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### ABSTRACT:

This article examines the parallel histories of medicine and history to about 1450. They emerged together as part of the shift from poetry to prose in Greek culture in the fifth century BC. They each pursued similar strategies of observation, compilation, and analysis. Hippocratic medicine provided a paradigm for Thucydides' development of analytic history. Medicine was further systematised by Galen in the second century AD.

After the collapse and division of the Roman Empire, the *Dar al-Islam* became the main area of intellectual advance. Its scholars had little interest in Graeco-Roman historians, but they translated and used the scientific and medical writers. In both history and medicine they tried to create sciences based on Aristotelian philosophy. The article looks in particular at Avicenna's attempt to reconcile Aristotle and Galen, and compares this with the eighteenth century debate between preformationists and epigeneticists. It emphasises the need to look at such arguments in the context of their times, and notes the continuing tension between the simplicity of theory and the messiness of data.

The transfer of learning from the *Dar al-Islam* into Western Europe paralleled that from the Graeco-Roman world into the *Dar al-Islam*. Again, historical writing was overlooked, but philosophical, scientific, and medical writers were translated. They would be the basis for the development of modern science.

**Key words:** History of Medicine, Hippocrates, Herodotus, Thucydides, Aristotle, Galen, Avicenna.

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### **History and Medicine in History, 450BC – 1450 AD**

Philosopher/historian of science Thomas S. Kuhn has noted a striking difference between the training and therefore the outlooks of those in the natural sciences and those in the humanities. For natural scientists “textbooks are systematically substituted for the creative scientific literature that made them possible” [1]. The great figures of the past are by no means ignored, indeed they are venerated, but for their input into the existing paradigms of what Kuhn calls “normal science”. The student of natural science is seldom required to read the actual works of, say, Newton, Faraday, or Einstein, and certainly not those of the scientists whose ideas they pushed aside and replaced. By contrast the student of the humanities rapidly moves beyond the textbook to the works which the textbook summarises and discusses. Whereas natural scientists read about Galileo and Galen, humanists read Shakespeare and Sophocles. Historians are quickly taught to move away from derivative “secondary” sources to “primary” ones, the documents and artefacts of the time we are researching. On that basis each historian reconstructs the past and tries to convince others of the plausibility of that reconstruction.

This difference in training means that natural scientists are seldom conscious of the intellectual world in which the great figures of the past operated and of the inwardness of the controversies in which they were involved. An historian interested in the mechanisms of intellectual development, and particularly in how one set of ideas is displaced by another may therefore be able to look at early medicine in a different way from a current practitioner, but, I would hope in a way which he or she may still find interesting. What we may broadly call the western world derives intellectually, and has a consciousness of deriving, from the classical civilisations of the Mediterranean basin. History and medicine emerged together and interacted fruitfully. They are the earliest products of Greek prose. Before their emergence the Greek world had been mythological and had expressed itself in poetry of great beauty and power. Prose marked a new approach to the world: questioning, investigative, and sceptical. In the second half of the fifth century BC Hippocrates emerged as the “Father of Medicine” promoting an approach which tried to explain health and disease as natural phenomena. At about the same time Herodotus began his “investigations” – the Greek word is *histories* – which won him the title “Father of History”. No other disciplines know their own fathers so well.

Hippocrates was the “Father of Medicine” largely because he established a profession of healers bound together by the famous Hippocratic Oath. The works ascribed to him were in fact written by several authors over a long period of time. His school worked within a tradition which saw health and illness in terms of balances or imbalances between, especially, the four bodily fluids (*khymoi* in Greek, translated into Latin as *humores*): blood, phlegm, bile (*khole*), and black bile (*melankhole*). Hippocrates himself seems to have been little interested in such theories. He and his followers recognised that diseases might have many causes. They emphasised instead careful observation, compiling case histories, and developing effective practices.

While doctors continued to revere Hippocrates, historians, by contrast, largely disavowed Herodotus. His prose style was admired for its clarity, its simplicity, and its effectiveness. When his *Histories* came to be divided into nine books, each was given the name of one of the Muses. Very unusually for a Greek historian, all nine books survive complete. Nevertheless, his ready acceptance of what were often tall tales from distant lands was dismissed as credulity; his willingness to consider non-Greek viewpoints was scorned as softness to barbarians by an increasingly xenophobic culture, while his lack of intellectual rigour

was apparent to all. A generation later Thucydides announced a new approach: “The absence of romance [*mythodes*] in my history will, I fear, detract somewhat from its interest; but if it be judged useful by those inquirers who desire an exact knowledge of the past as an aid to the interpretation of the future, which in the course of human things must resemble it if it does not reflect it, I shall be happy” [2]. That medical science was his paradigm for this new history appears from the introduction to his account of the plague of Athens of 430 BC: “All speculation as to its origins and causes, if causes can be found adequate to produce so great a disturbance, I leave to other writers, whether lay or professional; for myself I shall simply set down its nature, and explain the symptoms by which it may be recognized by the student if it should ever break out again” [2]. Both in history and in medicine, accurate accounts of relevant phenomena are seen as essential for taking right decisions in the future. Thucydides’ account of the collapse of trust and of social relations in the plague is closely paralleled by his description of a similar breakdown during the violent revolution in Korcyra (Corfu) in 427 BC. War and disease are presented as similar phenomena to be analysed in a similar manner. History is the product of human nature, which can best be understood by its pathology.

Thucydides is generally recognised as having been the greatest analytic historian of classical antiquity. His work was unfinished, but, as with Herodotus, all of it survives. He continues to inspire the “realist” school in the modern discipline of International Relations. While Thucydides overshadowed his successors, medicine developed beyond Hippocrates. Aristotle in the fourth century BC systematised many of what we would now call the scientific disciplines. Whereas his philosophical predecessor Plato had looked to mathematics, especially geometry, for paradigms, Aristotle looked to biology, especially embryology. He was particularly interested in questions of growth and development, building up a model of a purposeful, teleological universe.

The Greek world would eventually be incorporated into the political structure of the Roman Empire. Nevertheless, Greek, rather than Latin, remained the language of intellectual endeavour. The medical tradition culminated in the work of Galen in the second century AD. He saw himself as the systematiser of medicine, laying out the subject like the roads of the Empire, and connecting it to logic, physics, and ethics. In an age where Neo-Platonism dominated philosophy, he readily linked the characteristics of the body (microcosm) with

those of the universe (macrocosm), establishing paradigms which would last for more than a thousand years. He developed the system of the four humours, paying particular attention to blood, which in its venous form came from the liver and in its arterial form from the heart. The balance of health might most often be restored by blood-letting, which for almost two thousand years would be seen as the equivalent of taking a couple of aspirins. Improved knowledge of anatomy led Galen to reject the Aristotelian view of the primacy of the heart, and to ascribe comparable roles to the liver and to the brain.

After Galen the Roman world divided. Always intellectually lagging, the Latin west underwent barbarian invasion and almost complete cultural collapse, as knowledge of Greek was lost. Graeco-Roman civilisation survived in the east, where the Roman Empire, now based on Constantinople, continued, but where the southern portion was incorporated into the Arab Caliphate. For almost a millennium this would be the most dynamic area of intellectual advance. Historians, especially historians of science, and even more historians of medicine, know this well; but it is only dimly, if at all, perceived by the wider public. There is also a problem with terms. Writers refer either to the “Arab” or to the “Islamic” world, but the *Dar al-Islam*, like the Roman Empire, but

unlike Western Europe, was a multicultural world. Very few of its leading thinkers were in fact Arabs; many were Persian. Islam was indeed the dominant religion, but by no means the only one. Christians and Jews remained, and contributed to the development of the civilisation. Thinkers in the *Dar al-Islam*, like those in Christendom, had to reconcile the claims of a revealed monotheism with a heritage of secular learning which had emerged in a polytheistic culture.

There was a tension, often creative, between the demands of theology and the conclusions of *falsafa* (philosophy). To speak of “Islamic science”, or “Islamic medicine”, is therefore misleading. The historian Marshall Hodgson has proposed the term “Islamicate” [3]. Though this has so far failed to catch on, I shall make use of it.

Whatever terms are used, the scale of cultural transfer was astounding. To a large degree it was promoted by the Caliphs of the ninth century, especially al-Mamun with his House of Translation, *Bayt al-Hikma*. The process was selective. The translators were not interested in Greek literature or Greek historiography. Homer and Herodotus did not pass into Arabic. History writing in the *Dar al-Islam* was essentially a new departure. Instead it was the works of philosophy, science, and medicine which

were translated, assimilated, and made the bases of fresh intellectual advance.

Islamicate thinkers sought to develop new sciences, providing philosophical backing for studies which previously had been, or were seen as having been, excessively empirical. Writing in the late fourteenth, early fifteenth centuries ibn Khaldun contrasted a surface history which elegantly presented information about events in the remote past with a different kind of history which “involves speculation and an attempt to get at the truth, subtle explanation of the causes and origins of existing things and deep knowledge of the how and why of events” This would be rooted in philosophy and be a branch of it, dealing with big themes such as “the origin of races and dynasties, the synchronism of the earliest nations, the reasons for change and variation in past periods and within religious groups; also concerning dynasties and religious groups, towns and hamlets, strength and humiliation, large numbers and small numbers, sciences and crafts, gains and losses, changing general conditions, nomadic and sedentary life, actual events and future events – all things expected to occur in civilization” [4].

Ibn Khaldun’s history was grounded in Aristotelian philosophy. So also was the medicine of the *Dar al-Islam*. The eleventh

century thinker ibn Sina, who is better known in the west as Avicenna, tried to reconcile what he saw as the essentially empirical work of Galen with the natural philosophy of Aristotle, of which he was an authoritative exponent. His task was complicated by the fact that Galen's knowledge of anatomy was clearly far superior to that of Aristotle. Both for Aristotle and for Avicenna, questions of reproduction were central, as it was through reproduction that animals came to be organised. Embryonic development was therefore the key to a deep understanding of biology.

Reproduction had long been controversial. As offspring obviously had resemblances to each of their parents, Hippocrates had argued that seed was generated both by males and by females. Aristotle rejected this. Heat was central to his analysis. He believed that women were cool and wet. They could provide passive material, which he identified with menstrual blood. The active, organising principle came entirely from the man through the semen, a blood residue which could be created by the male's superior heat. The ovaries had been discovered by the time of Galen, who saw them as female testicles. Therefore, he argued, both men and women could produce semen as a blood residue, and each contributed to the foetus. Avicenna had to accept Galen's anatomy, and with it

the idea of female semen, but insisted that this had only a passive role. For medicine to be properly scientific, natural philosophy had to trump observation. With ibn Rushd (known in the west as Averroes) in the thirteenth century, Aristotelian orthodoxy on reproduction was taken further: ovaries were as functional as male nipples. There could be no active female principle in reproduction.

It is all too easy to jeer at the parties to debates based on premises and paradigms which we now know to be false as the result of greater empirical knowledge. Arabic litterateurs had great fun with Aristotle's belief that testicles functioned as pulleys. Even more dangerous is the distortion that results from using hindsight to pick winners and losers based on superficial similarities to our own understandings. This is why we need historians of science. Embryology involved deep questions about phenomena which were difficult to observe even with instruments such as microscopes, which were developed from the seventeenth century. European scientists in the eighteenth century divided themselves between preformationists, who believed that all structures were present in the embryo from the beginning, and epigeneticists, who believed that structures differentiated themselves out of an initial simplicity. Preformationists found themselves

committed to the conclusion that all subsequent embryos had to have been contained inside the first human egg or spermatozoon. Several claimed to have seen such homunculi nestled within spermatozoa or ova. As the ovum, was not discovered until 1826, the "egg" they were examining would have been the Graafian follicle. Epigeneticists, on the other hand, could explain the process of differentiation of structures only by invoking a rather mysterious "life force" As Stephen Jay Gould has pointed out, without a conception of coded instructions, eighteenth century biologists could not see that it was programmes rather than parts or forces which were transferred from one generation to the next [5]. Scientists of the *Dar al-Islam* did not have microscopes. They did have different paradigms from those of eighteenth century Europe. But two aspects of the problem were the same. One was the technical question of the role of the sexes in reproduction. Did males provide the crucial organising principle, as argued by Aristotle, his Islamicate followers, and preformationists seeing homunculi in spermatozoa? or did something equally important come from the female, as argued by Hippocrates and Galen? or was it all female, according to preformationists who looked at what they thought was the egg? If active principles came from each sex, how could they be so successfully combined in

the embryo? The second question involved the balance between theory, which seeks simplicity, and the messiness of empirical data. We may now have the concepts to deal with the first question, but the second will remain as long as men continue to look at the world and try to make sense of it. In the *Dar al-Islam*, *falsafa* had often been regarded with suspicion as a threat to religious orthodoxy. After, roughly, the time of ibn Khaldun it lost its vigour. By then its creative impulse had stimulated western Christendom.

The incorporation of Graeco-Roman science into the *Dar al-Islam* was paralleled centuries later by the transfer of Islamic learning into Western Europe. Unlike the earlier process, this owed little to the initiative of rulers. From the eleventh to the thirteenth centuries individual western European scholars journeyed to southern Italy and to Spain to acquire and translate Arabic manuscripts. They started the process of intellectual revival and development which has continued to the present day. As with the earlier process, the transfer of culture was selective. Western European had no interest in Arabic literature or historiography. Ibn Khaldun would not be known in the West until the nineteenth century. Admittedly, he wrote almost two hundred years after Western scholars had stopped reading contemporary Arabic

writers, but they might have translated some of the great historians of the eighth to tenth centuries whom ibn Khaldun would acknowledge as masters and whose tradition he sought to revive: ibn Ishaq, at Tabari, and al Masudi. They did not do so. The development of historiography in the west would owe nothing to the historians of the *Dar al-Islam*. In fact ibn Khaldun remains the only one of those historians whose work is easily available in English. Compared with the ready accessibility of classical Greek and Latin writers this constitutes a serious cultural weakness and an impediment to popular understanding of the development of our intellectual tradition.

What did pass from the *Dar al-Islam* was philosophy, natural philosophy (what we would now call science), and, outstandingly, medicine. Islamicate Aristotelianism posed a major challenge to Western Christendom, which was intellectually Platonic insofar as it was anything. Christianity emerged in a Neo-Platonic world and is most readily compatible with it.

The attempts of St Thomas Aquinas to reconcile revealed monotheism with Aristotle's philosophy followed in the tradition of the *faylasufs* (philosophers) of the *Dar al-Islam*: al Kindi, al Farabi, ibn Sina, ibn Rushd, and the Jewish ibn Maimun (Maimonides). The impact of

Islamicate medical thinking on the West was, if anything, even greater. It would remain authoritative until well into the eighteenth century. Arabic, along with Latin, and later on Greek, was recognised as one of the major languages of scholarship. Like Plato (Platon), Aristotle (Aristotles), and Ptolemy (Ptolemaios), the names of the major Arabic writers were bent into forms convenient for western Europeans: Rhazes (al Razi), Avicenna, Averroes, Avenzoar (ibn Zuhr). The acclimatisation of these names shows how central the thinkers of the *Dar al-Islam* were to us.

To carry this discussion forward into the European Renaissance and beyond would produce either a sweeping, superficial account, or a dull plod through facts and dates. In general we may note that medicine has subdivided itself into many disciplines, and in so doing acquired greater rigour. At first this had little effect on its efficacy. In the mid nineteenth century the English novelist Trollope gave his characters a choice of Doctor Philgrave and Doctor Killchild [6]. A stroll through any Victorian cemetery shows how right he was. Therefore this would be a golden age of quackery and snake-oil salesmanship, which indeed pioneered modern advertising techniques. A century later scientific medicine could at last cure diseases, but many in the wider society would worry that it ignored the patient as an

integrated human being. Such worries have partly fuelled the remarkable growth of “alternative medicine”.

The expansion and subdivision of medicine has contrasted with shrinkage of history. New disciplines emerged – economics, sociology, political sciences, international relations – each asserting an intellectual rigour which, it was claimed, history lacked. Partly in response, history tried to be “scientific”. There was even cliometry, which appeared to show, through the use of sophisticated statistical techniques, that American slavery was not oppressive – on average slaves were likely to be whipped only once in their lifetime –, and railways contributed little to nineteenth century economic development. Despite this, history still appeared somewhat as an elderly poor relation among the social sciences. As science lost its prestige by the 1980s, many historians took a “linguistic turn”, looking towards the humanities and especially to literary analysis in which examination of texts trumped whatever problematic reality old-fashioned historians might want to see behind them. Despite the obvious excesses and absurdities, which are so easy to caricature, “scientific” and “literary” approaches have each enriched and

continue to enrich our understanding of history.

Nevertheless, the core of the discipline remains the process of investigation and analysis which emerged with Hippocratic medicine in the fifth century BC.

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