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Outline of synthesis of cognitive and socio-cultural foundations of scientific knowledge evolution in research programs of western philosophy of science

Anna A. Kornienko *

National Research Tomsk Polytechnic University, 30 Lenin Avenue, Tomsk, 634050, Russian federation

Abstract

The article analyses the development of cognitive sociology of science, in the object field of which connection of cognitive and social structures of science is traced. The role of context in scientific knowledge formation is defined. It is stated that the basis for development of research program of cognitive sociology of science appeared to be reconsideration of the standard concept of science as a complex of gnoseological, epistemological and methodological interpretations of nature and morphology of the produced scientific knowledge, methods for its explanation and scientificity ideals. The difference between «strong» and «weak» varieties of scientific knowledge evolution, developed in western philosophy of science, is considered. «Social studies of science» are reviewed as a form of social constructivism and relativism, exhibiting their specific nature in macro-analytical and micro-analytical strategies of scientific knowledge evolution analysis. The thesis that multidimensionality of science cannot be adequately interpreted focusing only on conceptual history of science is proved.

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1. Introduction

At the turn of the 20-21st centuries one of the basic vectors of science study in the problem space of western philosophy of science became a discipline, called in the English-American tradition «Sociology of Scientific Knowledge» (SSK). Within its framework there emerged research programs of «interpretative» sociology of science (G.Low, D.French), relativistic researches (W.Collins), ethno-methodological analysis (H.Garfinkel, S.Woolgar), ethnographic studies (Y.Elkan), thematic analysis (G.Holton), discourse analysis (M.Mulkay, G.Gilbert), constructivist orientation program (K.Knorr-Cetina). The obvious advantage of the outlined research programs is a view of science as an open object, as a culture subsystem. This research angle enabled to analyze the dependence of

*Anna A. Kornienko

E-mail address: anna_kornienko@mail.ru

scientific knowledge content on the context space of academic community. Scientific knowledge in this case was viewed as the result of social construction.

Significance of studies lies in the fact that, for the first time, cognitive and socio-cultural factors and foundation for scientific evolution were presented as an integral and consistent research, thus encouraging the development of micro-sociological research. Furthermore, the scope of empiric data, obtained through these studies, will encourage discovering the nature of connection between cognitive and socio-cultural underpinnings of science development, which, will also set a base for efficient science management.

2. Subject and research methods

The author assumes that multidimensionality of science cannot be adequately interpreted only in terms of conceptual history of science. Synthesis of socio-cultural, sociological, methodological and gnoseological problematic is necessary. Within this research trend the subject of the analysis can be outlined as follows:

- to reveal evolution of cognitive sociology of science, tracing within its subject framework the relation of cognitive and socio-cultural factors;
- to interpret “Social Studies of Science” as a form of social constructivism and relativism which manifested itself in macro-analytical and micro-analytical strategies of scientific knowledge analysis;
- to set conceptual core and potential of the contextual analysis of growing knowledge in «strong» and «weak» programs of “Social Studies of Science”.

In the course of the designated research tasks potential of the historical method and comparative approach, as well as epistemological capability of socio-cultural methodology, method of structural-genetical analysis and structural-genetical synthesis were used.

3. The results obtained

In the 1970-s a number of scientific schools emerged in western philosophy under the name of “Social Studies of Science”. The program of the schools featured pronounced tendencies in western philosophy of science. Particular interest was shown to the analysis of content of scientific knowledge in its different forms, to science as a subsystem of culture, to establishing relation between single elements of scientific knowledge and socio-cultural context within which scientific knowledge is manufactured.

The basis for developing this field, also known as cognitive sociology of science, as “New Wave” sociology of science, turned to be sociology of knowledge. Hence, the term “Sociology of Scientific Knowledge” was coined in English-American tradition.

Preliminary to the analysis of issues concerning socio-cultural conditioning of science development was the controversy over internalism–externalism. For a long time this controversy influenced the structure of research foci (alternative and competing) in western philosophy of science.

The conceptual ground constituting the subject of “Social Studies of Science”, was reconsideration of traditional concept of science (in 1967 I. Scheffler, professor of Harvard University, tried to organize the ideas of science sociologists, developed on the principles of traditional science, and introduced the term “normative concept of science”). Notably, the normative concept of science was a complex of gnoseological, epistemological and methodological interpretations of nature and morphology of the manufactured scientific knowledge, methods for obtaining and explaining this knowledge, interpreting ideals of scientificity, and mechanisms regulating this activity. Some authors (e.g. B.G.Yudin) are, to our mind, rightly assert that the core of the normative concept of science is trivial common sense of science, the very form of science self-cognition through which non-reflexive attitude to the foundation and prerequisites of scientific work manifests itself. Namely, positivists and neo-positivists were guided by the standard concept. Normative concept of science did not favor the potential of sociological analysis of scientific knowledge. Neo-positivists did not acknowledge socio-cultural conditioning of cognition. It was considered a factor baulking the formation of true knowledge. The normative concept produced a certain image of “pure” science, independent of culture. Basically, it is “Social Studies of Science” that created an ideal, aimed at overcoming

positivistic ideas of science and its development, in favor of versatile, integrated analysis of science as a product and an essential factor of the society development.

Revision of the normative concept of science and emergence, at the turn of the 1980-s, of a range of conceptual patterns aimed at social studies of science within a framework of social constructivism justify the need for philosopho-methodological reflection of the holistic approach formed by this school.

The emerged sociological scientific programs focused on the synthesis of philosophy, history and sociology of science in its conventional interpretation. Thus, an ideal-paradigm, integrating cognitive and social factors, was created. It must be noted, that already by the middle of the 1970-s not only the general pattern of the “Social Studies of Science” paradigm was developed, but also a research team advocating the “strong program” made a statement (D.Bloor, B.Barnes). Both “strong” and “weak” programs, having chosen problems of sociology of scientific knowledge and nature of scientific knowledge as a subject of discussion, engaged in a hot argument (called “Science wars”) with “realists” opposing “post-modernists”. “Social Studies of Science” can be considered a branch of social constructivism and relativism: as a starting point of “strong” and “weak” programs, knowledge is viewed not as a reflection of reality, but as a result of some activity. Alternatively to this viewpoint, scientific realism, interpreted as a system of some fields within analytical philosophy, assumes that the only reliable way to attain knowledge about the world, alternatively to everyday experience and metaphysics, is scientific research where experimental and observational data are interpreted with special tools, i.e. scientific theories. Claims by the authors of scientific theories and definitions (without distinguishing “language of theory” and “language of observation”) have ontological status, i.e. objects (things, processes, connections, properties and relations, regularities) denoted by the terms are considered to be entities, while judgments about the objects can be true, false or probable (Porus, 2009). The latter viewpoint is supported by W. Sellars, A. Musgrave, H. Putnam, R. Harre.

Evolution of cognitive sociology of science stimulated development of microsocial studies of particular situations emerging during scholars’ cognitive activity (case-studies), which provide extensive empiric data on relation between cognitive and social structures of science. In the 1980-s a variety of methodologically alike conceptual schemes of social studies of science emerged. The subject of the analysis was generation of scientific knowledge in the context space of academic community. As early as 1980-s there emerged “interpretative” sociology of science (J. Law, D. French), “constructivist program” (K. Knorr-Cetina, 1975), relativist program (W. Collins), discourse analysis (M. Mulkay, G. Gilbert), ethno-methodological studies (Γ. Garfinkel, S. Woolgar), ethnographic studies of science (E. Elkan), thematic analysis (G. Holton) – the programs defined in analytical books as social-constructivists, because scientific knowledge is viewed here as a result and consequence of social construction: “causality in society implies self-reference, which explains the obligation of convention” (Mulkay, 1983; Bloor, 1999).

From the first half of the 1970-s Starnberg group from Max Planck institute in FRG engaged their attention to the issue of scientific knowledge dependence on socio-cultural context (V. Daele, V. Scheffer, G. Bohme, V. Kron). At the same period the ideas of cognitive sociology sprung in Great Britain, where such prominent sociologists as G. Collins, M. Mulkay, R. Whitley, D. Bloor, P. Weingart, E. Mendelsohn were concerned with the study of the system “social factors – logical structures” (Mulkay, 1981). American branch of the sociology of science preoccupied with this research program is presented by P.McHugh, E. Goldner, I. Mitroff, M. Polanyi, G. Ravets.

At the turn of the 20-21st centuries “Social Studies of Science” was recognized as a research area with a strong position in western philosophy of science. In the problem field of this area two varieties of socio-constructivist approach to the analysis of science outlined their subject matter. Within the macro-approach the following problems are analyzed: relations between social structures and scientific knowledge, influence of social changes on shifts in scientific knowledge, relations between science as a social institution and other social institutions. A specific of the macro-analytical approach is study of processes and structures and neglect of subjective aspect of science. Macro-analytical strategy, assuming that science is scholars’ domain, disregards this idea. Limitation and insufficiency of the macro-analytical strategy caused a turn to micro-analytical strategy, which rejected global sociological structures and concentrated on case-studies of scientific discoveries, disputes between scientists, hypothesizing, creating theories in a certain socio-cultural context.

It is to be noted that of special importance for interpreting modern epistemological issues of cognitive sociology of science is E. Durkheim's viewpoint, integrating such categories as time, matter, space, as well as some elements of causality with social context and identifying cognitive aspect of reason with social. It was V. Pareto and G. Simmel who came close to interpreting history of thought in sociological terms. They asserted parallelism between forms of cognition (definition coinage and ways of "intellectual grip") and forms of social organizations, which proves, to their mind, conditioning of concepts and intellectual orientations by socio-cultural changes. Although the nature of cognition forms dependence on social context is approached differently in the history of sociology of knowledge, specifics of the subject field of sociology of science allowed later applying the methods and concepts of sociology of knowledge for the analysis of scientific knowledge stages, for the genesis of scientific discoveries, for the formation of scientific communities. Thus, R. Landsberg carried out a sociological analysis of Plato's academy, P. Honigsheim described medieval scholasticism in terms of sociology of knowledge, A. Dempf and M. Ornstein interpreted transition from scholasticism to modern science and the role of scientific societies in the 17th century in the context of sociology of knowledge. In some other works terms and methods of sociology of knowledge were deployed for historical and scientific descriptions. Transition from sociology of knowledge to sociology of science gave rise to various historical and scientific investigations, executing programs of sociology of science, while formation of a complex approach in the investigations of science became possible through the application of concepts and methods of sociology of knowledge and sociology of science to historical scientific research. So, for example, the founders of sociology of science R. Merton and D. Bernal were also the authors of historical and scientific investigations written from sociological perspective. Connection of sociology of scientific knowledge and history of science is conditioned by their unity, historical intentions of sociology itself: inner logic of its development demonstrates that both classical sociology, represented by E. Durkheim, and non-classical sociology, e.g. P. Bourdieu's theory, inherently have historic character. E. Durkheim's sociology is historical because he sought to study institutions in progress, which requires, to E. Durkheim's idea, active and deliberate involvement of historiography. There is no sociology worthy of the name which does not possess a historical character, claimed E. Durkheim, being convinced that sociology and history were to come together and that one day historical and sociological spirits would differ only in shades. P. Bourdieu and other proponents of modern non-classical sociology adopt this and other E. Durkheim's ideas, extrapolating historical dimension to social ontology and epistemology, proposing to work on really universal human science, where history would be historical sociology of the past, and sociology – social history of the present. They entrust sociology with a task of triple historicism – firstly, historicism of the agent, secondly, historicism of different social worlds (fields), thirdly, historicism of the cognizer and cognition tools, with which he constructs the object.

Concerning the paradigm evolution of cognitive sociology of science, one cannot exaggerate the role of philosophical factors, – for example, T. Kuhn's works (Kuhn, 1975), positivist methodology. We consider that evolution of the research programs of the positivist methodology is conditioned by inner logic of the development of sociology as a discipline. In our opinion, this is due to paradigm transformations in sociology. Guidelines for interpreting the social changed. Especially it is typical for micro-sociological approach: the latter paradigm is guided by A. Schutz and I. Hoffman's ideas. "Social" is interpreted here as a socially organized interaction, "shared world" (A. Schutz), as collaborative activity of individuals who positively complement each other. It outlines the scope of problems of cognitive sociology of science, caused by insuperable contradictions between "micro" and "macro" and the inability of sociology to overcome them. Interest expressed by symbolic interactionism to "microtranslation strategies", explaining how social structures "are repeated" in interactants' locations, as well as considerable interest of phenomenological sociology to the agent's perspective resulted in changes in the social approach and science and called for such levels of analysis as everyday life and everyday contacts between scientists, i.e. anthropology and ethnography of science, which sociology of knowledge and sociology of science conceptually alienated from in the 1970-s. In the 1980-s the leading position was taken by "ethnography of science" (anthropological study of science), that is micro-analysis of local historical situations in socio-cultural context.

Today, when cognitive sociology of science is quite an autonomous discipline, thorough analysis of its social methodology and research methods (interview, involved observation, anthropology and ethnography of science,

biographical method, case-studies method), allowing to trace the genesis of scientific beliefs under the influence of cultural context, is vitally important, as sociology contributes greatly to the “deconstruction” of methodologies and methods used to investigate science problematics. The importance of social methodology is in refocusing to interpretative methods, emphasizing description strategies rather than explanation, i.e. the strategies which disregard causative or factorial explanation, stress narration of not only forms, methods and style of story, but also research methods.

It is also necessary to note an attempt of research varieties of “Social Studies of Science” to consider not causality, which is a traditional type of connection in determinism, but milder forms of interaction between mental processes and social, or more exact, socio-cultural context. Among these forms is “principle of generalized interaction”, “principle of state relation”, “principle of dependence on conditions”, consideration of connections and synchronization, which disregard time precedence and compulsory generation and are not casual or random coincidences. In fact, understanding constructivist approach, centered on the analytical paradigm of cognitive sociology of science, allows concluding that it rejects philosophical analysis. As K. Knorr-Cetina aptly remarks, traditional philosophical analysis of science is charged with inability to systematically consider the role of social factors and include them in the normative pattern of scientific activity (Knorr et al., 1975). Actually, hardly can such phenomenon as modern science, internally connected with modern society as an institutional and collective establishment, be deprived of inherent social characteristics, which are to be grasped by philosophy, if it intends to be aware of the world where it exists. Constructivism poses the problem concerning role of interests, flexibility of rules and standardization of criteria of contextual role of power in the theory of knowledge, incites to abandon universal standards through local agreements, substitute social and other characteristics for situational characteristics. It should also be emphasized that, fundamentally, constructivism is by far not consistent, which is acknowledged by analysts-proponents of cognitive sociology of science. The very fact that the central and basic concept of constructivism is the concept of “negotiations”, suggests limitation of its analytical resources.

Apparently, recognizing the deadlock of the research theory of constructivism, analysts introduce the term “constructionism” to define empiric constructivism. Within the latter framework the initial thesis is that to study the process of constructing reality is to study epistemic issues, to analyze “laboratory life” and localized, variable standards of cognition. Constructionism is guided by the “localized” concepts, by the thesis that construction means construction of internally confined spaces, based on local resources and changes, and conditioned by local practice. Apart of the above mentioned issues, cognitive sociology of science branches out cognitive constructivism (as well as deconstructionism), investigating knowledge from the standpoint of cognition and perception biology, rather than social communities. It is characterized by anti-interpretationism, opposed to most interpretative approaches of social constructivism. The research area referred to as “deconstruction” is also presented in “Social Studies of Science”. In this context the difference between “weak” and “strong” varieties of social constructivism is as follows. Theories studying reality, emerged within the “weak” variety, are considered to be social constructions, while within the “strong” variety reality is viewed as construction. For D.Bloor, a proponent of “strong” variety of social constructivism, of special importance for social epistemology is “under-determination thesis”. It states that it is impossible to explain the difference in perception of the object by different observers simply appealing to the influence of the object. To explain one needs information about observers. Description of reality also includes criteria conditioned by social factors. For B.Latour and S.Woolgar, proponents of relativistic approach and D. Bloor’s opponents, the emphasis are laid not on scientific evidence, but the process of its construction (Latour, 1983; Latour, 1999). Examining potential of the “strong” variety of social constructivism, J.S.Morkina, to our mind, keenly captures its relation to the “weak” variety of social constructivism and scientific realism, when she writes: “On the one hand, strong variety of social constructivism is manifestation of ultra-relativism. On the other hand, being an extreme it meets another extreme, i.e. scientific realism, rather than totally opposes it. The convergence lies in the fact that in both varieties definitions and statements of scientific theories are assigned with ontological status. In case with social constructivism it is due to the fact that reality itself is considered to be constructed during the process of scientific research” (Morkina, 2008).

“Social Studies of Science”, being a variety of social constructivism and relativism, proved that multidimensionality of science (cognitive-linguistic, social-normative, cultural-axiological) cannot be comprehended and interpreted correctly, taking into consideration only conceptual history of science. Having shaped a new research ideal, which promotes unity of social and cognitive characteristics, “Social Studies of Science” changed the concept of scientificity criteria in the cognitive research program, and highlighted the fact that scientific knowledge is directly conditioned by interpretative resources, interpretative context. Introduction of such categorical structures, as “socio-cultural context”, “interpretative resources”, “interpretative context”, substantially changed the very idea of “sociality” in science.

To conclude, it must be emphasized that it is western sociology of science that shaped the challenging, fundamental task to newly coordinate and re-orientate analytical approaches to such complex subject of research as social aspects of science operation, attempting to thematize the idea of complexity in social studies of science in terms of explicating basic programs and approaches in philosophy, history, cultural studies and sociology of science and their further synthesis in some universal ideal research program, based on the integration of cognitive and social factors.

4. Conclusion

The conducted research allows modifying the current understanding of science within the context of the concept “sociality”, complementing it with the concept of “socio-cultural context”, fundamental for socio-cultural methodology. The author substantiates the difference between “strong” and “weak” varieties of social constructivism, and the thesis about heterogeneous nature of constructivism. It is proved by increasing interest to “constructionism” as a form and branch of empiric constructivism. Namely, “constructionism”, as is presented in the paper, studies epistemic practice, practices of “internally confined spaces” (e.g., “laboratory life”). Heterogeneity of constructivism is proved by “deconstructivism” theory.

The author considers that developing a new research program aimed at thematization of the idea to synthesize the cognitive and the socio-cultural in the development of science, “Social Studies of Science” changes views on scientificity claims (knowledge is conditioned by “interpretative resources”, “interpretative context”), as well as transforms the idea of “sociality” in science. Furthermore, reorienting analytical approaches to social aspects of science functioning, developing the idea to synthesize cognitive and socio-cultural factors, western philosophy of science attempts to develop a unified integrated theory of science, able to synthesize programs and approaches of philosophy, history, cultural studies and sociology of science.

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