biological functions of man's organism are subordinated to the performance of his social functions to such a degree that the whole of biology becomes here merely a *form of the manifestation* of a principle that is quite different in nature. (Ilyenkov 2007c, 64-65)

Ilyenkov's approach has a dual meaning; first, the biological in human being is subordinate to the social; the key to human's biology is its social existence and not vice versa, just as the key to anatomy of the ape is human anatomy (Marx, 1992, 105). Second, although biology is the precondition of genesis of human being, with the emergence of human being as social species biology becomes a function of the social, just as is the case with the emergence of higher mental functions, which do not simply supersede the biological functions but qualitatively transform them into their own moments. "Thus, we can regard the biological functions of the

organism as a form of the manifestation of the historically determined social functions of the given individual" (Ilyenkov 2007c, 65).

Antiinnatism is the criticism of naturalistic positions that naturalise and eternalise the conditions of human unfreedom. Everything specific to human mind is socially mediated and (inter-) actively produced. The naturalistic and physicalist approaches seek genetically inherited (inborn, a priori) forms of brain activity that determine modes and forms of human social activity. Such approaches totally ignore the fact that there are a whole range of acquired specifically human brain activities such as categories of logic and moral norms, which cannot be explained biologically. Thus, according to Ilyenkov, the picture of evolution that arises from such stances "looks like a process of rising passivity", where "the ant is more active than the monkey and the monkey more active than human" (2007c, 95).

Human mind can appear only with the deployment of human artefacts, that is, "objects created by labor, objects that correspondingly demand artificial—that is, shaped in labor process itself—modes of action with them" (Ilyenkov 2007b, 90). Therefore, in each specific historical era emerges a specific form of human mind, because the form of mind is determined by the form of human artefacts and the skills required for putting them in action.

The capitalist mind-form, which is attributed with genetically-inherited capabilities, and which, among others, according to Kant, is a "gift" to the few, ironically yields its own antithesis: the quantifying tendency of capital acts as a leveller; it defines every individual person in terms of a specific quantity (of skills and "gifts") of another person, and therefore, the last semblance of uniqueness of the individual human mind under the capitalist relations of production disappears. Antiinnatism is historically possible and necessary in the aforementioned sense: it is the expression of the desirability, possibility and necessity of the re-appropriation of socially accumulated knowledge that is the condition of the emergence of truly social individual.

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# Value and Production of Knowledge: How Science is Subsumed to Capital

The relation between scientific knowledge and social relations that supposedly determine science is one of the central themes within the philosophy of science. The mainstream approaches to science and scientific knowledge, such as social constructionism and analytic philosophy of science (from realism to constructive empiricism), despite their apparent differences in conceptualising the nature of scientific knowledge, share the idea that scientific knowledge is a piling up of propositions. For some, scientific knowledge, in the final analysis, is verifiable or falsifiable before the facts; for others, it is a coherent bulk of propositions that has proven itself to be useful or has been accepted as true owing to the consensus within the scientific community.

A Marxist approach to the nature of science not only can show how and in what sense knowing in general, and scientific knowledge in particular, are socially determined, but also contributes to the conceiving of the historical specificity of the modern scientific mode of knowing, its historically determined success, and its historical limits. Such an approach to the nature of the scientific mode of knowing is not 'epistemology' in the usual sense of the term; rather, it is a critical approach that considers science within history and society. A Marxist approach to science and knowledge is not a 'theory of knowledge' but a critique of epistemology (Postone 2003, 218–19).

One major question concerning scientific knowledge is the problem of "correspondence" between scientific theories or laws and facts. This question is expressed in different forms: how one particular scientific theory is chosen in contrast to other alternatives; which "internal" or "external" factors are responsible in formulating a particular scientific law; what are the reasons for theory change, and what relation is there between an old theory and a new one that replaces it. These questions seem to be variations of the age-old question concerning the relation between thought and reality: what is the source of truth of thought?

Accordingly, thought is radically different from reality; thinking is a relating of propositions, ideas, images, etc. in the head or

mind and not an outward activity. Hence follows the question regarding the truth of thinking in general, and of scientific theories in particular. The distinction between thought and reality is itself rooted in the assumed distinction between thinking and acting. In contrast, for materialism the question concerning the truth of human thought "is not a question of theory but is a practical question" (Marx 1975, 3). Forms of knowing, therefore, should be considered in their relation to human activity. Since there is no such thing as "activity in general"—that is, since human activity assumes specific historical forms—knowing also assumes historically specific forms in relation to modes of human activity.

In order to obtain a better understanding of the relationship between modern natural scientific activity and capitalist relations of production, one should first analyse the historical genesis of human cognitive capacities in relation to human fields of activity (Azeri 2011, 8–37). Once the determination of these capacities by human activity and its mutual relation with the social environment is conceived of, it becomes clear that knowledge, as a particular product of human activity, is not a propositional aggregate but the reconstruction of the rules of human activity, which assumes a particular form in every historical era in the face of social relations of production. This particular form is also expressed in the form of historical necessity that determines the set of problems—practical and theoretical—humans put before themselves.

Under capitalist relations of production, these historical necessities are determined by the logic of capital, that is, its self-valorising movement. Hence, modern natural scientific questions and conceptual systems are formed in response to necessities put forward by capital's continuous demand for self-valorisation, which turns sciences into natural forces at the service of capital, and expresses itself in the process of scientification of the process of production as well as the process of conceptualisation and universalisation of modern scientific activity. Scientific propositions, thus, assume a nomological form as "laws of nature."

This chapter discusses that scientific knowledge is universal and objective, yet historically specific and socially constituted; the universal character of scientific knowledge follows from the historically specific means that are deployed for knowledge production. Science is the sum total of human knowledge, which is the product of the labour-mediated relation between humans and social nature. Knowledge is produced only within human activity, which is actualised at the point of conjunction of human's exchange with social nature. Human activity, all in all, is productive activity, as Marx states in *The German Ideology*. Thus every form of knowing the world is actualised within a specific mode of production.

Knowledge is not a product of consciousness (mind) in contrast to materiality. Neither is it a consequence of a consensus between consciousnesses—it is not a social contract; it is not a notional social construct. Its sociality and historical specificity do not make science less objective. Furthermore, it does not imply that knowledge is relative. Rather, it implies that modern natural sciences are destined to assume a universal form as the form of knowledge-producing activity under capitalist relations of production. Like all conceptual—ideal, as Ilyenkov puts it—categories, science and scientific knowledge have no reality independent from human activity, which is historically specific. There is no trans-historical form of knowing the world; the laws of science are the laws of human knowing activity of the world. Universality of science is the mode of actualisation of knowing activity under capitalist relations of production.

Modern capitalist society is different from pre-capitalist societies owing to the mediating nature of value-based relations of production, where the category of abstract labour forms the essence of value. Accordingly, every economic relation within capitalist society, from the relations among people to the relation between humans and nature, is mediated through the category of abstract labour. Even those relations that apparently fall outside the sphere of economic transactions—say, familial relations—are ideally subsumed to capital and therefore assume a seemingly mediated form (Murray 2000, 121–22, 128ff.).

Abstract labour functions like concepts; conceptualisation, in the modern sense of the term, is possible only because of the dual nature of capitalist labour. Concrete labour under the capitalist mode of production becomes a function or a moment of abstract labour—that is, it becomes a function of labour as commodity or commodity-producing labour.

Concepts are not mere generalisations or abstractions (in the formal logical sense of the term): they are new organs of cognitive activity; they emancipate cognition from the limits put forward by biological sense organs. They not only mediate (come between) the cognising subject and its social surroundings but also function as new organs of activity in the world.

In a sense, what is specific about the capitalist mode of production is its conceptual structure, which is also manifest in the structure of machines as specific tools of capitalist production. All production in capitalist society is organised towards the social goal of production of (surplus) value, the substance of which is abstract labour. Valorisation is actualised in the form of money, which is itself the existent form of abstract wealth; therefore, the activity of producing value is also posited as abstract (Arthur 2004, 53–54).

Conceptuality specifies a second moment of the relation between humans and nature alongside the concrete-labour-mediated

activity of changing, manipulating, and thus "knowing" the world; that is, humans materially and practically act within nature via concrete labour. However, this practical relation is determined, directed, and regulated through abstract labour (Postone 2003, 222).

One characteristic of modern natural science, from its early conception back in the 14th and 15th centuries to the mechanical revolution and to date, is its conceptual structure, which also shows itself—although not exclusively—in the form of mathematisation of scientific models. With the rise of modern natural sciences, conceptual systems, rather than functioning as aids to ordinary sense organs or superseding them, replace the so-called sense organs (of empirical observation and experiment). Galileo's replacing the telescope with the eyes is such an interesting historical example (Gal and Chen-Morris 2010, 121–47); the telescope is not an aid to the eye but is the new organ of observation. Its usefulness and applicability, however, cannot be simply shown owing to its magnifying effects—the telescope is not a large magnifier. It is different from a magnifier just as a machine is different from a mere tool—but requires a conceptual explanation in the form of a theory of optics.

Scientific theories or laws are conceptual in the sense that they "emancipate" scientific cognition from the limits of ordinary sense organs; furthermore, they replace these organs. For instance, it is due to the Copernican model, which would later be perfected by Galileo and Newton, that we come to perceive the sunrise and the sunset as the forms of appearance of the earth's spinning around its own axis (Azeri 2013, 1095–1123).

Conceptuality is the strand that keeps different moments of modern natural science together and presents them as a whole; conceptuality is the mode of existence of modern natural science. It is the conceptuality of modern science—which goes parallel to the separation between head and hand under capitalist relations of production and where this separation is a form of existence of the valorisation movement of capital—that makes science universally applicable. Science is the systematisation of laws of human behaviour and her interaction with nature—an interaction that is mediated by the capitalist mode of production; "laws of nature" are laws of human behaviour in social "nature."

The so-called "laws of nature," which are formulated in the form of scientific theories, are not found in nature in the sense that one finds a lost object or "discovers" an unknown territory. Such understanding, ironically, reproduces the Kantian notion of the thing-in-itself, which, in the final analysis, is unknowable. Scientific knowledge is a human product and therefore is determined by the historically specific forms and modes of human activity. The properties attributed to "nature" are for-us; they are

"secondary"—not in the empiricist sense of the term, but in the sense of being the products of the mode of activity. These properties are real insofar as they are the mediations of the mode of activity. They are principal and objective just as human activity is. Marx refers to this aspect of the human relation to nature as the conceiving of reality as "sensuous human activity" (Marx 1975, 3).

Therefore, in the following sections, it will first be discussed in what sense relations of production determine the mode of production of knowledge. Determination of knowledge-production is not a response to mere technical necessities put forward by the capitalist mode of production, as Hessen and Grossmann discuss (Hessen and Grossmann 2009). Further, each mode of production of knowledge will also produce the cognitive means appropriate to and required by this particular mode of knowledge-production; it will be discussed that concepts and conceptual systems (theories) are the proper cognitive tools for the production of knowledge under capitalist relations of production.

Conceptual systems are machine-like cognitive tools, the analysis of which reveals certain specificities of the mode of production. Just as machines are different from tools—machines are not a complex of simpler tools—conceptual systems are devices that are qualitatively different from sense organs. Just as simpler tools become moments of machines, sense organs, with the rise of conceptual systems, are revolutionised by and become moments of conceptual cognitive tools. Therefore, the specificity of machines in contrast to tools and their relation to capitalist relations of production will be discussed. It will then be discussed how the conceptual makeup of scientific knowledge amounts to the universal veracity of modern scientific laws (theories), and that science therefore assumes the form of abstract cognitive behaviour, since it apparently produces knowledge with tools other than the body.

## Relations of Production and Production of Knowledge

The relationship between the relations of production and forms of knowledge production has been treated extensively within the Marxist tradition. Boris Hessen (2008) and Henryk Grossmann (2008), separately, considered this relation with reference to the practical requirements put forward by capitalist relations of production. They clearly showed why early period mechanical science could develop in certain fields such as hydrostatics, hydrodynamics, and astronomy, while it could not formulate, say, the law of conservation of matter and energy.

The problem with their approach, however, is that they assumed the process of production and "scientification" of production to be neutral; this image of neutrality itself was rooted

in their assumption that labour is a transhistorical category. By labour, they understood "labour as such" or labour as the direct metabolic relation between humans and nature, independent of the mode of production. Hessen and Grossmann did not consider capitalist labour in its historical specificity and therefore did not take into consideration value-producing (abstract) labour and the effect it has within the process of material production as well as the process of production of scientific knowledge. For them, the development of science was the consequence of attempts aimed at solving technical questions (Kurz 2014).

Alfred Sohn-Rethel (1978) provides a more sophisticated account of knowledge production in capitalist society. He, in contrast to Hessen and Grossmann, considers the separation of head and hands as the source of the capitalist form of abstraction ("thought abstraction")—in contradistinction to "real abstraction." He considers money—and in antiquity, the expansion of coinage—the source of thought abstraction, a feature he finds in both modern capitalist society and money-based ancient Greek city-states. However, he assumes the source of fetishisation, which is crystalised in money-fetish, to be not in the field of production but in the field of circulation. He considers the realm of production as neutral and transhistorical (Jappe 2013, 7).

Thus, not only can he not break with the traditional Marxist conceptualisation, but he also fails to see the dual character of scientific knowledge—production and the process of scientification of production. Sohn-Rethel assumes that there could be a neutral form of scientific endeavour that is not distorted by the fetishising effects of circulation relations. Therefore, he fails to conceive the emancipatory role that science and the scientification of the production process may have in abolishing capitalist relations of production. As Robert Kurz (2014) and Moishe Postone (2003) notice, the scientification of the production process, which is continuously intensified owing to the capitalist drive for the production of surplus value, not only accelerates the development of modern science—as it opens up new fields of application for science and brings about new problems that yield new areas of scientific research—but also makes value-producing labour, that is, abstract labour, redundant. Furthermore, such redundancy gives way to what Kurz formulates as the crisis of (exchange) value.

Relations of production are most evidently manifested in commodity and in money. In this, the capitalist mode of production assumes a universal character that is qualitatively different from former modes of production. According to Sohn-Rethel, under the capitalist mode of production, the only way that "social synthesis" is possible is through exchange. Social synthesis is the totality that is formed through interrelated activities of members of society. For

such a synthesis to be actualised, a minimum uniformity is required. The social synthesis of each era is determined by the totality of social needs of that era, which also becomes manifest in forms of thinking and acquisition of knowledge in that era. Social synthesis determines the limit of the thinkable in a particular historical era and is bound to social functions by which material production is actualised. In the capitalist mode of production, this synthesis is possible only through the material production of commodities and through exchange. For exchange to happen—and to be separate from and exclude use or the "action of use"—a market is presupposed: "Market as a time- and space-bound vacuum devoid of all interexchange of man with nature" (Sohn-Rethel 1978, 29).

For Sohn-Rethel, production is a transhistorical metabolic relationship between humans and nature. In the case of knowledge as a form of "thought abstraction," he recapitulates the duality between the physical/bodily (the concrete) and the mental—something that he intends to criticise. He assumes that there is a sphere where disillusioned knowledge, as a result of an immediate relation between humans and the environment, is attainable. Therefore, he does not conceive the link between the production of value and forms of abstraction under capitalist relations of production.

The capitalist mode of production differs from former modes of production also in its being a universal (global) system determined and motivated by the social, abstract goal of production of value (and surplus-value). Capitalist relations of production are social relations of production owing to this social goal—that is, they do not pertain to any transhistorical natural basis; rather, these relations and the laws of their necessity are socially constituted. Sohn-Rethel is totally correct when he formulates the real epistemological question as "how knowledge is possible through means other than bodily activity?" However, in assuming that such a possibility is an illusion that is to be surmounted once the contradiction between the historically specific relations of production and transhistorical forces of production is dissipated, he reproduces the age-old dichotomy between mind and body, and thus mirrors the rationalist conceptualisation of knowledge as a propositional product. Sohn-Rethel assumes the existence of a transhistorical body that is suppressed by the non-social (individual) capitalist form of appropriation of products (in contrast to the social production process).

However, knowing via means other than the body is possible because of the truly social nature of capitalist relations of production. Knowledge is a social product: modern scientific knowledge is the product of a mode of production where production is social in the sense that it is determined by the universal social goal of value-production. It is not the case that knowing through means

other than the body—that is, conceptual knowledge—will disappear once the capitalist mode of production is abolished.

Capitalist relations of production have a dual character, and so does every capitalist product, such as a single commodity itself. Knowing through incorporeal means becomes possible under capitalism because capitalist relations of production are the first truly social—yet abstractly social—relations of production. The mind's producing knowledge is not an illusion; it truly acquires knowledge. The illusion is formed once the fact that knowing through incorporeal means is possible only as knowing through the social body and truly socially organised relations of production is concealed. It is the body that knows—but the social body.

Marx characterises such socialisation (of the process of production) as the dividing of humans into head and hands. As Marx put it in his *Critique*, "labour, which is thus measured by time, does not seem, indeed, to be the labour of different subjects, but on the contrary the different working individuals seem to be mere organs of this labour ... [of] human labour in general" (Bonefeld 2014, 135).

Just as use-value is "historically-specific [in] character" and that "use value in general cannot be produced, has no material existence and does not satisfy human needs" (Bonefeld 2014, 138), there is no knowledge in general abstracted from specific socially constituted needs and questions that are raised in response to the satisfaction of such needs. "Man has needs only as concrete Man, and concrete Man is Man in her definite social relations" (Bonefeld 2014).

Postone considers the shift in the form of inquiry from "why" and "what" to "how," which Marx formulates in *Capital*, vol. 1, as the process of emergence of abstraction in the form of quantification, or the process of mathematisation of production and therefore of knowledge production (Postone 2003, 136). He correctly identifies the process of production as the source of the logic of quantification. He further draws parallels between the category of abstract labour and such a form of abstraction (Postone 2003, 179).

Yet, one may add that, just as quantification of the production process is possible owing to the peculiarity of value-producing abstract labour—and not vice versa—the source of the universal applicability of scientific laws and scientific quantification is the conceptuality of modern scientific models. Quantification and mathematisation, rather than being the source of the universal applicability of modern natural scientific laws, are forms of existence of conceptual models. Although quantification, in the general sense of the term, precedes capitalist relations of production, under capitalism it arrives at its concept and claims every sphere of production.

Modern science is a conceptual activity of knowing—that is, it works with abstract tools for manipulating the world. These

abstract tools consist of concepts. Knowing is an act of manipulating the environment (nature and society). Quantification, which is only one of the forms of scientific abstraction, is in the service of such a pragmatic agenda: just like value, which quantifies the qualitatively different and makes them identical, science reduces phenomena into quantifiable units that are identical to each other.

The concept of time as an abstract, independent variable—which is divisible into identical units and is measurable universally—is one particular example of such quantificational abstraction. Modern science reduces quality into quantity, meaning that it subordinates the question "what" or "why" to the question "how."

On the other hand, science projects its own form of manipulating the world onto nature as if the question "how" were inherent in nature; in other words, it claims that there are no such things as qualities in nature, but that all such qualities are reducible to one or another form of a combination of identical units. Modern science "naturalises" its own unique form of manipulating the world—that is, its own form of "knowing" the world. This naturalisation amounts to ignoring the historicity of science: modern science (or scientism) is blind to its own historical limits.

What makes this quantitative tendency actualisable is the idea of "general human labour" or "abstract labour." Quantification requires the idea of equality, which in turn requires the idea of abstract time that is possible only based on the idea of abstract human labour. Different magnitudes of different things can be compared only if they are reduced to quantities of the same units. This commensurable unit, perhaps, in the case of the commodity, is value, which is the expression of abstract labour. Value as a unit, therefore, is an abstraction: quantification is possible only when the abstract unit of the phenomenon at hand is identified, although it is not a necessary consequence of the identification of this unit.

As Marx states, "It is only the expression of equivalence between different sorts of commodities which brings to view the specific character of value-creating labour, by actually reducing the different kinds of labour embedded in the different kinds of commodity to their common quality of being human labour in general" (Marx 1993, 142). In the absence of the idea of abstract equality—which is the expression of a measurable magnitude of abstract human labour—the idea of the identity of things and reducing each to the other does not appear (Marx 1993, 141).

## Concept Formation and the Field of Activity

Thinking, as a form of external activity, is bound to human activity and its particular mode. Thinking is not boundless; one cannot think of "everything." Thinking is limited by the boundaries of the

thinkable, which, in turn, are determined by the limits of human activity. The mode of activity determines the set of practical and theoretical questions one faces—not necessarily the content of the answers one may propose to those questions.

Furthermore, thinking and cognition are mediated by the particular tools and devices in use: tools, and in this particular context, concepts as peculiar tools and conceptual devices (theories and models), function as a particular source of double stimulation and mediation. As Steven Thorne (2015, 66) puts it, "artifacts and social relationships do more than neutrally mediate human activity; they enable the remediation of human activity to create new morphologies of action." Tools (artefacts) are not auxiliaries to human action, nor are they in a dichotomous relation to humans, but are an integral part of human activity and the process of meaning production. Furthermore, the object of activity, which is to be construed with the use of these artefacts (which themselves are also artefacts being construed within human activity), is not given or constituted all at once, but historically evolved. As Juan Espinosa (2012,233) puts it, "The object of the activity is the 'raw material' or 'problem space' at which the activity is directed and which is shaped or transformed into outcomes with the help of artefacts".

In pre-capitalist modes of production, the logic of notion-making (or the logic of generalisation and relating ideas) is a function of the immediate field of activity—in particular, the immediate field of production. For instance, the categorisation of colours by a farmer in an isolated pre-capitalist society is not only different from conceptual categorisation under the capitalist mode of production but also from that of other members of the same pre-capitalist society who are engaged in a different profession—say, ironworking.

Luria (1976) presents the findings of a study on the relationship between the development of cognitive functions and social surroundings, conducted by the Luria–Vygotsky team in the early 1930s in Uzbekistan, in his book *Cognitive Development: Its Cultural and Social Foundations*. One of the preliminary and important findings and suppositions of the Luria–Vygotsky team—who studied the cultural shift and the resulting changes in mental activity and consciousness of the then pre-modern people of Uzbekistan—is the difference in the mental processes of these people in comparison to those in modern societies.

Like consciousness, the social and historical conditions that give rise to the emergence of cultural–cognitive categories—categories that find their reflection in human consciousness—undergo change and are not given, stable, or unalterable metaphysical entities. The studies conducted by the Luria–Vygotsky team, while revealing much valuable information that deepens our understanding of mental activity and human consciousness, emphasise

the changing nature of consciousness, cognitive functions, cultural categories, and social and historical conditions.

> We hypothesized that people with a primarily graphic–functional reflection of reality would show a different system of mental process from people with a predominantly abstract, verbal and logical approach to reality. Any changes in the encoding process should invariably show up in the organization of the mental processes behind these activities. (Luria 1976, 18)

In studying the perception and categorisation of geometric figures, the Luria–Vygotsky team aimed to test the validity of principles assigned to the process of perception of such figures that had formerly been suggested by Gestalt psychologists. If the perception of geometrical figures is a complex process involving semantic and system-based structures, then it will considerably depend on the person's concrete, practical activity, which in turn is shaped and formulated within specific social and historical conditions. In such a case, the principles posed by Gestalt psychologists lose their universal validity. "The laws of 'good form' and of structural continuation (or amplification) as described by the Gestalt psychologists are fully apparent only for subjects who have mastered geometrical concepts, and do not appear in people who perceive shapes in an object-oriented fashion" (Luria 1976, 33–34).

The same is true for visual perception. Visual perception involves a complex semantic and system-based structure that undergoes change during historical development. "In the transition to more complex historical conditions of shaping cognitive processes, visual perception also changes" (Luria 1976, 41).

Concepts are formed at the conjunction of thinking and speech. Historically, once human language is conceived, concepts come into existence. However, we should think of concepts not as things (in the head or in the realm of ideas) but as processes that are reducible to social relations. Concepts refer to non-conceptualities; they are the ideal reconstructions of social processes, on the one hand, and tools for manipulating these processes as well as social nature, on the other.

Full concepts—in contrast to sympractical thinking and objective generalisations—appear at the final stage of the ontogenesis of consciousness. Speculatively speaking, full concepts are late products of human civilisation. They appear only under the capitalist mode of production, since fully conceptual models for manipulating social nature emerge only under capitalist relations of production. The relation between concepts in general (word-meaning) and full concepts can be conceived of in analogy to commodity in general and commodity as the product of the capitalist production process.

While the former precedes the latter historically, the latter is the key to understanding the former; the latter precedes the former logically. It is a concrete totality, while the former is abstract.

One important aspect of concepts—as such late capitalist products—is their universality. Concepts not only emancipate human perception from the immediate field of activity and perception, but are also themselves free from such immediacy. Concepts are related to the relations of production, but relations of production cannot and should not be reduced to immediate physical productive activity in a factory. Under capitalism, there are phenomena that are specifically universal and can only be conceived conceptually: money, the capitalist state, and the social class are among such phenomena. It is not possible to point at the state or at money, while it is possible that a particular representative of the state or of money—say, a police officer or a single coin in one's pocket—could be conceived as the state or as money, respectively. Moreover, it is impossible, in a sense, to refer to social strata in pre-capitalist societies as social classes. As Marx puts it,

> In so far as millions of families live under economic conditions of existence that separate their mode of life, their interest and their culture from those of other classes, and put them in hostile opposition to the latter, they form a class. In so far as there is only a local interconnection among these small-holding peasants, and the identity of their interests begets no community, no national bond and no political organization among them, they do not form a class. (Marx 1978, 187)

Class requires a universalised consciousness—a consciousness that is not reducible to the sum total of the consciousnesses of the "members" of the class; a consciousness that appears as independent from their physical being. Such consciousness is based on a universal opposition with another class. Lukács, too, draws attention to this universalising tendency, which is the prerequisite for the emergence of class in the Marxist sense of the term (Lukács 2002, 89).

Abstraction is not something specific to capitalism. However, there is a historically specific form of abstraction—conceptual abstraction—which emerges with the formation of capitalist society. Historically speaking, abstraction begins with tool-making; to abstract means to turn some mere thing into a meaningful thing by making it into a tool of action. A tool is abstract owing to the scope of its applicability, which means it is emancipated from the immediate field in which it is located; a tool is a product of the body. A piece of stone is a simple "thing," but once it is used and reused to crack a shell, it is produced as a tool.

The production of tools does not signify a simple change of "form" of some general "matter"; "matter-as-such," like "form-as-such," is only a distinction of mind. With the production of the tool, the "thing" undergoes a qualitative change—it disappears as a mere "thing" in order to appear as actual material.

Concepts are specific means of (scientific) cognition, and conceptual systems are cognitive machines; it seems as if they produce knowledge by themselves—as if machines employ the workers. (For instance, Descartes believed that, once his analytic geometrical algorithm had been formed, it could be automatically deployed by every human being.) Furthermore, it seems as if, once knowing becomes conceptual, it is truly emancipated from the field of bodily activity and in particular from the relations of production. However, such "emancipation" is only a semblance; conceptual knowing signifies a change in the form of knowledge-production.

Under capitalism, the form of activity is mediated by abstract labour; it is the mediation of abstract labour that constitutes the appearance of the independence of conceptual cognitive activity from the field of action—namely, human society. Thanks to abstract labour, which constitutes the essence of value, capital as a social relation appears as a self-valorising substance-subject. Yet just as capital's subjectness is not a mere appearance, the universality of conceptual systems and of modern scientific knowledge is not just an appearance but is the mode of existence of knowledge under capitalism: it is the expression of the universality of capital that subsumes all human activity.

For instance, capital inherits all inequalities and power relations from pre-capitalist societies but reproduces and reconstitutes them as forms of capitalist inequalities and relations of domination. Furthermore, capital subsumes even those fields that are required for the reproduction of free labour—say, the family. Yet, as mentioned above, these fields are also subsumed to capital, but ideally.

Newton's laws of motion and theory of gravitation—and his own account of the discovery of these laws—are illustrative in this case. According to Newton's account, hypotheses have no place in his discovery of the laws of motion and gravitation. However, as Duhem points out, it is hardly plausible that Newton inferred his laws from Kepler's model of the planetary system, because Kepler's system assumes that the planets move in perfectly circular orbits, whereas Newton's laws predict that they move in ellipses. Furthermore, Newton's first law—that bodies continue to move unless some external force is exerted on them—cannot be rooted in observation, since in reality it is not possible to observe any such body that is not experiencing the exertion of external forces.

The introduction of new theoretical terms such as "mass" and "force" adds to the complexity of the problem. All in all, these laws

cannot be rooted in observation but are abstract structures—they are conceptual abstractions. However, such a situation does not undermine the precision and applicability of these laws (Ladyman 2002, 55–56). Furthermore, Newton's laws, for one, are not becoming more precise as they are "corroborated" against facts, nor were they less precise prior to the hundreds of thousands of experiments and observations made by post-Newtonian scientists; the same goes for any other scientific law.

## Machines

The historical conception of the growth of science, on the one hand, reveals the relation between scientific activity and relations of production, while, on the other, it defines the limits of scientific knowledge. Hessen and Grossmann, for instance, show how the formation of mechanics in the seventeenth century was based on the analysis of machines and technology used in material production. "Scientific developments depend on the material and symbolic means which determine both the concrete problems and their possible solutions, not on the personal motivation of the scientists" (Freudenthal and McLaughlin 2008, 8).

This explains why science grows in certain directions, and it also reveals the limited horizons of science—that is, it explains why certain abstractions are not possible under certain circumstances. This aspect is also related to the social nature of need: need is not preconceived, ready-made, or ossified. It is not formed in direct response to external stimuli, as behaviourists or pragmatists would assume. Need is a function of human activity; humans do not do what they will—they will or want what they can do. As Freudenthal and McLaughlin put it,

> The means available are decisive in conceptualizing a need... Means are not developed in order to satisfy existing needs (or interests), but the concrete conception of needs and purposes which may explain action, depends on the means available, that are then used to satisfy them... To explain an action, we should refer to a concrete purpose, not to an abstract wish or need. (Freudenthal and McLaughlin 2008, 7)

Yet, one should note that it is not the immediate technical questions caused by the working of machines that are responsible for the abstract character of modern scientific knowledge. The type of pragmatic problems that the pioneers of modern science faced as early as the fourteenth century—which allegedly amounted to the development of modern science—were also at stake in other parts of the world, say, in the Ottoman Empire. The problem is that a similar set of questions in the Ottoman era did not yield the

abstractly formulated scientific theories and systems that were formed in certain European countries, such as Italy. Moreover, as Postone also notices, certain mechanical devices—for example, mechanical clocks—were not unknown to other societies such as the Chinese, Japanese, and Ottoman. Ibn al-Razzāz al-Jazarī's mechanical water clock is a good illustration of such a situation. Although as early as 1209 he had devised a mechanical clock, neither al-Jazarī nor his contemporaries and disciples came up with the idea of universal, abstract time that assumes the status of an independent variable (Hill 1993, ch. 7).

Science is essentially related to practice: it systematises the set of questions that arise in material practice. In other words, science is determined by the sets of questions it faces—it is the idealisation and systematisation of these questions in the form of theories. Science questions, analyses, and eventually produces the necessary reciprocal relations within different aspects of reality; that is why the problem of verification should be considered a practical question. Theories, in this sense, are posterior to praxis; for example, the optical theory of the seventeenth century does not precede the use of the telescope. To the contrary, the mode of cognitive activity facilitated by the use of the telescope necessitates a systematisation of this activity in the form of an optical theoretical tool.

Moreover, the praxis that determines science is not limited to activities that use physical tools; sign systems and symbolic machines—as tools of meaning production—are also a source of scientific elaboration. Yet the limits of such "pure" theoretical activity, in the final analysis, are defined by the totality of socio-historical human practice.

Analysing the passage from manufacture to mechanical production, Marx states:

> Every kind of capitalist production, in so far as it is not only a labour process but also capital's process of valorization, has this in common, but it is not the worker who employs the conditions of his work, but rather the reverse, the conditions of work employ the worker. However, it is only with the coming of machinery that this inversion first acquires a technical and palpable reality. Owing to its conversion into an automaton, the instrument of labour confronts the worker during the labour process in the shape of capital, dead labour, which dominates and soaks up living labour-power. The separation of the intellectual faculties of the production process from manual labour, and the transformation of those faculties into powers exercised by capital over labour, is, as we have already shown, finally completed by large-scale industry erected on the foundation of machinery. (Marx 1993, 548–49)

In this passage, what defines capitalism is the double-sided process of production: it is both a labour process and a valorisation process. This manifests itself also in capital's tendency to employ the conditions of work over labour. Machinery is here introduced as the physical medium that enables capital to actualise its ideal of self-valorisation, which is inherent in its very constitution. The aforementioned valorisation process finds its expression most clearly in the commodity, and in its most universal form—that is, money.

In this, machines function as the notion of God functions in Newton's physics. Hessen draws attention to the dualism inherent in Newton's physics. He maintains that, although Descartes is a dualist in that he assumes the existence of two separate substances, his physics—unlike Newton's—is monistic and materialistic. In contrast, Newton introduces God as an integral element in his physical theory. Newton defines space as a container that is separated from matter. This becomes manifest in Newton's conceptualisation of space as an absolute entity. In answering the question concerning the essence of space, Newton defines it as the "sensorium of God" (*sensorium dei*) (Hessen 2009, 72).

Although Hessen identifies an important feature that is inherent to modern science, he does not fully explicate the reasons behind such a formulation. God, as the essence of absolute space and time, is the expression of the universal applicability of Newtonian laws of physics—just as money is the expression of the universal applicability of the dictums of capital and the laws of value. The universal applicability of mechanical machinery is not a mere technological achievement; it is the expression of the universal character of the laws of capital.

As Hessen also notes, the Marxist conception of the machine is radically different from traditional and non-Marxist conceptions. A machine is not merely an amalgamation or a complex of simple tools. A machine transforms the object of labour in such a way that it brings about a revolution in production (Hessen 2009, 76). For example, it is mistakenly assumed that the steam engine caused the Industrial Revolution. This is mistaken in that it treats the development of productive forces not as part of and within relations of production, but as a purely physical development of tools. This view fails to distinguish properly between tools and machines—and when it does, it does so by relying on arbitrary criteria. The Industrial Revolution of the eighteenth century precedes the invention and introduction of steam engines into industry (Hessen 2009, 77–78).

What differentiates a machine from simpler tools is its universality, which follows from its universal applicability. For example, mechanical machines consist of three main parts—the motive, the transmitter, and the tooling part—each of which is "useless" by

itself (that is, abstract), but when assembled together they form a meaningful, functioning whole. This abstract structure gives the machine a scope of applicability far beyond that of a simple tool. Machines represent a form of universality that parallels that of scientific concepts and theories as formulated in scientific laws.

Modern scientific laws and models, in contrast to pre-modern scientific practices, claim to reproduce the laws that govern the movements of the universe—whether in a laboratory or in the very functioning of a machine. This explains, for example, why the clock becomes such an important metaphor in explaining the workings of the universe with the rise of mechanical philosophy. The operation of a clock mechanism materialises the abstract idea that mechanical laws are universal laws of motion: laws that govern not only the motion of machine parts and systems, but also the motion of heavenly bodies. As Grossmann states, "The experimental imitation of the structure of heavenly mechanics removed the latter's mystic veil and suggested the idea that the heavenly bodies' movement was governed by principles similar to those of the mechanics of the planetarium" (Grossmann 2008, 143).

This, after all, is not a contemplative or purely theoretical stance, but a practical one. The proof of the universality of mechanical motion follows from its universal reproducibility by humans. The modelling of the universe after the machine violates the Aristotelian view that sharply separates the natural from the artificial. In the Aristotelian framework, it was improper to consider artificial products and natural entities on the same ontological plane. However, by the seventeenth century it had become a widespread belief that humans can securely know only what they themselves make—either by hand or by mind.

The universality of modern science, thus, results from the universality of human activity facilitated by the machine—a universality that is itself determined by the relations of production. These relations dictate their logic onto activity through abstract labour. As mentioned above, the capitalist relations of production are the first truly social relations of production in that they are organised around the abstract goal of value production. Owing to this, human activity—especially productive activity as the mediated metabolic relation between human and social nature—assumes a universal and abstract form, regardless of the specific content of that activity.

Machines are conceptualised tools; in other words, they are tools that produce commodities under the capitalist mode of production: "The machine is a means for producing surplus-value" (Marx 1993, 492). The commodity is an abstract universal and is characterised by an essential contradiction between use value and exchange value. It is also the "unit" or "cell" that contains all the essential characteristics of capitalist relations of production.

Machines are means of producing abstract universals in the form of commodities—some of which are, in turn, machines. In this sense, machines themselves assume an abstract form.

Therefore, science, which both studies and produces physical and symbolic machines, inevitably assumes a universal–conceptual, abstract character. On the one hand, with the scientification of the production process, science becomes a force of nature at the service of capital, enhancing capital's power to subsume labour on an ever-larger scale. On the other hand, it contributes to the semblance that the activity of knowing is independent from human activity, thus reproducing the separation between head and hand.

Science, as an activity aimed at producing knowledge, operates with true or full concepts. With the emergence of modern science, not only does the way we "look" at or "observe" nature change, but so too does the way we act within nature and exchange matter with it. Thus, what we are comparing are not merely differing "outlooks" but differing *tools of activity*—whether external-cognitive tools for manipulating the environment or internal-emotional tools for influencing human inner states and affective behaviour. Scientific knowledge entails a form of consciousness of nature. This includes, reflexively, consciousness of consciousness itself, insofar as a conscious being also acts upon itself.

Modern science is no exception to this rule. The difference between contemporary science and earlier forms, then, must be explained in terms of the distinct forms of activity and the specific tools and devices that each science uses to actualise these forms. What distinguishes contemporary science is its conceptuality and universality—an aspect that must be understood both in relation to contemporary (capitalist) social relations of production and in comparison to other (former or co-existing) modes of acquiring knowledge.

Yet contemporary science assumes a form that is radically different from earlier forms of knowledge acquisition and scientific activity. This, in turn, follows from the revolutionary nature of the capitalist mode of production. The rise of money as a category representing the process of valorisation corresponds to the rise of universal concepts in capitalist society: just as the former signifies the universal character of the capitalist economy and explains its tremendous development, the latter accounts for the emergence and rapid advancement of modern science.

Concepts, as previously discussed, are processes that correspond to human relations. Under the capitalist mode of production, however, concepts no longer appear as tools or organs that mediate historically specific social relations, but rather as thing-like mental entities that possess an apparent autonomy

and generate knowledge on their own. In this, they replicate the apparent self-movement of capital. Just as the productive forces of capital are, in fact, human capacities subordinated to capital, and just as capital, as a social relation, is the mode of existence of actual human relations, science likewise becomes the form in which human activity in knowledge production is organised and appears—so that it seems as though the production of knowledge is driven by some innate Aristotelian curiosity.

Yet knowledge is, above all, the activity of manipulating nature—that is, the exchange of matter with nature—accomplished through productive human activity. As the forces of production develop, so too do the means of appropriating knowledge. These increasingly assume the form of productive activity, which, in turn, is determined by the prevailing social relations of production.

## Universals

Money is a universal. In this, it is as real as any other human product. The concept, the true concept, is a universal in that it reveals the essence of the real phenomena it aims at reconstructing; it also reveals the contradiction—as the source of movement or self-movement—inherent in those phenomena. That money is such a universal does not make all universals into a reflection of money. To the contrary, one should identify, analyse, and explain the true source of the formation of such universals; that source, in principle, is identified as human activity—in particular, human labour or productivity. Money is not the exemplary form of an abstract universal as such, but the exemplary form of an abstract universal produced within conditions that yield alienation (negative alienation).

One consequence of such an alienated view of the world is the classical subject–object dichotomy that lies at the core of modern science. As Postone notices, "The commodity form of social mediation historically gives rise to the independent private producer, on the one hand, and it constitutes the social process of production and the relations among producers as an alienated system independent of the producers themselves, a system of all-round objective dependence, on the other" (Postone 2003, 264). So be the case, the subject–object dichotomy follows. This becomes manifest both in epistemologies from Descartes on to logical positivism and social constructionism, as well as in the very world-view of science that envisions the world as the world of things that are ruled by certain, universal laws. The reified picture of the world is common to both epistemology and the sciences.

Concepts, similar to money, assume a universal character as they are universal; they are not bound to immediate productive activity. That is why concepts are the same for every member of capitalist society regardless of their immediate physical economic

position. In a pre-capitalist society, the notion of red, as a sign signifying a particular shade of colour, may be different for a farmer than, say, for a blacksmith. A farmer might categorise a shade of red with reference to the colours of plants and wheat in a certain season; a blacksmith may categorise the same shade in a different group with reference to the colour of the rust of a certain metal and the heat of fire necessary for melting that metal, etc. Although both the farmer and the blacksmith follow a logical path for their categorisations, their logics, and thus their categorisations, are different—they are local and exclusive to them.

In the capitalist mode of production, however, a certain colour is categorised by all as a particular shade: a shade of red is a member of the category "red" for every member of the society. This does not exclude the possibility that a certain group of people may have a different perceptual experience—say, a group of people might perceive a larger number of shades of white; yet, this does not contradict the fact that even these people categorise these shades under the heading "white" (Jameson 2005, 304, 312–15).

Universals are ideal, and as ideals they have a law-like structure. The ideal defines the universal norms of a culture, which should be internalised by the subject in order to enable it to conduct its life-activity (Ilyenkov 2009, 154). The question that Plato posed, and which still holds, concerns the nature of the ideas (universal concepts) and the world of the ideal. How do these immaterial (incorporeal) strange entities determine the rules of action, the syntax, the logic, and arithmetic? How do they interact with the corporeal? What is the source of their determining effect? What is the source of their universality? Universality is not mere generality; it is not achieved through empirical generalisation.

The universality of concepts signifies the ideal reconstruction of essential bonds that constitute different phenomena as different moments or forms of existence of the essence. Universals are the form of existence of the logic of human activity in capitalist society. In capitalist society, laws of logic appear as independent from humans' collective activity and assume an alienated form. The root of this alienation is the pertaining of the laws of logic to the logic of capital as self-valorising value. Thus, Marx formulates logic as the money (value) of the spirit, as "alienated thinking, and therefore thinking which abstracts from nature and from real man: abstract thinking" (Marx 1959, 128).

This explains an important aspect of modern scientific activity and knowledge production—its universality. What determines the character of modern scientific thought and scientific theories is not the character of the practical questions to which this science supposedly responds; rather, it is the abstraction dictated by cap-

ital and the capitalist mode of production that determines the abstract (purely theoretical) character of modern science.

By analogy with Marx's explanation of the capitalist labour process—"The labour-process is a process between things the capitalist has purchased; things which belong to him"—one may attempt to define scientific production, or the scientific labour process, not as a relation between the scientist and the "scientific" question in its "first" nature, but as a relation between abstractions, where the scientist herself is also one of these abstractions. The scientist is a means of production—of abstract scientific production—just as the worker is but a means of value production.

## Knowing and Knowledge

Knowledge is the outcome of praxis, or of human social activity. Production is the height of human activity and is thus the fundamental source of the acquisition of knowledge as the ability to manipulate the environment within which productive activity takes place. Productive activity, at its basis, is manual production. Under the capitalist mode of production, manual labour is separated from intellectual labour, which in turn yields the illusion that knowledge is the product of pure thought.

Thus, the question "How are pure mathematics and pure science possible?"—according to Sohn-Rethel—if a proper understanding of the nature of knowledge is aimed at, should be reformulated in Marxian terms as follows: "How is objective knowledge of nature possible from sources other than manual labour?" (Sohn-Rethel 1978, 30).

Lukács also draws attention to the necessity of such a reformulation with reference to Marx's thesis that the social existence of people determines their consciousness: "Are the mental forms in which people express their relation to nature an exception? To put it another way, do people stand in an immediate relationship to nature, or is their metabolic interchange with nature mediated socially?" (Lukács 2002, 96).

Furthermore, if human beings' relation to nature via science is not an exception to this mediation, then what is the character of the modern scientific relationship to nature? In other words, how is this mediation actualised scientifically?

Sohn-Rethel's aforementioned thesis should be understood properly. What is at stake is not a physicalist reduction of thought and/or abstraction to the relation between, or a function of, particular physical entities such as neurons. To the contrary, the aim is to show that thinking is a bodily material activity in a historical–materialist sense of the term. Thinking is an activity not of a brain or of a mind but of the psycho-physical unity: the human being. That abstraction is not exclusive to thought should be

understood in relation to the process of meaning-formation: true abstraction is the production of meaningful objects in the sense of making mere objects into tools of action (production). Thus, tool-making is a form of abstraction. Thinking is able to abstract in that it produces peculiar types of tools that are material (but not necessarily physical). These tools are terms, signs, and most importantly, concepts that make the formation of meaningful scientific systems possible. Yet, in each epoch, the production of tools, machinery, meaning, and concepts is determined by the mode of production—for example, by the study of the machinery that is peculiar to and necessary for that mode of production. Note that this machinery can assume a physical form as well as a symbolic form. Furthermore, and in contrast to the Hessen–Grossmann thesis, the conceptual form of knowing is not an immediate outcome of the study of machines; rather, the study of machines yields conceptual knowledge because the machine itself is a peculiar type of tool that is determined by the capitalist mode of production.

All in all, thinking, the production of meaning and concepts, and problem-solving activity—in response to questions faced in human activity—are determined by the totality of historical-social human activity. The form of this activity, in turn, is determined by the relations of production, which should not be understood in terms of the physical production of useful artefacts (use-value), but in terms of the production of commodities that constitute the fundamental unit of capitalist production. The use of machines, therefore, is not an external addendum to the capitalist mode of production but is intrinsic to it. As Postone puts it, Marx analyses industrial production as "intrinsically capitalist"; this view is parallel to his critique of historically determined abstract universality: "The two-sided quality of the process of alienation signifies, in other words, that its overcoming entails the appropriation by people—rather than the simple abolition—of what had been socially constituted in alienated form. The Marxian critique differs from both abstract rationalist and romantic critiques of capitalism in this regard" (Postone 2003, 165).

To the extent that the problems of universal applicability and veracity of modern natural scientific conceptual systems are concerned, this means that the source of universality of modern science is human activity itself, but that the "laws" of this activity appear as if they have an independent existence from and above human beings. In contrast to pre-capitalist societies, where the field of activity determines modes of knowing immediately but limitedly—as shown by Vygotsky and Luria—the capitalist mode of production determines the mode of knowing universally and in a value-mediated form. Thus, knowledge appears "as if" it has an independent ideal existence in the Platonic sense of the term, which waits to be discovered in the form of scientific laws of nature.

However, pertaining to Ilyenkov, one can propose that knowledge has an independent "ideal" existence, in the sense that knowledge is neither in the head of the subject nor in nature, but is produced and revealed within human activity, just as value is neither in money nor in the head of those who use money, but is the expression or a form of existence of alienated social relations. "Ideality is a characteristic of things, not as they are determined by nature but as they are determined by labour, the transforming and form-creating activity of social man, his purposeful, sensuously objective activity" (Ilyenkov 2009, 192). This purposefulness, and the form of this life-activity, however, in capitalist society are determined by the will of value (capital), which is the product of abstract labour; it thus inevitably appears in abstract, reified, and fetishistic forms.

Differentiating manual knowledge from theoretical knowledge should be done clearly so that the dichotomy of "knowledge-that" and "knowledge-how" is not uncritically reproduced. What is required is, first, a double explanation of the differentiation between manual and intellectual labour—that is, a descriptive together with a critical explanation of it—and, second, a dialectical conception of the contradictory nature of such a differentiation: manual labour or knowledge both is and is not different from intellectual labour or theoretical knowledge. Theoretical knowledge is different from manual labour in that it does not involve the flesh-and-blood hands and sense organs, and it applies tools and apparatuses different from physical–bodily organs (it uses signs, sign systems, and concepts or theories). However, in this latter case, it is no different from manual knowledge, qualitatively speaking, because it is a form of outward activity with the use of a new set of organs—that is, conceptual cognitive organs (Azeri 2013).

Epistemology, traditionally, ignores this second aspect of knowledge in order to formulate it as "pure" knowledge or pure science. Formulating it as pure knowledge reduces the alleged objectivity of scientific knowledge to the indifference of science toward objectivity—that is, into detachment from objectivity. The objectivity of knowledge, in this view, is formulated as its objectivity in the form of propositions and propositional knowledge. Ilyenkov's formulation of logic explains this stance more clearly:

> Logic must show how thought develops if it is scientific, if it reflects, i.e., reproduces in concepts, an object existing outside our consciousness and will and independently of them, in other words, creates a mental reproduction of it, reconstructs its self-development, recreates it in the logic of the movement of concepts so as to recreate it later in fact (in experiment or practice). Logic then is the theoretical representation of such thinking.

> From what we have said it will be clear that we understand thought (thinking) as the ideal component of the real activity of social people transforming both external nature and themselves by their labor. (Ilyenkov 2009, 2)

Thus, thinking—including logical thinking—is not a relation between propositions or 'ideas', but an outward activity. Thinking involves concepts as tools or organs of action and activity. It is a creative activity in that it entails both the production and transformation of ideational tools and concepts, as well as the transformation of external reality through the development of tools for such transformative action. Therefore, rather than contrasting thought-abstraction and real abstraction, it is more accurate to contrast conceptual abstraction and non-conceptual or bodily abstraction. Bodily abstraction corresponds to simple tool-making; conceptual abstraction produces machines. Pre-conceptual abstraction is analogous to deploying simple tools, whereas conceptual abstraction involves abstraction through conceptual machines. What differs are the forms, and thus the means, of abstraction.

Scientific knowledge appears in the capitalist mode of production as a mere relation between propositions—one that reflects only upon sensuously available objects. It is ignored that knowledge, after all, is a means of manipulating and thus dominating the social world. So be the case, *in reality*, human scientific knowledge of the world cannot be apprehended independently of conceiving a dual universe: one of concretely given "things", and another of abstractly acquirable "universal laws". In this way, science ignores its own historicity and historical determination. Although it aims to liberate humans by dominating the so-called forces and laws of nature, due to its ignorance of its own social and historical determination, it unconsciously becomes a means of restraining humans. It becomes a "force of nature" serving capitalist relations of production—a force of nature that costs the capitalist nothing (Marx 1993, 508n23). It is appropriated by capital and incorporated by it, just as labour is incorporated by capital. So be the case, it becomes a tool for fully subordinating labour to capital through the scientification of the production process. It is with machines that capital (value) dominates the labour process completely and dictates its own rules onto it; that is, it is through machinery that the laws of the activity of labour appear as (and indeed transform into) laws of capital—laws which exist prior to labour and condition its movement. Under capitalist relations of production, the scientification of the production process through machinery turns workers into extensions of the machine and renders them disposable. Moreover, modern natural science itself is subsumed

by capital in this process so that it assumes the objective form brought into the production process through machinery. Science then becomes a quasi-independent field of knowledge production. Epistemologically, it thereby appears as if a transhistorically universal, abstract method of knowing the world is available—as if knowing the world had a distinct meaning and significance apart from manipulating the world and behaving or acting in it. In this sense, science and epistemology reproduce the notion of materiality and objectivity as objects of the senses, and not as objects of activity and praxis—an understanding that Marx criticised as early as 1845 in the *Theses on Feuerbach*. Thus, as Postone states, "in classical modern natural science, behind the concrete world of manifold qualitative appearances is a world consisting of a common substance in motion, which possesses 'formal' qualities and can be grasped mathematically" (Postone 2003, 175).

## Conclusion: Science as the Form of Abstract "Cognitive" Behaviour

Science, as the most efficient method and device of knowledge production (better to say of knowing), considers the laws it produces as laws in nature, whereas in reality these are laws produced by science. This is not to claim that science is "subjective" or "socially subjective" (as some constructionists may claim). Rather, this is to underline that the laws and rules that science produces are the rules and laws of human manipulation of the environment. They are objective not because they have an independent existence from human activity or because they are "discovered" within the so-called reality; rather, they are objective in that they determine the laws and methods of action in the world.

Thus, scientific theories, for instance, are not verified against the facts (as some positivist verification theories may claim); they are also not falsified against the facts. Furthermore, they are not incommensurable (as the claim to incommensurability of science covertly entails the idea of verification–falsification against the facts). Scientific theories are not only verified or falsified, but are also developed in relation to and against each other, and from within one another, just as the forms of activity are, in the final analysis, comparable with each other. This is so because all human activity, including production and knowing, occurs within the world.

To claim that different theories refer to different worlds suffers from two major defects. First, it covertly assumes a third vantage point that enables the theorist to compare and identify the "worlds" as different. Second, it reproduces the idea of knowledge as a combination of propositions, statements, etc.—that is, the idea of knowledge as verbal–linguistic consensus among members of the scientific community.

Knowing is not a matter of observation and learning; rather, it is based on acting and changing. Changes in the mode of knowing do not need to have a one-to-one correspondence with ways of seeing or perceiving the world. The difference between ways of knowing is not a matter of perception; rather, it is a matter of action. The problem of truth is a practical question, as it is a problem of conducting action. What changes when our modes of knowing change are our methods of confrontation with reality: there has never been a "pure," general form of confrontation with nature—whatever that may imply. Nature or the environment is the environment of our activity, be it our own immediate habitat or the farthest reaches of the heavens. Our methods of knowing—say, scientific theories and laws—are the explanation of how the environment and the whole universe become an organ of our social activity.

In pre-capitalist society, the human's confrontation with nature assumes a limited, concrete form. The limited, concrete, and particular form of this confrontation is manifest in the human's view of nature and of herself: the human views herself as subordinate to nature and attributes sacredness and livelihood to it. In a sense, the concreteness of nature is followed by the particularity of human consciousness. Under the capitalist mode of production, owing to the subject–object dichotomy—which is the consequence of the mediation of the commodity–capital—knowing assumes a universal, abstract form. This is manifest in the fetishistic view of nature that envisions the universe as an amalgamation of things, related and united by certain abstract laws. This is also visible in the social makeup of human consciousness: it is viewed as an individual, related to other individuals via abstract intersubjective laws. Moreover, this view veils the social process of the formation of consciousness as the ontogenesis of interiority, thus attributing essentiality to the individual.

Modern science is a genuine form of knowing; moreover, one should admit that, beyond its genuineness, modern science is the most effective and successful historically constituted form of knowing. The point is to explain such success and its relation to the relations of production. Science is the activity of manipulating nature with the use of conceptual machines. This aspect of scientific activity is reflected in Kantian epistemology, which attributes a transhistorical nature to categories such as space and time, which humans project onto the world. Yet, even in this picture, a world of thing-in-itself is assumed, meaning that science is presented simply as a technical confrontation with the world of objects. This fetishistic picture ignores that science is also a mediating activity—that is, it is the form of manipulating the world by consciousness, which itself is a part of the world. Analogically speaking, the knowing consciousness is in constant proximity with the world; it is in the world

not in the sense that water is in a vase, but in the sense that consciousness is a part of the world—it is not detachable from it. Forms of knowing the world are forms of manipulation of social nature by subjects; this subject itself is not a transhistorical consciousness but is produced through this very activity. The success of modern science is based on the pragmatic–fetishistic conceptualisation of the world as a world of manipulable objects and subjects reducible to identical and therefore quantifiable units.

This is not to undermine science. Relativism—and social constructionism—share the fetishist assumption that there is a world of thing-in-itself, and that knowing is a matter of "how" to look at the world—that is, they share the Kantian assumption of conceptual lenses but assume the simultaneous existence of a multitude of such lenses. They also share with Kantianism and positivism the claim that knowledge is an accumulation of propositions; that is, knowledge is that which is expressed in some form of "theoretical" attitude. This claim runs parallel with the assumption that humans, cultures, communities, etc., have some transhistorical essence. Moreover, these approaches also maintain a transhistorical conceptualisation of history itself: they do not view history as the history of the activity of humans; rather, they conceive of it as a thing, a reified entity, in which humans participate—but from outside. Relativism's conceptualisation of science is similar to traditional Marxism's conceptualisation of capitalism as a problem of the form of distribution. For the latter, under capitalism, labour is estranged from itself, as it is, in-itself, "social", whereas the mode of the appropriation of its product is individual. In other words, for traditional Marxism, labour is a transhistorical positive activity that is separated from its own real essence. Capitalism prevents humans from seeing this estrangement; socialism ends this estrangement by bringing labour back to its own. This is a Hegelian resolution to the Kantian problem of the relation between noumenon and phenomenon.

Relativism shares this Kantian core with regard to natural science, claiming that science is just one system of belief—thus one form of obscuring the access to the world. A criticism of science, however, is a criticism of the form of activity that determines scientific activity and forms of knowing the world. One question of interest may be considered with reference to Marx's analysis of the relation between value and use-value, where the latter is the form of the appearance of the former. Under capitalist relations, value appears only in the process of exchange of useful things. Moreover, in capitalist society, utility or usefulness does not have an independent being to which value is parasitic. Utility has no existence other than the form of value. (The immanent assumption here is that there is a parallel between scientific abstractions,

concepts, and conceptual systems on the one side, and abstract labour and value as the manifestation of abstract labour on the other.) Technology and machinery are the forms of the appearance of scientific abstractions in the world. This includes both physical–material and symbolic machinery. This is not to say that technology is an application of science; rather, it is to say that it is the inevitable and the sole form of the appearance of scientific abstractions and conceptualisations. The study of machines, thus, can reveal facts about science just as the study of commodity reveals the nature of value and of abstract labour. In other words, there is no relation of precedence between science and technology as its form of appearance—neither in the positivist sense, which deals with science as a reified end-product preceding its application, nor in its traditional Marxist sense, which reduces science to the immediate resolution of technical obstacles on the way of material production. As Marx states, "Technology reveals the active relation of man to nature, the direct process of the production of his life, and thereby it also lays bare the process of the production of the social relations of his life, and of the mental conceptions that flow from those relations" (Marx 1993, 493n4).

Scientific models, thus, are conceptual–symbolic machines; since they are made of concepts, they are universal. The knowledge they produce is proposed to be true universally. Modern science is a capitalist enterprise—but not in the sense that those who produce such knowledge are bourgeois, or that the institutions that produce knowledge belong to the bourgeoisie. Such a view would be just another variation of the reductionist picture that conceives of the capitalist form of production with reference to concrete labour only. Rather, science is a capitalist enterprise in that it is produced under the capitalist mode of production and is a means of capitalist reproduction—a force of nature in the service of the process of the self-valorisation of capital. "Science and technology give capital a power of expansion which is independent of the given magnitude of the capital actually functioning. They react at the same time on that part of the original capital which has entered the stage of its renewal" (Marx 1993, 754). Yet, this does not undermine its universality and its claim to universal truth. To the contrary, it explains the objective, abstract universality of modern scientific activity in terms of the mediating structure of abstract labour.

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# Conceptual Cognitive Organs: Toward an Historical-Materialist Theory of Scientific Knowledge

The relation between scientific concepts and phenomena is a central question in philosophy of science; this question is an instance of the more general philosophical question concerning the relation between thinking (the ideal) and reality; it is also related to other questions such as the relation between theoretical and observational entities, realism and anti-realism, meaning variance, and theory change. Various schools of analytic philosophy of science, such as Kuhn's social constructivism and Quine's pragmatic relativism, share certain suppositions in response to this question: they are all based on empiricist epistemology and distinguish between "appearance" and "reality;" they assume that the perceived is something other than spatiotemporal objects; they dramatically differentiate basic human perception from cognition; they hold on to the view that perception happens *in* consciousness (e.g., in mind, the brain, sense organ)[1]; they also hold that perception, as a human faculty, is a naturally given immutable capacity. Moreover, they seem to ignore the specificities of human (cognitive scientific) activity. In short, these various approaches are based on a common epistemological outlook: knowledge, accordingly, is the result of observation-description. This epistemological assumption is the outcome of their "contemplative" stance.[2] A departure from empiricist presuppositions and a study of the process of concept formation seem necessary if the question of the relation between scientific concepts and the phenomena is to be satisfactorily understood.

Vygotsky's methodology provides a powerful tool in order to formulate an alternative philosophy of science to resolve these

1. Although Quine does not endorse the language of sense-datum and explains perception in a more "naturalistic" language, he still differentiates between sensation as a response to sensory stimulation and the perceived object. From a materialist point of view, I believe, there is not much a difference between Quine's naturalism and sense-datum theories. For the latter perception happens in the subject, for Quine it happens on the surface of the sense- organ of the subject.
2. See Karl Marx (1975b), *Theses on Feuerbach*, the first thesis.

problems, which are mostly consequences of the aforementioned empiricist suppositions.

First, the supposition that the objects of perception are not the spatio-temporal objects but are sense data, impressions or sensations is self-defeating in that justifying such a claim requires knowledge of external reality. Second, if this assertion is accepted, then we face the problem of the conformability of perception to external reality; this relation becomes, at best, a "miracle". We are then pushed either to give up on reality or sneak in the aforementioned inherent claim about knowledge of the external world, which amounts to inconsistency. Third, in order to avoid inconsistency and save this illegitimate assumption we are left with no choice but one or another form of Berkeleyan idealism.

The empiricist and rationalist views ignore historicity of perception. As Marx Wartofsky puts it, the reason that both empiricist and rationalist theories of perception, especially the former and analytical philosophy, are mistaken is that they stick to a mechanical, 17th century optical model and Euclidean geometry and to associationist logic. They are ignorant of the historical limits of their own models (1973b, 192–93).

Freudenthal and McLaughlin (2009) formulate this historical delimitation as the "second Hessen theses" concerning the limited horizon of science. The issue is not only to explain why certain abstractions are made, but also why certain abstractions are not possible under certain circumstances. Conditions established by the social relations of production determine the limits of social consciousness and the limits of what is thinkable. In line with this historicist tradition we can assume a hypothesis concerning perceiving the external world and verify it within our Vygotskian model: we perceive a thing where the thing is; we perceive the properties of the thing in relation to the thing and its relations where it is located within the context of other things. Perception in this hypothesis is a "groping movement" to use Mikhailov's brilliant analogy (1980), which is socio-historically determined and mediated.

A Marxist attempt to solve the problem of ideal–that is, the relation between human thought and reality and the problem of actuality of thought–should be a historical account of the genesis of cognitive capabilities and knowledge on the one hand, and a historical account of the determination of modes of knowing by the relations of production, on the other. Modern science, in particular, and human knowing activity under the capitalist mode of production in general is profoundly conceptual. Therefore, analyzing the onto- and phylogenesis of concepts alongside the determination of this genesis and the formation of scientific conceptual systems is a necessary condition of forming a framework for an adequate study of knowing activity and the knowledge it

produces. The question "how is conceptual knowing possible?" should be answered at two levels: a genetic-analytic explanation of the formation of individual conceptual cognitive capabilities, which analyzes the genesis of concepts and acquisition and internalization of concepts, and a historical-analytic explanation of the particular historical forms that conceptual cognitive systems assume. Both levels aim at explaining the historical necessity of conceptual forms of knowing; the former explains how conceptual forms of knowing are shaped through the process of interiorization and the emergence of consciousness, the latter explains how knowing activity and scientific knowledge production as the height of this activity is determined by the capitalist mode of production and assumes the "pure" theoretical form it has at present. However, this distinction is a logical one and the two cannot be separated in reality as both are forms of human activity and praxis. This last claim serves as a point of departure to explain how a Marxist account of knowing activity and scientific knowledge is different than both empiricist-positivist and social constructionist accounts of knowledge.

## Concept Formation & Scientific Concepts

Drawing on Vygotsky's view that concepts and sign systems are tools (tool-like or instrumental systems) I suggest that we can consider concepts as a new (higher/later) type of cognitive organ. Marx maintains that the human hands are an extension of the human brain. To conceive concepts as higher cognitive organs is to maintain that concepts are extensions of sense organs, or to put it more precisely, they are organs that are extensions of the body and its activity.

There are a number of immediate consequences that follow from this model:

Conceptual cognitive organs (CCO) have a history of development—a genesis. Just as "natural" organs have a biologically-based, yet social history; conceptual organs have a social history. CCO are organs of cognition; however, they are socially produced. Therefore, they bear the mark of their socio-historical determinations. Moreover, as organic tools of cognition, they determine cognition, just as means of production are not only determined by, but determine the modes of production.

CCO require human language to emerge: 1) language is the fundamental sign-system that provides the medium, material, and basic tools of CCO; 2) thus, a study of genesis of CCO must include a study of the ontogenesis and phylogenesis of language; 3) the dependence of CCO on language also implies that CCO and their activities do not take place in immediate confrontation with reality, rather, such confrontation is always mediated by linguistic and

conceptual activities. CCO become part of mediating activity, so that the activity is determined by and determines this mediation; 4) in contrast to theories of "representation," CCO model detaches itself from the empiricist dogma that objects of perception and cognition are sense data and not spatio-temporal objects.

This model is based on an alternative epistemological stance that defines knowledge in terms of act-change. The questions that any epistemology must answer is what it means to know and how something is known. To know, in this model, means to manipulate the object in the sense of changing it into a tool of action. Humans know through their bodily activity, the most refined form of which is production. To know is to produce something not in the sense that reality is constructed but in the sense that reality is changed into means, tools, and sources of action. As Sohn-Rethel puts it, we should do away with the "old-age assumption" of traditional epistemology that abstraction is the "exclusive privilege of thought":

> If this thesis can be argued convincingly it would dispose of the age-old idea that abstraction is the exclusive privilege of thought; the mind would no longer be enshrined in its own immanence. It would give room for a completely different appreciation of science and of mental labour generally laying all intellectual activity open for an understanding of it in terms of the social formations of its epoch and critically evaluating its conceptual structure as well as its functional application in the light of the pertinent social conspectus. (Sohn-Rethel 1978, 7–8)

Sensing is a form of activity not only figuratively. It is a literally outward act that deploys certain tools and organs to manipulate reality. This act of manipulation is formed in response to "stimuli", external or internal. There is no such a thing as "pure" perception: all perception is perception of something in response to the necessities of particular forms of activity, which in turn are determined by social needs. Perception is not a "bundling" of sense-data but the perception of the historically situated object by the socio-historically determined subject.[3]

The history of development of CCO reveals 1) their social nature. Education is the warehouse where CCO reach their developed forms.

2) This history also reveals that while at the beginning CCO require "natural" sense organs as their basis of development, due to their social character—which also depends on the structure of education where they reach their full development—this de-

3. Wartofsky (1973b) formulates the historical-activeness of perception as follows: "I do not hit you because I see you; I see you because I want to hit you."

pendence weakens and the relation between the two is reversed. CCO not only provide us with a larger capability to cognize and perceive, but also to free perception and cognition from determination by natural sense organs; furthermore, they adjust the way such natural organs function. One example for such a shift in relations of determination is the way the sunrise and the sunset is perceived: "naturally", perception leads us to believe that the sun moves; however, thanks to knowledge provided by our conceptual systems, we come to cognize these phenomena as consequences of the spinning of the earth around its own axis. Similarly, with the disappearance of a ship on the horizon and our conceptual knowledge of the shape of the earth. One characteristic feature of human perceptual activity is that it is not merely a species activity but a social activity, in that it depends on and is determined by socially- produced and socially-functioning organs and apparatuses such as language, sign- systems, conceptual-theoretical systems, etc. A blind cat can hardly perceive anything through the species-evolved organs; a blind person can in principle conceive every- thing a sighted person does, thanks to CCO. As Ilyenkov puts it, "If an individual has acquired a notion of a thing from other individuals who observed it directly, the acquired form of consciousness of it is precisely that which he would have received had he contemplated this thing with his own eyes" (1960/1982, 43).[4]

3) This history explains the rationality of certain conceptual cognitive activities, on the one hand, without attributing trans-historicity to reason, while, on the other, it prevents us from falling into the pit of relativism, that is, it shows that conceptual systems are commensurable.

Such an interpretation is in line with two important aspects of Vygotskian method- ology: Vygotsky introduces consciousness as a responsive function, i.e., consciousness is the body's capacity to become the stimuli of its own acts through its own acts (Vygotsky 1925/1997, 71).The thesis that concepts are cognitive organs and extensions of body is in harmony with this important aspect of Vygotskian materialist methodology, which represents a positive rejection of dualistic systems. Second, this interpretation is also consistent with the instrumental character of concepts, implying that concepts are means of action. It recognizes the scientific enterprise and the production of knowledge as the genuine activities of a psycho-physical unity, i.e., the human agent.

4. Bakhurst (1991) calls the Vygotskian-Ilyenkovian idea of genesis of human consciousness "antiinnatism". He states, "Like Vygotsky, Ilyenkov maintains that the higher mental functions do not evolve 'naturally' or 'spontaneously' in a process analogous to physical growth. Rather, the child's mind must be created through the agency of the community. Children become thinking subjects as they are socialized by their elders into the community's forms of 'life activity.' As they appropriate, or 'internalize,' those activities, so their minds are born" (1991, 218).

Following Vygotsky, I propose that concepts are introduced when specific questions cannot be answered with the use of existing cognitive tools including the present conceptual stockpile. Moreover, new concepts are introduced not only when particular questions remain unanswered, but also when the very phenomena are formulated as particular questions, that is, when these phenomena are conceived as objects of cognition. Concepts widen the scope of the thinkable; they are determined by the demands of social consciousness. Concepts yield new ways of thinking and acting that were not formerly available to the acting subject. Concepts are not mere responses to questions and problems but are devices of formulating new questions that facilitate new forms of practice. To use Kmita's terminology; concepts and conceptual systems are formed in response to two factors: functional and genetic determinants. The functional determinant addresses an objective demand put forward by social practice, which amounts to the formation of the "social methodological-theoretical humanist coefficient" (something like Kuhn's paradigm), if this coefficient is a sufficiently adequate response to this demand. The genetic determinant signifies the fact that that a theory *T'* does not appear in vacuum; it is based on the 'thought material" provided by the former theory *T* (Kmita 1991, 102–3). Scientific theories and concepts appear only against a background of existing scientific practice and scientific systems. Social consciousness, alongside functional-genetic factors, determines the mode of scientific practice and the consequent scientific theories. Thus, we can explain how new scientific theories are "internally" and "historio-rationally" related to former or rival scientific theories. Moreover, we can explain the growth of knowledge in "positive" terms.

Scientific concepts are a particular kind of concept. They are subject to the same rules as other concepts. However, they extend beyond the boundaries of "natural" concepts and therefore follow a particular path of development. Concepts are components of sign systems, which function as tools of cognitive activity. Conceptual cognition, qualitatively speaking, is very similar to perceptual cognition because all human cognition, including the simplest perceptual act, thanks to language, involves some degree of generalization or a theory.[5] Concepts may be considered an extension of human sense organs. They are particular higher cognitive organs the function of which is cognitive activity. Zinchenko, too, draws attention to the idea that psychological (mental) tools are organs

5. "All use of language embodies theory; as I have said in various earlier contexts, the grammar of every language contains a theory of human experience: It categorizes the elements of our experience into basic phenomenal types, construing these into configurations of various kinds, and these configurations in turn into logical sequences" (Halliday 2004, xvii).

of human activity. They are products, means of production, produced by human activity and thus are named "artifacts." They are also referred to as "functional organs." "Psychological instruments like words, signs, and symbols are living, active forms, and like all living entities they are mortal" (Zinchenko 2002, 13).

Vygotsky defines the fundamental aspect of language—the most important sign system—as conveying information about objective reality. Concepts and signs pro- vide human beings with the ability to generalize and abstract, freeing perception and cognition from the immediate field of perception and from the limitations of our natural sense organs. The development of higher mental functions is realized through language and sign systems. With the emergence of higher mental functions the lower, "natural", mental functions undergo qualitative change. Every concept is a generalization to some degree. Concepts are abstractions too. Thanks to concepts and higher mental functions, the simplest human perceptual activity involves generalization and abstraction to a certain degree, i.e., it becomes cognitive activity. It is the degree of abstraction and generalization that differentiates perceptual and cognitive activities and distinguishes different forms of cognition.

Concepts are different from notions. In traditional atomistic-individualistic views, concepts, in the final analysis, are reduced to the meanings of words. However, not every notion transforms into a concept. For the traditional view, any general notion that is expressed in word/speech is a concept. However, on my view, such linguistic generalization is only a prerequisite of arriving at a concept. A true concept expresses the real nature of thing. The traditional view of concepts, when compares concepts to contemplative/sensual images of a thing, conceives concepts as a lesser, impoverished, one-sided—and in this sense "abstract"—image. As Ilyenkov states, in this view

> The abstract is counted of less worth than the concrete, because from the former so much of that kind of material has been omitted. To those who hold this view, the process of abstraction means that for our subjective needs one or another characteristic is taken out of the concrete… and it is only the incapacity of understanding to absorb such riches that forces it to rest content with meagre abstraction. (1960/1982, 46–7)

And he contrasts this with the following conception:
Concepts reveal some essential features of reality. Concepts being defined as reflection of the *essentially general*, materialism in logic compels one to distinguish most strictly between *what is essential for the subject* (his desires, aspirations, goals, etc.) *and what is es-*

*sential for the objective definition of the nature of the object entirely independent of the subjective aspirations.* (Ilyenkov 1960/1982, 50, emphasis added)

Concepts, similar to words, signify not an individual, singular entity in isolation but a particular unity as an element of a whole system. Concepts reveal the bonds between this element and the whole system. These relations are essential not because they are eternal and immutable relations between the elements of a system, but because they make a whole system a manipulatable totality. This is realized in response to the socially and historically achieved modes of activity, which is reflected in social needs. It is in this sense that concepts reconstruct reality in an ideal form, which in turn is realizable in actuality. Concepts turn mere objects into the extension of humanity's social body and make them organs of activity.

Scientific sign systems (theories) and concepts, therefore, appear to be a particular form of higher mental activity. They are cognitive tools that provide the ability to systematically cognize phenomena, which cannot be grasped by ordinary sense organs. They are tools of the scientific "groping" of phenomena. Scientific concepts free perceptual and cognitive activity from determination of ordinary sense organs by providing a high degree of cognitive abstraction and generalization. Scientific cognition, like perceptual activity, is actualized *by* consciousness but *outside* consciousness.

Just as the perceptual activity of every sense organ is accompanied and tested by the activity of other sense organs and perceptual-cognitive faculties, scientific cognitive activity is accompanied and tested against other perceptual-cognitive faculties including the existing body of scientific theories and concepts as well as other sign systems. The acquisition of new scientific concepts does not begin with acquiring a new orientation toward the object world. Rather, the acquisition of scientific concepts in general, and the formation and acquisition of new scientific concepts in particular, is always mediated by a conceptual system, in particular by natural language. It should also be noted that concepts, everyday and scientific, undergo change and develop.

One issue that is neglected in empiricist and idealist views is that both spontaneous and scientific concepts ("true concepts" as Vygotsky calls them) develop. Everyday and scientific concepts differ in their directions of development. Empiricism also ignores the question of the relationship between instruction/education and development of scientific concepts: scientific concepts are not acquired in their finalized forms whereas empiricism treats concepts as reified end-products only.

In contrast, activity theory proposes that the analysis of human consciousness, including cognitive processes, must always

have human activity in view (Jensen 1999). In most philosophical traditions, ancient and contemporary, philosophy is reduced to its products (categorical or metaphysical systems, conceptual structures, strings of arguments, etc.). Science too, as Lektorsky puts it, has been reduced to its products (hypotheses, system of hypotheses or theories).

Empiricism radically differentiates between concept development and the emergence of scientific theories (conceptual systems). If the *genesis* of concepts is different than the *history* of scientific theories (history as reconstruction of scientific theories) then one might say that a psychological account of development of concepts is utterly different from a historical analysis of science, i.e., this distinction is based on a supposed distinction between genesis and history.

However, the historical approach relates the nature of knowledge to the methods of its acquisition. One consequence is that the ontogenesis of scientific concepts becomes an underlying part of history of science; understanding birth and growth of scientific knowledge requires understanding the ontogenesis of such concepts. Furthermore, the ontogenesis of concepts recapitulates the phylogenesis of human cognitive abilities, which in turn relies on practical activity. Thus, a proper philosophical-historical understanding of science requires understanding the history (both phylogenesis and ontogenesis) of cognitive abilities and faculties, which is a part of history of human praxis. Marx and Engels, in *The German Ideology*, formulate this as the historicity of human existence: "We know only a single science, the science of history. One can look at history from two sides and divide it into the history of nature and the history of men. The two sides are, however, inseparable; the history of nature and the history of men are dependent on each other so long as men exist" (Marx and Engels 1975, 21).

Studies (Vygotsky 1987) about acquisition of scientific concepts by school children show that accumulation of knowledge leads directly to increase in the level of scientific thinking, which in turn influences the development of spontaneous concepts and thinking. Human knowledge accumulates because it is carried in symbolic systems and is concept-dependent; conceptual knowledge is a universally applicable machine. One important consequence of this is that the relationship between social structure and scientific activity (and its resulting worldview) is not a one-way street. Social structure affects scientific activity, but as social practice, that is, as an activity that is societal in essence; scientific activity too has a tremendous impact on social structure.

Concepts are not learned by making associative connections with the help of memory (as different forms of empiricism have held). Concept learning is not an automatic mental habit.

"Concepts are a *complex and true act of thinking* that cannot be mastered through simple memorization … the concept is an *act of generalization*" (Vygotsky 1987, 169, emphasis in original). The development of concepts signifies a transition from one level of generalization to another (Vygotsky 1987, 170). Every word, every concept, at each stage designates a level of generalization; thus, the development of concepts is completed once the "true concept" is formed. Vygotsky identifies two different directions of the development of concepts: everyday concepts move from the empirical toward the abstract, whereas, scientific concepts start from abstract definitions and descend to the empirical-concrete.

## Criticism of the Mechanical Understanding of Scientific Development

Vygotsky's criticism of Piaget views on this issue may be used to criticize views about incommensurability of scientific theories (conceptual systems), such as Kuhn's model of science.[6] In Piaget's model, states Vygotsky, "The socialization of thought is viewed as an external, mechanical process, in which the characteristics of child's thought are forced out… Development is reduced to dying out of the characteristics of the child's thinking. What is new to development arises from without" (1987, 175). In this view, instruction and development are presented as antagonistic processes. Vygotsky continues,

> [D]evelopment is reduced to continual *conflict between antagonistic forms of thinking*; it is reduced to the establishment of a unique compromise between these two forms of thinking at each stage in the developmental process. This compromise changes with each stage in the process, a process in which the child's egocentrism ultimately dies out. (1987, 176, emphasis in original)

According to Wartofsky, Piaget's genetic epistemology maintains that physical concepts are those that develop fully in physics; however, its roots can be traced back to the prehistory of physics, in human's action. Since access to primitive man is restricted, the phylogenesis of the concept is studied analogically via its ontogenesis, that is, in children "*who may be said to recapitulate the stages of this prehistoric conceptual development*" (1971b, 160, emphasis in original).

However, there are some problems regarding Piaget's "teleological" account of epistemology: As Wartofsky also notes,

6. In preface to *The Structures of Scientific Revolutions* (1970), Kuhn introduces Piaget's *The Child's Conception of Causality* as one of the sources that inspired his approach to science: "A footnote encountered by chance led me to the experiments by which Jean Piaget has illuminated both the various worlds of the growing child and the process of transition from one to next" (vi).

Piaget's account of the teleological develop- ment of scientific concepts recapitulates his account of the development of child as the process of socialization of an egocentric infant, where such socialization means "the successful socialization of the child with respect to norms of adult community. In cognitive terms, this means the conceptual socialization of the child with regard to norms of adult common sense and adult natural science, mathematics, and logic" (1971b, 161).

This teleological growth is automatic—as Vygotsky notices—or "naturalistic," to use Wartofsky's term. Moreover, it fails to explain how theories (conceptual frameworks) change; how a new theory emerges dialectically from within older theories. The reason why Piaget intends to handle this question as a "psychological" one and not as an "epistemological" question is a second difficulty rooted in the first: Piaget's account, ironically, leaves no room for human activity in the process of the development of the child. Moreover, he continues to read this naturalistic program into epistemology and growth of science. He writes,

> It may very well be that the psychological laws arrived at by our restricted method can be extended into epistemological laws arrived by analysis of the history of sciences: the elimination of realism, of substantialism, of dynamism, the growth of relativism, etc., all these *evolutionary laws* appear to be common both to the development of the child and to that of scientific thought (Piaget 1960, 240, emphasis added).

Although Wartofsky defends Piaget as non-idealist and/or non-performationist but as interactionist we can raise a number of objections: Development, in Piaget's view, is the process of socialization of an innately and originally egocentric individual child. Thus, socialization is imposed on the child mechanically and externally, as is the child's conceptual development. This external/mechanical process of socialization becomes evident in Wartofsky's discussion of the sequences ABCDF and ABDEF, where each letter symbolizes a sequence in the development of cognitive structures of the child. He concretizes these sequences with the example of the blind, where the F of each sequence is different than the other as each follows a different former structure in the sequence. In either case the consequent structure is mechanically and necessarily determined by the previous structure: it is necessary because the consequent structure is deduced from previous one; it is mechanical because the sequence is one-way. Concretizing the case of missing structural link in each sequence with the example of a blind's person's cognitive development Wartofsky states,

> We may compensate in experience, for missing structures, as for example, the blind do. But the result is a different structure from that acquired by the sighted. Still, where the compensation has to do with *cognitive* structures, there may be equivalences, so that the same set of formal properties of a group of operations may be achieved. (1971b, 172)

In this view, CCO have no effect on biological sense organs. Higher mental functions are only abstracted formal outcomes of natural sense organs and not the higher social cognitive organs that qualitatively change the functions and operations of biological sense organs. In the CCO model, a blind person's ability to cognize is not an "equivalent" structure but is a structure identical to a sighted scientist's cognition of non-observable (theoretical) entities, such as subatomic particles. In the Piagetian view, even in its refined form suggested by Wartofsky, perceptual and cognitive activities are essentially individual: my perception is mine and thy perception is thine. The Piagetian model of perception shares the empiricist-atomistic approach to perception, but here, atomic sense-data are replaced with individually perceived structures. In the Piagetian model, the essentially egocentric child never conceives higher mental functions *as* social relations but only *in* social relations, where social relations are reduced to an amalgamation of externally related atomic individuals.

This line of reasoning may be applied in considering the social constructivist[7] point

of view, such as Kuhn's, that views "progress" in science by the mechanical (external) replacement of one theory by a rival one. An important aspect of Vygotskian under- standing of the relation between everyday and scientific concepts is their mutual influence and interaction. Scientific concepts cause change in the structure of spontaneous concepts. If concepts are understood as cognitive sense-organs (tools), this aspect may be analogically understood in relation to the changes caused in "natural" or "lower"

7. I am aware that social constructionism is not a homogenous phenomenon and that the term refers to a wide spectrum of ideas. I follow Bakhurst (2011) in identifying characteristics of social constructionism: "We can characterize social constructionism in somewhat abstract terms as follows. Those who claim that *X* is 'constructed' typically have an ontological purpose. Sometimes they aim to contrast the constructed to the real, either by arguing that *X* is *un*real—a *mere* construct, or that *X* is not *robustly* real in the way that, say, physical objects are real (*X* is real but owes its reality to processes of construction). Sometimes the point is not that to contrast the constructed and the real, but to question the very notion of reality. The point of calling *X* a 'construct' is often to emphasise its historical contingency: *X* is not an immutable feature of the order of things but the product of human practices, modes of categorization or discourse. This point may be supplemented by the thought that what is mutable is open to transformation. What is made can be remade, at least sometimes" (2011, 24–5).

mental functions by "logical" or "higher" mental functions. This aspect is also reflected within the context of science when the interrelation of scientific concepts in a particular scientific system is concerned. As Lektorsky notices, in modern science, theoretical activity is not the pure revealing of primordially given content, but is related to a certain type of activity. The work of theoreticians with ideal objects resembles the work of technicians with material constructions (perhaps with certain tools) (1999, 101). In modern science, ideal experiment precedes real experiment; the former makes the latter possible. Theory is not a record of the results of experimentation: "Theory doesn't depict current experimental practice, but expresses possibilities of constructive human activity" (Lektorsky 1999, 102).

What basis do we have to claim that scientific and spontaneous concepts are different? One answer is reflected in empirical data: "these two types of concepts produce different results in tasks that require *identical logical operations*. They indicate that they manifest different levels of development at one and the same moment in one and the same child" (Vygotsky 1987, 177–78, emphasis added). This is to say that scientific concepts should be considered not mere epistemological-cognitive devices, but as organic-cognitive devices, sense-organs that have a more refined structure and precision. The difference in precision of the results of scientific research, for instance, corresponds to the different levels of mastery of the use of these conceptual organs.

Learning and processes of concept-formation of the deaf-blind children shows the similarities between natural sense-organs and the CCO and their action-dependency. Meshcheryakov (1979) states that a chief shortcoming of methods of educating the deaf-blind was their attempt to teach those children language from the beginning. However, these methods failed to be systematically reliable because in the case of the deaf-blind the learned language did not correspond to the child's images reflecting her experiencing the environment. Thus, language did not become a part of the deaf-blind child's mental development.

The "mistake" of the former methods of educating the deaf-blind was rooted in an impossibility: the distinguishing feature of human beings is activity –in contrast to animal behaviour; speech is an act that requires the acquisition and mastering of a certain type of tool, that is, the concepts that signify the relation between phenomena and the relation between signs (words) in form of meaning. Under "normal" circumstances, acquisition of concepts proceeds through acquisition of the words that refer to objects (the process of formation of meaning via object-relatedness). In the absence of images or impressions to which words refer, such process will be impossible. Meshcheryakov states,

> The humanising influence of objects, as the products of social labour, and the importance of teaching a child to manipulate them correctly are to this day underestimated both by teachers and in psychological theory. Yet it is precisely this behaviour with objects, that is, the ability to use objects in accordance with their intrinsic logic, which constitutes the essence of human behaviour. In this connection Marx wrote: "Each of his *human* relations to the world – seeing, hearing, smelling, tasting, feeling, thinking, observing, experiencing, wanting, acting, loving – in short, all the organs of his individual being ... are in their *objective* orientation, or in their *orientation to the object*, the appropriation of the object, the appropriation of *human* reality" (Marx 1975a, 299-300). (1979, 85)

Sensing as a cognitive capability and sense organs as the organs of manipulating the world are subordinate to action; action precedes sensation and cognition; sensation and cognition are actions. The so-called "sense-organ" is an organ of activity. The meaning of a thing is a function of its use as a tool of activity. There is no significance/meaning to a thing independent of action/activity. Yet, this dependence does not assume an immediate form. Abstraction from the immediate field of activity is a property that follows the formation of language and use of concepts.

Knowing, first and foremost, is a bodily activity. It is a function of bodily movement and action. The need to know arises as a function of what Meshcheryakov calls the "orientative reaction". To know means to make things sensible or to bestow sense or social "significance" on things; to make things meaningful where meaningfulness is linked with abstraction in the form of tool-making. The quest for knowledge is determined by assimilated social needs. Even curiosity, as a function that facilitates the acquisition of knowledge, is a derivative of bodily activity; it is rooted in orientative reaction. A child that lacks activity will not develop curiosity.

> So the "What's this?" reflex (to use Ivan Pavlov's term) is a later achievement in the case of the deaf-blind child. We have never observed the "What's this?" reflex in the early stages of a deaf-blind child's development. In its place we observed more concrete reactions such as "Is it safe?" or "Is it edible?" If it emerges that the stimulus is not linked to the body in a practical relationship, the orientative reaction to it does not evolve. (Meshcheryakov 1979, 89)

Cognitive activity that is needed for acquisition of knowledge is based on practical/bodily activity, although it will later assume an independent character. Moreover, just as it with higher mental functions and their relation to lower functions, cognitive activity, once it emerges, will determine the mode and variety of practical activity. Walking independently is essential for deaf-blind child to

develop orientative skills and to start "picturing" the world. Lack of certain "sense-organs" cannot, in principle, deprive the child of developing higher mental skills because higher functions such as cognition are in fact subordinate to action. Sense organs are but our organs of activity.

A spontaneous need for movement cannot of itself give rise to any object-linked human behaviour. *The emergence of human behaviour and mental processes in a deaf-blind child from the outset of his development consists in the assimilation of human experience*, *concentrated*, *firstly*, *in the objects required for the satisfaction of his physical needs*, *secondly*, *in the instruments or tools necessary for the satisfaction of these needs*, *and*, *thirdly*, *in the modes of action linked with these instruments or tools*. The child's assimilation and subsequent appropriation of social experience proceeds in his direct communication with an adult in the course of which the latter instructs the former in practical activity directed towards the satisfaction of the child's needs. (Meshcheryakov 1979, 134, emphasis in original)

The process of the formation of the concept of time in the deaf-blind child clarifies both the action-dependency of development of sensorimotor skills and the similarities between bodily sense-organs and the CCO. The basis of the concept and understanding of time is regularity and organization of activity. In sighted and hearing children, this regularity, which is already present within the social organization of human activity, is "observed" and internalized. In deaf-blind children the organization of activity must be taught to the child, as the child lacks some of the usual organs for accessing this regularity. Yet in both cases understanding and formation of the concept of time follows the regularity of human behavior. Rituals –such as dances and rhythmic movements—and art that are born out of such rituals, precede the conceptualization of time. At the pre-conceptual level, regularity of time is still a function of environment; even with sundial clocks the time is still a derivative of environmental and behavioral regularity. At a conceptual level or age, however, time becomes independent from both environmental conditions and humans' behavioral organization. Moreover, with the emergence of mechanical clocks that divide time into universally equal intervals, time assumes a wholly conceptual character and human behavioral organization becomes subordinate to the very conceptual time that is born out of this regularity. Since conceptualized time becomes independent/abstracted from the immediate environmental and activity field, it can be used reflexively, i.e., it can be applied to itself.

Thus, it can be said that time is the time-of-action: it is succession of actions. "*Time- tables are a vital factor in developing a child's sense of time*. Thanks to them time ceases to be no more than a monotonous flow, in which certain events and actions performed

by the child himself and by those around him occur in chaotic turmoil" (Meshcheryakov 1979, 153). The world, for instance the sky, the movement of sun, moon, and stars, from the outset function as the external signs of regulation of human activity. The source of the idea of regularity in nature, thus, is the regularity of human activity and not the observation/contemplation of any regularity. Regularity and thus time are discovered thanks to the understanding of time; these were further understood with more precision thanks to the concept of time.

> When he masters an object of action, a child comes to understand the object involved in the action. This means that the child, as he masters the method of action, assimilates the social value inherent in the object concerned. Indeed, knowledge of objects is social values transferred to the mind of the child, i.e. appropriated by him. In attaining this knowledge the initial act, as we have seen, is the practical action involving the object. The social experience assimilated by the child lies at the basis of his knowledge of the world. (Meshcheryakov 1979, 296)

In other words, the process of the humanization of the child is a process where she appropriates tools as the extensions of her body; the tool and the child unify. The child uses the tool to act; she needs to use the tool correctly. The correct use of the tool that becomes manifest in satisfaction of needs is dictated and determined by the very tool. The process of mastering behavior and performing an action with a tool is a process of mutual transformation of the child and the tool into one another. This is so because the tool is a specific object with social significance; because the tool is an element of social culture. The concept of time, which is necessary for realization of a systematic under- standing of child's environment, is based on the fixing of the object world surrounding the child, which in turn, makes repetition possible. The dialectics of tool-making/tool- using in order to meet a need and the perfection of the need and the emergence of new needs can be also thought of when the change of theories and progress of theories is at stake. The progress of a theory is the process of the development of the CCO, which resembles the development of sensorimotor skills. Acquisition of the social significance of tools not only facilitates the use and mastery of tools but also contributes to the development of sensorimotor skills. A child that can use a knife and a spoon or can lie down in her bed by herself, will also have better control of her movements and can orient herself in the world of objects more easily. To the extent that she masters the use of the tool, the tool becomes an organic extension of her body. The child uses the timetable at the outset to master her

behavior toward manipulating her surroundings. As the child develops, the externally-determined time is internalized in form of the concept of time. Now, the child uses conceptual time as a regulating organ in order to manipulate the environment. Similarly, CCO as symbolic tools consist of concepts that are put in action in order to facilitate the manipulation of the environment. The high level of abstraction that is provided by the CCO, which facilitates a deeper and more sophisticated under- standing of the world is a function of mastering the use of the CCO in order to manipulate the material world and the human behavior.

Vygotsky's own analogy that compares acquisition of scientific concepts with acquisition of foreign languages explains this line of reasoning with more clarity. Learning a foreign language, in this view, is similar to learning algebra; the impact of foreign language on understanding one's mother tongue is similar to the influence learning algebra has on conceiving arithmetical operations. "Just as algebra frees the child from the grasp of concrete numerical relations and raises it to the level of more abstract thought, learning a foreign language frees the child's verbal thought from the grasp of concrete linguistic forms and phenomena" (Vygotsky 1987, 180). Similarly, we can say that scientific concepts (theories) free the senses from the grasp of concrete perception and emancipate them from the limitations that are imposed upon them by "natural" sense-organs. For instance, in case of the sunrise and sunset, we can say that the issue is not the lack of influence of theory on perception (as opponents of theory-ladenness propose). The important thing is not that despite knowing the sun is stationary we continue to perceive it as moving. Rather, notwithstanding perception via "natural" sense organs we come to cognize that it is the earth and not the sun that moves.

Following Davydov, we should draw attention to Marx's characterization of labor activity. Marx states that in the labor process "man uses the properties of certain natural things as tools to affect other things and turns them thereby into an organ of his activity. By acting on nature and changing it, man at the same time changes himself" (1990, 151). We can think about scientific theories, their tool-like functions and their subsequent evolution into new sensory organs by analogy with Marx's view about the process of human labor activity. Scientific activity and new theories provide humans with the ability of appropriating phenomena in form of their organs of activity. Not only is the world thus changed but also, thanks to new conceptual organs, human beings view the world through new conceptual lenses. As Marx notes, human material labor activity that transforms nature and produces tools is creative activity.

Historically, abstraction is not a capability of thought but is immediately related to the process of tool-making. Tools are

meaningful entities that acquire universality as they are applied to various situations. As Sohn-Rethel puts it,

> Abstraction can be linked to the workshop of conceptual thought and its process must be a materialistic one if the assertion that consciousness is determined by social being is to hold true. A derivation of consciousness from social being presupposes a process of abstraction which is part of being. (1978, 18)

Concepts can only exist within a system of concepts, that is, in a systematic complex relationship with other concepts. Concepts do not impoverish reality; on the contrary, by facilitating new modes of activity they open up new ways of manipulating the world: they facilitate knowledge of the essential bonds among the elements of a system. Thus, concepts enrich activity and experience. In other words, concepts, as cognitive tools or higher order sense organs allow us to cognize certain real relationships that are not present to our ordinary senses. Concepts as sense organs depend on conceptual systems, just as bodily organs depend on whole organism if they are to function as tools of human activity.

The web of concepts can be thought of as organized longitudinally and latitudinally. The longitude of the concept represents its position within the hierarchy of degrees of abstraction: from extremely graphic to extremely abstract. The latitude represents the position of the concepts among the concepts of same longitude (Vygotsky 1987, 226). Vygotsky states,

> The concept's longitude represents the nature of the act of thought itself; it represents the way the object is grasped in the concept in terms of the way the concrete and the abstract are united in it. The concept's latitude represents its relationship to the object, the link between the concept and a particular point in reality. Together, its longitude and latitude represent both the act of thought and the object with which it is associated, that is, they represent the nature of the concept itself. (1987, 226–7)

Vygotsky calls this "the structure of generalization." A concept's position in this structure explains its relationships of generality, i.e., its relationship with other concepts. Technically speaking, the structure of generalization determines the set of thought operations that are available for a given concept (Vygotsky 1987, 228).

The structure of generalization of concepts, which signifies their system-dependency, can be understood in analogy to mechanical machines that are, virtually speaking, universal. Machines are not an amalgamation of simple tools; they are revolutionized tools. A simple mechanical machine is made of three distinct parts: a motive, a transmitter, and a tooling part. These parts have no

significance by themselves; yet, they can be made part of a system, combined with other similar parts, and applied in different locations. The abstractness of the parts of a machine facilitates their universal concreteness in the form of their universal applicability. Scientific conceptual systems have a similar characteristic: the notion of "mass" in classical mechanics, for instance, has no particular meaning by itself; yet, combined with a set of other notions such as "force, "acceleration", "gravity" etc. it becomes a meaningful part of a universally applicable symbolic machine.

Moreover, conceptual systems do not have any significance out of relation to action; we might think of them abstractly, as symbolic machines by themselves; however, in actuality, their meaningfulness is bound to their active relation to reality. Just as the "hammer-ness" of a hammer is not a function of its being extended in form of a hammer, but is rather a function of its nailing capability, the reality of concepts and conceptual systems lies in their social significance as tools for appropriating and manipulating reality.

The development –self-movement—of concepts can be represented as a spiral based on a series of connected and ascending circles. In actuality, concepts (and generalizations) of higher levels of abstraction do not emerge from generalizations of isolated representations or perceptions; rather, they emerge from generalized perceptions. "That is, they emerge from the generalizations that dominated the previous stage" of abstraction (Vygotsky 1987, 229–30). This explains, for instance, how different scientific theories are related to each other; new theories can appear only against a background of other older scientific theories. Scientific conceptual systems do determine and define our relation to reality; however, they do not form this relationship as a consequence of an immediate confrontation with reality, but only through the mediation of language and prior conceptual-theoretical systems. Therefore, no matter how radically different theories might be, there are grounds upon which they can be compared (both with each other and with reality, thanks to the structure of generalization); theories are commensurable because they are generalizations about the same (structure) of reality, reflected and refracted within conceptual systems.

Associationism and structuralism suffer from an essential mistake in their view of thought: they fail to see the qualitative difference between the laws that govern thinking as a higher and independent form of (cognitive) activity and perception and memory. Thinking, as an operation that reaches its height with the use of true concepts, undergoes different stages. In a child, for instance, since there is no relation of generality among concepts, the only connections between concepts are the ones that can be established in sense perception. "Thinking as such becomes possible only with the development of structures of generalization and with the

emergence of increasingly complex relationships among concepts" (Vygotsky 1987, 232). Thus, for instance, the positivists' attempt to reduce all meaningful concepts to ostensive/observational concepts is an impossibility, a futile task based on a mistaken associationist outlook that conceives the formation of the higher mental functions in terms of the "law of replacement" only.

The emergence of thinking as such as the expression of the relation between concepts may be interpreted as the emergence of thinking activity in form of cognition and scientific cognition: thinking as relating concepts means forming conceptual systems in order to cognize reality. Cognition, thus, is the outward activity of the brain, that is, it is thinking outwardly. Brain events, as Wartofsky maintains, are not identical with either consciousness or thinking as footsteps are not identical with walking (1971a, 116). The ontogenesis of verbal thinking indicates that acts of thinking happen outside the organism: just as the activity of the hands is external to the hands, brain activity, that is, conceptual cognition happens outside of the brain. Conceptual cognition, then, is the outward activity of CCO.

## Education and Scientific Concept Development

An important issue, which can be related to debates surrounding the formation of new theoretical frameworks, is the relation between concepts that require conscious aware- ness (scientific concepts) and systematic education. Some philosophers of science, such as Feyerabend, treat the rise of new scientific theories as an irrational process influenced by propaganda and power relations among rival scientific communities. Moreover, such views romanticize the element of spontaneity as the mark of the genuineness of the activity that issues in the formation of a system of beliefs. They claim that at certain historical turning points, new scientific theories lack the theoretical basis upon which science as a rational enterprise is to be erected; in such eras, older conceptual frame- works are considered more "scientific" than the rival new theories. One particular example is the introduction of telescope in the absence of an optical theory. To these philosophers, science is a matter of the relationship between propositions or elements of pure thought that happens in the brains of the scientists or theoreticians involved in the production of knowledge. They fail to see how science, as a particular form of social practice, is determined by practical problems through a systematic study of physical and symbolic machinery in use. In this, these views reproduce the fallacy of what Engels calls the "historical ideologist":

> The ideologist … possesses in every sphere of science material which has formed itself independently out of the thought of previous generations and has gone through its own independent

> course of development in the brains of these successive generations. True, external facts belonging to one or another sphere may have exercised a codetermining influence on this development, but the tacit presupposition is that these facts themselves are also only the fruits of a process of thought, and so we still remain within the realm of mere thought, which apparently has successfully digested even the hardest facts. (Engels, 1968, 496)

Such views simply ignore that both old and new frames are based upon a systematic institutionalized educational process and that as different theories they represent differing types of activity as mode of relating to the world of objects. Vygotsky states,

> Only within a system can the concept acquire conscious awareness and a voluntary nature. Conscious awareness and the presence of a system are synonyms when we are speaking of concepts, just as spontaneity, lack of conscious awareness, and the absence of a system are three different words for designating the nature of the child's concept. (1987, 191–92)

Feyerabend, for one, ignores the educational aspect and simply confuses the laws of emergence of spontaneous and scientific concepts. His conceptualization of education, like that of Kuhn, reduces education to text-book education; in this, it re- produces the historical ideologist fallacy. As Kmita states,

> Feyerabend also stands on the grounds of "historical ideology", where the principle reigns which stipulates that every thought has been elicited by another thought, or more specifically, a thought which is constitutive for a scientific theory or accepts one has been elicited by a prior thought which endorsed certain "rational" principles of procedure or some aesthetic, religious, metaphysical, etc., guidelines which decide why a certain theory is more valuable than another. (1991, 93)

Vygotsky, following Blonsky, defines "behavior as history of behavior" (1997, 88). He underlines the active genetic nature of behavior and formation of certain higher mental functions. When compared to Kuhn's formulation of "science as history of science," a formulation that appears to be akin to a Vygotskian understanding, the true essence of a Vygotskian approach and its differences with the Kuhnian model become manifest.[8] Vygotsky draws attention to the process of education as another important feature of the genesis of behavior: "The child is not only a developing being but also an educable one. Education is the artificial development

8. For the relation between history of science and science according to Kuhn, see 1970, Chapter 1, 1–9.

of the child… Education not only influences certain processes of development, but restructures all functions of behavior in a most essential manner" (1997, 88). Kuhn criticizes science education for not incorporating an element of historicity in contrast to, say, painting and music education. This comparison reveals Kuhn's empiricist conceptualization of science as a system of propositions/ideas/concepts that reside, perhaps, in the mind or in the "mass-mind". Thus, he assumes science to be what is taught in science books. First, even in music education, when one is exposed, say, to techniques of playing an instrument, no one is taught first Viola de Gamba and then the Cello. Kuhn's confusing science with science books is like conflating music with musical etudes. This, however, points to a second yet more fundamental problem: science is not just the set of sentences, statements, and problems that are formulated in sentence form problems in the book. Science is the activity, the very practice of science. Science is the totality of scientific practice and the accumulation of the outcome of this activity, which is formulated in theories, definitions, and formulae. The source of Kuhn's confusion is ignoring this fact and reducing science to a propositional system consisting of sentences. Kuhn, therefore, stands within the frame of historical ideology.

Concepts and theories, as new cognitive organs/tools, are artificial instruments. Their development entails a process of education that yields mastery of their voluntary and logical use. The problem with the Kuhnian model is that it shares the empiricist-dualist prejudice that severs object and subject. In this view the objective is reduced to the object of bare senses, and whatever fails to be grouped under such a heading is "subjective" and non-rational. Hence, the role of education is reduced to mere propaganda or a means of oppressing rival theories and establishing hegemony, because scientific concepts and theories are not considered instruments for cognizing and acting within the objective, but as subjective (social-subjective) representations or images that replace the "real" or the "objective." Kuhn's reliance on the idea of Gestalt can be interpreted in this direction. Theory, in this view, is a form (gestalt) that determines perception (in the empiricist sense of the word) and not a tool/organ of cognitive action and praxis. Theory, on this view, has no history, ontogenetic or phylogenetic, because it is related to other theories externally only, and it merely replaces the old ones. The form or gestalt, too, is considered as a finished structure that exits meta-historically; forms of perception, in this view, are mere replacements for empiricism's meta-historical "common sensation." One point of divergence between a Vygotskian approach and Gestalt theory is latter's lack of such an instrumental (active) understanding of forms of perception.[9]

9. For instance, Kuhn states, "Perhaps the most striking feature of the normal

The systematicity of a child's notions, which is attributed to his conscious awareness of concepts, is not imposed upon the child from without; it is not a simple replacement of child's own unsystematic thought. The system, on the contrary, presupposes a rich and mature form of concept in the child (Vygotsky 1987, 192). Analogically speaking, this can be seen in the case of the relationship of scientific theories. New, revolutionary ideas that amount to a paradigm shift do not emerge in a void but presuppose the existence of a rich conceptual system. This explains, for instance, why quantum mechanical theories appear within the "western" scientific tradition and not elsewhere, e.g., against background of witchcraft. This reciprocally determining relationship is also visible in the relation between social consciousness and the individual that partakes in and contributes to the change and genesis of "social consciousness".[10] Following Kmita, it can be said that there are two aspects of social consciousness that a genetic-historical approach should consider: the sufficient conditions that keep a belief in social consciousness and the sufficient conditions that amount to a change in the content of social consciousness: to the extent that "the 'thought material' (Engels) is functional, it remains in social consciousness, whereas new beliefs, individually articulated, have a good chance of penetrating into the realm of social consciousness" and may change social consciousness by making it more functional (1991, 6).

The important issue is the relation between scientific and spontaneous concepts, on the one hand, and between new and old scientific concepts, on the other. In both cases this issue follows from what Vygotsky calls a unique relationship between a scientific concept and its object:

> This relationship is characterized by the fact that it *is mediated through other concepts. Consequently*, *in its relationship to the object*, *the scientific concept includes a relationship to another concept*, that is, it includes the most basic element of a concept system. (1987, 192, emphasis original)

This explains how scientific concepts are related to everyday (non-scientific) concepts and activities: scientific theories, inevita-

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research problems we have just encountered is how little they aim to produce major novelties, conceptual or phenomenal. Sometimes, as in a wave-length measurement, everything but the most esoteric detail of the result is known in advance, and the typical latitude of expectation is only somewhat wider" (1970, 35). See also 1970, 23–4, and 34.

10. "Social consciousness is an idealization of the class of beliefs consciously espoused by concrete individuals, and in some circumstances the Popperian conception of the 'third world' makes an adequate account of some properties of social consciousness" (Kmita 1991, 8).

bly, are mediated linguistically when their relation to their objects is at stake. In addition, it explains how (new) scientific theories are related to the very scientific activity itself: new theories are also mediated by former (older) scientific conceptual frameworks. Moreover, this explains why scientific theories can only approximate truth (verisimilitude): scientific concepts and conceptual systems are always mediated at different levels; they are always refracted cognitions of reality. These refractions and mediations always carry the stamp of particular scientific- historical and socio-historical eras and activities. Thus follows their indirect relation to objectivity, which Marx formulates: "all science would be superfluous if the outward appearance and the essence of things directly coincided." (Marx 1959, 807).

Elaborating on this point, Vygotsky states,

> The concept must be seen as part of the entire system of relationships of generality that defines its level of generality, just as a stitch must be seen as part of the fibers that tie it to the common fabric. At the same time, it becomes apparent that the distinction between spontaneous and non-spontaneous concepts in the child coincides logically with the distinction between empirical and scientific concepts. (1987, 193)

The essence of the problem of non-spontaneous concepts is the problem of instruction and development; it is the more general problem of the relation between the two. Spontaneous concepts provide the potential for the emergence of non-spontaneous concepts through instruction (Vygotsky 1987, 194). Vygotsky enumerates different approaches to this problem; the lines of reasoning of these approaches may also be identified in discussions concerning scientific activity. One tendency considers these two processes distinct and essentially independent. Development in this frame is subordinate to natural laws and instruction is an external utilization of potentials that emerge in development (Vygotsky 1987, 194). One major assumption of such approach is that a high level of development is achievable without instruction.

The logic of paradigm shifts in the Kuhnian model of science implies some similar ideas. Educating scientists within a new paradigm has no essential positive influence on the development of a paradigm. Education in this model is an external imposition of certain beliefs and related algorithms on the potential scientist who will be mostly engaged with "normal science." Even anomalies and unresolved problems function similarly because they fall outside the boundaries of the paradigm; i.e., success and failure of the scientific enterprise, in the final analysis, is success and fail-

ure of the paradigm.[11] The goal of education is not achieving the truth but recruiting new members to the scientific community. Moreover, science does not intend to facilitate human activity and practice; rather, it aims at producing representations (worldview) that are shared by the members of scientific community.

This latter aspect, which amounts to the reproduction of the traditionally asserted gap between theory and practice, is also evident in Kuhn's conceptualization of "progress" in science. Progress, for Kuhn, is identical to dominance of one paradigm. The scientific community, and the set of legitimate scientific questions the community is supposed to ask, are determined by the linguistic agreement –convention- among members of the community. Thus, it is proposed that there is an already-existing rationale, independent of the activity of the community, and in contrast to the rationales of competing communities, that determine the mode of agreement among the members of that community. What remains unexplained is the source of such rationale.

Science, in this picture, is introduced as an attempt to explain what the world looks like. Therefore, it is claimed that the scientific community assumes from the outset that it has access to such an explanation. Thus, one major aspect of scientific inquiry is to defend this picture of the world (Kuhn 1970, 5). Consequently, science is reduced to maintenance of a representation or model of the world. This yields the idea that such modelling or representation is independent of how the world "really" is. Moreover, science in this view is a tautological activity: the paradigm, from the outset not only dictates the questions but also the answers: on this view, science formulates questions to the answers that have already been dictated by the paradigm.

Equating science with the production and appropriation of a world-view in form of a linguistic convention also implies that science and practice should be severed. For example, Kuhn states that science is profoundly different from technology; the reason we fail to see this profound difference is that both science and technology progress (1970, 161). As mentioned earlier, for Kuhn, progress in science is the result of dominance of one paradigm in a field; in the pre-paradigmatic era we cannot speak of progress in the sense we talk about it when a paradigm is established (1970, 163). Progress in science, for Kuhn, is just a matter of increasing the number of problems solved. In other words, progress is a matter "internal" to science; it doesn't have anything to do with

11. "No part of the aim of normal science to call forth new sorts of phenomena; indeed those that will not fit the box are often not seen at all…. Indeed, normal-scientific research is directed to the articulation of those phenomena and theories that the paradigm already supplies" (Kuhn 1970, 24).

reality or truth. The scientist, in this view, is just a member of a scientific community. The problems the scientist is dealing with are dictated by the paradigm, which may or may not bear relation to anything other than itself. Thus, Kuhn arrives at the conclusion that, "We may, to be more precise, have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer and closer to truth" (1970, 171). In the face of reality, Kuhn has to admit that new scientific paradigms are more likely to have greater ability to resolve certain problems.[12] Yet he does not provide a clear explanation of how such progress happens and he thereby reproduces the historical ideologist fallacy. In this, Kuhn recapitulates Piaget's ideas, which Vygotsky criticizes as follows:

> [Piaget] assumes that *the child's thinking inherently passes through certain stages and phases* [regardless] *of whether or not he receives instruction*... In this opposition of instruction and development we are brought once again to Piaget's basic premise: Scientific concepts do not emerge from spontaneous concepts or transform them; they force them out and replace them. (1987, 196, emphasis in original)

Vygotsky's own approach differs from the above in that it considers the two as neither independent nor identical. Instruction and development are interrelated in a very complex way. In order to formulate the Vygotskian approach three aspects must be explained: the maturation of certain mental functions so that instruction can begin, the influence that instruction has on the further development of these functions, and the nature and significance of instruction as a formal discipline (Vygotsky 1987, 201). In order to explain the first point, Vygotsky considers the example of relation between oral and written speech. Despite the child's mastery of oral speech, his written speech may be poor because written speech requires further abstraction from the sensual aspects of speech. In written speech, we use not words but their representations: "In this respect, written speech differs from oral speech in the same way that abstract thinking differs from graphic thinking" (Vygotsky 1987, 202). This point can be extended in order to cover all fields of conceptual thinking. Scientific theories or concept systems may be considered to be sense organs (cognitive tools) that abstract from the sensual aspect of sensation. Here abstraction involves the attribution of meaning, to make an object into a tool of action. A meaningful object is thus abstracted from

12. "Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute" (Kuhn 1970, 23).

its immediate surroundings and concretized universally so that it assumes universal applicability. Contradictory as this may seem, scientific concepts and conceptual systems use concepts as representations to facilitate new and higher forms of activity. They are sense organs of a higher logical or voluntary order.

There is also an asymmetry between instruction and development; the curves representing the progress of the two do not coincide. Development is not completed once the instruction of, e.g., a scientific concept comes to an end (Vygotsky 1987, 207). This aspect is also applicable to science education and scientific practice: it can (be used as a factor in order to) explain how new theories are born from within older ones. New theories do not emerge due to an accumulation of anomalies –although these may be considered factors igniting the quest for alternative explanations—but because in scientific practice a theory will develop to maturity after its introduction into the body of science. It can mature into an organ of scientific cognition that conceives certain questions and problems that could not be anticipated beforehand, due to their inaccessibility to formerly existing theoretical frameworks or conceptual cognitive tools/organs. Therefore, even the cognition of anomalies should be considered a byproduct of the dialectical procedure of instruction and development of scientific concepts and theories as organs of scientific activity.

## Activity Theory vs. Social Constructivism

Piaget's theory –as a form of social constructivism—shares some of the basic elements of Mach's positivism. In this latter view, the objective reality and the world is the product of mutual agreement or assessment among people.

One major problem with social constructivism is its rejection of the idea of the mind-independent existence of objective reality; it is pushed to an idealistic position. However, if mind-independent objective reality is rejected, social constructivism is devoid of its basis, because it remains an enigma how coherently one can assume the mind-independent existence of other minds, mutual agreement among which is going to construct the reality, while reject the existence of objective reality (see Bakhurst 2011, Chapter 2). Hence follows the oscillation of social constructivism (as a form of eclecticism) between the poles of idealism and materialism.[13]

13. For instance, Kuhn writes, "In a sense that I am unable to explicate further, the proponents of competing paradigms practice their trades in different worlds. One contains constrained bodies that fall slowly, the other pendulums that repeat their motion again and again. In one, solutions are compounds, in the other mixtures. One is embedded in a flat, the other in a curved matrix of space. Practicing in different worlds, the two groups of scientists see different things when they look form the same point in the same direction." However, in a passage right after this one he continues, "Again, that is not to say that they can see

Moreover, a social constructivist account of reality neglects the relationship between human agents and reality; it ignores human practical activity that is responsible for the formation of the idea of reality due to its perpetual contact with the real (human activity is the very contact between human agent and reality). In case of child development, for instance, Piaget dismisses the child's practical activity (Vygotsky 1987, 87). Thus, the process of development of the child, or the process of development of scientific conceptual systems, is treated in isolation from reality and practice, and is considered only as pure interaction or communication among minds. This amounts to the positivist-based supposition of social constructivism that reality is "socially organized experience" (Vygotsky 1987, 87).

Another relevant discussion is the problem of rationality of activity. Rationality, in a broad sense, is relative. Or rather, it is a combination of the relative and the absolute; it continuously approaches closer to rationality, just as verisimilitude represents permanently approaching truth. One way to get out of the dilemma of the rationality and/or irrationality of activity is to notice the social essence of activity and the concept of "social need". In the context of social needs the content of an activity is revealed and realized. Thus activity acquires a social meaning and a social rationality. Activity can be divided into two parts; productive and reproductive. The latter is oriented toward the satisfaction of certain needs, whereas, the first type is creative and innovative. Yet, in science, as a highly formalized activity, the boundaries of productive and reproductive activity–which correspond to development and instruction—become relative. If, for instance, we compare science and magic rituals, we observe that the former is productive, the latter reproductive. Yet, elements of productivity and re-productivity are present in both. The difference is that, for instance, in science, repetition (reproduction) of experiments aims at attaining more accurate results toward development of science, whereas, in magic, the creative element aims at preserving the initial system to resolve an increasingly complex problem (Kasavin 1990, 20–1).

While criticizing traditional-analytic philosophies of science, Wartofsky defines science with reference to "needs," and thus maintains that science is teleological (goal-oriented). The question is whether goal-orientedness is sufficient in order to explain the formation of scientific systems? For instance, in case of a drought, people in "need" of water might come to practice rain-dance rituals. This activity is goal- oriented, in that it seeks to cause fall of rain. Is this activity scientific? Wartofsky defines science as

anything they please. Both are looking at the world, and what they look at has not changed. But in some areas they see different things, and they see them in different relations one to the other" (1970, 150).

follows: "Science, therefore, is a practice of acquiring knowledge, whose presupposition is that such an acquisition of knowledge itself serves a social human need" (1977, 134). It also aims at serving a concrete social need. The historical case of the resistance of the official science of the fifteenth century to modern science is a good example of how social need determines the mode of scientific activity. It is usually said that the resistance of the official science to observe the spots on the sun through the telescope is due to lack of a theory of optics that would justify the use of the telescope and ascertain its reliability in scientific observation. This apologetic stance is due to an upside-down understanding of the relationship between conceptual systems and scientific studies. This stance, despite the historical evidence, asserts that theory precedes so-called sub-theories and their application. This is a reified picture of science that conceptualizes science in terms of its end-products. It falls short in explaining the true nature of scientific development by metaphysically distinguishing scientific theory from application of science, say, in technology and scientific practice. Hessen, for one, shows that social practice, the practice that is determined by the social relations of production, precedes and determines the questions, problems, and therefore the direction of scientific studies and the genesis of scientific concepts, conceptual systems and theories. The set of theories, formulations, and questions that fail to correspond to social needs inevitably dissolve. The question regarding the number of angels that can stand on the head of a pin is one example of such dissolution due to its irrelevance to social practice. That the law of the conversation of energy did not appear until the introduction of steam engines is but another example that shows how social need determines the mode of scientific thinking (see Hessen 2009, 74–5). How are we to distinguish between science and non-science in this case? How do we avoid a social-constructivist standpoint in response to this question?

Kasavin proposes an interesting resolution: magic is not simply one of the many activities of primitive societies; it is their window to the world, their outlook on the world. Due to territorial and cultural isolation and backward production relations, primitive societies fail to form a cultural stockpile of worldviews. Primitive human beings do not choose among views but are put within the schematism of magic. Science, on the contrary, is a late product of cultural development, emerging in the midst of cultural conflict and interaction of a whole range of cultural traditions and practices. It chooses from among these conflicting views by critical assessment, evaluation, and criticism. Thus, it can conform or not to a particular system of social values. It not only is goal-oriented and formed in response to social needs, but it also

contributes to the deepening and redefinition of those goals and needs. Moreover, it can problematize the very axiological axioms to which it is supposed to conform. As Kasavin states,

> Any activity, if it claims to be rational, should not be based on any one isolated social position or system of convictions. On the contrary, its very capacity for making a practical choice and assessing it reflexively by using the available cultural resources should serve as its point of departure. In this case, activity will not be threatened by the "magic circle" allegedly imposed upon it by its theoretical premises and practical conditions. On the contrary, activity *includes entering this circle and analyzing the resultant effect*. (1990, 21–2, emphasis added).

As Wartofsky puts it, scientific activity is revolutionary action. It is revolutionary in that it makes the future now. However, this revolutionary essence is realizable only if existing modes of action, that is, existing scientific theories and conceptual systems, are criticized. This is to say that there is a normative aspect to scientific activity. New theories do not replace older or rival theories simply and naturally; they emerge only as a normative dictum that is based on criticism of older practices: new theories determine the new norms of scientific activity, by defining the "rights" and "wrongs" that correspond to the newer forms of such activity, on the basis of criticism of the former theories and widen the scope of scientific activity. As Wartofsky states, "This is how one *ought to* approach the doing of things; this is the mode of operation one *ought to* adopt" (1968, 146).

Scientific theories can emerge only against a background of other scientific theories and conceptual systems in the course of the rational criticism of such systems. We might thus use this aspect to answer the question we formerly raised: scientific models are "necessarily critical of the present, and not simply an envisioning of the future" (Wartofsky 1968, 147). Therefore, criticism is an element that may be used to explain the development of the rationality of scientific activity. Moreover, this critical aspect explains the interactive nature of scientific activity and the production of knowledge. Criticism in this latter sense is the critical collaboration and reciprocal corrective activities of conceptual organs. "Models are technological tools of experimentation" meaning that they require activity. The history of conceptual systems as higher cognitive organs is a history of the development of these organs via experimentation where "experiment is something that should be performed and not merely conceived to be useful" (Wartofsky 1968, 148).

The logic of action precedes logic of thinking. Thinking itself should be understood as a type of human activity that is qualitatively different than mere contemplation (as submission to sense

data) or compiling information gathered by senses. Thinking, as mentioned above, is actively related participation in objective reality through language, sign-systems and conceptual frameworks. Social constructivism divorces thinking from action and activity. It conceives thinking outside the concrete, practical reality. "The function of thinking, however, is knowledge and reflection of reality" (Vygotsky 1987, 88). Divorcing the logic of action from the logic of thinking runs parallel with divorcing instruction and development when the formation of spontaneous and scientific concepts is considered; this separation also explains why in this viewpoint the relation between concepts is conceived only externally and mechanically. Divorcing the logic of action and the logic of thinking and instruction and development, Piaget ends up in an essentialism that attributes uniqueness to the child's thought as an expression of the child's essence. Such essentialism is a distorted form of subject-object and internal- external dualism. The subjective essence, in this view, is actualized due to arbitrary, contingent external factors only. Vygotsky states,

> One cannot more precisely or directly express the thought that the unique character of the child's intellectual organization is inherent in its essence. It does not emerge in development. Conceptualized in this way, development is not self-movement but a logic of arbitrary circumstances. And when there is no self-movement there is no place for development in the true sense of the word. Here, one phenomenon replaces the other, but it does not emerge from the other. (1987, 88–9)

It is not difficult to discern the same lack of conceiving development in scientific conceptual systems, when a social constructivist point of view, such as Kuhn's, is adopted. So conceived, paradigm shifts and theories replacing each other will not follow any developmental path but are subject to arbitrary, external factors that, in the final analysis, are considered alien to the essence of science. For instance, Kuhn introduces accuracy, consistency, broad scope, simplicity, and fecundity as paradigm-free court of appeal in deciding between theories. He suggests that these factors do not play an *evidential* role, but are used by scientists to *persuade* other scientists. This means that a scientist may change another's mind by pointing to the inconsistencies in his theory, but it doesn't mean that his own (new) theory is any better. The reason that these factors have any power, according to Kuhn, is that they are *commonly accepted*. In other words, they are not grounded rationally; there is no way of justifying them (Kuhn 1970, 17–22). Activity does not take place in a void; it is in response to other activities. Therefore, it does not contemplatively assert a reality or "alternative realities." Social con-

structivist models still remain within the framework of positivism, which throws reality out the door as a "meaningless," "metaphysical" commitment, while sneaking it back in the window in the form of sense data. The reason for this is the empiricism of such views: empiricism, like mechanical materialism, knows no other reality than the object of passive contemplation.

Social constructivism's recapitulation of positivist dogma becomes evident, for instance, in discussions about theory-ladenness. Approaches that assume all observation is theory-laden (or is culturally determined and therefore, culturally relative) still work with the myth of the *given*, for instance while defining all "seeing" as "seeing-as". As Wartofsky states, "Even this notion has a residual notion of the *given*, as that which *then* becomes laden with theoretical or background context" (1973b, 205). As, in principle, there is no machine that does not do anything (there is no machine that only "ma- chines"), there is no concept that exists independent of conceptualizing cognition: machines in principle are in use; similarly, concepts, in principle, are formed within cognitive activity and they are not added to perception or cognition from without. The discussion about theory-ladenness recapitulates the biological determinist argument in form of social-environmental/contextual determinism, because, like the other, such a standpoint does not take human activity and praxis into account. To put it differently, it deals with human activity in form of behavior which is formed in direct response to external stimuli: the discussion of theory-ladenness is bound to "postulate of directness".

Social constructivist models preserve the empiricist representationalist view that differentiates between reality and appearance in form of sense-data, ideas, or image- like representations. These models preserve the S—R model in form of a pseudo- mediated S—B—R model, where B stands for not action but a socially, culturally, pragmatically, or naturalistically predetermined behavior. This amounts to replacing the S—R model with a R1—R2 model, which signifies a one-sided emphasis on the subjective component in the original S—R model. This is to say that social constructivism ignores the role of the objective aspect in formation of the responses. It lacks an interactive conception of knowledge and the formation of the organs of acquisition of knowledge, namely CCO. Social constructivism uses a distorted empiricist model, where representations or theories replace sense-data devoid of any relation to reality.

Not a social constructivist, but a pragmatist and relativist, Quine's holistic model of meaning is a good example of such a distortion. In "Posits and Reality" (1955/1966), Quine articulates a pragmatic model of scientific enterprise. He argues that theoretical claims are "posits" –provisional conjectures that may or may not map onto realities in the world—that either earn their keep in

our theories or justly fade away if they don't. Earning their keep is possible through overwhelming pragmatic usefulness: they allow us to predict events and explain, systematize beliefs, and adjust our beliefs in the face of ongoing experience in ways that preserve five pragmatic virtues: simplicity, familiarity, scope, fecundity, and success. Theories that maximize these pragmatic virtues are more likely to be "true" than theories that do not maximize them.

Quine bases his view on the justified rejection of the qualitative difference between theoretical and observational terms but he over-generalizes what positivists held to be true for the relations among theoretical terms that determine their meanings. Quine argues that specialized scientific terms are introduced into scientific theories in large interdependent networks of terms, not one at a time, so the positivist requirement that rules be provided term by term for all theoretical terms in a scientific theory is entirely misguided and impossible to achieve anyway. However, his view is an extension of positivist radical meaning variance thesis so that it covers all terms, observational or theoretical. Although Quine is justified in his criticism of positivism, he sticks to certain empiricist dogmas that are also dear to positivists: he agrees with positivists that theoretical terms refer to unobservable entities and thus their existence can only be shown indirectly, but not through reducing them to observational terms but because they are useful in organizing our experience (1955/1966, 236). He also shares the empiricist presumption that what is perceived is nothing but subjective sense data (1955/1966, 237),[14] notwithstanding that he also takes perceptive capability as immutable and given, a meta-historical capacity that has no genesis and is not subject to development. When it comes to objects of common sense, he then argues, we come to realize that we are in no better position than we are with unobservable entities, since the only things we directly perceive are "variformed and varicolored visual patches, varitextured and varitemperatured tactual feelings, and an assortment of tones, tastes, smells and other odds and ends" (Quine 1955/1966, 237). Thus, the existence of objective reality is as indirect a pragmatic assertion as assuming the existence of unobservable entities. Thus there follows the Quine-Duhem thesis of underdetermination that states there is always more than one way to accommodate—render consistent with what else one already believes—sensory experience that seemingly conflicts with certain favored beliefs.

## By Way of Conclusion

Activity theory rightly criticizes the postulate of directness for its impoverished, one- sided emphasis on determinative role of the external stimuli. However, the alternative mediated model that it

14. See note 1 above.

suggests is not a simple reversal of the relation between the stimuli and responses. Material reality plays a constitutive role in the genesis of sense- organs and CCO, in that, human action takes place in response to this materiality, where the act itself becomes part of material reality and thus acquires the role of a higher, mediating stimulus. Human hands, speculatively speaking, have acquired their form due to human activity but in response to external stimuli; activity of hands is always outward. As activity becomes richer, the hands acquire the further capability of becoming stimuli of a higher order, which not only determine the development of hands, but also contribute to development of material reality in a form that suits the activity of hands. Sense organs are not organs of contemplation but of action. Perception and sensation, therefore, are functions of action.

The same is true in the case of CCO. In their mediating and mediated confrontation with reality and with other concepts of different degrees of generalization, CCO, as a system of concepts acquire a form that is deter- mined by other concepts, the activity of CCO and the reality they intend to cognize. This being so, CCO develop toward a better cognition of reality in question, i.e., they grasp/grope newer forms and modes of reality at different levels of abstraction. For instance, "electron" is not simply a name or the label that refers to some "observable" or "theoretical" entity (notwithstanding that the aforementioned distinction betrays the empiricist and positivist fetishism of visual images or ideas); rather, it is a part of a whole conceptual system. The real electron is the entity that corresponds to this whole and is cognized/grasped/groped by CCO. That the electron or another "theoretical" entity is not visible, that it is not perceived or cognized by the eyes but is cognized through CCO, does not make it any less real, just as cognizing a cancerous tissue with the use of the hands and not the eyes does not make the tissue any less real. The conceptual system that cognizes the electron, then, is not a "representation" of electrons, but it is the CCO that make cognizing electrons possible.

Social constructivist accounts of science and conceptual systems fail to recognize this because, like empiricism and positivism, they lack a proper understanding of scientific knowledge in particular and knowledge in general. Knowledge is the interaction between the subject and object just as consciousness is social relations; it is not in social relations. As Wartofsky states, "the material fact of knowledge is itself an interaction" (1973a, 101). This requires considering conceptual systems not as mere "representations" or auxiliary apparatus of human cognitive activity, but as organs of such activity; moreover, these conceptual organs of cognition have a history analogous to the history of the development of biological sense organs. This history is crystallized in knowledge as the interaction between objects of cognition and

cognitive activity. Defining knowledge as interaction is to be understood as the relative differentiation between the "subject" and the "object" of knowledge; this differentiation is based on this interaction. In a nutshell, if knowledge is the interaction between subject and object, and if the former needs its organs of activity to participate in this interaction, then, knowledge as interaction should be considered to be the organ, the medium and the very interaction itself, just as language is not only the medium of communication but is the organ and the very communication as well.

This interactive formulation, furthermore, points toward a resolution of the question concerning the ontological status of objective reality in praxis: the expansion of knowledge, thus, signifies widening of the scope of our cognitive activity, where the "new" object becomes part of the CCO and its reality is confirmed within human activity, as interaction. This is not to say that the object does not exist prior to interaction – this is not a form of conceptual idealism; rather, it means that the object becomes this specific object of cognition and it acquires the specific meaning it has, and reveals new levels of its existence within this interaction. In other words, the object is being grasped/groped/conceived with the use of new cognitive organs, and thus formerly unknown or unrecognized features of the object are now being cognized so that a new form of interaction with the object, a new form of activity, becomes possible. Subject and object, cognizing and cognized, are unified and differentiated only relatively.

Activity theory based on a Vygotskian model successfully explains reality in terms of real human activity without leaning toward relativism, constructivism, or positivism. In this view, it is the reality that corresponds to real human activity and not the perception to reality. In this view, reality is not a mere assumption or an axiom; it is the reality of activity. Due to human activity nature becomes an artifact, not only as the immediate object of human productive activity as is the case with a bow, an axe, or a domesticated animal, but in a larger sense, the whole nature becomes an artifact in that it becomes a representation of human action; it becomes an organic part of human action since it becomes the object of conceptual cognitive activity. Nature, then, becomes, for instance, "a source of food, of danger, etc." (Wartofsky 1973b, 206); to borrow Bakhtin's terms, nature, then, loses its sound and acquires a voice, a human voice. Nature, thus, becomes historicized and socialized, as it becomes object of human activity.

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# Consciousness as Objective Activity: A Historical–Genetic Approach

The Question of the nature of consciousness is a central theme in psychology, philosophy, and human sciences, which, apparently, still lacks a universal answer. The historical– genetic method — i.e., the theory that regards consciousness as objective human activity — seems to be the only approach that can provide a universal ground in order to resolve the problem of the nature of conscious- ness: what consciousness is, how it is constituted, and where it is to be localized. The question of consciousness, from this point of view, should be related to labor, human cognition, language, and linguistic activity.

A (historical) materialist, Marxist psychology cannot be a mere negation, an "antithesis" of empiricist, idealist, and dualist stances. Materialist methodology does not simply assert the existence and sociality of consciousness; these cannot be taken as mere axioms. Rather, as Vygotsky formulates the matter, a genuine Marxist methodology should treat the axiom as the problem. The Marxist study of conscious- ness has to not only show the genesis of consciousness, but also to explain its social essence, that is, to explain why consciousness is social. Fulfilling this task has significant importance for Marxism, because it contributes to dissolving one of the fundamental elements of bourgeois ideology and propaganda: the individual as a self-contained, autonomous (independent), finalized being. It betrays the ahistorical, conservative, and determinist nature of bourgeois approaches to consciousness in the forms of individualism, ethnic associationism, or cultural relativism by showing the essentialist core of these approaches. A genuine Marxist study of consciousness also contributes to clarification of the Marxist approach to human agency, society, and history, and differentiates it from any form of determinism.

The task of this article is multifaceted. I intend to show that activity and its language-like structure in general, and linguistic activity and the tool-like nature of linguistic signs in particular, are the fundamental constituents of the genetic process of formation of consciousness. Activity and linguistic mediation are *sine*

*quibus non* conditions of the sociality of consciousness. I also hope to show that the idea of the self, the "I," is based on the idea of consciousness in its emancipated form. Furthermore, that there is a continuity of ideas toward resolving the problem of consciousness, from Vygotsky, via Luria, to Leontiev. The root of this continuity is Marx's analysis of human activity versus animal activity; Marx introduces the idea that human activity is emancipated activity in that it becomes the very object of human will and consciousness. He states:

> The animal is immediately one with its life activity. It does not distinguish itself from it. It is its life activity. Man makes his life activity itself the object of his will and of his consciousness. He has conscious life activity. It is not a determination with which he directly merges. Conscious life activity distinguishes man immediately from animal life activity. It is just because of this that he is a species-being. Or it is because he is a species- being that he is a conscious being, i.e., that his own life is an object for him. (1975, 276.)

## Historical Materialism vs. Empiricism, Idealism, and Dualism

### *The Root of the Problem*

The problem of consciousness can be traced back to John Locke. In his Essay (1975) Locke rejects the notion of knowledge as the harmony between human and divine ideas and the notion of innate ideas, and proposes that the mind is a blank sheet. Interestingly, Locke tries to show that there is no qualitative distinction to be made between knowledge of external phenomena and knowledge about one's own self, since the basis of the two is experience. He tries to explain how unconscious encounters with the environment leads to the emergence of consciousness. For Locke, the self is identical with conscious- ness and consciousness is accessible empirically, i.e., it is acquired via self-reflection, which is a form of experience. According to Locke, consciousness is the element that accompanies all acts of thinking, including acts of recollection. Despite all his anti-Platonic and anti- Cartesian intentions, lacking a social understanding with regard to consciousness and the idea of the self, Locke fails to fulfill his own empiricist project and inevitably ends up in asserting the existence of the self as an essential core, of which consciousness is nothing but a form.

The problem can also be followed in David Hume's Treatise (1967), where Hume tries to resolve the problem of the notion of the self with reference to sense experience. As does Locke, Hume begins by rejecting the idea of the self as manifestation of any

kind of substance. He intends to show that we can construct an idea of the self without relying on any substantial account of the self, just as it is possible to achieve certain categories, such as causality, without considering them to be impressions of physically perceivable relations or entities. I have treated the Humean elaboration of this question elsewhere (Azeri 2008); I should mention, however, that Hume successfully proposes the rudiments of a society-oriented resolution of the problem.

*Vygotsky's Instrumental Method*

Locke's futile attempt to explain consciousness was an effort to understand consciousness as an objective phenomenon. Some of Vygotsky's early elaborations on this problem (*e.g.*, 1997b) reveal an affinity between his approach and the Lockean formulation. Rejecting the dualist, mechanical differentiation between the external and internal (the subject–object dichotomy) Vygotsky states: "Consciousness is the experience of experiences in precisely the same way as experience is simply the experience of the object" (1997b, 41). This formulation also reveals a central feature of Vygotsky's approach at later stages of his scientific studies: rejecting the false dichotomy between the subjective and objective yields to apprehending and appreciating the role of human agency in forming stimuli, and thus paves the way to his breaking with simplistic–mechanical reflexological[1] and behaviorist stimuli–response formulations: "*The response part of each reflex* (*movement, secretion*) *becomes itself a stimulus for a new reflex from the same system or another system*" (Vygotsky 1997b, 40, emphasis in original). Moreover, discarding the internal–external dichotomy reveals the true essence of what Vygotsky later formulates as a process of interiorization, not as a mechanical internalization of what is external, but as a process of individuation of the human person.

Despite the apparent resemblances, the inherent difference between Locke's empiricism and Vygotsky's yet-to-be-matured dialectical methodology lies in Locke's implicit dualism: for Locke, the inner and the outer are distinct and discrete, where the inner has epistemological priority; that is, the inner, in contradistinction to the outer, is intimately and assuredly known to the person. The internal is the plane (the blank sheet) upon which the external appears. By contrast, for Vygotsky the two are dialectically linked, and, even though not identical, are unified.

Another important element in this discussion is the instrumental (tool-like) nature of language, its objectivity (object-relatedness) and its essentiality in the formation of consciousness.

1. Reflexology is a 20th-century school of psychology that studies human activity as a mere collection of conditioned reflexes; it can also be considered the Russian counterpart of American behaviorism.

Consciousness is formed via signs (language); therefore, it is also linguistically attain- able, that is, consciousness reveals itself through linguistic mediation and is objective. Consciousness is objectivity subjectivized (interiorized). Vygotsky insists upon including a subject's linguistic account of himself as a legitimate part of a radically revised scientific method of studying consciousness; he states: "I claim that in each particular case such perfectly objective methods are possible which will turn the interrogative of the subject into a perfectly accurate scientific experiment" (1997b, 42). Vygotsky sees language as a system of "reflexes of social contact," formed in reaction to human-made stimuli such as words, which in turn act as stimuli that anticipate other reflexes. This aspect emphasizes the objectivity and sociality of consciousness and the ideational (semiotic)[2] material that forms the content of consciousness. Speech is a kind of stimulus, which is created by people and thus differs from other stimuli. This difference is due to its reversibility— that is, speech can be reconstructed by the individual; it serves as the way to compare one's own behavior with that of others; hence, it functions as a means to individuation because it is what identifies one with oneself.

> The source of social behavior and consciousness also lies in speech in the broad sense of the word. Speech is, on the one hand, a system of reflexes of social contact and, on the other hand, primarily a system of reflexes of consciousness. (Vygotsky 1997b, 42.)

*Criticizing Reflexology (Behaviorism)*

Dialectical methodology holds that self-consciousness and becoming conscious of another are the same; more precisely, consciousness of another precedes and is the prerequisite for self-consciousness: "We are conscious of ourselves only to the extent that we are *another* to ourselves; *i.e.*, to the extent that we can again perceive our own reflexes as stimuli" (Vygotsky 1997b, 42, emphasis in original).

Vygotsky's main criticism against reflexology — which may well be extended to behaviorism — aims at its dualist, and thus idealist, approach to psychological phenomena. Reflexology severs behavior (or the reflex) from the mind: when dealing with reflexes and behavior it is pure (mechanical) materialism; while it turns toward mind, however, it is pure idealism because it has to ascribe an essence to the mind which is distinct from behavior and is not attainable externally or objectively; it is pure subjectivity. Vygotsky formulates his criticism of reflexology as a positive statement:

2. 2 "Semiotic" pertains to sign. The term was introduced by Saussure, derived from the Greek word "*semîon*" (sign). Language is one of the many semiotic systems in that it is a system of signs, albeit the most important one.

"*Mind without behavior is as impossible as behavior without mind*, if only because they are the same" (1997b, 46, emphasis in original).

Marxist materialist psychology is not limited to physiological phenomena (physicalism); it does not limit its scope to the so-called physical or the body. Such physical materialism is a form of dualism that either ignores the mind and denounces its existence, or arrives at idealism and essentialism when it admits the existence of the mind or consciousness. Materialist psychology has to show and explain the objective, non-physicalist, and ideational material (and therefore social) genesis of consciousness.

Vygotsky formulates his Marxist criticism of reflexology as follows:

> Reflexology's basic assumption that it is possible to fully explain all of man's behavior without resorting to subjective phenomena (to build a psychology without mind) is the dualism of subjective psychology turned inside out. It is the counterpart of subjective psychology's attempt to study the pure, abstract mind. It is the other half of the previous dualism: there mind with- out behavior, here behavior without mind. Both here and there mind and behavior are not one but two. (1997a, 65.)

Such dualism, as mentioned earlier, results in essentialisms of different kinds. Vygotsky names biological determinism, for one. In the present-day context one may consider cultural relativism as a similar kind of essentialism, which absurdly attributes essentiality to cultural environment and structures, eternalizes culture, and excludes human activity from the process of formation and determination of consciousness as well as the very cultural environment itself. Both bio- logical determinism and cultural relativism as a form of environmental determinism ignore consciousness as social consciousness. Vygotsky clarifies his criticism of such essentialisms when ridiculing Bukharin's environmental determinism, which suggests that individuals are no more than "sausage skins stuffed with the influence of environment" (Vygotsky 1997a, 375n.).

Vygotsky also criticizes ahistorical and essentialist tendencies in the behaviorist–reflexological tradition that see the mind as an immutable and eternal phenomenon. He states: "This anti-historic idea found its highest expression in the well-known thesis of associationist ethnic psychology, which says that the laws of human spirit are always and everywhere the same" (Vygotsky 1997d, 125). Vygotsky's emphasis on psychological–scientific study of development of human individuals is a criticism of any such determinism and paves the way toward acquisition of dialectical methodology in the human sciences. For instance, when considering the developmental study of memory as a higher (later) mental function he

states that the aim of such study is "to explain the development of memory not from its properties but to deduce its properties from its development" (Vygotsky 1997d, 125). This by itself suffices to show the relevance of Vygotskian criticism of present-day non-Marxist approaches in the social sciences; it also contributes to a proper understanding of the formation of consciousness.

Consciousness, according to Vygotsky, is the backbone, the wholeness, of human behavior, just as the organism is the wholeness of bodily functions. In other words, consciousness is responsible for the structure of human behavior (Vygotsky 1997a, 66). The task of psychology is thus the study of human behavior in its complexity, in its actual context, and as a whole but not as an amalgamation of reflexes or discrete behaviors. This approach requires a new hypothesis about the psychological nature of consciousness, which Vygotsky formulates as "the problem of the structure of behavior" (1997a, 67). Consciousness is the body's capacity to become the stimuli of its own acts through its own acts. Vygotsky intends to resolve the problem of consciousness without reference to any transcendental unifying principle (*e.g.*, as in Kant's philosophy) but with reference to a general law of reflexes or behavior. In this way Vygotsky resolves Locke's question regarding consciousness as the "perception of what goes on in man's own soul" (Vygotsky 1997a, 71).

## Materialist Methodology

Vygotsky's efforts to found a unified, monist science of human behavior and mind were in part a response to the crisis of the psychology of his time. This aspect of cultural–historical psychology is relevant at the present time too, given the lack of a monist framework in the psychological sciences, at least in North America.[3]

Vygotsky suggests that the dead alley of three major psychological schools, that is reflexology (and American behaviorism), descriptive psychology,[4] and psychoanalysis, can be avoided only if a proper materialist methodology is formed; the core of such an adequate methodology is dialectics. Dialectical methodology proceeds from certain fundamental points: First, it considers the mental and the physiological in unity, *i.e.*, it admits that mind is a part of nature. Vygotsky poses "psychological" (or psycho-physiological) in contrast to both "mental" and "physiological." This contrast points toward under- standing psychological processes not as manifesta-

3. For a study of the parallels between the crisis in psychology at the beginning of the 20th century and the present-day crisis, see Jantzen, 2002.

4. Descriptive psychology is a school that was founded by the German philosopher Wilhelm Dilthey. It is also known as understanding psychology. It aimed at proving an objective description of mental phenomena without reference to introspective methods.

tions of separate and discrete aspects such as mind and body, but as representations of acts of a psycho-physical unity. Second, it also holds that mind develops; that is, mind has a genesis. Dialectical methodology's rejection of dualism and idealism should not be interpreted as identification of the mental and physical but should be conceived as emphasizing their unity (Vygotsky 1997c, 112–113).

Vygotsky introduces the idea of "psychological tools," in analogy with labor tools, to emphasize the active and social nature of both human mind and the method of studying its development. "Psychological tools are artificial formations. They are social and not organic or individual devices" (Vygotsky 1997f, 85). Language and sign systems are examples of such tools; psychological tools modify the entire course and structure of mental functions just as labor tools modify the course and structure of labor process. These tool-like or instrumental functions are of a mediating nature; they replace direct associative connections (what Leontiev will later criticize as the "postulate of directness"), such as A — B, with mediating processes such as A — X, X — B.

Speech is a tool for humans to reflect upon themselves, objectively, from outside, as if from a distance. Psychological tools have a remarkable feature: they not only act as stimuli that anticipate certain responses, reactions, or behavior, but also evoke various types of internal activity, "which among other things makes external behavior unpredictable" (Zinchenko 2002, 9). It is only through acquisition of the ability to look at oneself from a distance that the self-image is constituted for the first time. Self-image or the idea of the self is only constituted once humans start to externalize this image. We can call this the process of objectivization of the self or the process of emergence of emancipated consciousness.

A stimulus becomes a tool not due to its physical properties but to its psychological properties that enable it to affect the mind. If a stimulus could not affect the mind or consciousness it would not become a tool. This means that we can conceive every tool as a stimulus, but not *vice-versa*. The tool analogy draws attention to the active role of human agents in development of consciousness and mind. A tool after all, is an instrument of action. Moreover, since it is artificial, it is not finalized and is itself subject to development. Its relation with the mind and consciousness is also changing and is not constant and given once and for all. Vygotsky: "The connection between activities of consciousness is not constant" (1997e, 130). Vygotsky clarifies this aspect of tools when with reference to Blonsky he states that "behavior can only be understood as history of behavior" (1997f, 88). He also identifies the instrumental method as historical–genetic. Behavior should be conceived as a historical–genetic formation; the mind is formed through a genetic process. Yet this is not the whole story: once the historicity of the mind is

conceived, the active role of humans in this process should also be admitted. Vygotsky draws attention to this role when emphasizing the role of education in childhood development.

> The child is not only a developing being but also an educable one. Education is the artificial development of the child. Education not only influences certain processes of development, but restructures all functions of behavior in a most essential manner. (Vygotsky 1997f, 88.)

The social meaning of the sign — as a psychological instrument of consciousness — is worth noticing. "The sign changes the interfunctional relationships" of consciousness (1997e, 131), meaning that sign is a fundamental constituent of consciousness — its content, as Voloshinov calls it. Meaning is available to humans only, and is responsible for transforming the stimulus into a tool. Comparing human and animal behavior, Vygotsky states: "*For ape things have no constant meaning*. For the ape the stick does not become a tool, *it does not have the meaning of a tool* " (1997e, 131, emphasis in original). The ape does not attribute a constant meaning to the stick because the ape is bound to the immediate field of its perception and action. In other words, its consciousness is not emancipated from its immediate surroundings and its reaction to this immediacy. The ape is not able to abstract from the immediate environment; this situation points toward another aspect of the tool as an abstraction from immediate conditions.

Vygotsky's effort to form a Marxist science of behavior is not a simple replication of some of Marx's ideas; rather, it is a quest to apply Marx's methodology in this field, to form the *Capital* of psychology. "I do not want to learn what constitutes the mind for free, by picking out a couple of citations, I want to learn from Marx's whole method how to build a science, how to approach the investigation of the mind" (Vygotsky 1999a, 331). In this connection Jantzen outlines the project of overcoming the crisis in psychology by further clarifying the differences between empiricist and Cartesian psychological schools and the materialist school. Empiricism, which takes data and facts at face value, should be overcome. Eclecticism, which combines explanatory principles from differing areas, and which causes contradictions, should also be surmounted. Imprecise language also should be done away with and a unitary language should be constructed (2002, 103). Materialist psychology should be based on empirical facts; how- ever, it should be able, in contrast to empiricism, to deal with reality theoretically by employing the strictest conceptual standards.

## The Sociality of Consciousness

The sociality of consciousness is based on that of the labor process: the emergence of human consciousness or of the human being as a conscious being depends on her creation of a world of objects. Humans create not only human existence and nature, but also emancipated human consciousness *via* the freedom produced in the work process. Vygotsky sees the formation of emancipated human consciousness as a process of individuation *via* linguistic and sign activity and other forms of higher mental functions.

Similarly Voloshinov proposes that consciousness is a filling-up with signs, where the sign is considered *ideology par excellence*. This points toward the dialectical dissolution of the seemingly "paradoxical" mode of existence of consciousness: it is activity objectified, but subjectively, where activity constitutes this emancipated consciousness and in turn becomes the emancipated activity of this consciousness. Individual consciousness is emancipated from its immediate social determinations when it is emancipated from the immediate field of activity. It also reproduces this immediacy so that the continuity of the emancipated individual is preserved. Consciousness arises when the externally actualized activities (practical as well as higher mental activities) are synthesized in order to constitute the self. Conscious- ness signifies the emancipation of the self from the immediate field of perception and action. It is also responsible for the apprehension of intimacy or internality of the self, despite external structure and actualization of the self. Emancipation of consciousness, which also yields to the formation of the notion of the self, is actualizable only through an ideational semiotic filling-up of consciousness. The self *is* this filled, emancipated consciousness. Vygotsky draws attention to this semiotic (and dialogical) nature of consciousness when he defines it as a response apparatus: consciousness

> is the interaction, the reflection, the mental stimulation of various systems of reflexes. Consciousness is what is transmitted in the form of a stimulus to other systems and elicits a response in them. Consciousness is a response apparatus. (1997b, 46).

The cell (unit, as Vygotsky calls it) of consciousness (higher mental functions that are synthesized to form the consciousness) is the linguistic sign. The linguistic sign can assume this role because it is the microcosm, the carrier of social meaning. This clarifies what Vygotsky means by interiorization. Interiorization is not a duplication of the Cartesian–empiricist external–internal dichotomy. Rather, it explains the formation of consciousness (and hence emergence of the idea of the self) as "individuation" of the social. Consciousness is a social relationship.

Vygotsky's goal was a synthesis, not a mere conglomeration of techniques and approaches of the two aforementioned schools. For instance, his aim was not a diluted form of empirical psychology. Consciousness is not a "stage" upon which mental states act. It should be understood and analyzed concretely; thus, prior to concrete psycho- logical methodological problems, a philosophical and methodological resetting of psychology is required.

Two essential elements should be considered in resetting the problem of consciousness as a social phenomenon. First, human cognition is an active process. It consists not only in immediate sensory perception, but also in a process that recognizes things, and transcends what is immediately available to the senses. Consciousness is peculiar to humans; it is formed through social interaction, which requires, among other things, linguistic interaction. As such, consciousness contains internal contradictions and oppositions. Leontiev explains the relation between action and the formation of consciousness: "Consciousness must be considered not as a field contemplated by the subject on which his images and conceptions are projected but as a specific internal movement generated by the movement of man's activity" (1978, 7).

Second, consciousness is a social product, generated in the process of work and externalized as a construction. It is activity objectified. During this social process people formulate language, which functions as signifying the theoretical elements of objects. "Acquisition of language by individuals is acquisition of its signification in the form of perception" (Leontiev 1978, 18). Language and consciousness, however, are not identical. Language is the *form of existence of consciousness*. Social practices and human activity fill consciousness *via* signs and meaning, and are its content.

> Words, the language signs, are not simply replacements for things, they are conditional substitutes. Behind philological meanings is hidden social practice, activity transformed and crystallized in them. (Leontiev 1978, 18.)

An adequate approach to consciousness, therefore, must consider human behavior neither in isolation (as, *e.g.*, a phenomenology of mental acts), nor in mechanical relation to other "lower" types of reflexes (as, *e.g.*, reductive physicalism); it should see human consciousness within the complex of human social and historical existence. Leontiev: "The emergence, functioning, and development of psychological processes should always be studied in relation to personality as a whole" (Leontiev 1931, 251, quoted in Sokolova 2002, 72). Similarly, Vygotsky states: "It is not the mind that thinks, it is the person who does the thinking and the most important thing is — what kind of a person" (Vygotsky, 1986, quoted in Sokolova, 2002, 72). Alexander

Luria notes: "All fundamental human cognitive activities take shape in a matrix of social history and form the products of sociohistorical development" (1976, v; see also Leontiev 1978, 8).

## Localizing Consciousness via Linguistic Activity

Use of language is the distinguishing feature of human activity. The "thinking" of apes, for instance, is entirely independent of speech, and this is an extremely important feature, since it designates distinct genetic roots of thought and language. Work is an essential distinguishing element that divides humans and other primates. Vygotsky and Luria state that

> although the ape manifests the ability to invent and use tools, which is the premise of all human cultural development, nonetheless actual work based on that ability has not yet been developed in apes even to the slightest extent. *The use of tools in the absence of work* both unites and divides the behavior of the ape and man. (1992, 32.)

The basic element of language is the word: "Words codify our experience" (Luria, 1982, 31). The sympractical[5] sense of words designates their origins in the history of labor; this is to say that words can only have meaning and this meaning can only be understood in the process of related labor and only in that context. The sympractical nature of words in human language, on the other hand, signifies the qualitative difference between human language and quasi-languages. Due to this contextual–practical nature, a word can express a different number of situations. According to Vygotsky, the unit of verbal thought is word meaning (*slovesnoe znachenie*). Every word is a generalization as it refers to a class of objects; it is also an abstraction, since it is not bound to exclusively refer to one particular object. The word is the unit of thought because the powers of abstraction and generalization are the most important functions of thinking. Due to these same features a word also becomes an instrument of communication. According to Vygotsky, due to their incorrect methodology that divorces the word (sound) from meaning, both structural psychology and associative psychology fail to properly analyze and understand the relation between thinking and speech. Although the external aspect of the word is known to us, thanks to the aforementioned shortcoming of traditional approaches, meaning, which is the inner aspect of the word, remains unknown. Hence, the problem of the relation between thinking and speech remains unsolved (Vygotsky 1987, 47). Both Gestalt and

5. The "sympractical" aspect of the word is related to the field that consists of human behavior.

associative theory[6] have been looking for the intrinsic nature of the word-meaning in wrong directions.

> The word does not relate to a single object, but to an *entire group or class of objects*. Therefore, every word is a concealed *generalization*. From a psycho- logical perspective, word meaning is first and foremost a generalization. It is not difficult to see that generalization is a *verbal act of thought*; its reflection of reality differs radically from that of immediate sensation or perception. (Vygotsky 1987, 47.)[7]

This radical transition from sensation to thought represents a dialectical leap that is comparable to transition from inanimate matter to the matter that is capable of sensation. This qualitative difference between perception and thought signifies that consciousness reflects reality in a generalized way. Generalization is the essence of meaning. Hence meaning is an act of thought. At the same time, meaning is an inseparable part of the word and so also belongs to the realm of language. Meaning is categorical or conceptual; it also functions towards analysis of things (Luria 1982, 37).

The primary function of language is communication. Understanding another person is impossible without the use of a mediating expression. Language, by its construction and function, is social. "Social interaction based on rational understanding, on the intentional transmission of experience and thought, requires *some system of means*" (Vygotsky 1987, 48). Human speech is a prototype of such a system, which has resulted from needs that have emerged within the work process. However, words as signs alone are not sufficient for communication. Vygotsky states: "Just as social interaction is impossible without signs, it is also impossible without meaning" (1987, 48).

The study of concept formation is essential in order to properly understand human consciousness and its relation to language and speech. The most essential feature of the concept is its relation to reality; objective material is that material basis upon which the word is formed and the concept arises. The concept, which is formed at the conjunction of the sign and objective material, is thus the bearer of meaning.

A concept always fulfills some function in communication, reasoning, understanding, or problem-solving. Concept formation involves both the form and the content of thinking. Following Ach, Vygotsky holds the view that the concept is a general objective representation (Vygotsky 1987, 123). Its objectivity signifies not only

6. Associationism is the view that explains all mental functions such as memory, attention, and thinking, etc. in term of associating individual data.

7. "The basic function of a word is its 'referential' function. According to Vygotsky, any word possesses an *object reference*. It can function as a substitute for an object. A word is always directed towards an object. It may designate an object, an act, a property, or a relationship" (Luria 1982, 34).

its object- relatedness, but also designates it as an in-between phenomenon. An important functional feature of concept formation is communication and mutual understanding among people through speech and sign systems. Through mutual understanding the complex of sound turns into words or concepts that carry the meaning.

Vygotsky also emphasizes the essential role of human activity and labor in concept formation. Similar to labor that cannot be explained solely with reference to goals and needs but with reference to use of tools and application of means, concepts can be understood in relation to higher forms of human behavior as the tools and means of mastering behavior. All of the higher mental functions are mediating processes. The "central and basic aspect of the structure [of higher mental functions] is the use of the sign as a means of directing and mastering mental processes" (Vygotsky 1987, 126).

Thinking is also akin to affect; the relation between intellectual and affective processes signifies the active nature of thinking. Thinking is active in that it involves application of signs and concepts onto the objective reality; it is not a mere reflection. This means that thinking is inevitably related to external reality; it is an action that is actualized in response to real questions rooted in interaction with reality, notwithstanding the fact that such interaction is social. As Bakhtin states, "with meaning I give *answers* to questions. Anything that does not answer a question is devoid of sense for us" (1986, 145). Word meaning is also the unity of thinking and speech as well as the unity of generalization and social interaction, *i.e.*, thinking and communication. It is in its relation to human thinking that sound becomes speech, *i.e.*, it acquires meaning and is differentiated from other sounds that exist in nature.

## Individuation of Consciousness

Vygotsky's differentiation between "lower" and "higher" mental functions is not a replication of Cartesian parallelism and dualism. Cartesian theory (and mechanical materialism) considers emotions to be pure bodily affect independent of the movements of the mind. However, as Zinchenko notices, "Vygotsky viewed movement exactly as a higher process, similar to processes of perception, memory, and attention, and he also linked movement to the development of symbolic activity" (2002, 16).

The ground of parallelism is the Cartesian polar conceptualization of thinking vs. extended substance. In Vygotsky's view, Cartesian dualism yields to the postulate of absolute freedom of our will (that) necessarily leads to the absolute power of will over passions. Vygotsky considers such a psychology of emotions "applied metaphysics" (Jantzen 2002, 108). Eventually, Cartesian dualism, which considers emotions to be pathetic rudiments of animal

life, ends in separation of consciousness and life: "From the very beginning the soul is placed outside life" (Vygotsky 1999b, 198).

Understanding the process of interiorization correctly depends on apprehending the non-Cartesian, dialectical nature of the distinction Vygotsky draws between the external and internal and between the lower and higher mental functions. The emergence of higher mental functions reflects a transition from inter-individual (shared) object-related action to intra-individual (personal). This doesn't mean that the action is internalized. There is no such a qualitative difference between external and internal. This, rather, points toward the process of individuation. It is the process of objectivization, exteriorization, and emancipation from object-related activity (immediate field of action) that looks like a "return" to subjective origins. In fact, subject/subjectivity is this very emancipation from object-related activity. Interiorization does not simply mean transferring the external into the internal plane; rather, it emphasizes the process of building the inner (mental/ideational) structure of consciousness.

Vygotsky himself refers to this notion of emancipation (emancipated consciousness):

> A person's action which has emerged in the process of cultural–historical development of behavior is voluntary action; that is, action emancipated from the power of immediate needs and the immediately perceived situation. It is action directed toward the future. (Vygotsky 1983, 35, quoted in Zinchenko 2002, 21.)

A comparison between George Herbert Mead and Vygotsky, in passing, contributes to apprehension of the unique character of Vygotskian conceptualization of formation of consciousness. One may detect a parallel line of reasoning in Mead's works regarding the social self and social formation of consciousness. Mead locates the beginning of language formation in cooperation (1981a, 101). Cooperation in this view is anticipation of others' responses in face of one's acts that assume the form of stimuli. Mead calls the ability to act in response to other's actions and stimuli "social instinct" (1981a, 98). He further defines consciousness as a part of reality, meaning that human agents have to assume an active role in process of formation of consciousness (1981b, 106). Consciousness, in this view, cannot be considered in isolation from social surroundings and experience. Moreover, what Mead calls "objective consciousness," that is, consciousness of others' selves, precedes "subjective consciousness" or consciousness of one's own self (1981b, 112).

Mead elaborates on "consciousness of meaning" (1981c) and emergence of a child's social consciousness *via* acquisition of

language and appearance of internal speech (1981d). He defines speech as a higher form of gesture (1981d, 132). This view, however, is somehow naturalistic in that it implies that language is the outcome of communication between consciousnesses and it supersedes lower forms of communication in the form of gesture that happen among members of non-human animal species. Mead draws attention to the importance of speech in formation of consciousness. However, he does not openly maintain what is the distinctive feature of human speech. Mead's formulation is silent about concept formation and the conceptual nature of human thinking. He acknowledges that external speech precedes internal speech in the process of the child's acquisition of language, and that the child's egocentric external speech is a counterpart to the adult's inner speech and thinking (1981d, 136–7).

Yet, the aforementioned naturalistic tendency in his account results in assumptions that contrast with his overall position. Mead assumes the existence of an inner self, the "I" in contrast to "me" (1981e), although as a fictitious entity (1981d, 141). Thus, rather than depicting the formation of self-consciousness as a process of constructing this inner plane, he explains this formation as the process of "awakening of social intelligence" (1981d, 138) — a position that recalls Piaget's model of child development as proceeding from the child's naturally given egocentric autism towards a social self *via* acquisition of externally situated social features. Thus he states: "Inner consciousness is socially organized by the *importation* of the *social organization of the outer world*" (1981d, 141, emphasis added).[8]

## Cognition, Concept, and Objectification of Consciousness

The changing point of view that sees internal, mental–psychic movements in terms of objective activity changes one's whole understanding of the subject–object dichotomy. The Cartesian–Lockean understanding separates the world into two spheres: subjective existence (corresponding to consciousness) and objective being (spatial extension). The new approach leads to another form of distinction. Leontiev defines this distinction as follows:

> on the one hand, objective reality and its idealized, transformed forms, and on the other hand, activity of the subject, including both internal and external processes. This means splitting activity into two parts or sides as if they belonged to two completely different spheres is eliminated. (1978, 61; see also Leontiev 1981, 58.)

8. For a comprehensive study of the relation between Mead's and Vygotsky's views and their common intellectual roots, see Valsiner and van der Veer, 2005.

At the same time, the seemingly paradoxical form of the subject's existence as consciousness of externally actualized activities is dispelled. Consciousness and selfhood are therefore necessarily external and objective and are mediated by objectivized action. Consciousness is socially, historically mediating action that is subjectivized. The psyche (consciousness) is the subjective image of objective reality.

Objectification of activity does not mean a mere manifestation or expression of an internal image that belongs to consciousness. The product is not impressed by the image but is objectified by the very activity, that is, it carries the content of the activity objectively. There we acquire a circle of *subject* → *activity* → *object*, where the circle is broken and enriched by practical activity each time. Leontiev states that "the realized activity is richer and truer than the consciousness that precedes it" (1978, 78). If we limit ourselves to the postulate of directness (stimuli–response), then we face the apparently irresolvable question: how does the internally formed subjective image appear outside our subjectivity? By contrast, the genetic–historical approach not only resolves this question based upon the notion of human activity but it also resolves the seemingly paradoxical issue of the notion of the self as something that is perceived internally and intimately while, at the same time, being based on external, objectively comprehended and subjectively internalized perceptions derived from activity.

Perception is a complex and active process of assigning incoming data to familiar categories. It is intimately related to the abstracting and generalizing functions of language:

> Sensory impressions serve only as a stimulus bringing into action our cognitive capabilities, and images of objects are engendered by internal mental operations — conscious or unconscious — that, *in other words, we would not perceive the object world if we did not think it*. But how could we think this world if it did not initially disclose itself to us specifically, in its objectivity, sensually perceived? (Leontiev 1978, 84, emphasis added.)

Studies done as early as the end of 19th century have indicated a close relationship between color perception and the categorization of color and color names.[9] Studies initiated by Humboldt and continued by Sapir-Whorf show that "languages can distinguish among certain color differences and ignore others, something that inevitably leads to different groupings" (Luria, 1976, 19–22). The ontogenesis of perception suggests that perceiving separate and isolated objects (data) is preceded by perceiving wholes and

9. A similar approach has recently been conducted in cognitive science; see Giere, 2006.

complete structures (Vygotsky, 1999a, 29). This development of perception is parallel to the ontogenesis of speech. Although language, initially, appears to be formed of individual phonemes or words that will be organized into meaningful structures at later stages of the individual's development, a child's single words should not be understood as words as such but as replacements for sentences that designate wholesome situations and processes rather than signifying singular objects.[10] Vygotsky maintains that

> the primary function of the word that the child uses actually can be reduced to pointing, to isolating a given object from all the whole perceived by the child in the integral situation. Speech does not simply accompany children's perception — from the very early stages, it begins to assume an active part in it; the child begins to perceive the world not only through his eyes, but also through his speech. (1999a, 29.)

One important aspect of perception of higher animals is that it never acts in isolation but is a part of more complex whole. Perception is part of an action directed toward achieving an object that attracts the animal. In this sense, perception is a dynamic process: it is always combined with motor activity and motion (Vygotsky 1999a, 30). Vygotsky's view of the interconnection between movement and perception is also formulated by Leontiev (1981) within the frame- work of the concept of activity, and is further explained by Mikhailov's formulation of perceptive activity in analogy to groping movement (1980). Yet, in human activity the natural combination of perception and movement is disintegrated as soon as the mediation of sign and word is introduced into action and is replaced by cultural structural relations; thus, the whole human activity attains an indirect, mediating character (Vygotsky 1999a, 31).

Animal activity is bound to the immediate visual (perceptual) field. It is organized directly by the goal–object. Once the object of the action is excluded from the field of perception the problem that the animal confronts becomes insoluble. Humans, on the contrary, determine and organize their activity through verbalized systems and apparatus. That is why goal-directedness alone cannot explain human activity and, more importantly, its rationality. Through language and sign systems the sensory field is reorganized. Language provides humans with the capacity to place elements of past and present experience within the same sensory field. Vygotsky: "The possibility of placing elements of the past and the present visual fields (for example, the tool and

10. Voloshinov refers to this generalizing aspect of single words as "complexness of thinking" (Voloshinov 1973, 100–102).

the goal) into a single field of attention leads, in turn, to a major reconstruction of another important function that participates in the operation — memory" (1999a, 35).

Human perception has acquired a high degree of perfection through- out man's historical development. Perception requires sensory organs to be actualized. However, the existence of sensory organs is necessary but not sufficient. For realization of perception an active relationship between man and object is necessary. At the same time, this process determines the degree of completeness of such a reflection. A satisfactory study of the process of perception not only involves scrutinizing the sensory organs and their work and the physical nature of the effects of the object upon them, but also "penetrat[ing] into the activity of the subject that mediates his ties with the objective world" (Leontiev 1978, 20).

The radically fluctuating nature of perception is also observable ontogenetically in child development. The child's perception is different from the adult's, not only in its content (which is linguistically and conceptually limited) but also in its form.[11] The adult knows the world basically with his eyes, the child with his mouth. For the child's perception to become adult-like a long process of acquiring experience and skill is required. The child's vision has no perspective. He apprehends the same object at various distances as qualitatively different. Yet, we should not conclude that the child is less intelligent than the adult. He is intelligent but in a qualitatively different way (that is, in a more primitive way). The child's world of perception is unstable and alterable. It is only after the apprehension of "visual images" and their integration that the child develops a proper perception of the external world. Although now being able to perceive the world as an integrated whole, he still can confuse reality and fantasy.

> There is a need for speech and thinking to develop, for the child's reality-based experience to become strengthened and sufficiently autonomous. [A] great deal of cultural change has to take place, in order for the child to move out of the phase of primitive perception, into the next phase, that of full-fledged forms of adaptation to the external world. (Vygotsky and Luria 1992, 93–95.)

Sensory material and the word are the indispensable parts of the concept.

11. The Vygotskian approach to perception and its relation to language and other cognitive abilities holds "language [as] the most decisive element in systematizing perception; insofar as words are themselves a product of sociohistorical development, they become tools for formulating abstractions and generalizations, and facilitate the transition from unmediated sensory reflection to mediated, rational thinking" (Luria 1976, 49–50).

> The concept does not live in isolation, it is not a congealed, static formation but a formation that is always encountered in the vital and complex process of thinking. A concept always fulfills some function in communication, reasoning, understanding, or problem solving. (Vygotsky 1987, 123)

In early stages of ontogenesis, words are attributed to objects and object-groups due to mere external associations; they are bound to emotional "immediate" perceptual experiences. During later development of the child, words assume a codifying and abstracting– generalizing function that categorizes perceptual data due to development of meaning.

The existence of associations, however strong and numerous, is not sufficient to explain the formation of concepts (Vygotsky 1987, 123). There is a third element in the formation of concepts, a determining tendency which is set up by an image or a goal. A concept is formed only after the comprehension of impossibility of resolving a problem without it. However, a model that aims at explaining higher human activities and their organization only by way of needs is incomplete. All higher human activities are performed through mediation, which in the case of psychic behavior, appears as sign or language (see also Luria 1976, 49–50). Studies have shown that traditional psychological explanations of the formation of concepts that base concept formation on logical association only are irrelevant to reality. "The central feature of [concept formation] is the functional use of the word as a means of voluntarily directing attention, as a means of abstracting and isolating features, and as a means of synthesizing and symbolizing these features through the sign" (Vygotsky 1987, 164). Abstraction is not a device alongside other mental devices within the civilized psyche. It is more appropriate to say that abstraction is the necessary component; it is an indispensable tool of thinking. Speech is not the expression of some so-called natural perception. It dissects the perception, isolates a particular point from the whole, introducing an analytic moment to the perception process; it replaces the natural structure of perception with complex, psychological, mediated structures. As is obvious, the active participation of speech and the mediated determination of perception do not correspond to a simple, verbal replacement of "natural" with "social." Rather, such participation and mediation emphasize the active form of human perception in particular, and higher mental functions, in general.

The regulative function of language in human cognition also points toward the language-like nature of human activity. The language-like structure of human action follows from the way it relates to its surroundings. Animal movement matures at a very early stage and acquires an absolute motor function. The world

animals perceive is fixed and stubbornly indifferent with regard to their perception. In early childhood, however, the child moves in various ways, where these movements communicate with objects (with the use of senses and a coordination between hands and senses, especially sight). These actions are circular: they deal both with the objects and with oneself (Fichtner 1999, 62).

## Inner Speech

Further elaboration on the regulative functions of language provides us with a clearer understanding of perception, imagination, volition, and thinking. Vygotsky: "Inner speech is speech for oneself. External speech is for others" (1987, 257). External speech is materialization of thought. With internal speech the process is reversed: speech turns into inward thought. Speech is a collective activity. Hence we should conclude that the structures of the two are different. In contrast to Piaget, who considers egocentric speech to be the reflection of the child's egocentric thought, and who claims that egocentric speech dis- appears as the child grows out of his autistic individuality and becomes socially mature, Vygotsky considers the pattern of development to originate in the collectivity and evolve toward individuality.

> Speech for oneself has its source in a differentiation of an initially social speech function, a differentiation of speech for others. Thus the central tendency of the child's development is not a gradual socialization introduced from outside, but a gradual individualization that emerges on the foundation of the child's internal socialization. (Vygotsky 1987, 259)

This means that an individual, as a component of the collective subject, who appeals to others (realizes others' potentialities) has an idea about his associates' positions and potentialities. This realization is what Ilyenkov calls "the ideal in man: the ideal plane that is present in an individual." Internal speech is a material form of realization of this ideal space. It is a method of individuation of collected activity through which the emancipated individual self appears from within the collective.

According to Vygotsky, one semantic peculiarity of inner speech is the superiority of sense over meaning. Sense designates the totality of psychological states related to the word, its context. Meaning, on the other hand, is just one of these states, albeit the most stable. It is like a cornerstone in the edifice of sense. "The enrichment of the word through the sense it acquires in context is a basic law of the dynamics of meaning" (1987, 276). For Vygotsky, the relatively stable meaning (*znachenie*), which is related to sign

and symbol (*znak*), is rooted in "sense" (*smysl*). This is to say that meaning is rooted in objective human activity and practice because the sense of the word is "associated with its use in various contexts" (Vygotsky 1987, 276). The sense is also related to the individual's act of thought or thinking. The dependence of meaning upon sense is responsible for the dynamic nature of meaning, which according to Vygotsky leads to the problem of the relationship between the two. "Isolated in lexicon, the word has only one meaning. However, this meaning is nothing more than a potential that can only be realized in living speech" (1987, 276). Yet, thinking is closely related to reality through concepts, and therefore, even the more personal aspect of meaning, the personal sense, is also rooted in objective human activity and most of all in the labor process.

## Resolving the Problem of Consciousness

According to Voloshinov, a sign is different from a mere material thing in that the latter (*e.g.*, an object) does not go beyond itself. Nevertheless, as an object it can be combined with a sign, or can assume the function of a sign, or become a sign. However, a sign exists not only in reality. Since it has meaning, it has value as well; it can be right, wrong, true, false, fair, good, etc. Therefore everything ideational has semiotic value. As a phenomenon that belongs to the external world, the ideational sign, which reflects and refracts reality, has a certain type of embodiment. This embodiment may be sound, color, or the like. The sign and its effects occur in the external world (Voloshinov 1973, 11). Reality is not only reflected but also refracted in consciousness, because cognition is an active process that involves grasping the reality *via* concept-tools (conceptual sense-organs). Concepts, on the one hand, are related to objects and, on the other hand, are related to other concepts. They appear on a conceptual web of longitudes and latitudes, where the coordinates signify the degree of generalization and abstraction of concepts (Vygotsky 1987, 226). Due to these coordinates, concepts are always related to objects but mediated by other concepts; moreover, this object-relatedness is mediated by the linguistic sign system. That is why concepts never manifest the essence of things as they are; otherwise, as Marx states, no science would be necessary.

Traditional philosophy locates mental phenomena *in* conscious- ness, whereas they belong to the sign and realm of semiotics, and therefore are parts of the external world. Voloshinov states:

> Idealism and psychologism alike overlook the fact that understanding it- self can come about only within some kind of semiotic material (*e.g.*, inner speech), that sign bears upon sign,

> that *consciousness itself can arise and become a viable fact only in the material embodiment of signs.* Understanding is a response to a sign with signs. (1973, 11.)

A sign is produced as the result of interaction between consciousnesses. Moreover, social interaction is impossible without meaning as much as it is impossible without signs. In addition, meaning is closely related to generalization; social interaction presupposes generalization, while meaning and generalization are possible only through social interaction. Vygotsky: "The higher forms of mental social interaction that are such an important characteristic of man are possible only because — by thinking — man reflects reality in a generalized way" (1987, 48–9). Consciousness itself is filled with signs that are ideational (ideological) phenomena.[12]

Consciousness appears only when this filling of itself with semiotic content takes place, and therefore consciousness comes about only as social interaction. By committing the same error of localizing mental phenomena in conscious- ness, and studying the latter in isolation from the real conditions of their being, both idealism and empirical psychologism reduce the study of ideology to the study of isolated consciousness and its laws. In this way, they treat consciousness either as transcendentality or as an amalgamation of empirical data. In the former case, consciousness appears to be every- thing; in the latter, it amounts to nothing. For idealism, consciousness exists above and beyond existence and determines it in some mysterious way. For psychologism, it is but a conglomeration of psycho-physiological reactions that in some magical way result in a meaningful whole. The sign can only be produced in the social realm. In this sense it is not natural but social. The term "social" has a specific meaning: it refers not only to a multitude of individual members making up a particular species called Homo sapiens. Society is a particular form of unity that organizes a plurality of human beings. As an ideational product, consciousness can- not be presupposed. Its existence has to be demonstrated and it should be explained by the use of its objective, social roots. As Voloshinov puts it, "the individual consciousness is a social–ideological fact" (1973, 12). Therefore consciousness can only be defined sociologically.

An ideational phenomenon acquires its reality from the objective reality of the social sign. Therefore, as an ideological product,

12. The term "ideological" in Voloshinov's sense means "mental" or "mental phenomenon." It should not be confused with the present-day use of the term that considers ideology as an expression of political bias. Yet, in contradistinction to "mental," which has pure subjectivist connotations, "ideology" signifies objective phenomena; it emphasizes the objectivity of mental phenomena. Thus, beside personal mental phenomena the areas that form the superstructure such as religion, art, sciences are considered ideology or ideological.

the reality of consciousness, too, depends on the objective reality of the social realm. The ideological structure is not constructed by individual consciousness; on the contrary it is the individual consciousness that owes its existence to the being of the objective reality of the ideological superstructure.

When setting up the psyche or human consciousness as an object and as a part of external reality, the question arises how to define the inner experience in external, objective terms. The basis of the answer is that the reality of the psyche, the inner experience, is the reality of the sign. The psyche is not reducible to physiological and nervous processes. The subject, the consciousness or the psyche, resides in the borderline area that separates the organism from its surrounding world. This is the paradoxical mode of existence of consciousness.

The paradox is that the internality of consciousness is based upon external reality. To put it in another way, although there is no immanent substance to the consciousness, and although consciousness is totally based on external reality and experience, there is nonetheless a sense of intimate access to consciousness. Although consciousness is not internally and intimately founded, it is internally and intimately accessible.

Everything that acquires semiotic experience can become the sign material of the psyche. Yet the most important of these materials is inner speech. Inner speech is not identical with thought. Moreover, consciousness is not reducible to speech — inner or outer. However, speech in general and inner speech in particular appear as the sign material of consciousness, of the self.

Additionally, the acquisition of language and formation of sign material coincides with the formation of the self or the psyche. And language (speech) has a regulative and determining effect on the formation of notions in general and the notion of the self in particular. Voloshinov: "it is the word that constitutes the foundation, the skeleton of inner life. Were it to be deprived of word, the psyche would shrink to an extreme degree; deprived of all other expressive activities, it would die out altogether" (1973, 29).

In studying the psyche and the meaning implemented in the material of inner activity, we come to realize two planes of unity of the psyche: one is the unity that the particular psyche depicts as part of the objective, external ideational realm; the other is the unity that goes along with the determination of the psyche as a biological unity together with the totality of all historical and sociological factors. This second realm, in the final analysis, is a part and an element of the greater realm of ideology. The biological and the sociocultural lines of development of mental functions work alongside each other in order to produce the higher mental functions. The merging of these two lines, which identifies the

primitive area that exists between the natural and the cultural, designates the "natural history of sign" (Vygotsky 1999a, 50).

Understanding the inner psyche means referring a particular sign to an interwoven totality of other signs, whereas understanding the former sense of the psyche means referring it to an ideational system appropriate to it (Voloshinov 1973, 34–5). The basic form of observing the psyche is inner experience or introspection. However, introspection happens through signs and an inner sign can also be an outer sign. Introspection has to be expressed; it has to be brought up to the level of outer expression. Since introspection (self-observation) is a form of observation, it has to be understood. This observation is not seen or felt; it is understood through signs. To understand means to illuminate a sign with the use of other signs (Voloshinov 1973, 37).

Once consciousness is understood in terms of a filling-up with semiotic material, the objective ideational makeup of consciousness is grasped and the idea of emancipation of consciousness from immediate field of action and production is apprehended. As a result of all these, the problem of consciousness is resolved and the meaning of the "sociality of consciousness" is clarified. It is also shown that what Vygotsky presents as the process of individuation of the human person *via* linguistic activity and higher mental functions can be followed to Leontiev's idea of objectification of consciousness through human activity. The seeming "paradox" of consciousness is thus dialectically dissolved.

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