

Bukharin and the Social Study of Science

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Abstract This paper studies Bukharin's *Theory and Practice from the Standpoint of Dialectical Materialism* presented at the 2nd International Congress of the History of Science in London, June 29–July 3, 1931. Bukharin's paper has not received the attention it deserves despite the fact that it provides the theoretical framework for the paper mostly highlighted in this Congress, Boris Hessen's *The Social and Economic Roots of Newton's Principia*. In this work, I try to show that Bukharin's main achievement is a theory of science based on the concept of *practice* and at the same time present the internal coherence and the logical structure of Bukharin's schema. Finally, I discuss what, in my opinion, is a drawback in Bukharin's paper: his failure to discuss the possibility for scientific objectivity.

Keywords Bukharin · Marxism · Science Studies · History of Science · Practice · Objectivity

Introduction

This work studies Bukharin's paper *Theory and Practice from the standpoint of Dialectical Materialism* (Bukharin 1931/1971) delivered at the 2nd International Congress of the History of Science organized by the International Academy of History of Science in London, from June 29 to July 3, 1931. The paper mostly highlighted in this Congress was Boris Hessen's *The Social and Economic Roots of*

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Newton's Principia which marked the beginnings of the field of Social History of Science.¹ Although Hessen's paper has been the subject of study recently (Freudenthal and Mclaughlin 2009) and has been referenced numerous times, especially in the Science Studies literature, Bukharin's paper has not received the attention it deserves despite the fact that it provides the theoretical framework for Hessen's paper.

The main reason is that Bukharin has been falsely associated with a positivist or mechanist interpretation of Marxism due to the ideas expressed in his early work *Historical Materialism: A System of Sociology* (Bukharin 1921/1969). Bukharin's *Historical Materialism* has been the target of critique not only by non-Marxists but also by prominent Marxist thinkers such as Gramsci (1971) and Lukács (1923/1971), the forerunners of the version of Marxism known as 'Western Marxism' which developed as a critique of Soviet Marxism and of which Bukharin is considered to be one of the central figures.

References to Bukharin's London paper are few as it has been largely neglected. Young (1990) finds Bukharin's paper to be the most interesting among those presented at the London Congress in the sense that it proposes a theory of science based on the concept of *practice*. Indeed, Bukharin's approach to the study of science based on *practice* is an important theoretical contribution not only for Marxism.

Sheehan (1993) praises Bukharin for using the term *theoretical practice*, mistakenly attributed to Althusser, explaining that theory is accumulated and condensed practice and that practice is itself theoretical. Sheehan rightly writes that in his London paper Bukharin overcomes the narrowness of mechanist materialism, that is, its ahistoricism, its failure to understand problems of quality, its contemplative objectivism and that this paper represents a significant evolution from Bukharin's earlier philosophical thinking.

In the 1930s, the work of Bukharin, Hessen, and others of the Soviet delegation had a major impact in Britain, where a generation of radical scientists turned to Marxism. Werskey (1978) has written a collective biography of the five famous British Marxist scientists flourishing in the 1930s. His *Visible College* includes Hyman Levy, J. B. S. Haldane, Lancelot Hogben, J. D. Bernal, and Joseph Needham.

These scientists founded a tradition that produced a number of influential popular and scholarly works.² But the most influential single work in this tradition was J. D. Bernal's *The Social Function of Science* (1939)³ where Bukharin's influence is heavy.

In his review of Polanyi's biography Steven Shapin (2011) states explicitly that Bukharin's agenda can be recognized in the work of Bernal.

¹ The papers of the Soviet delegation given at the Congress were published with help from the Soviet embassy in a book *Science at the Crossroads*, only 10 days after the end of the conference. The second edition of this book appeared forty years later (Werskey 1971). Accounts of the congress include Joseph Needham's Foreword to the 1971 edition of *Science at the Crossroads*. This edition also contains a well-researched introduction "On the Reception of Science at the Crossroads in England" by G. Werskey who also gives an account of the Congress in his book *The Visible College* (London 1978), pp. 138–149.

² Crowther (1941), Needham (1943, 1945), followed much later by his monumental (1954), Haldane (1932, 1938), Hogben (1938), Levy (1938).

³ This publication was followed by a number of books, the most relevant of which are (Bernal 1949, 1954). Bernal's influence was celebrated in Goldsmith and Mackay (1964) and Needham's in Teich and Young (1973).

Bernal was a leading figure in the movement for social responsibility in science that took a number of organisational forms (i.e. Association of Scientific Workers, Division for Social and International Relations of Science within the British Association for the Advancement of Science, etc.). Bernal, following Bukharin, believed that science was inextricably entangled with social forces. Science, philosophy, and politics were interconnected in his methodological approach and he is considered to be the pioneer of the discipline of Social Studies of Science or Science Studies, although not recognized by many in the field (Sheehan 2007a).

Indeed the contribution of Marxism to the discipline of Science Studies is a disputable question. To a large extent this is due to the inherent heterogeneous elements within both Marxism and Science Studies. The literature on the topic is rich starting with Rose and Rose (1972) and recently (Werskey 2007; Sheehan 2007b; Roll-Hansen 2012).

Sheehan's paper in particular, traces the trajectory of Marxist ideas from the origins of Marxism to the present looking at certain key episodes, such as the Congress in London, as well as subsequent interactions between Marxists and exponents of other positions at later international congresses. It examines the influence of Marxism on contemporary trends in science studies and argues for a favourable interpretation of Marxism's contribution not only in the past but also for its explanatory power in the present and future.

I share Prof. Sheehan's confidence to a great extent but I would like to add, along the lines of Bukharin's paper studied in this work, that whether Marxism will maintain its explanatory power in academia will also be affected by social factors external to academia.

This paper is structured as follows: In section "[Introduction](#)", I argue for the importance of studying Bukharin's paper with emphasis on questions such as the place of Marxism in Science Studies. In section "[Bukharin's life and politics](#)", I give a brief outline of Bukharin's life and politics underscoring the periods of change of his ideas both in economics and epistemology. In section "[Bukharin's Marxist philosophy](#)", I analyze Bukharin's philosophy focusing on the allegations of mechanist materialism and the criticism of Gramsci and Lukács. In section "[On the interconnection between theory and practice](#)", I analyze the paper "Theory and Practice from the standpoint of Dialectical Materialism" and highlight what I consider to be Bukharin's main achievement therein: a theory of science based on the concept of *practice*. At the same time I will present the internal coherence, the logical structure of Bukharin's schema. In the section "[Epilogue: once again on the cognitive autonomy of science](#)", I discuss what in my opinion is a shortcoming in Bukharin's paper: his failure to discuss the possibility for scientific objectivity, an issue which consigns to one short sentence in his paper.

Bukharin's life and politics

Bukharin was born on October 9, 1888 in Moscow, the son of teachers. He joined the Bolsheviks in 1906. After his third arrest in Moscow, he escaped abroad in 1911, settling in Vienna, where he wrote the *Economic Theory of the Leisure Class*, a critical study of the Austrian school of economics (Bukharin 1914/1972).

Deported from Austria to Switzerland in 1914, he attended the anti-war conference in Berne in February 1915. In this period he clashed with Lenin over the latter's support for the right of national self-determination.

However, in 1915 Lenin wrote an approving introduction to *Imperialism and World Economy*, in which Bukharin argued that internal capitalist competition was being replaced more and more by the struggle between 'state capitalist trusts' (Bukharin 1915/1972).

After periods in Scandinavia and the USA, Bukharin returned to Moscow in May 1917, following the February Revolution. Elected to the party's Central Committee three months before the October Revolution, he remained a full member until 1934, and was a candidate member from 1934 to 1937. He edited the party daily, *Pravda*, from December 1917 to April 1929.

In 1918 Bukharin was a leader of the 'Left Communists' opposing the signing of the Brest-Litovsk treaty with the Germans and calling for a revolutionary war. In the party debate on the role of the trade unions in 1920–21, he favored incorporation of the trade unions into the state apparatus.

Bukharin's *ABC of Communism*, written jointly with Preobraženskij in 1919, and *Economics of the Transformation Period*, written in 1920, carry the imprint of his 'Left Communist' outlook at that time, which he was later to abandon.

His *Historical Materialism: A System of Sociology*, which appeared the next year, represents a substantial attempt to explain and popularize Marxism as a sociological theory. As mentioned in the Introduction of the present paper, this book drew the criticism of Gramsci and Lukács for its alleged positivist and mechanist views.

In his 'Testament', in December 1922, Lenin described Bukharin as 'a most valuable and major theorist' who was 'also rightly considered as the favorite of the whole Party', but he was very critical on Bukharin's understanding of Dialectics (Lenin 1966).

After the introduction in 1921 of the New Economic Policy which permitted free trade inside Soviet Russia, Bukharin undertook a thorough reappraisal of his ideas not only in economics but also in philosophy and epistemology.

In economics, from the end of 1922 he advocated a gradualist strategy for Russia to 'grow into socialism' envisaging the theory of 'socialism in one country' first enunciated by Stalin in December 1924. In philosophy, he abandoned the materialism of his previous period and turned in the direction of a more Hegelian viewpoint.

In 1925–7 Bukharin was closely allied with Stalin in seeking to implement this policy and in opposing Trotsky's proposals for accelerated industrialization. He argued strongly against Preobraženskij whose 'law of primitive socialist accumulation' was intended to underpin Trotsky's proposals.

In 1928–9 Bukharin came into conflict with Stalin, who made an abrupt turn to all-out industrialization and a program of collectivization. He attacked Stalin's policy and the 'extraordinary measures' used to enforce it.

Publicly accused as a right deviationist in 1929, Bukharin was removed from the editorship of *Pravda*, from work in the Communist International which he had led since 1926, and subsequently from the Politbureau. From 1934 to 1937 Bukharin was editor of *Izvestija* and in 1935 he played an important role in the commission

drafting the new Soviet constitution which was adopted in 1936. In 1937, he was expelled from the party. A year later he was tried and sentenced to death for treason and espionage at the third great Moscow Trial. He was executed on March 15, 1938 in Moscow.

Bukharin was rehabilitated by the Soviet Supreme Court in February 1988 and politically by the Soviet Communist Party—CPSU, which restored him to membership 5 months later.

Since 1988 there has been a Bukharin renaissance in the Soviet Union with the republication of his writings in hundreds of thousands of copies and the appearance of biographies [including a Russian translation of Stephen Cohen's (1974) pioneering study]. The publication of his latest philosophical writings written in his prison cell while awaiting trial and execution appeared in English (Bukharin 2005) with an Introduction by Helena Sheehan.

Bukharin's Marxist philosophy

In the 20's, a serious theoretical schism took place within Marxism. The schism was initiated by the publication of Georg Lukács *History and Class Consciousness* (1923/1971). The publication of this work signifies the birth of what is generally known in Marxist literature as *Western Marxism* in contradistinction to the tradition of *Classical Marxism* (Anderson 1976).⁴

The debate throughout the 1920s was between those who were grounded in the natural sciences and emphasized the materialist aspect of dialectical materialism and those who were grounded in philosophical dialectics, particularly Hegel, and emphasized the dialectical dimension of dialectical materialism.

Lenin and Bukharin, participated in these philosophical debates actively raising questions of epistemology, ontology, ethics, and aesthetics (Sheehan 1993: chapter 4 on Soviet Marxism).

Bukharin's thought developed throughout these debates. It is true, that in his early years, Bukharin sided with the mechanists (Stepanov et al.) against the dialecticians (Deborin et al.) in the debates within the Bolshevik Party. In his *Personal Confession* written in July 2, 1937 he admits of having had "a certain heretical inclination to the empiriocritics" ("Avtobiografija" p. 55, cited in Cohen (1974), 14). He believed that Marxists should study the most advanced work in the natural and social sciences and cleanse it of the idealism of the Hegelian

⁴ The "Classical Tradition" which includes thinkers such as Lenin, Luxemburg, Preobraženskij, Bukharin and Trotsky is a product of the failure of the Marxism of the 2nd International and the capitulation of its leadership to bourgeois politics in relation to its stand in the advance of World War I. This tradition ends violently with the Stalinization of the USSR marked by the execution of Bukharin in 1938 following the parody of the Moscow trials and the assassination of Trotsky in 1940, in Mexico. After this period the "Classical Tradition" ceases to exist and is replaced by the official Soviet version of Marxism-Leninism according to the line promoted by Stalin's "Questions of Leninism". The Classical Tradition was revived in the wake of the events of May 68 in Europe with the theoretical current represented by Isaac Deutcher, Christian Rosdolsky and Ernest Mandel (see Skordoulis 2008).

formulations. Bukharin spoke at the funeral of Alexander Bogdanov,⁵ the main representative of empiriocriticism in the Bolshevik Party, with great admiration for Bogdanov's life and work.

In *Historical Materialism*, Bukharin interpreted dialectics in terms of the *concept of equilibrium*.⁶ For his schema, Bukharin was criticised by those Marxists educated in classical German philosophy who, like Lenin in his *Testament*, saw the origins of Marxism in this intellectual tradition.

Reading *Historical Materialism* in his prison cell in Italy, the Italian Communist leader Antonio Gramsci wrote an extended critique of Bukharin, whom he regarded as the embodiment of the positivist tendency within Marxism (Gramsci 1971).

Gramsci's critique of Bukharin's *Historical Materialism* has been the subject of extensive research and a vast literature exists on this controversial topic. In two of the most important works so far, Maurice Finocchiaro (1980, 1988) defended Bukharin's work from Gramsci's and Lukács' philosophical critiques arguing that there is no connection between Bukharin's materialism and his system of sociology and that his sociological theories are not invalidated by the inadequacy of his materialism.

Recently, McNally (2011) revisited the Gramsci–Bukharin relationship, exploring a number of symmetries between the two thinkers which had been little recognised in the current literature as well as by Gramsci himself. While acknowledging the significant divergences between Gramsci's and Bukharin's thought, he suggests that the similarities are such that a serious revision is now required in the way that current Gramscian scholarship interprets the relationship between these two leading Marxists of the early 20th century.

Georg Lukács, associated with a neo-Hegelian interpretation of Marxism, also criticised Bukharin. Lukács' critique of Bukharin is mainly exhibited in the article "Technology and Social Relations" (Lukács 1925/1966). In this article, Lukács does not confine himself to a purely philosophical critique, but examines crucial areas of the Marxist interpretation of history with the aim of criticizing Bukharin's work. This approach is in sharp contrast to the abstract character of *History and Class Consciousness*. However, these texts are fundamentally in harmony and have explicitly in common the concern to combat the evolutionist determinism descending from the Second International, and to replace it with a theory of revolutionary action.

Lukács was highly critical of Bukharin because of the latter's preoccupation with natural sciences which brought him to create a methodology not appropriate for social sciences. According to Lukács, the proximity of Bukharin's theory to

⁵ Alexander Bogdanov died on April 7, 1928 as a result of a blood transfusion experiment that he conducted on himself at the Institute for Blood Transfusions he founded in 1926. Bogdanov was an early member of the Bolshevik Party and later the leader of various Bolshevik splinter groups. Bogdanov's split with Lenin is well-documented by the latter's attacks on his alleged "Machism" in *Materialism and Empirio-criticism*. Bogdanov's contribution to science was his "universal organizational science" (or "Tekhtology"). The history of Bogdanov's personal and professional interactions with Bukharin is not well-documented, but Bukharin's speech at Bogdanov's funeral is indicative of his appreciation for the deceased.

⁶ The conflict of opposing forces causes a disturbance of equilibrium, a new combination of forces leads to the restoration of equilibrium.

scientific materialism (Lukács called it “bourgeois” materialism) derives from his choice of natural science as a model as a result of which positivism entered into the study of society.

Anderson (1976) provides a vivid explanation of the views of early Lukács. Lukács wrote *History and Class Consciousness* while still deeply under the intellectual impact of the sociology of Weber and Simmel, and the philosophy of Dilthey and Lask. His hostility towards the natural sciences, something entirely foreign to all previous Marxist literature, was largely inspired by Dilthey and German vitalism (*Lebensphilosophie*).

In the midst of these debates, Engels’s *Dialectics of Nature* and Lenin’s *Philosophical Notebooks* were published. Bukharin seriously studied them and was particularly influenced by Lenin’s *Philosophical Notebooks*, which dealt with problems in philosophy and the natural sciences, but paid great attention also to Hegel. In his writings in the 1930s, he came to a new understanding of dialectics and to the relationship of Marxism to Hegel which appears explicitly in his London paper.

In 1931, Bukharin led the Soviet delegation to the International History of Science Congress in London. He was already the Director of the newly founded Institute for the History of Science and Technology of the Soviet Academy of Sciences.⁷

In 1933, Bukharin edited *Marxism and Modern Thought* (Bukharin 1933/1935), a collection of essays by leading soviet scientists: Y. M. Uranovskij, S. I. Vavilov, V. L. Komarov and others.⁸ The collection was published by the Academy of Sciences to commemorate the 50th anniversary of the death of Marx. In this book, Bukharin took greater note of the Hegelian roots of Marxism. Once again, he put heavy emphasis on natural science. He engaged in a polemic contrasting Marxism with all other philosophical trends of the times: logical positivism, pragmatism, Gestalt psychology, neo-Kantianism, neo-Hegelianism etc. These were the themes he took up again at much greater length in his prison cell in 1937 in his “Philosophical Arabesques.”

Despite this auspicious beginning, the field of the history of science in the Soviet Union soon fell into grave political difficulties, similar to those that afflicted other fields of scholarship under Stalin. In 1936 Stalin’s chief prosecutor, Andrei Vysšinskij, accused the Institute of the History of Science and Technology, directed by Bukharin, of being the center of an anti-Soviet conspiracy. Bukharin and a number of other scholars prominent in the field were arrested and executed, including the author of the famous 1931 essay on Newton, Boris Hessen. The

⁷ The Soviet Union was the first country in the world to establish a specialized institution for the study of the history of science and technology. In 1921, the Russian Academy of Sciences organized the Commission on the History of Knowledge, which in 1931 was transformed into the Institute for the History of Science and Technology under the direction of Bukharin. The institute published, in 1933–36, several volumes of the *Archive of the History of Science and Technology*, devoted to the elaboration of a Marxist approach, with strong emphasis on socioeconomic analysis. After the arrest and execution of Bukharin, this field of scholarship was reestablished only on Stalin’s personal intervention in 1944.

⁸ The most important papers in the collection were: “Marxism and Natural Science” (by Y. M. Uranovskij), “The Old and the New Physics” (by S. I. Vavilov), “Marx and Engels on Biology” (by V. L. Komarov).

Institute of the History of Science and Technology, which had pioneered the field worldwide, was abolished and not re-established until 1944 (Graham 2001).

On the interconnection between theory and practice

Bukharin's *Theory and Practice from the Standpoint of Dialectical Materialism* consists of three parts: In the first part, Bukharin outlines the epistemological importance of the problem of the relation of theory and practice giving simultaneously a brief exposition of the basic principles of Marxist epistemology. In the second part, he examines the relation between theory and practice from a sociological viewpoint setting the basis for a social history of science, and in the third part he discusses how the relation between theory and practice is shaped in a new social formation, the new society of the USSR.

In his paper, Bukharin gives an exposition of the fundamental principles of Marxist epistemology in order to base the development of human history and consequently the history of science in the interrelation of theory and practice.

Bukharin starts his paper by simply answering the realist—antirealist debate concerning the objective existence of an external world, independent of the subject perceiving it. He doesn't provide any arguments in favour of realism because he considers this discussion to be superfluous. He simply states that the starting point of epistemology is the reality of the external world.

This discussion is followed by a critique of empiricism stating that the external world is not cognizable by pure experience alone. He declares that human sensations are shaped by the *products of transmitted knowledge* (i.e. speech and language), and that in a man's individual experience society, external nature, and history exist beforehand.⁹ This is far from the philosophy of a mechanist materialist.

Having settled matters with anti-realism and crude empiricism Bukharin continues with the definition of the fundamental concept of Marxist epistemology, which for him is the concept of *practice*. In fact, one can sense an anxiety throughout the text to arrive at the most adequate definition of practice, which comes at the end of Part 1 where he writes: "Practice is the process of transforming "things in themselves" into "things for us" (Bukharin 1931/1971: 17).

This is a very successful definition of practice¹⁰ based on the Hegelian distinction between "things in themselves" and "things for themselves." It has to be noted though that the Hegelian definition is based on the Aristotelian definitions of «*ἐν δυνάμει*» and «*ἐν ἐνεργείᾳ*». It is also important to note at this point that in his

⁹ Bukharin writes explicitly: "But historically there is no absolutely unmixed individual sensation, beyond the influence of external nature, beyond the influence of other people, beyond the elements of mediated knowledge, beyond historical development, beyond the individual as the product of society—and society in active struggle against nature" (Bukharin 1931/1971:13).

¹⁰ In Marx's first thesis on Feuerbach (Marx 1845/1970), practice is defined as "sensuous human activity." In Soviet textbooks of Marxism, e.g. (Deyev 1987) and (Konstantinov et al. 1981), practice is defined as man's multifaceted and purposeful activity aimed at mastering and transforming natural and social objects. But this definition, as well as Marx's, brings into the forefront the concept of "activity" whose definition has caused a debate in Marxist circles and still is under discussion (see Blunden 2009).

Historical Materialism, Bukharin devotes a chapter on the transformation of the working class from class in itself to class for itself denoting a transformation of consciousness, i.e. that the working class becomes conscious of its position in the production process and of its revolutionary potential. Here too, Bukharin resorts to the Hegelian schema.

He does not consider practice in isolation but in connection to theory stating that both theory and practice are the activities of “social man” (Bukharin 1931/1971:17). Two issues are raised here: a definition of activity and the conception of social man. Bukharin takes refuge in Hegel’s *Introduction to Philosophy* for the sake of a definition of activity.¹¹

And for the conception of social man, Bukharin returns to Marx, namely the sixth thesis on Feuerbach, which states: “the human essence is the ensemble of the social relations.” For Marxist philosophy, man is predominantly a social being.

He then links theory and practice to the concept of labour. By considering the division of labour into mental (intellectual) labour and material (manual) labour, he proceeds to associate mental labour with theory and manual labour with practice.

The concept of labour is central in Marxist philosophy. Marx, in his *Economic and Philosophical Manuscripts* (1844/1977), defines labour as a “formative” activity, an activity through which human beings give form to materials and thus objectify themselves in the world. Marx talks of labour as a process of “objectification”. Sayers (2007), in one of his latest works, argues that the theory considering labour as a “formative activity” has a Hegelian origin. The concept of labour is present in Hegel’s philosophy. According to Hegel, labour is a distinctively human activity. Through it human beings satisfy their needs in a way that is fundamentally different from that of other animals. Human labour creates a mediated relation to surrounding nature.

The outcome of practice as a process is action and the outcome of theory as a process is cognition. On the basis of the unity of the opposites, action passes into cognition and cognition passes into action (Bukharin 1931/1971: 14).

Both theory and practice are steps in the joint process of “the reproduction of social life” (Bukharin 1931/1971: 14). For Marxism, the course of human history is a process of the reproduction of social life. Bukharin here connects theory and practice to a working definition of History.

Next, Bukharin offers a definition of epistemology based on the concept of *practice*: “epistemology bases itself upon the unity of theory and practice, includes the practical criterion, which becomes the criterion of the truthfulness of cognition” (Bukharin 1931/1971: 14).

¹¹ Here Bukharin (1931/1971: 14, n6) quotes Hegel: “Theoretical capacity begins with the presently existing, given, external and transforms it into its conception. Practical capacity, on the contrary, begins with internal definition. The latter is called decision, intention, task. It then transforms the internal into the real and external—i.e., gives it present existence. This transition from internal definition to externality is called activity.” (G. Hegel: “Introduction to Philosophy,” sections 8 and 9).

The practice criterion for the truth of scientific theories states briefly that a scientific theory is true if it is successful in practice. The practical criterion has a prominent role in Marxist epistemology associated with Marx's second thesis on Feuerbach.¹²

The criterion of practice has been the source of tension among Marxists and non-Marxists.

Ernest Mandel, one of the Marxist theoreticians who revived the classical tradition following May 68 in Europe, in his *The Place of Marxism in History* states explicitly (Mandel 1986/1994):

“Thought and science can progress (though not necessarily in a linear and permanent manner), and this can be verified concretely and practically, in human history by the consequences (verified predictions, successful applications, etc.) that is the practical results of these advances. The ultimate criterion of the veracity of thought, of science, is therefore practical.”

On the other side, Roll-Hansen (1989) supports the idea that the criterion of practice is inadequate and that its uncritical adoption in Marxist epistemology led to the disaster of Soviet agriculture by Lysenko.¹³

Bukharin (1931/1971: 15) then continues to elaborate that in Marx we find that the interaction between theory and practice develops on the basis of the primacy of practice: (1) Historically: the sciences “grow” out of practice (2) sociologically: the practice of material labour is the constant motive force of social development as a whole: “social being determines social consciousness” (Marx 1968: 181), and (3) epistemologically: the practical influence on the outside world is the primary “given quality”.

In his epistemological elaboration, Bukharin turns to Marx's eleventh thesis on Feuerbach. The problem of the cognition of the external world is here stated again as the problem of its transformation; in other words, the problem of the cognition of the external world is an integral part of the problem of its transformation.

At the same time, for Bukharin, the external world is not static but has a history. The relations between the knowing subject and the knowable object are historical. Linking the process of knowledge with the economic base of production (mode of production) through their historicity he arrives at the statement that the “modes of production” and the “modes of conception,” are historical (Bukharin 1931/1971: 16).

Consequently, truth can be understood historically as a process and this means that at any given time we know only to a certain extent. Therefore, on this basis one cannot talk of absolute truth. Truth is always approximate.

Truth is associated with science and the function of science, according to Bukharin is primarily the “function of orientation in the external world and in

¹² Marx's 2nd Thesis on Feuerbach states (Marx 1845/1970): “The question whether objective 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 which is isolated from practice is a purely scholastic question”. Bukharin (1931/1971: 15) quotes the German text.

¹³ One could argue that the practice of scientists shows a way of accepting scientific theories on the basis of the practice criterion. Quantum Mechanics, whose basic theoretical premises are still under a philosophical dispute, has been accepted by the scientific community of physicists on the basis of its successful practical applications.

society, the function of a peculiar struggle with nature, with the elemental progress of social development, with the classes hostile to the given socio-historical order” (Bukharin 1931/1971: 20). Science and society are inextricably linked. Science functions in society by extending and deepening practice. The function of science in society is therefore political. Science takes sides and therefore science has a class character. Science is a weapon against capitalism, in the same way that the Enlightenment and the French revolution turned to science and science education as weapons against aristocracy and the feudal order. Therefore, the idea of the self-sufficient character of science (“science for science’s sake”) is naïve (Bukharin 1931/1971: 20).

Along the same line of thinking, Bukharin raises a question about the division between pure and applied sciences. The problem of the “pure” and “applied” sciences reflects the relationship between theory and practice. In the same manner, “pure sciences” are not “pure” to the extent that the selection of the object of science is determined by aims which are practical and this, in its turn, can be considered from the standpoint of social classes. Since social factors intervene in the selection of the object of science, therefore science is not value-free.

For Bukharin, science stands in a peculiar relation to nature. Bukharin described this relation in detail in his *Historical Materialism*. He applied Marx’s concept of the metabolic interaction of human beings and nature. “The material process of ‘metabolism’ between society and nature,” Bukharin wrote in *Historical Materialism*, “is the fundamental relation between environment and system, between “external conditions” and human society. Thus, the interrelation between society and nature is a process of social reproduction. In this process, society applies its human labour energy and obtains a certain quantity of energy from nature” (Bukharin 1921/1969: 108–112).

Bellamy-Foster (2000) in the Epilogue of his *Marx’s Ecology* highlights Bukharin’s synthetic perspective, his attempt to link the dialectics of nature to the dialectics of society, his references to “Biosphere,” and despite his methodological shortcomings he considers it a crucial aspect of Marxism that was lost in the tradition of the Frankfurt School.

It was technology that, for Bukharin, was the principal mediating force in this metabolic exchange. The social metabolism with nature was therefore an “unstable equilibrium” which could be either progressive or regressive from a social standpoint. “The productivity of labour,” he wrote, “is a precise measure of the ‘balance’ between society and nature” (Bellamy-Foster 2000: 241).

This active relationship of man with nature, which at the purely animal stage of human development presupposes the natural organs of man (the hand), is replaced by the relationship through the medium and with the help of the “continuation of those organs,” i.e., with the help of the “productive organs of social man”, the instruments of science which are products of technology greatly extend the sphere of action of the natural organs of the body and immeasurably widen our sensual capacities, render possible the victorious advance of technique. It is here that Bukharin introduces the role of technology in the production of knowledge and the relation between technology and science.

This is a precise elaboration of Engel's schema for the role played by labour in the transition from ape to man and the idea that the production of tools and the use of the hand precede conceptualization of the physical world. In Engel's terms, it is the primacy of the hand over the mind.

The economic structure of society (the "mode of production") comprises, above all, the relationship between classes. On the basis of the mode of production there arises a "superstructure": political institutions, moral values, art, religion, philosophy, etc. Bukharin includes scientific theories in the superstructure. This changed later in Soviet philosophy with science understood as part of the production process. The relationship of the mode of production and the superstructure is an issue of dispute among Marxists. Is there a relative autonomy of the superstructure or does it depend directly on the mode of production? For Bukharin, the "mode of production" determines the "mode of conception" (the superstructure) and consequently the prevailing conceptions (ideas) are those of the ruling class, which is the bearer of the given mode of production. It follows that the prevailing scientific theories as part of the superstructure are bourgeois scientific theories.

Bukharin then proceeds to analyze how the changing relation between theory and practice¹⁴ manifests itself in the division of labour in each particular historical phase of the mode of production.

Thus, in the epoch of industrial capitalism, the division of intellectual and physical labour, an important feature of industrial capitalism, comes about (Bukharin 1931/1971: 26–27):

- (a) a certain degree of "democratisation of knowledge" necessary for the development of technology
- (b) the formation of a broad stratum of a technical intelligentsia
- (c) the specialisation of science and
- (d) the development of science completely remote from the *consciousness* of the mass of wage-workers. As a consequence, scientists bound up with the ruling class put science in the service of capital.

In contrast, in the U.S.S.R. where the division between intellectual and physical labour gradually disappears, the development of science proceeds as the conscious construction of scientific "superstructures": the planning of scientific tasks is determined by the technical and economic plan. The unification of theory and practice, of science and labour, signifies the entry of the masses into the arena of cultural creative work, and the transformation of the proletariat from an object of culture into its subject, organizer, and creator. And Bukharin concludes that this revolution is accompanied necessarily by a revolution in the methods of science. The synthesis presupposes the unity of scientific method: and this method is dialectical materialism, objectively representing the highest achievement of human thought.

¹⁴ The socio-economic formations—"modes of production," "economic structures"—differ from one another in the particular character of the relationship between theory and practice.

Epilogue: once again on the cognitive autonomy of science

Reading Bukharin's paper it appears that a very important matter seems to remain unanswered. Does the dependence of scientific theories on bourgeois ideology exclude objectivity a priori? Bukharin has explicitly stated: "The "class subjectivism" of the forms of cognition in no way excludes the objective "significance" of cognition," but offers no further analysis and explanation.

I will elaborate on this possibility and argue on both the epistemological and socio-historical levels in favour of the cognitive autonomy of science as I have done elsewhere (Skordoulis 2008).

The Marxist theory of knowledge based on the dialectical interrelation between subject and object can offer an explanation for the potential objectivity of scientific knowledge.

It is a necessary condition of the objectivity of knowledge that the subject should be aware of the object's characteristics that have "grown together" with the subject (Lektorsky 1985). This means that the objectivity of scientific knowledge presupposes awareness of the part played by the various factors through which the subject interacts with the object, i.e. the measuring operations, the instruments used, the frames of reference, the means of codifying knowledge in one or another system of reference, and the ability to distinguish the code from the content of knowledge. Thus, objective knowledge necessarily presupposes that the subject is aware of his/her place in the structure of reality, because only then is it possible to reconstitute the various aspects of the object and to detect the special features of the "thing in itself."

On the socio-historical level my approach draws on (Benton 1979): new scientific theories born out of a theoretical rupture with their past establish a cognitive autonomy from other forms of social consciousness operating in the superstructure. The cognitive autonomy of science signifies a historical discontinuity between scientific practice and the other forms of practice.

Historically, social conflicts have developed over the appropriation and/or suppression of new scientific knowledge.

From the standpoint of the dominant social classes, new scientific theories are always potentially subversive: they constitute a challenge to the prevailing social formation. Thus major social clashes erupt over the appropriation of the scientific achievements by competing social forces.

For the dominant social classes, the subversive potential of scientific theories can be controlled because of the disassociation of scientific practice from other forms of practice and its containment within a group of experts. But in the case where scientific theories attained diffusion beyond the elite of knowledge, the dominant political power had to adopt a strategy by which to suppress the appropriation of these new scientific ideas. This frequently has taken the form of a one-sided elaboration and articulation of scientific theories to render them coherent with the dominant ideology.

In some cases, this amounted to more than a mere defensive neutralization of the new scientific theories used as an ethical justification of a political strategy of the dominant power bloc.

There are numerous examples in the History of Science to elaborate on this schema: Galileo's trial, Arian Physics in Nazi Germany, the McCarthy purges of physicists in the US in the 50s, and of course the Lysenko case.

All I want to underline is that from the standpoint of the popular classes and the oppressed, new scientific ideas served as a major source of ethical legitimacy. They furnish new resources for the critique of the established order since scientific advances remove the irrational bases of the established forms of social and political authority.

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