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# Archery, mathematics, and conceptualizing inaccuracies in medicine in 13th century Iraq and Syria

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## Abd al-Latif al-Baghdadi

Abd al-Latif al-Baghdadi was born in March 1162 in his grandfather's house in a street called Darb al-Faludhaj in Baghdad. He died there on 9 November 1231, and was buried in the Wardiyah cemetery next to his father, Yusuf.

Abd al-Latif travelled extensively and spent a large part of his life in Aleppo, Cairo and Damascus, all three of which were important intellectual centres in the medieval Islamic world. Under the supervision of numerous famous teachers, he first studied introductory subjects – such as Arabic grammar, lexicology, and poetry – and later traditional (Islamic) and ancient (foreign) sciences. The former included law, jurisprudence, and hadith (the utterances of the Prophet Muhammad); the latter dealt with mathematics, medicine, and philosophy.<sup>1</sup>

Abd al-Latif had a strong preference for the ancient Greek physicians (Hippocrates, Dioscorides, Rufus of Ephesus and Galen). But he also clearly respected some Arab physicians, such as Ibn al-Tilmidh and Ahmad ibn abi l-Ashath, and cherished two Arabic medical handbooks in particular – the *Small Compendium* (al-Kunnash as-saghir) by Yuhanna ibn Sarabiyun, and *The Hundred Books on the Medical Art* (al-Kutub al-mi'a fi al-sina'a al-tibbiya) by Abu Sahl al-Masihi. He had a high regard for al-Razi's *Comprehensive Book of Medicine* (al-Kitab al-Hawi fi al-tibb) (al-Razi 10th century) and other works by that author, and he drew extensively on al-Razi when composing his treatise on the disease now called diabetes (Fi l-marad alladhi yusamma diyabita).<sup>2,3</sup>

Abd al-Latif was able to concentrate on textual research and teaching without being bothered too much by the 'annoyances' of the practical side of medicine because he received ample royal patronage from Sultan Saladin and other Ayyubid rulers. In Abd al-Latif's eyes, the most excellent scholars earned the right to be granted this kind of remuneration in order not to have to follow the 'basic' occupa-

tions. In this sense, he reflected Aristotle's view, expressed at the beginning of the *Metaphysics*, that the highest level of intellectual activity is that which is free from material concerns and devoid of practical considerations and applications.

## The Book of the Two Pieces of Advice

Most of Abd al-Latif's medical oeuvre is lost today, but we are fortunate that a number of interesting and important medical works by him survive. We have discussed these in more detail elsewhere.<sup>4</sup> Here we concentrate on the treatise selected for inclusion in the James Lind Library: *The Book of the Two Pieces of Advice*.<sup>5</sup> This book was probably written in Aleppo, Syria, during the years 1216–21, but may have been composed in the Anatolian city of Erzinjan sometime during the 1220s. It is an extensive diatribe directed against 'false knowledge', which, according to Abd al-Latif, was even worse than ignorance. As the title suggests, the book is divided into 'two pieces of advice': 'advice' for would-be physicians, and 'advice' for would-be philosophers. Both incur Abd al-Latif's scathing criticism and find themselves lambasted in no uncertain terms.

## The passage

Greek physicians eagerly debated questions about medical epistemology and the basis of medical knowledge. The concepts of hidden causes, substitution of drugs and treatments through analogy, experience, and the use of reason already figure prominently in Greek debates about medical epistemology.<sup>6,7</sup> Abd al-Latif discussed some of these concepts in his *Book of the Two Pieces of Advice*. In one passage, Abd al-Latif employs a number of comparisons to illustrate both the high standing of the art of medicine, but also its inexact nature. He

website (www.jamesindlibrary.org), where it was previously published

first compares medicine with archery, and then, somewhat surprisingly, likens it to mathematics.

*'When the conditions [shurut] of the medical art are fully adhered to, then it never makes a mistake. The intelligent physician only errs occasionally, but gets things right a hundred times, as Galen said. Moreover, his mistake will be neither decisive nor great nor far from what is correct. One can compare him to an expert in archery who mostly hits the mark, and when he misses then it [i.e. his arrow] will not be far off, but it will rather land near [the target]. But in the event of the arrow falling entirely in the opposite direction, then [this is like] a physician committing an error.*

*I shall give you as an example the surface of the circle or a square root such as that of [the number] ten. Someone skilled in this art determines this [irrational number] as closely as possible, and will tolerate [only] the smallest part [of error], the difference of which is not apparent to sense-perception; however, it is not equivalent to a small difference for the intellect [that is, the error cannot be perceived by the eye, but by the intellect]. Such a solution is deemed to be correct, even if a certain tolerance is present in it, provided that it does not exceed a part [that is, an amount] which basically does not count. As long as the part which one tolerates [that is, the margin of error] is small, the solution is quite correct, and the person arriving at it is quite skilled. Therefore, artful conjecturing in medicine is similar. Yet what is different to this [small amount of error] is evidently an error, and those who commit it are not deemed to belong to those exercising the art [of medicine]. Likewise, if someone says that the square root of ten is three, he cannot be counted as an arithmetician, and his words cannot be accepted. This is also valid for those who are in the same situation, namely those who claim to master the art of medicine without [actually] being a physician.'* [folio 64a14–65a1]<sup>5</sup>

## Commentary

In medieval philosophy, two topics closely linked to each other were eagerly discussed. The first was that of matter and form; the second that of the general (or universal) and the particular. Plato believed that the world which we see and in which we live is derived from a world of ideas. The ideas are real, but our world is a mere shadow, a figment of our imagination. Aristotle, Plato's pupil, took the contrary position: for him, all objects are

composed of matter and form, but form (Plato's idea) has no independent existence from matter. For Plato, to arrive at the highest form of knowledge is to contemplate the ideas, particularly the highest idea, that of the perfect good (*to agathon*), comparable to the perfectly beautiful (*to kalon*). For Aristotle, one had to proceed from individual instances (the particular) to the general.

In the first part of the quotation above, Abd al-Latif makes the point that, insofar as medicine is an art (*sina'a*; Greek, *techne*) concerned with universals, it does not make mistakes. Rather, it is individual practitioners of this art, physicians, who inevitably make mistakes, since they are concerned with particulars; and particulars are by nature imprecise and prone to variation. To put it differently, medicine can correctly describe general principals, although concrete, individual practitioners will still, of necessity, make mistakes when applying them. The fault does not lie with medicine as such, but

- (a) With the particular circumstances which may be too complex to be fully encompassed by general principals; and
- (b) With the practitioner himself, who, as an individual human being, makes mistakes.

His examples in this context are quite unique in that we know of no Greek antecedent where medicine is compared either to archery or to mathematics in this way. Among the different branches of science, mathematics deals with abstract concepts. But even in this most theoretical science, imprecision and insoluble problems occur. It was well known that one cannot square a circle – that is to say, that one cannot geometrically construct a square which has the same surface area as a given circle. Moreover, irrational numbers cannot be expressed as a ratio of two integers, and when expressed decimally are infinite and non-recurring (i.e. after the decimal point, a never-ending sequence of digits follows which has no distinguishable pattern). In other words: when one writes down an irrational number, one can only give an approximation. Examples of irrational numbers include  $\pi$  and the square root of 10 – incidentally,  $\sqrt{10} \approx 3.162$  is often used as an approximation of  $\pi \approx 3.142$ .<sup>8</sup>

Abd al-Latif adduces these examples to illustrate that, in this respect, medicine resembles mathematics. Sometimes one can only give an approximation, and the competent mathematician, like the good physician, will arrive at a fairly good approximation, whilst incompetent ones will be

far off the mark, to use Abd al-Latif's earlier image. Thus inaccuracies in mathematics are compared to inaccuracies in medicine.

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