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The demarcation problem in the history of science, or what historical epistemology has to say about cultural identification*

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This article discusses mechanisms of demarcation in science, as a case of establishing identity – one of the topical problems of contemporary cultural studies. Evidently, the quality of cultural interaction depends on the status of the other in relation to one's identity. Contemporary cultural studies distinguish two types of this interaction: exclusion, i.e. suppression of the other as a condition for the formation of one's identity; and inclusion, a retrieval of the excluded, leading to the transformation of one's identity. This article claims that the historical epistemology, as a special approach to the history of science, has elaborated a number of strategies regulating the relationship of science and non-science in the form of an attitude of present science towards its past. The article examines four of these strategies – three of them construct the identity of science through establishing boundaries and by excluding the other; the fourth presupposes acknowledging the other and endowing it with actuality. The last strategy demonstrates the dialogue between science and its other in action and, more importantly, identifies the necessary condition for the successful interaction – the destruction of a homogeneous scientific identity and allowance of self-identification to continue without end. Consequently, studying the types of interaction between scientific and non-scientific views in the field of historical epistemology allows one to conceptualize the general procedure of establishing cultural identification.

Keywords: history of science, epistemology, cultural identity, exclusion, inclusion

Проблема демаркации в истории науки, или что может сказать историческая эпистемология о культурной идентификации

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В статье рассматриваются механизмы демаркации научного знания как примера установления идентичности – одной из ключевых проблем современных исследований культуры. Определенность культурного взаимодействия зависит от статуса Другого по отношению к идентичности себя самого. В со-

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временных исследованиях культуры различаются два типа этого отношения: исключение, т. е. подавление Другого в качестве необходимого шага на пути формирования самоидентификации; и включение, т. е. возвращение исключенного, предполагающее трансформацию собственной идентичности. Историческая эпистемология, направление исследований науки, предполагающее объединение философии и истории науки, демонстрирует целый ряд стратегий регулирования взаимоотношений научного и ненаучного знания в форме отношения науки к ее прошлому. В статье рассматриваются четыре таких стратегии, три из которых формируют определенность научного знания путем установления исторических границ и более или менее явного исключения Другого (ненаучного знания), последняя же предполагает признание Другого как актуального. Четвертая стратегия демонстрирует, как осуществляется диалог между наукой и ненаучным знанием и, что еще более значимо, обнаруживает, в чем состоят необходимые условия его успешности. Таким образом, развернутый анализ типов взаимодействия между научными взглядами прошлого и настоящего в исторической эпистемологии вносит вклад в концептуальную разработку процедур установления культурной идентификации в целом.

Ключевые слова: история науки, эпистемология, культурная идентичность, исключение, включение

1. Introduction

Any identification in culture occurs in relation to the other. Therefore, be it a matter of nation, religion, gender or any other social group, an act of self-determination inevitably raises the problem of rules and norms of how to treat this other. What are these rules in the modern world and who should take the responsibility of establishing them? Which language would most adequately define the rules and norms of cultural identification – the language of political studies, psychology, aesthetics or some other? It is proposed in this paper that the language of modern epistemology can successfully cope with this task, because the object of epistemological interest, science, is normative. Scientific views predominate in the curriculum from primary school to the university level, and, consequently, influence the social conscience indirectly but, nonetheless, strongly. Epistemology primarily deals with scientific normativity as it reflects upon scientific practice, interprets the mechanisms of how science identifies itself as an agent of culture, and defines the norms and rules of these mechanisms. Obviously, normativity as such exceeds scientific normativity alone. Similarly, the language of epistemology is not the only language that would allow formulating rules and norms of cultural identification[1].

[1] See, for example, Crowther's analysis of the normative status of art, in the context of cultural exclusion [Crowther, 2003]. On the focus of contemporary epistemology to the norms of scientific practice see the research of H. Collins and R. Evans on the so

However, given that scientific identification is a special case of cultural identification, epistemology may, undoubtedly, offer us some approaches to the solution of the problem of cultural interaction.

Contemporary researchers feature two mechanisms of social and cultural identification [Stäheli, Stichweh, 2002]. The first mechanism is one of cultural exclusion. This mechanism forms self-identity by means of opposing oneself to the other, suppressing and displacing the other into obscurity and insignificance. The second, conversely, is a mechanism of inclusion. By contrast, it rests on the idea of continuous transformation of self-identity and, thus, recollects and retrieves superseded images from the cultural archive. Some scholars note that, in discussions on social and cultural identification, the main role belongs to the concept of exclusion, whereas the term inclusion is only defined by opposition [Rawal, 2008]. The insufficiently elaborated concept of inclusion is lacking in substantiating concrete practices aimed at overcoming the alienation. This paper will also highlight the possible contribution of epistemology to the analysis and the development of the concept of inclusion as a mechanism of cultural identification. In the course of its self-determination, science as a cultural phenomenon asserts a new format along with allocating specific areas of the alien – the other; against which its own identity is formed. However, precisely because any border not only divides but also unites, the recognition (inclusion) of the other, which was declared as non-scientific, occurs.

The establishment of border lines between science and non-science is defined through a fundamental epistemological principle of demarcation, and the ambiguity of this establishment will be treated here as the demarcation problem. Moreover, this paper will concentrate on how these border lines are drawn historically, studying examples from the domain of the historical epistemology[2]. Referring to images of science created by historical epistemology will enable us to present a scheme of excluding "pre-scientific past" from the self-identity of modern science and three modes of including the past in the set of actual cultural elements. We will discover that two of the three actually disguise exclusion, and only the third fully allows including the other by discovering the contemporaneous nature of the past. This third mode will be most thoroughly analyzed. As a result, contemplating the fundamental problem of epistemology, that is self-determination of science,

called Third Wave of Science Studies, in which they aim to develop a 'normative theory of expertise' [Collins, Evans, 2002, p. 237]. Controversies regarding descriptive and normative character of modern epistemology see in [Stolyarova, 2014; Nazim, 2013; Kuznetsova, 2017].

[2] Here we use the broadest meaning of "historical epistemology" as a study of historical forms in which scientific perception and cognition have developed. On different interpretations of this concept see [Kasavin, 2005; Gavrilenko, 2017; Sokolova, 2017]. It is characteristic for the twentieth century epistemology to presume that knowledge, scientific concepts and facts can only be understood within the historical context. [Nazim, 2013].

and viewing how historical epistemology considers the past of science as valid and worthy in the present, we will show that historical epistemology sets an example of "being with the other", which can be applied to other research fields and practices, thereby proving the high social value of contemporary philosophical and historical studies of science.

2. Scientific Revolution as a tool of excluding the other

Historically, the first considerable exclusion of the other in science occurred in the era of the Scientific Revolution, when the old lost its value and the modern European identity emerged. The determination of abandoning the past and a refusal to follow its paths sounds clearly in writings of those who built the theoretical basis for the new science; Bacon and Descartes. For example, in the introduction to his *Novum Organum*, Francis Bacon writes of his discovery of a knowledge that does not excel the ancient – such a statement would arouse "controversy or rivalry", require comparisons, maintain the position of the ancients and thus weaken Bacon's own position otherwise absolute by providing an alternative to it – but represents a completely "new way for the understanding", "untried and unknown" before [Bacon, 2000, p. 29]. The new science, establishing and justifying itself (17th and 18th century), despite the terminological connection with the preceding scholastic tradition, obviously embraces the new and discards the past; to identify itself it distinguishes itself from the past. It uses the method of doubt (dubitatio) as a way to deprive the former authorities of their importance. Natural philosophy, based on mathematical principles, equipped with a new organon of «the true and complete induction» and a new method of proof through experiment, replaces the old form of science, which relied on the qualitative interpretation of first elements and precluded their mathematical justification. Forms of objective validity of knowledge, which suggested relying on experience and logical or mathematical verification of proofs, received approval as precedent over the old subjective certainty based on the truth of revelation. The old moral certainty, built upon authority, gives way to the new one, ensured by a majority of disinterested witnesses [Dear, 1992].

Although the term Scientific Revolution entered the glossary of historical epistemology relatively late and is not at all unambiguous, it remains meaningful as it signifies a temporary but, nonetheless, radical, break with the past[3]. Koyré, for instance, defines Scientific Revolution as

[3] On the ambiguity of the term Scientific Revolution in epistemology, see [Wootton, 2015]. In this work, Wootton distinguishes between the interpretation of Scientific Revolution as an "epistemological break" (Bachelard), shared by Alexandre Koyré, and the understanding of Scientific Revolution as a long-lasting (at least two centuries)

"bringing forth the destruction of the Cosmos, that is, the disappearance, from philosophically and scientifically valid concepts, of the conception of the world as a finite, closed, and hierarchically ordered whole <...> and its replacement by an indefinite and even infinite universe which is bound together by the identity of its fundamental components and laws". Aristotelian essence-oriented conception of space gives way to the Euclidean geometrical space, which "implies the discarding by scientific thought of all considerations based upon value-concepts, such as perfection, harmony, meaning" [Koyré, 1957, p. 3].

The self-identification of the new scientific knowledge was carried out by exclusion those certainties, characteristics and approaches that characterized the old knowledge. Consequently, the new European identity of science emerged through detracting and neglecting the ancient and medieval "scientific" thinking, having declared them as "pre-scientific"; displaced to a cultural archive with a limited-access and not recommended for use. Scientific Revolution[4], thus, represents a dissolution that establishes a border line between the new (own) and the old (other).

3. False inclusion of the other, or the continuous history of science

In historical epistemology we also observe a quite different tendency of preserving past in the present of science. Pierre Duhem, for instance, studying the case of the choice of hypotheses criticizes, in terms of positivist thinking, the opinion of a sudden creation of theories and counters it with the idea of their continuous development going back to the mists of time [Duhem, 2007]. Tracking the origins of Newton's theory of universal attraction, he discovers medieval and ancient foundations of modern physics and embeds different historical interpretations of movement, from Aristotle on, in the process of preparation for this "discovery". This example reveals Duhem's conviction that scientific knowledge develops continuously. The boundary between the old and the new, the radicalism of the gap, the "great event" of the modern European Scientific Revolution as such – everything disappears in a continuous flow of barely noticeable

transformation, shared by Herbert Butterfield [Butterfield, 1965a] and Wootton himself. On the gradual adoption of the term Scientific Revolution in the discourse on transformations of science, see [Cohen, 1976].

4 Noteworthy, current research in the field of historiography of science views scientific revolution as quite an ambivalent break with the past. Not disputing the fact that the general disposition of the Scientific Revolution was to start a new tradition of knowledge, it also distinguishes the first stage of the revolution associated with more tolerant attitude towards the past and even the desire to revive ancient science. [Diar, 2009; Schuster, 2013, p. 77–87].

historical changes. Can we assume that this epistemological approach truly ties together the divided and includes what had been considered insignificant or solely negative? It may seem that what was excluded as vulgar before now enters science when considered more broadly. However, it is not exactly so.

An attitude to the past as a prerequisite of the modern science is usually interpreted in terms of Whiggish History [Butterfield, 1965b]. Whig, or Whiggish historiography, according to its critics – Herbert Butterfield and his followers – "rectifies" the past by producing the so-called "abridged" or "general history". Subsequently, this rectification is carried out from the position of the present and appears in its light[5]. Scientific events of the past receive the status of relative actuality. However, they prove to be detached from their own context and construed solely as preparatory for the meaningful present: a medieval theory of impetus as a proclaimer of the law of inertia, Aristotle's biological ideas as preparatory for the physiological discoveries of William Harvey (1578–1657) and so forth. Here, the nostalgic view of the past gives the present an impression of its own grandeur. Following this way of identification, science continues to assert itself through the negation of the other, the "non-scientific" knowledge, because it identifies only selected historical events as constituents of its past.

The label "Whiggish History" can be justly applied to a branch of historical epistemology that, while reconstructing a continuous story, reinterprets the past, as also to the one that defines the Scientific Revolution as a break with the past. In both cases, the rules of establishing the identity involve drawing a line between actual science and "parallel worlds" of non-scientific knowledge[6]. The cumulative history of science, thus, keeps alive the tradition of excluding the other, the tradition, which inevitably accompanies the process of establishing one's own identity. This is the first mode of false inclusion, which to a greater or lesser extent conceals that depriving the other of a meaning it resorts it as a tool.

Remarkably, those who criticize the Whiggish position in historiography often recognize its relevant suitability for the history of science. To some extent, it is true of Butterfield himself, who, according to a number of researchers, in the book *The Origins of Modern Science 1300–1800* violates his own principle when discussing whether using the term "Scientific Revolution" is appropriate [Alvargonzález, 2013, p. 97]. The history of

[5] In Russian epistemological tradition this position is known as "presentism" [Kuznetsova, 2009].

[6] Current studies in scientific history offer several attempts to compose a continuous history of science outside the Whiggish approach [Lindberg, 2007]. At the same time, these attempts are confronted with criticism, which urges to emphasize the negative influence of religion or Plato's "bad philosophy" on the formation of modern European science and take into account only those historical events which helped modern science to emerge [Seiler, 2010].

science necessarily testifies to advancement in certain areas of knowledge. The progress is obvious in the comparison of new technologies to those of Modernity, the medicine of Antiquity and that of today, the precision of mathematical formulations of laws of motion of celestial bodies, etc. For those who write of such a progressive history, it is quite natural to regard the pre-scientific past as erroneous and declare it dead. "Progress in science is compatible with the recognition and study of failed theories, closed paths and dead ends", writes David Alvargonzález, justifying the need for boundaries and taking present as a starting point in the identification process of science [Alvargonzález, 2013, p. 93].

Is there a different possibility for the epistemology to include past into present as its other? Can the rules of scientific identification, instead of distinguishing between the own and the other, accommodate their actual convergence?

4. False inclusion of the other, or the discontinuous history of science.

The second mode of inclusion the scientific past into present, in historical epistemology, corresponds to the revolutionary ideas of Thomas Kuhn, Paul Feyerabend and other representatives of the post-positivist philosophy of science. These thinkers problematize the integrity of scientific identity and scientific normativity setting border lines between the own and the other of science as its immanent events. This position implies recognition of the «other academic», which as «pre-scientific» was earlier displaced to the margins of history or construed as the «same old science» in terms of cumulative Whiggish historiography. In other words, a co-existence of diverse and hardly compatible world pictures and their conceptualizations is now being proclaimed.

One could assume that, in this case, the real inclusion of the other finally happens and modern science now recognizes, say, views of Aristotle and Ptolemy as scientific. It is wrong, argues Kuhn, to consider a theory non-scientific only because it was once rejected. Furthermore, a hierarchy should not be constructed of different paradigms, because they are just as incomparable as works of art. This incomparability (incommensurability) of different scientific theories, fundamental for both Kuhn and Feyerabend, has its basis in the "opacity" of paradigms (scientific theories) between one another, a fundamental refusal by each paradigm to acknowledge the scientific value of the other. The recognition of equal scientific values is only possible from some third point of view, the "view from nowhere", which parallels different modes of scientific thought to different styles of art.

It is worth mentioning that when the interpretation of scientific identity includes a multitude of incompatible paradigms as true but different, a ghastly ghost of relativism arises, an epistemological equivalent of the "absent identity" of cultural studies. Science, like no other human activity, claims to be the universal and justified worldview. Therefore, the danger of relativism forces one to reconsider the idea of historical succession of scientific paradigms. In the face of this danger, the study of the past as "another science" cannot be interpreted as a pure interest of "an historian antiquarian" (Nietzsche). The narrator of the history of science should call it either the *history* of science or the *pre-scientific* history. In the second case, they create a zone of cultural exclusion, whereas in the first, one faces a threat of relativism.

Perhaps we should not be terrified by this relativistic position. Indeed, in this case we deal with the true inclusion of the other past science in its modern form. After all, this kind of attitude to science, which may be different despite the fact that it is always conceived as a universal project, can serve as a model for recognition of irreducible plurality in cultural interactions. But are we really dealing here with the equality of the other and the own?

We have to admit, unfortunately, that such assumptions are false and hopes that this way of inclusion is effective are unjustified. Whereas at the first attempt of inclusion, when past was understood as a preparation for present, binding of different did not occur since the difference was eliminated as such, at the second attempt, binding of different cannot occur again because of the radical status of differentiating principle, which does not permit binding and blending of any kind. The "other science" abides as if in the parallel world not having any impact on the current state of scientific research. It remains alien and excluded from the standpoint of current paradigm, in which we always find ourselves.

Carlo Ginsburg compares Feyerabend's notion of incommensurability of scientific theories with incomparability of artistic styles. He also draws a parallel between the exclusion, which is inherent to both of these cases, and the alienation of nations and different cultures, e.g. Jews and Germans. He writes: "If each civilization is a homogeneous phenomenon, both stylistically and racially, Jews and foreigners could not play any intrinsic role in the development of the German nation because by birth they were excluded from it. The implications of these ideas – from Auschwitz to the former Yugoslavia, from racial purity to ethnic cleansing – are well-known" [Ginsburg, 1998, p. 45].

A similar attitude towards relativism in the context of cultural interactions is shared by Diego Marconi in the discussion on cultural identity in *Revista di Estetica*. He claims that "cultural relativism is just the other side of racism and chauvinism. A chauvinist does not perceive

the variety and inner conflicts of *other* cultures <…>. Symmetrically, a relativist doesn't perceive the variety and inner conflicts of *our* culture" [Marconi, 2014].

Here again, we are facing a latent exclusion. Behind the interpretation of science, which includes the study of diverse and equitable ways of rationalizing the world, also lays an opportunity to disregard "the other science", to avoid interaction with the other. It turns out that this approach of epistemology is not only problematic for the science itself in its urge for unity but also unreliable as a model for cultural interactions.

It must be emphasized, however, that recognizing diversity in science is an indispensable act, especially in such critical moments through the course of the development of science that can be qualified as crises and usually lead to the emergence of new scientific paradigms. Therefore, it is quite natural that in the works of Albert Einstein researchers discover statements that allow viewing this great physicist as a predecessor of Kuhn and Feyerabend [Oberheim, 2016]. Einstein insists that the scientist on the eve of a revolutionary discovery must be "an unscrupulous opportunist", ready to use any approach to the interpretation of the world [Einstein, 1998, p. 683].

Is it possible to find another way of building scientific identity? Is there a mode of inclusion of the other that would take into account the benefits of the first two and avoid the dangers of their consequences?

5. True inclusion, or how the science as a non-homogeneous phenomenon is possible

One more approach in modern epistemology does recognize the diversity of scientific identities, not as a point of final destination but as a provocation, which initiates work over the desired unity in science. This approach considers the unity of identity not as a prevailing contemporaneity, from the standpoint of which the judgment is being pronounced, but the goal. Consequently, the border line between the own and the other, which divides and excludes the other into the area of non-actual, becomes dynamic and unifying. This mechanism of identification using the expression of Marconi can be called "discovering the other within each of us" [Marconi, 2014], and presupposes the destruction of scientific identity as a homogeneous phenomenon[7].

The following are examples from the field of epistemology demonstrating how the mechanism of the true inclusion really works. The first group of examples refers to the awareness of the importance of maintain-

[7] Noteworthy, the issue here is not about blurring of the boundaries between the self and the other, but that the certainty of scientific knowledge, at least at the stage of its production, is no longer conceived as homogenous. [Collins, Evans, 2002, p. 247–251].

ing a connection, a dialogue between different and seemingly incompatible types of scientific rationality. The emergence of a new paradigm always involves not only a rejection of the old, but also the demonstration of how the old and the new can be reconciled. This is a sort of initial recognition, without which the emerging new will not be taken seriously by the scientific community. Feyerabend points out how Galileo in his work *Dialogo sopra i due massimi sistemi del mondo* manages to make his interlocutor, representing the old Ptolemaic concept of the universe, accept (willingly) the arguments in favor of the new Copernican concept. Thus, Galileo, defending Copernicus, manages to maintain a dialogue between and old and new sciences. This means that a radical gap between the two scientific paradigms, which served as a way of understanding the Scientific Revolution, is converted into an event of a temporary and yet actual connection of tying together the divided. In this context, a scientist revolutionizes science through starting a dialogue between different possibilities of the object's representation (movement in this particular case) [Feyerabend, 1993, p. 54–64]. Similarly, the need for a dialogue is realized in contemporary epistemological studies, looking for conditions of interaction between different scientific disciplines. These studies show that the recognition of other's competence and admitting the importance of their knowledge for one's own research leads to the emergence of "trading zones", and consequently, to the origination of new scientific disciplines [Galison, 2010; Kasavin, 2017].

The second group of examples regards providing conditions for establishing a dialogue. Changing an attitude of science towards the other constitutes the first of these conditions. Thus, modern historical epistemology emphasizes on the role of lay knowledge [Ludwig, 2016]. And what matters is not whether contemporary epistemology justifies the existence of this kind of knowledge but whether a dialogue between non-professionals and experts in science is possible. Although being remote from science, lay people often have "specific" views of objects, which can, nonetheless, be proved valuable in the scientific research. Such are, for instance, manifold characteristics of animals and plants, of which lay people know in abundance due to long years of co-existence with nature, but which are unfamiliar to scientists observing these objects sporadically and mainly in artificial conditions. This very openness to the other kind of knowledge is the necessary condition for recognition and respect of the autonomy of another subject. Moreover, not only the role of lay knowledge should be recognized for various stages of the research, but also the meaning of a non-professional expertise in different cases of decision-making [Collins, Evans, 2002; Wynne, 1996].

The second condition consists in changing an attitude of science towards itself. Contemporary researchers in the field of epistemology focus on a historical variety of meanings of basic scientific concepts [Daston,

Galison, 2007] and on a radical historical mutability of scientific objects [Rheinberger, 1997]. Thus, homogeneity and uniqueness of scientific identity in the historical context gets called into question. Scientific identity now becomes an object of "re-assembling" (Latour). The scientist does not work alone but together with numerous and equal actors. Among them people – professional and lay experts, things – scientific objects and equipment, ideas – already recognized and still problematic. This way the new mechanism of identification emerges. Identity proves to be not the prerequisite of the research but its goal; and this goal is never final.

6. Conclusion

Searching for possible rules of successful cultural interaction, this paper analyzed mechanisms of demarcation in the history of science, and approaches to forming scientific identity used in historical epistemology. Eventually, four ways and corresponding rules of constructing an identity of science were encountered. Three of them imply setting border lines and a more or less direct exclusion of the other: 1) by attributing the other to the area of pre-scientific past; 2) by interpreting the past (the other) knowledge as a premise of the present science; 3) by recognizing the past as the other and yet, insignificant for the present form of science. The fourth way of identification, by contrast, presupposes the invitation of the other to the dialogue and the acknowledgement of their significance and actuality. Successful implementation of this last path becomes possible through following the rule of viewing self-identity as heterogeneous and considering the process of self-determination as continuous and endless.

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