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ON THE HISTORIOGRAPHY OF THE HISTORY OF SCIENCE (T. I. RAINOV AS AN INVESTIGATOR OF THE DEVELOPMENT OF SCIENCE)

I remember Lev Tolstoy said once that science reveals itself through its history. As it is known, Tolstoy's approach to science was contradictory. But whatever our attitude to his views on science may be, this statement is to be considered as exceptionally true and profound.

Indeed, among many shades of views on the history of science as a scientific discipline held by investigators of scientific development*, there are those who regard it as a science whose main task is to study the history of human knowledge of the surrounding world, and which is therefore closely connected with philosophy and epistemology in the first place; and there are those who view it from the standpoint of the history of the productive forces of society, as an integral part of the general, so called social history, history of culture or a section of some social science, or something else: anyway, everyone who approaches history of sciences, does it in the hope that thus he might obtain a better understanding of the phenomenon of science as a whole and the particular field of knowledge he is interested in, its problems and the state-of-the art, and if possible, to make one's way through the shroud of obscurity and conceive its future.

In any case, historiography of science has always been studied to achieve a better and more profound understanding either of a particular discipline or of the ways and laws of the development of science in general. In our days when science has come to play such an important role in human life and, it would not be an exaggeration to say, in the life of every man, there appears in addition the aspiration to obtain understanding of the societal place and role of science, its

* For the purpose of distinguishing science as an actual process from the science which studies the process, we shall further call history of science as a scientific discipline historiography of science.

relation with culture and other spheres of human activity, to find the ways and means of accelerating its development, the ways and means of preventing its use to the detriment of mankind.

Thus one may say that historiography of science is not only the memory of science, its archives, but also the instrument of its active mastering and development. However, what is true for any science, should be equally applicable to historiography of science itself. Historiography of science has rapidly developed in the 20th century, especially from the middle of the century. Its progress is obvious to everyone who is aware of it at least to some extent. The major outcome of this development, in my view, consists in the fact that it has evolved as an independent science, as a special profession. Of course, much has been done. Yet, there is a field of studies which has received little attention so far. I mean history of the history of science itself or else historiography of the history of science. Historians of science study and describe history of any sciences to the minutest, sometimes negligible details, except the history of their own science.

Each well-developed science has its history. If historiography of science is science, it should have its history. It certainly does have a history, moreover, very rich and interesting, but we study it insufficiently and know it poorly. Historians of science have produced numerous writings on the history of physics, chemistry, geology, biology and other sciences of different periods throughout the world and in individual countries, in individual universities. They have elicited from oblivion a mass of facts and events, have analyzed in detail and very thoroughly the life and scientific work of a great number of specialists in various fields of knowledge, and not only of their prominent representatives. Thus a vast amount of empirical material, without which the study of the scientific development would be impossible, has been brought into light. Still, there is yet not a single summary, generalizing basic work either on the development of historiography in some individual country or its world-wide development. Dozens of thousands of writings about natural scientists, philosophers, sociologists, etc., are available in the world, but where are the writings thoroughly analysing the works and views of such prominent historians of science as George Sarton, Alexandre Koryé, John Bernal and others, the views on the development of science and its history held by Saint-Simon, Comte, Emile Meyerson, Gaston Bachelard and other outstanding philosophers and naturalists, who gave much attention to the problems of science and its history? Certainly about each of the scientists mentioned above quite a lot has been written in separate articles on different occasions. But as for the works especially devoted to the comprehensive analysis of the writings of the eminent historians of science, their views on the history of science, its problems, its methodology, etc., if they exist at all here are very few of them. The same may be said about the naturalists who were much engaged in the problems of the history of science even if it concerns such scientists as Wilhelm Ostwald, John Bernal, Russian botanist Clementii

Timiriazev and others. And it is particularly difficult to name a generalizing fundamental work on the analysis of the history of our science—the history of science and technology. Much interesting information is contained in Joseph Agassi's book *Towards and Historiography of Science* and Pietro Redondi's book on the history of science and epistemology in France and others. But they do not expound systematically the history of our science and do not pretend to do it.

In order to demonstrate the fact of how little is known about the works of historians of science, I shall allow myself to refer to two examples in this connection. The name of the Swiss botanist Alphonse de Candole (1806—1893) is well known throughout the world. You may find a list of his major achievements in any encyclopedia. Still, until recently, one would encounter nothing in the literature, except for some references, concerning his original basic writing *Histoire des sciences et des savants depuis deux siècles* (Genève-Bâle, 1873), which was one of the first attempts to create a social history of science and where for the first time a quantitative method to the analysis of the history of science was applied. The other example concerns V. I. Vernadsky (1863—1945). Today in the world there arises an increasing awareness of the fact that he was a great scientist of the first half of the 20th century. His name is known to every scholar in my country. Still in 1979 when I submitted my paper "Vernadsky as a historian of science" to an authoritative Soviet journal, while it was discussed, I was asked at the meeting of the editorial board made by very educated people, to "change the title". Vernadsky, I was told, is a great scientist, but he cannot be called a historian of science. Only those may be regarded as historians of science who have historical studies. Meanwhile, Vernadsky is the author of more than 3 thousand pages of special writings on the history of science. He was no less historian of science as he was a geochemist. While such was the case in our country, i.e. in Vernadsky's motherland, in other countries he was totally unknown as a historian of science. But he was a prominent historian of science working on a high professional level. I shall not dwell on the proofs here since my arguments have been already presented at the 16th International Congress of History of Science and in my papers published in *Scientia* (1983, vol. 118) and *Isis* (1984, vol. 75).

In my opinion, many difficulties in the development of the theoretical foundations of our science and discussion on these problems are accounted for by the insufficient elaboration of the historiography of the history of science, as one of the reasons. I mean here the analysis of research into the history of science conducted both by our predecessors and contemporaries. The discussions are not always fruitful, I think, not in last place because we have insufficiently full and profound knowledge of the history of our science, conceptions and views relevant for the methodology of elucidating the development of science.

In this connection I would like to pay attention to another essential

problem. When it is said in a philosophically educated society that some works belong to the Hegelian, Kantian, positivist, neopositivist, phenomenological, or existentialist trend, anyone, even if unfamiliar with the works, may conceive in general outline the framework of ideas in which they are written. Unlike in the history of philosophy, the main methodological trends in the history of science have been insufficiently manifested. For many years we were speaking about the externalist and internalist trends. But this is not even a schematic classification of methodological trends in historiography of science; at best it is merely its rough frame, unable to provide even the remotest expression of the whole wealth and variety of ideological and methodological trends in historiography of science. And here I agree completely with M. A. Finocchiaro's opinion expressed in his paper delivered at the VI International Congress on the Logic, Methodology and Philosophy of Science (1979, Hannover). I think that also in this very case one of the reasons of the situation consists in the fact that we have given insufficient attention to the study of historiography of our science. Without its profound investigation, it appears impossible to elucidate the main methodological trends.

I would like to emphasize again what I said at the 16th Congress. I consider fundamental, analytical writings on historiography of the history of science to be one of the pressing, vital task of the current generation of historians of science. Their creation would greatly enrich concepts of historiography of science, accelerate critical reviewing of the accumulated knowledge, reveal contradictions and ambiguities, surface new important problems, promote further deepening of the theoretical foundations of our science, methodology of research in the history of science, and, in the end, of the theory of scientific development. At the same time it would facilitate solution of another problem. It is well known that many still view historiography of science as a minor occupation, and historians of science as those who have not found their place in natural science itself. Those who view history of science and technology in such a way are decreasing in number, still they area numerous. Deep exposure to the history of our science and its problems and intense search for their solution would contribute to the spread of truthful concepts of this field of scholary studies, which is complicated and important also for the growth of the general culture of modern man, for the formation of the humanist scientific view of the world. This is not merely a matter of the prestige of our science in society's estimation. Together with other types of work on the history of science and technology, it will facilitate the realization of the social destination of our science in contemporary world. Indeed, in the 19th century nobody could be considered a cultured person unless he was familiar with masterpieces of the world of belles-lettres, while now, at the turn of the 21th century, it appears impossible to be a cultured person without knowledge, in addition, of the foundations of modern science, without understanding the place and role of science and technology in human life, in the development of the material and

spiritual culture. This is also the problem of ensuring a flow of the new young forces, without which it cannot further develop.

Let me give one more example to justify what I said about insufficient study of the history of our own science and the work of its representatives. I mean the work of the late Soviet historian of science Timofei Ivanovich Rainov (1888—1958). Shortage of time does not allow me to dwell upon details. Rainov began his scholarly activities with literary criticism and historical and philosophical papers including essays on Tolstoy's aesthetics, Lotze's gnoseology, Kant's theory of art in connection with his theory of science, Leibnitz in Russian philosophy, the book *Theory of Creative Work*, and from the early 1930s he concentrated on the study of the history of natural sciences. Let us mention among his works in this field papers on the origins of science, typology of scientists, on M. V. Lomonosov, Daniel Bernoulli, history of science in Central Asia , his book *Science in Russia in the 11th–17th Centuries* (1940). Rainov was in correspondence with G. Sarton and published a detailed review of his writings.

Here I would like to pay attention to Rainov's large paper "Wave-line fluctuations of creative productivity in the development of West-European physics in the XVIII and XIX centuries". It was published in English in *Isis* (Vol. 12, No. 38, pp. 287–319) in 1929 and so was readily available to historians of science in the West. Nevertheless it appeared to have been substantially forgotten both in the West and in our country until it attracted Günter Kröber's (GDR) attention in 1982. After that its Russian version was first published in our journal *Voprosy istorii estestvoznanija i techniki* (*Problems of the History of Science and Technology*, 1983, No. 2). This is a writing of a pronounced pioneer nature. The point is not only that it was one of the early experiences in the application of quantitative methods in analysing the development of science (they were used for this purpose already in 19th century by Alphonse de Candole and Francis Galton), and not that it was published when scientometrics did not exist yet and there was even no question of it. What is more important is that Rainov used quantitative methods to analyse the growth of the number of scientists, journals, publications, etc., with practically no reflection of its content. In 1929, G. Sarton referred to Rainov's work as a brilliant study. Who knows how the development of scientometrics would have proceeded, if Rainov's study had been taken notice of in due time.

Later, in 1934—1945, Rainov used quantitative methods to analyse the dynamics of versatile scientists (i.e. scientists who worked simultaneously or consecutively in two or more fields of science) during the 17th—20th centuries.

These works by Rainov are interesting not only because of the use of quantitative methods, for elucidation of the content characteristic of science. Analysing the nature of scientific versatility and the conditions of its manifestation, he developed already in 1934 the ideas of the role which the internal social organization of science played in the formation of the scientist's

creative mentality, that, as is known, later became one of the major themes in sociology of science. Not only did Rainov give a general outline of the social conditionality of science in his writing "On the Type of the Scientist's Versatility", but he clearly stated the idea that characteristic features of scientists form under the influence of the social organization of labour in science and socially conditioned means and methods of scientific work which are definite for each major historical period. At the same time he emphasized, and one cannot but see the great depth of his thought here, that the influences of social conditions are refracted through the structural laws governing science itself. Paying attention further to the fact that both social conditions and structural features of scientific work come to influence a scientist after they have, so to say, passed through his personality, Rainov concludes that any phenomenon in science may be understood and explained only if regarded as a result of the interaction of social and historical factors, internal laws governing the development of scientific knowledge and the scientist's personal features. It is easy to see how deep and subtle were these views stated in the early 1930s by the historian of science who sought to follow the Marxist methodology, as compared with one-sided, trivial schemes both of internalism and externalism, whose confrontation broke out in the 1930s, continued for nearly two decades, and pushed into the background ideas which were far more profound in their content. I will observe by the way that rather similar thoughts expressed by Gerald Holton in his *Thematic Origins of Scientific Thought: Kepler to Einstein* (Cambridge, Massachusetts, 1973) also have not received a sufficiently widespread elucidation in literature.

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I would like to finish this presentation neither with a slogan nor with abstract reasoning, but to dwell on the work done in our country in order to make the ideological heritage accumulated by the history of science the property of all those working in the field, with a view to depending modern studies. A special group studying historiography of history of science was set up in our Institute of the History of Science and Technology of the USSR Academy of Sciences. A series of writings of prominent naturalists on the history of science is being published. A commented edition of such works by V. I. Vernadsky has appeared, and a similar edition of N. I Vavilov's writings is under preparation. Historiography of the history of science is systematically dealt with in our journal *Problems of the History of Science and Technology*. Apart from biographies of the world's prominent naturalists, books devoted to historians of science are issued and planned for publication in the Academy series of scientific biographies. Two volumes of *K. Marx, F. Engels, V. I. Lenin on Science and Technology* are to appear in the near future, systematizing their statements concerning science and technology and role they play in society. Studies on the historiography of the history of chemistry, botany and

technology are under preparation. We hope to be able to prepare also a summary study of the major trends in the development of historiography of science from its origins until present time. Works by John Bernal, Alexandre Koyré, Thomas Kuhn, Gerald Holton and others have been published in Russian translation.

Thus historiographical studies of the history of science are shifting from the sphere of good wishes to the domain of practical deeds.