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## **Importance of Philosophy of Science to the History of Medical Thinking**

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Popular approach to the history of medicine rests on naive assumptions that: 1) only the present state of medical knowledge can be counted as scientific and only those elements of the former knowledge and practice which fitted the body of contemporary science should be regarded by the historians of medicine (presentism); 2) medical sciences, like the other natural sciences, portray natural phenomena as they really are (naturalism); 3) progress in sciences consists of cumulative growth of information and explanation. The twentieth century philosophical critique of science revealed that none of these assumptions were true. Empirical facts, which are taken as a basis for any true knowledge, are dependant on the presumed theories; theories are intertwined into a broader socio-cultural context; theory-changing processes are caused by social factors rather than by the theoretical content. Therefore, it is a common task of historians of medicine and philosophers of science to reveal all theoretical and cultural premises on which our comprehension of the contemporary medicine is founded.

Key words: education, medical; ethics, medical; health education; history of medicine; medical education; modern medicine; schools, medical

In this article I will approach the question of the importance of philosophy of science for history of medicine not from the point of view of a historian of medicine but of a philosopher. Moreover, I will not refer to the view of the history of medicine by professional historians, but rather to the popular image of medicine and its past. The inspiration for this article was the understanding of medicine, its history, and its role in common life, that I learned from Polish students of medicine during the course in general philosophy. In other words, I want to investigate how medicine and its history are understood by the apprentices of medical profession. The article will, therefore, reflect general approach of medical beginners to the medical reality and natural sciences as a whole i.e., the popular image of intellectual legacy of mankind as it was shaped during the years of school education. As my numerous contacts with practicing physicians showed, medical students and physicians have many similar elements in this mental approach to medicine. This approach reflects to a large extent the nineteenth century's comprehension of science and its progress, bound to positivistic philosophical tradition of Auguste Comte (1).

The purpose of the study is to show how the twentieth century philosophical reflection over science changed the image of modern natural sciences and their development, and thus undermined naive, uncritical belief in linear and cumulative growth of scientific knowledge. Such a critical reappraisal of the modern medicine also took place during the last decades, but its influence on the perception of the history of medical practice and scientific development still seems rather weak. Hence, philosophers and historians of medicine have the common task of deepening and broadening the apprehension of the past and the present of our healing theories and practices. The role of the philosophy of science is to criticize and inspire, and the role of historians is to follow this inspiration and study real history.

### **Popular Approach to the History of Medicine**

The statement that medicine has been undergoing an enormous development throughout the twentieth century is trivial. Many diseases that had decimated human population within the past centuries have become at least controlled, if not completely eradicated; average life expectancy has grown to the previously unimaginable 70 years or even more in the most developed countries (2). Contemporary physicians, equipped with technical devices that empower them to discern failures and defects of different organs or tissues, even individual cells and genes, are hardly comparable to their colleagues, even of the recent past. The above-described revolutionary changes in medicine are commonly seen as a result of the development of natural sciences in the nineteenth and twentieth centuries.

Such an optimistic picture of modern medicine, rapidly and continuously progressing because of solid scientific foundations, is almost unexceptionally shared by contemporary physicians and patients.

Hopes are high for further perfection that will lead to the ultimate solution of all our health problems in a predictable future. David Greaves, a British philosopher, in his search for the lost feeling of mystery in western medicine (3), wrote: "A central tenet in our understanding of the role of western medicine is that it involves a program of inevitable progress, because the goal being pursued is unified and objective. This is further allied to the view that it is only through scientific rationalism that such a process is possible". Since medicine entered the path of a scientific, rational examination of diseases and causes underlying them, it has definitely left behind the tricky way of trials and errors it had formerly had in use, replacing it with methodical and precise mode of investigation of nature and the practical response to clinical complaints adequate to this mode. It reached the status of "normal science", to use a genuine term invented by Thomas Kuhn (4). Hence, "we do not refer to medical mysteries but to medical puzzles, and to see western medicine as first converting what were once mysteries into puzzles, and then through research solving each of these puzzles in turn. [...] There are two ways in which it is maintained, first by claiming that some such puzzles can already be solved and second that the remainder are potentially soluble" (3).

This breakthrough in the development of medical knowledge had a great impact on regarding medicine itself and its role in society, and resulted in the reinterpretation of the whole tradition of medical thinking and practice from the newly acquired point of view. Those elements from the past, which survived a severe trial of scientific verification, remained a valid part of the new medical knowledge. A large part of the healing tradition, which failed this verification, was automatically defined as superstition and banned from the field of legitimate medical activity. Almost total rejection of traditional medical practices in the second half of the nineteenth century for the lack of their therapeutic validity (like blood letting or cataplasms, use of emetics or mercury) illustrates of this radical change. Rapid evolution of natural sciences in the nineteenth century revealed that almost none of the previous therapeutic methods had adequate explanation within the new theoretical framework or an experimental proof of their efficiency. The growing knowledge of anatomy, physiology, and histology combined with scrutinized clinical observations showed that many of the traditional methods of treatment had no influence on the examined tissues or organs and did not cause any modifications in them. For example, the famous study of P.C.A. Louis from 1835 (5) showed therapeutic inefficiency of blood-letting. It was one of the first cases of employment of statistical analysis in assessing a certain medical practice. Other methods turned out to be more or less harmful and no treatment at all was more successful. The reactions to those findings varied, ranging from cautious skepticism of the French School, represented by X. Bichat, X.R. Leännec, J. Gavarret (6), and P.C. A Louis (5), to the radical therapeutic nihilism of the outstanding Viennese physicians K. Rokitansky, J. Skoda, and J. Dietl. These latter physicians stopped using usual methods of treatment because of their lack of effect on pathological modifications of tissues (7). Further development of basic medical sciences and their successful application was reinforced by the general intellectual climate of that time - positivistic cognitive optimism.

#### Main Features of the Popular Approach to the History of Medicine

The revolutionary shift in the perception of medicine delineated the history of medical thought into two sharply distinguished stages: the "dark" pre-scientific period when rare successful cases of treatment happened only by pure chance, and the unbiased scientific era with its therapeutic methods established on the firm ground of objective results of exact sciences. As a logical consequence of such a division, re-evaluation of the whole therapeutic heritage took place. Facts from the past, compatible with the updated standards of knowledge, were selectively chosen and extracted from their real context. Their role was overestimated and the importance of other facts was depreciated. Ivan Illich (8) illustrated the overestimation of medical treatment of contagious diseases: "The combined death rate from scarlet fever, diphtheria, whooping cough, and measles among children up to 15 shows that nearly 90% of the total decline in mortality between 1860 and 1965 had occurred before the introduction of antibiotics and widespread immunization".

Overestimation and underestimation applied also to historical figures: great inventors of the past frequently died unnoticed in their time, and their authentic influence was seen only from a temporal distance, and the other way round -- many undeserving historical figures were appreciated by their contemporaries. The image of the past is designed from the point of view of the present, and the contemporary socio-cultural and intellectual context is imposed on historical circumstances. Thus, such an image is far from the real state of affairs and has often other implications than purely scientific (the case of the so-called "scientific world view" in Marxism may serve as an illustration of a misuse of history for political and ideological reasons). Such a deformation of mankind's intellectual history, in which sparse seeds of truth, although hardly noticed against the background of false authorities, lead directly to further discoveries and finally to the present state of knowledge, could be term "presentism". In English tradition, a similar approach is usually called "whig interpretation of

history" (9,10).

#### Presentism

Presentism has got its intellectual grounding in the prevailing conviction that the present knowledge, in contrast to its previous forms, brings an objective and adequate description and explanation of the reality. We are now able to comprehend reality as it really is, in its very nature, not as a reflection in an uneven mirror of erroneous presuppositions and delusive convictions of our predecessors. It is objectivism, fundamental for our understanding of science, that is a guarantee and certification of adequacy of our knowledge. By revealing deeper and deeper dimensions of the real world and reaching its hard core, today's scientific cognition replaces spurious conjectures and fallacious hypotheses with the knowledge based on true facts and permanently verified. We can call this certificate of certainty "naturalism", as the ultimate nature of reality is reached by the knowledge at stake.

#### Naturalism

Naturalism and presentism refer to the dynamic development and enormous growth of natural sciences within the last few centuries. The turning point in their development was the introduction of quantitative methods. Only those things that were at least virtually measurable and countable, became justified objects of scientific cognition. This, in turn, introduced mathematics in the process of structuring the theories that striven to describe and explain the reality. Consequently, the discovery that nature is countable and measurable was such a strong impulse for natural sciences that it became a hallmark of scientificity in general. The apprehension of this fact was so widely shared by scientists and philosophers in the seventeenth and eighteenth centuries that Kant used the term *Mathematische Naturwissenschaften* as a proper name for natural sciences (11). Perfect mathematization of physics in the nineteenth century, which resulted in a rapid progress of physical theories, put a request on other branches of natural sciences to follow methods and theories taken from it. This process culminated at the beginning of the twentieth century when the neo-positivistic philosophers from the Vienna Circle (*Wiener Kreis*) postulated physicalization of all sciences (making them physics-like in methods and translating all their concepts into physical concepts). They limited the domain of justified knowledge exclusively to those scientific branches that could conform to these procedures (12). "Vienna Circle" consisted of Austrian philosophers and scientists (including, among others, R. Carnap, M. Schlick, and O. Neurath) who, in the 1920s and 1930s, presented and promulgated a very radical program of establishing natural sciences on the concepts and methods of modern physics and inductive logic. Although their program failed, its influence on many fields of natural sciences is still noticeable.

Basic medical sciences entered this road during the nineteenth century, and achieved most of the results in our century. Thus, it does not seem strange that the controversy of the nature of medicine, i.e., whether medicine is a science or a practical art of healing based on cumulated therapeutic experience of human species merely contingently bound with science, was finally settled for on side of science (7,13). This image of medicine became dominant and is still commonly shared by both the majority of contemporary physicians and the patients. It refers to all branches of medicine including those that require additional, practical abilities (like manual abilities in surgery), because it is believed that these practical abilities can be adequately developed only on the ground of scientific knowledge.

#### Philosophical Critique of Science at the Beginning of the Twentieth Century

Shaped in a positivistic view, the model of natural sciences as exact sciences was subjected to a very strong philosophical critique already at the turn of our century. Henri Bergson (14,15) criticized the distortion brought about by the rational reconstruction of the real world; by schematization of what was originally unprecedented, thus missing the uniqueness of each fact; and, above all, by the loss of attention to the most constitutive feature of reality – its durability (*durée*). French conventionalists, like Henri Poincaré (16,17) or Pierre Duhem (18), criticized the empiricism of our understanding of the world. They claimed that reception of pure facts was impossible because the science had to deal with what was a particular construct, made in accordance with a set of previously accepted theories. Hence, pure, unmediated empirical facts were inaccessible to our cognition. The best critique of empiricism was given by Edmund Husserl in his book "The Crisis of European Sciences and the Transcendental Phenomenology" (19), where he questioned the very idea of quantification of reality. In his view, natural sciences are an exact but one-sided and partial mean of comprehension of the real world, enabling man to manipulate the reality. Because of this one-sidedness, natural sciences cannot understand the whole reality. One-dimensional scientific/technological approach to the world does not allow capturing of the aspects of the real world that cannot be counted and measured. However, rapid development of knowledge in natural sciences and the enormous growth of technical capabilities of manipulation with worldly objects that followed, significantly decreased the relevance of

such a critique.

#### Philosophy of Science in the Twentieth Century

The deconstruction of the scientific/technological knowledge continued in the philosophy of science in the twentieth century (20,21). Karl Popper (22,23), Thomas Kuhn (4,24), and Imre Lakatos (25,26), and the works of their followers disclosed and meticulously examined, all overt and hidden metaphysical, epistemological, and ideological presumptions of science and their methodological standards. They deepened the critique of the concept of fact put forward by French conventionalists (4,22-26,28). They also criticized the basics of the positivistic view – priority of facts to theories, and challenged it in both genetic sense (a pure fact as such does not exist but is a result of expectations or predictions stemming from the given theories) and logical sense (a fact is a theoretical construction derived from these theories) (22).

In Popperian falsificationism (or fallibilism), a theory is scientific only if it provides a possibility for the existence of new, still undiscovered facts, including those that might falsify the proven theory (22,23). This means that the development of science does not proceed by generating universal rules from a set of particular events or observations, using inductive procedures. On the contrary, it is based on deductive reasoning followed by matching the known facts to the previously presupposed statements. Scientific fact is a set of quantitative parameters of a real event, which are significant from the angle of a given theory or statement, i.e., the set of those parameters that, when approached from the point of view of exact science, can be expressed by a mathematical formulation. Such picture of a real phenomenon is essentially nothing but its more or less simplified model, far from its entire complexity (27). Moreover, there is no sufficient justification that the given features of a fact are substantial for it; they are significant only from the investigator's perspective, and subsequently, from the point of view of its usefulness to the entire human species. Science is thus ultimately proper to adaptive strategy of the human race, leading to survival of a whole species, claimed Popper (23). Models are created not with regard to real relations that exist in nature, but are taken from the cultural legacy of the mankind, myths, beliefs, formerly rejected theories, and metaphysical convictions – all that contained within Popper's "third world" (22)

Individual scientific theories cannot be taken as equivalent or independent from each other. This means that the rejection of one theory has consequences to other theories connected to it. Theories create hierarchically ordered explanatory systems, called "scientific research program" by Lakatos (25) or "paradigm" by Kuhn (4). Defensive strategies undertaken to protect theories and their systems from rejection encompass a wide range of different actions, from ignoring unsuitable facts, and considering them as anomalies, to adopting additional ad hoc hypotheses only to absorb such facts and neutralize their potentially dangerous output. Further step is making deeper modifications of the hard core of the system, and rejection of the whole system (program, paradigm) is used only when everything else fails. However, even then there is an additional but relevant condition - preliminary structure of a new challenging system must emerge. Such a replacement of one system by another takes place in the scientific community and resembles sociologically a process of revolution rather than a change stemming from logical necessity and evoked by purely rational causes (4). Thus, neither a comparison between different theoretical systems nor translation of a given theory taken from one system to another is possible. This is because even the same terms have different, contextually influenced meanings in different theoretical contexts, and are therefore incommensurable. The question of incommensurability of theories was discussed particularly by Kuhn and Feyerabend (4,24,28). The most famous example they used was the problem of the concept of mass in Newtonian physics on one side and the relativity theory on the other. From the mathematical point of view, there is a transition from the first theory to the second, but the concept itself is intransducible because in the first case it is bound to the absolute space and time, whereas in the second it is always relativized to the frame of reference.

The described character of the scientific knowledge makes the claim for validity and the truth of this knowledge somehow illusory. If there are no means to compare theories and if the only way of preferring one to another is its higher acceptance within the scientific community, the truth itself is relativized to a given sample of scientists and may change with any change within this sample. Even the sole concept of truth as a cornerstone of any knowledge and the criterion that verifies both theorems and research methods leading to scientific discoveries is put in doubt (4). The only surviving rule making it possible to choose between competing theories becomes a substantially anarchistic principle proposed by Paul Feyerabend: "anything goes" if it brings practical results, i.e., if the outcomes achievable by accepting this particular theory outweigh the results stemming from others (28).

Finally, the myth of a continuous, cumulative, and linear development (i.e., progress in a popular sense) of scientific knowledge is questionable. This development is to a very large extent influenced

and conditioned by metaphysical and ideological convictions - frequently deprived from rationality – as well as by aesthetic delights or pragmatic choices (4,28). Therefore, scientific rational attitude turns out to be nothing but a “rational belief” as proposed by social anthropologists (29), and does not differ much from other kinds of culturally and ideologically influenced attitudes.

#### Philosophy of Medicine and Bioethics

Philosophy of medicine and bioethics are not distinguished in this article. Both terms are used interchangeably to indicate the special form of philosophical criticism considering modern medicine, which appeared some 30 years ago (30-33).

Recent developments in the philosophy of medicine and bioethics became a challenge to the biomedical model, taken as a quintessence of the scientifically influenced comprehension of medicine and its goals in the social life. What is essential to this model is that it is unable to apprehend a human being in his/her individuality and the uniqueness of his/her illness. A patient is nothing more than a “disease case”, a trigger of a given “disease unit”. The disease is the exclusive matter of interest and intervention of a physician, who should only recognize and fight a disease, and nothing else. A person with his/her illness is principally beyond the focus of physician's attention. A disease, but not an illness, is the subject of action and as such is reduced to its somatic dimension because nothing but a body is what is measurable. The psychological, mental part of the human being may undergo medical intervention if and only if its change results from a physical cause or is, at least, somehow translatable into physical terms. A reverse relation, the influence of psyche on soma, is paradigmatically impossible and as such is not a subject of theoretical reflection. These points culminate in the theoretical concept of diseases as an objectively described state of a bodily dysfunction, primarily free from any evaluation (34-36). For the opponents of this model, a disease should be evaluated by the virtue of its very essence and thus is substantially normative (37-41). If we accept this argumentation, normativeness of a given concept excludes scientificity as it is understood in the positivistic approach. The famous postulate of Wertfreiheit – value-free science as a *conditio sine qua non* of any science, was formulated by a German sociologist and philosopher Max Weber (42). Thus, the controversy concerning the real nature of medical endeavor and the discussion whether medicine is a science or an art of healing has returned to present-day debates over medicine.

All weak points of scientific approach to medicine are concentrated in the biomedical model of the disease. Aspiring for a status of natural science, it has to accept - with the entire set of consequences - limitations of natural sciences and their commonly shared presuppositions, all the so-called tacit knowledge (43) of modern Naturwissenschaften. These limitations, such as focusing attention only on what is quantitative and measurable, or compulsory reduction of all complexity of a human being to its somatic dimension, have significant compensation in rather high and still growing efficiency of its practical applications. At the same time, such a perception excludes the most essential spheres of human existence from the domain of valid scientific cognition. Cognitive certainty, reinforced by a practical efficacy, also turns out to be susceptible to doubts when one takes into consideration an inexorably “modelling” character of any kind of empirical knowledge and inherent arbitrariness corrected with it. Cumulative continuity of the development, which serves as a basis for evaluation of the past achievements of sciences from the present point of view, is also dubious. Common approach to medicine and its history, where a sharp distinction is made between the pre-scientific period of superstition and delusions and objective period of a scientific progress, becomes naive and full of illusions and prejudices that usually remain overlooked.

#### Common Task of Philosophy of Science and the History of Medicine

It is the task of philosophy of medicine, already started but still far from reaching satisfactory results, to identify and analyze the foundations of our present understanding of medicine. History of medicine seems to be inevitable tool for this task. The past is usually examined to get a better comprehension of the present and a clearer look into the future. By revealing all theoretical and ideological premises of our perception of the world, a philosopher and a historian of medicine can – in a concerted action – help us in our self- liberation from at least a part of those illusions we maintain about our present intellectual achievements. They can help us understand more profoundly the very sense of what we exactly do. Imre Lakatos says: “Philosophy of science without history of science is empty, history of science without philosophy of science is blind” (25).

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