

PIROGOV VS. GALEN: PHILOSOPHICAL METHOD IN MEDICINE

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Adjacent fields of research are of much interest in modern medical science—neurobiology, biochemistry, bioinformatics, robotics, etc. At the same time, if the existence of high-tech medical equipment is disregarded, it is possible to discover that modern medicine exists not only within the ethics of Hippocrates but also depends in many ways on his ideas in the fields of theory and practice. This fact underscores the important methodological role of the history of medicine in the emergence of the researching doctor. The comprehensive nature of posing scientific problems in this field allows us to investigate the circumstances, emergence and development of the scientific method in medicine and identify epistemological reserves for promising scientific discoveries. This ensures the formation of the researcher's perception of the world based on the understanding of the continuity of the development of modern scientific medicine and rational medicine of the preceding centuries. There is an opportunity to find the answers to important methodological questions: 1) how substantial are the differences between the medicine of antiquity and that of the 19th century; and 2) is it possible to assume the existence of a systematic appraisal of the approaches in medical theory and practice, with which it becomes possible to describe and analyze the prerequisites of discoveries at various historical stages?

Discoveries in science made by scientists always exist in the context of the general development of a particular discipline, which is impossible without the awareness of its methodological and philosophical tenets. The broadest philosophical ideas are realized in the philosophical foundations of science—or in our case—medicine. Therefore, they are present in any serious scientific study, either in the process of a heuristic search or with the substantiation of basic ideas and principles. As K. Popper rightly noticed, philosophy is important to us only because we want “to find out something about the mystery of the world in which we live, and about the mystery of human knowledge about this world.” (Popper 2008: 6).

The close link between philosophy and medicine is foremost defined

by the fact that medical theory is always situated within a general field of ideas that forms the philosophy of medicine, which in turn allows the comprehensive study of complex living systems, namely the human body. In the opinion of the distinguished Soviet pathologist I. V. Davydovsky, the fact that most concepts of medicine were of non-medical origin was related to this (Davydovsky 1962). The history of the development of the philosophical method in medicine has its origins in antiquity. Hippocrates had emphasized the necessity to transfer wisdom (i.e. philosophy) to medicine, and medicine to wisdom. Medicine as a branch of scientific knowledge always strives toward the truth. At the same time, the understanding of truth in medicine is specific, as it is defined by its applicability and the peculiarities of a doctor's clinical thinking. The category of causality, completely philosophical at first glance, is the basic system of the theory of general pathology and allows us to comprehend the metaphysical foundations of various phenomena in medical practice, as it includes within itself the constant connection of phenomena, one of which always precedes the other. Ontologically, a doctor's way of thinking is arranged as a path connecting the study of changes to a part of the body to its cause. For example, in the 19th century, professor I. V. Varvinsky noted that "the clinical doctor is an ontologist, a researcher of the ill", who joins "the pieces into a whole" and speculatively attempts to determine the nosological form of disease on the basis of existing representations of semiotics (Varvinsky 1849). This largely echoes Galen's idea (2nd cent. AD) that it is necessary not only to recognize disease expression but also predict further disease development by observing the actual condition of the patient (Singer 1997: 33-34).

Medicine and Philosophy

The term "medicine" comes from the Latin word "medicari", or "to prescribe a remedy". It literally means "someone prescribed medicine for someone else", i.e. acted in the role of a person who is well-versed in drugs or simply a seller of medicine. If we deviate from the narrow definition of this term, we will substantially limit our opportunities to investigate the role of philosophy in this phenomenon, since the phenomenon of "medicine" is more varied than actions undertaken with prescriptions. If we use Aristotle's categories, it is necessary to establish the essence of the art of healing, named as such in the original and true sense.

Medicine holds a special place among other fields of natural science. Its objective is the human body. Medicine studies the diseases of the body,

prevents and eliminates them and leads to successful outcomes. Generally speaking, the presented definition expresses the goal of medicine (“for the sake of what”). In this case, at question is the elimination of human illness or a possible reduction of suffering and striving toward good health. Herein emerges a set of epistemological problems, partly biological, partly physical and partly philosophical (Afanasyev 1964). It is necessary to clarify how these can be combined in the process of discourse about the nature of medicine. For a long time, fundamental science was ambiguously related to this issue. To some extent, this is understandable, as the foundation of medicine is clinical practice. In complicated cases, decisions are made by a council which comprises authoritative physicians in the relevant field who have extensive experience with patients. Doctors with insufficient experience to make such decisions are not permitted to do so, as in such cases the problem that must be resolved concerns not only the person’s health but his life. To treat according to instructions, that is, to use a certain set of mechanical manipulations, such as during physical experiments or chemical reactions is impossible. To cure, help, alleviate suffering, and save lives—these lie at the centre of the doctor’s attention. What is medicine? Is it a practice or theory? Is it scientific knowledge or a broader subject that includes philosophy, ethics, and socio-cultural components? In medicine, practice has always been closely linked to the general problems of studying the physical world, where it is practically impossible to achieve the initial link of the chain of causes and their consequences. Identifying the causes of diseases, the correct interpretation of symptoms, each of which may indicate contradictory types of diseases, the etiology doctrine—on the one hand, all of these are related to clinical reasoning, and on the other—to the field of philosophical problems of medical theory. It is impossible to cure a person without visualizing the connection between these processes and understanding the sequence “symptom–syndrome–disease”. Moreover, a systematic understanding of these processes makes it possible to identify links between nosological units and find the one and only correct course of treatment. Fragmentary knowledge of anatomy, histology, and physiology is of little use without an understanding of the ontological nature of the treatment process, which can only be based on every doctor’s understanding of the holistic nature of the human body. Philosophical fundamentals in medicine permit a clearer establishment of the link between pathological phenomena and processes occurring in the body (i.e. causal relationships). A number of completely new laws, which previously had deviated from the vital functions of a healthy body, are discovered during disease onset and development. Here, a question emerges about the content of research methodology. The

methodology, as well as the philosophy of science in general, certainly, should be based on research by historians of science. In turn, the history of science must turn to philosophical and methodological principles, which, with a broad philosophical point of view brighten the general prospects of scientific development. We can, therefore, agree with I. Lakatos' opinion that the history of science without philosophy is blind, and philosophy without the history of science is empty. For many doctors, such as C. Bernard:

Philosophy embodies the eternal aspiration of human reason toward knowledge of the unknown... By ceaselessly stirring the inexhaustible mass of unsolved questions, philosophy stimulates and maintains this healthful movement in science... Philosophy and science, then, must never be systematic: without trying to dominate one another, they must unite... (Bernard: 221, 223, 224)

Thus, it is possible to investigate to the fullest extent possible the role of the philosophical method in medicine by relying on an analysis of its history as a science. M. Ya. Mudrov, a distinguished Russian clinician of the 19th century, spoke of this, stating:

It is an indisputable truth and impervious to doubt that such a review of the whole of science offers a great benefit for beginners to learn medicine. It makes them capable of easily understanding and impressing onto their memory classes taught by professors on each particular science; it greatly facilitates their study of its individual parts; it reveals to them the logical connection between them and their mutual relationship; it shows them how they are different sciences, serving as both a means and an end, like the various members of organic bodies, form from themselves the unity of the whole of science. (Mudrov 1949: 264)

According to Edmund Murphy, a researcher of the philosophy of medicine, medical science is developing on two levels: ontological and epistemological (Murphy 1928: 139). In the former, of fundamental importance is taxonomy, i.e. ways of classifying diseases, and its part—nosology, where specific diagnostic units are indicated. The epistemological level presents a strategy regarding the diagnostic process, or, more precisely, the primary goal of this procedure. The logical nature of the problem, which involves consideration of the use of evidence gathered in the preparation of the diagnostic evaluation, and tactics associated with specific methods of diagnosis are included as well (Gungov 2013).

The Peculiarities of Understanding the Experimental Method in Medicine

In the history of philosophy exists a tradition according to which it is thought that in antiquity there was neither experimental science nor the study of nature and that researchers were limited to observations and descriptions of their results. Due to this, the new science that emerged in the 17th century not only revived the Greek ideals of evidence and the validity of mathematical knowledge but was to create a new ideal for the scientific study of natural phenomena. The experimental method formed the basis of the newly emerging approaches to this type of rationality based on a detailed analysis of the phenomena observed separately from the influence of non-essential factors and the mathematical processing of their results. Galileo's initial experiments on the mechanical motion of bodies were directed against the scholastic contrivances of medieval scientists and natural-philosophical hypotheses. To what extent science at that time was dominated by various kinds of natural-philosophical hypotheses about the so-called hidden qualities is attested in the assertion of Isaac Newton, who claimed that he did not "contrive" the hypothesis. With this statement, he separated himself from the inventors of the "hidden qualities" and claimed that his conclusions were based on accurate observations and experiments. Herein, awareness emerges of the specifics of the development of scientific knowledge in medicine in relation to other branches of natural science. The development of rational methods of knowledge of medicine is based on the assumption that a scientist can form knowledge of the human body that accords with objective reality (i.e. true knowledge), namely its structure and diseases on the basis of indirect "visible" or "tangible" signs characterizing its current condition. This practice had been used since Hippocrates's time, after which it was supported by data obtained as a result of systematic anatomical dissections and developed on the basis of their comparative anatomy. In essence, in the language of modern science, anatomical autopsy in medicine is the truest experiment. As Russian historian of medicine D. A. Balalykin claims, the "experiment" had been known since antiquity (Balalykin 2016).

According to H. Helmholtz, the history of medicine represents "a very special interest in the history of the human spirit. No other science, perhaps, has so far been able to show to such an extent that the proper criticism of the sources of knowledge is, from a practical point of view, a highly important task of true philosophy" (Helmholtz 1907: 14). We also know that Hippocrates believed that "God is like a physician-philosopher." However, this saying must be understood correctly. What does it mean?

How should “philosopher” be understood? In this case, it is necessary to turn to ancient tradition to correctly interpret Hippocrates’s thought and satisfactorily analyze this approach in terms of its existence at different historical stages of medical development.

The ancients also understood philosophy as a theoretical science. Their philosophy is also involved in mathematics, physics, astronomy, and natural history (in close connection with actual philosophical and metaphysical arguments). Thus, the physician and philosopher, Hippocrates, seriously “delved into the causal relationship of processes in nature” (Helmholtz: 15). The aspirations of ancient scientists, according to Helmholtz, were foremost directed against the thought process, logical consistency and wholeness of the system. Methodologically, it is true to a certain extent, as full knowledge of the causal connection of many known phenomena provides a coherent system. However, this can lead to the erroneous understanding that all diseases have a common basis. Thus, in the history of medicine, we see how schools of dogmatic and deductive medicine developed. Their intolerance was partly mutual and partly directed against the eclectics that explained various forms of pain in different ways. The last, an essentially reasonable method according to taxonomists, was inconsistent. Thus, in Helmholtz’s opinion, “the greatest doctors and observers, headed by Hippocrates, along with Aretha, Galen, Sydenham, and Boerhaave were eclectic or at least very unsteadily systematic” (Helmholtz 1907: 23-24). For them, all theories were speculative, subject to a test of the facts that ultimately determined their significance.

During each newly discovered phenomenon, a true investigator of nature wonders whether substantiated laws and the actions of well-known forces should undergo change (naturally, we speak only of those changes that do not contradict previously accumulated observations). Of course, absolute truth is never achieved, but rather it is highly likely that it is equivalently reliable from a practical standpoint (Helmholtz 1907: 36).

Having greatly enriched the research capacity of the history of science, an important scientific mainstay of the late 20th century is academic V. S. Stepin’s concept of different types of rationality (Stepin 2015: 506-542), which allows the explanation of historical and scientific phenomena in all stages of the development of scientific knowledge, using the methodology of the philosophy of science. From the perspective of the modern concept of the history of science, the scientists’ requirement to turn to the methodology of the philosophy of science is directly due to the objective relationship of their research topics and the common striving toward the ideal of rationality.

Ideas of rationality date back to ancient philosophy. Parmenides had clearly distinguished knowledge by truth (available to the mind) and knowledge by opinion (which relies on sensory perception). Moreover, he believed that this criterion of truth was the mind. However, rationality as a particular philosophical tradition began to take shape only in the 17th century. During this period, experimental science appeared in modern understanding. Currently, in the broad sense of the word, rationality is regarded as an activity aimed at achieving the best and most satisfying results in a particular field of consciousness and practical action. The most important characteristics of these activities are the choice of objectives and their achievement. The probability of achieving a goal and a self-evaluation of the result of the action is determined depending on the goal. For us, the methodology of scientific research is important, that is, the disclosure of principles, methods and techniques to comprehend the truth throughout the course of a study. The method as a kind of systematic procedure comprises a series of repetitive operations, the use of which in each case leads to goal attainment. Difficult problems of science are the least amenable to algorithmization and their solutions cannot be reduced to the use of any rules of thumb or recipes. They require the mobilization of all intellectual effort and a tireless, creative search. Such methods are called heuristics. They are co-opted as guesses, especially at the initial stage of the search, but scientific knowledge is not limited to a continuous chain of conjectures and assumptions.

Issues related to how experimental medicine and philosophy are correlated have always worried doctors. Criticisms of the role of philosophy have reached extremes, as in opinions expressed by C. Bernard: an experiment in medicine does not correspond to any medical doctrine or philosophic system. However, we must understand the essence of his objections. Bernard did not deny the value of heuristics for the philosophy of medicine, but was rather against unnecessary dogmatic thinking:

As experimental medicine, like all the experimental sciences, should not go beyond phenomena, it does not need to be tied to any system; it is neither vitalistic, nor animistic, nor organistic, nor solidistic, nor humoral; it is simply the science which tries to reach the immediate causes of vital phenomena in the healthy and in the morbid state. It has no reason, in fact, to encumber itself with systems, none of which can ever embody the truth. (Bernard 1949: 219)

C. Bernard wrote:

In the experimental method we never make experiments except to see or to

prove, i.e., to control or verify. As a scientific method, the experimental method rests wholly on the experimental verification of a scientific hypothesis. We obtain this verification with the help, sometimes of a fresh observation (observational science), sometimes of an experiment (experimental science). In the experimental method, the hypothesis is a scientific idea that we submit to experiment. Scientific invention consists in the creation of fortunate and fertile hypotheses; these are suggested by the feeling or even the genius of the men of science who create them.

When a hypothesis is submitted to the experimental method, it becomes a theory, while if it is submitted to logic alone, it becomes a system. A theory is a verified hypothesis, after it has been submitted to the control of reason and experimental criticism. The soundest theory is one that has been verified by the greatest number of facts. But to remain valid, a theory must be continually altered to keep pace with the progress of science and must be constantly resubmitted to verification and criticism as new facts appear. If we consider a theory perfect and stop verifying it by daily scientific experience, it becomes a doctrine. (Bernard 1949: 220)

We find examples confirming the existence of such a campaign at all stages of the formation of the history of medicine as a science. For example, D.A. Balalykin considers the term “experiment” applicable as it relates to the analysis of Galen’s legacy:

For Galen, the autopsy of animals was an important method of experimental surgery and a source of knowledge in the field of comparative anatomy ... He rejects the use of rhetorical parcels for creating medical arguments, countering them with irrefutable arguments based on the results of anatomical dissections. (Balalykin 2016: 577-578)

We find supporting examples in many of Galen's works, but here we present excerpts from the second book of his fundamental treatise “On the teachings of Hippocrates and Plato”, which, in our view, are the most representative:

2.3.3. The main point was that the appropriate and proper premises must be found in the very essence of the matter under investigation... 2.3.7. So it has become evident from the method of scientific proof that it would be more useful to dissect animals and observe closely what and how many kinds of structures grow out from the heart and spread to the other parts of the animal; and, these very structures being of such and such kinds and so many in number, (to observe) that this one transmits sensation or movement or both, that one some other thing, and thus to reach the point where one understands which powers in the body have the heart as their source. (De Lacy 109: 111)

This treatise was translated from ancient Greek to Russian by department members of I. M. Sechenov First Moscow State Medical University (Russia). In 2016, parts of it were published in Russian (Balalykin 2016). Somewhat earlier this treatise was translated by Phillip De Lacy into English—in his version he calls it *On the Doctrines of Hippocrates and Plato* (De Lacy 1978). Being familiar with the text of De Lacy, we conducted a reverse translation of our own text of Galen’s treatise into English. The resulting translation was from ancient Greek to Russian and then to English. We thought this necessary because of the importance of the issues and because we felt it necessary to make sure that meaning had not been distorted in any of the languages. We now know that the meaning is the same for any English-speaking reader. Given that this article is published in English, we will provide the original source of the translation of De Lacy, illustrating the ancient Greek source reproduced by his edition (De Lacy 1978).

This approach to Galen’s legacy is unfamiliar among historians of science. Moreover, it can be applied to evaluations of the studies of Herophilus—Galen’s forerunner (Balalykin 2016: 589). Numerous anatomical dissections of animal and human cadavers—methodically carried out year after year to gain insight into their organizational structure by checking the location and form of the organs—accord with the concept of an “experiment”. It was not an accident that such great scientists as H. von Staden (von Staden 1991), V. Nutton (Nutton 2013) and J. Longrigg (Longrigg 2004) use this term in reference to the works of Herophilos and Galen. Moreover, Galen’s modeling of acute pathological cases in animal experiments fully corresponds to the definition of “experimental surgery”. (Balalykin 2016). Galen describes these experiments in the second book of the treatise “On the Teachings of Hippocrates and Plato”:

2.4.41. It would not, I think, be at all surprising that injury to the trachea, which we also call the *pharynx*, or to the lung or the heart itself should destroy speech, if speech came from the heart; but it would be absurd and utterly irrational for speech to be destroyed by pressure on the brain or on one of the nerves that pass from the brain to the muscles of the larynx, if it were true that none of these is needed for the production of speech. But the observed facts are quite the reverse of their doctrine. 2.4.42. For when the heart has been exposed, as I mentioned also in the preceding book, if you lay hold of it and press or crush it, you will see that the animal is not deprived of breath or speech and is not prevented from performing any other of the activities that follow on conation; but when you have stripped the brain of its bones and have pierced or pressed any one of its ventricles, you will immediately deprive the animal not only of speech and breath, but of all sensation whatever, and of all the movements that follow on

conation. (De Lacy 1978: 127)

In this way, in Galen's argumentation, we find a lot in common with the views of N. I. Pirogov. As he settled into his research, Pirogov articulated the importance of the topography of the blood vessels for their dressings. He drew particular attention to the structure and function of the abdominal aorta and tasked himself with clarifying the reaction in the ligation of the aorta of the organism as a whole. The solution to Pirogov's tasks could not have been achieved solely through anatomical studies, so he broadly applied the experimental method. Pirogov experimented on animals of different species, at the same time comparing the results of the underlying operation. This enabled him to establish a fundamentally important fact that attested to the fact that animals of different species react differently to the ligation of the aorta. Here, Pirogov, as with Galen, actively applied the comparative anatomical study method. He clarified the true essence of pathological disorders, advancing in the body following ligation of the abdominal aorta, and in the same way showed the inadequacy of principles created by Astley Cooper (Pirogov 1957: 15). In ancient times, Galen, with the aid of anatomical demonstrations also pointed out the inadequacy of his opponents'—also physicians—opinions. Both researchers, each at his own time, were able to achieve results solely based on systematic autopsies and a methodological belief in the possibility of the knowledge of laws in the organization of the human body, i.e. an understanding of teleology and the logic unit of the material world.

Thus, by using the philosophical method and an analysis of history, it is possible to gain a clearer and more complete understanding of the contents of medicine as a science and a branch of human activity. In the 19th century M. Ya. Mudrov said:

Medicine, as well as all other major areas of human knowledge, comprises many different branches or separate sciences. Despite their diversity, all these separate sciences are based on one another, followed by one another, supported by one another and enable one another. Therefore, the sum of their parts forms the entire unity of the art of science and medicine; they all flow logically, that is, an indispensable link, all are to the whole of medical science as individual parts of an animal are to the body from which they are taken... (Mudrov 1928: 264)

Thus, the fundamentals of science are philosophical ideas and scientific principles, which are formulated in the framework of the philosophy of science. These philosophical foundations are more concrete embodiments

in the ontology of science, particularly in the scientific representation of the world. Value systems, ideals and norms of science are realized when solving various scientific problems. All of these components are structures of the foundations of science and closely interact with each other both in terms of the ideals and norms of science and the philosophical and scientific worlds.

Pirogov vs. Galen?

The method, on which rests the priority of identifying the causes of changes in the function of any part of the body, allows the physician to more fully explore the essence of its normal function and numerous external and internal processes and their causes, and also leads to the development of medical theory and concepts of general pathology. The effectiveness of the method, or a philosophical approach that underlies the physician's practice, is determined by a successful treatment outcome based on correct diagnoses. For example, Galen pays special attention to the possibility of obtaining true, reliable knowledge about an object of research, which he calls the "truth". Galen lists the necessary requirements to be presented to a real physician-scientist ("natural sharpness of mind", "acquired from childhood ...skill to learn," hard work, etc.). But most of all he is concerned about the need to "learn a method to distinguish truth from falsehood" and "seek the truth" to address specific health problems, however, he considers it necessary "to use the method so that not only does everyone obtain the knowledge, but also be able to use it". According to Galen, a reliable system of ideas about the human body and its diseases and methods of treatment can be created by empirical knowledge and based on its theoretical generalizations. Later an outstanding surgeon, founder of topographical anatomy and of the comparative anatomical method N. I. Pirogov, discussing the basics of knowledge in medicine, said:

The doctor's life has periods of credulity and skepticism. Entering the medical field, we can easily believe in what we have heard, read or what we ourselves have seen. At the centre of the field, in the middle of our pursuits, disappointment sets in: we begin to believe only what we ourselves have seen or experienced. Toward the end, doubt spreads itself where conviction borne of personal experience used to lie. This is as it should be. First, it is necessary to believe... (Pirogov 1854: 1)

This line of reasoning was transformed by him into a method of "falsification", known in the history and philosophy of science as one of

the basic methods of the development of scientific knowledge:

...Now that I am starting to even continually doubt my convictions, attained by personal experience—only one direction from the past remains inviolable, a direction that consists of the frank discovery of success and failure in practice. (Pirogov 1854: 2)

The priority of clinical practice that we see in both Galen and Pirogov largely focused on the close relationship with speculative practices, which should complement each other. Without concerning themselves with the sequence of actions, the medical practitioner will not be subjected to so-called logical blindness, as he is persistent in the sequential understanding of applicable problems, enabling him to act and constantly doubt the authenticity of his received tasks, and to seek truth in the knowledge of the world. According to N. I. Pirogov, “logical blindness” (excessive theorizing, and fascination with speculative practices) “originates not so much from the logical consequences of a perfect start conducted to the last extreme, but rather on an erroneous view of the beginning”, that is, from an incorrect methodological tenet (yet another overlap of Pirogov’s views with those of Galen). The properly chosen method, natural-philosophical doctrine or idea or, N. I. Pirogov claimed, something “ideal” will be the “thread of the electric telegraph, one end of which extends to us through all life on earth and the other disappears into infinity” (Pirogov 1985).

To accumulate empirically verified knowledge, anatomic dissection, according to Galen, is the only trustworthy way to study the organization of the body. This method allowed him to criticize the views of opponents, who believed that the arteries transform into nerves and, on this basis, considered the heart as the source of the “highest pneuma” diverging along the nerves, and as the body control centre (Balalykin 2015). Not by chance, he begins his discussion with a reminder about the use of anatomical dissections as the only reliable tool for studying the organization and, more importantly, the function of the human body.

Many of the leading historians of medicine willingly employed the concept of “experiment” in relation to the works of Aristotle, Galen and Herophilus. Indeed, their works had a purposeful feel, as they closely linked theory and practice. However, we cannot always speak of Galen as a discoverer of some phenomena in the absence of scientific and experimental evidence and studies in his work. This may be ascribed to brilliant foresight, owing to the stunning professional intuition and experience of the doctor, armed with a rational system of natural philosophy, which, for its time, was the most appropriate with regard to the problem being solved.