

Meton of Athens was one of ancient Greece's more renowned astronomers and geometers. In 432 B.C., he used a sundial to calculate the precise date of the summer solstice. Ancient sources report his date as the 28th of June, and modern astronomy can confirm the date as accurate (to be precise, the solstice occurred at 2:36 a.m.). Knowing then the precise length of the *solar* year, and knowing from other sources the precise length of a *lunar* month (the period required for the moon to go through all its phases), Meton was able to calculate that 19 solar years were almost exactly equivalent to 235 lunar months, provided that 110 of these months had 29 days, and 125 had 30.

There were good practical reasons why Meton wanted to calculate this equivalence. The calendars of Greek cities were based on the lunar months, with twelve months to the year. People watched the phases of the moon to know where they stood in the calendar. Of course, twelve lunar months do not make up a solar year; there are a few days left over. If this is your system, it doesn't take long before your calendar is seriously out of line with the seasons, and you are celebrating winter festivals in midsummer. To solve this problem, Greek cities (and Rome in a later period) inserted extra, "intercalary" months periodically to make the calendar right. The problem was to know how many months of what length to insert when.

This is where the astronomers came in. There had been other attempts before Meton to discover the most practical way of expressing the relationship between the lunar and solar years, based either on an eight- or a sixteen-year (solar) cycle, but they all ran into problems with odd fractions of days left over. These systems therefore merely postponed the lack of coordination between sun and moon; they did not eliminate it altogether. Meton's system, however, would leave you out by about 7 minutes after 19 years. It would take a very long time before further adjustments to the calendar would be needed.

Curiously, Meton's recommendations did not find immediate favour with Greek cities. In Athens itself there is no evidence that they were ever officially adopted. The reason may have been that, with the length of Meton's months being fixed at 29 or 30, and the actual length of a lunar month being 29.5305941 days, in some months the first day would coincide with the new moon, but in other months it would not. Traditionally Greeks liked to think that a new month began as soon as you spotted the new moon. Another reason for the reluctance to adopt Meton's system may have

been the suspicion many Greeks in his day entertained of sciences such as astronomy. To say that the moon was not a goddess but a lump of rock could land one in court on a charge of blasphemy. Although Socrates had no interest in any of these topics, he knew how dangerous such suspicions could be, however false they might be; in his defence speech of 399 he refers to the widespread misconception that he was interested, like the scientists, in "things above and below the earth." Such prejudices cost Socrates his life.

Apart from the suspicion attached to all scientists, Meton may have had to deal with prejudices about himself in particular. It is a striking coincidence that two comic poets in Athens simultaneously referred to him in plays produced in 414 B.C. — and apparently at no other time. Sharp and unkind satire of prominent public figures was the stock-in-trade of the comic poets, and references to individuals in their plays are a sure sign of notoriety. Any rumours of wrongdoing or scandal would be picked up and amplified a hundredfold before large crowds gathered in the theatre of Dionysos to see the plays. What perhaps began as a quiet whisper, far from dying out harmlessly, would be trumpeted far and wide. Such attacks, however much they were meant in fun, could have quite harmful effects on one's reputation.

What did these poets say about Meton? One of them was Phrynichos, but all we are told by our source is that his play referred to Meton as the man who "brought the fountains in." Although this quotation is disappointingly brief, it is sufficient to suggest that Meton was involved in public works such as constructing the conduits that would bring water from the hills into the city. His geometrical knowledge would have been put to good practical use in surveying. The other poet was Aristophanes, who brings Meton on stage in his play *The Birds*, which we possess complete. In this play, the hero and his sidekick have left the hopelessly corrupt human race to become birds, buying entrance to bird-dom by building a grand city for the birds in the sky. Their former human companions hear of their new life, and want to be part of it. A parade of well-known public figures crosses the stage, only to be ridiculed, satirized and ultimately refused admission to the new city. They must stay behind to live in the wicked world they have created.

One of these figures is Meton. Here is part of the scene (Peisetairos is the hero of the play):

PEISETAIROS (seeing Meton coming with various odd bits of apparatus). Here's more trouble. What is it *you're* up to then? What kind of scheme is this? What's the idea, and all the get-up?

METON. I want to survey the air and divide it up into streets for you.

PEISETAIROS. Lord help us! And who are you?

METON. Me? I'm Meton. All Greece knows me. So does Hill Street.

PEISETAIROS. Tell me, what are these?

METON. Air-rulers. The atmosphere resembles nothing so much as a big oven. So I put my curved ruler here up top, see, and put in my compass — get it?

PEISETAIROS. No.

METON. Then I can measure it by applying the *straight* ruler, so your circle becomes squared, and in the middle there's a market-place, and straight roads leading right into the centre of it; just like a round star, with rays shining straight out in all directions.

PEISETAIROS. The man's a Thales.

"Thales" was a much earlier thinker who by Meton's day had acquired the reputation of an Einstein. Upon delivering this judgment, Peisetairos unceremoniously chases Meton from the stage with his fists. His bewilderment at Meton's confusing demonstration of how to survey the atmosphere is only momentarily a joke at his own expense; the real object of satire is Meton, who is presented as a quack.

The reason why Aristophanes would want to poke fun at Meton is not obvious from the scene itself. Some later sources fortunately provide additional information. It seems Meton's house had burned down, resulting in a serious loss of property. Meton consequently claimed that he and his son were no longer able to meet their obligation to outfit and command a ship in the navy, as the wealthier citizens were required to do. Subsequently a rumour started that Meton had set the fire himself because he was a coward and wanted to shirk his patriotic duty. The ship would have sailed with the great Sicilian expedition in which the Athenians placed extravagant hope. Anyone opposing this enterprise was suspected of being cowardly or traitorous. As it turned out, the expedition met with utter disaster, contributing in no small measure to Athens' eventual loss of the war with Sparta. Whether or not the rumour about Meton's attitude to the campaign was true would be of little concern to Aristophanes and Phrynichos, who would be very happy to exploit his misfortune.

In the scene from the *Birds* Meton plainly has a reputation for expertise in geometry. He appears to refer to the problem of "squaring the circle" that much exercised geometers of the period. The problem is to construct a straight-sided figure that has the same area as a given circle. By referring to it casually Meton probably wants to give the impression that he can solve the puzzle without difficulty — an obvious falsehood. It is interesting too that his surveying skills, which in Phrynichos were applied to aqueducts, are in Aristophanes applied to town-planning. Hippodamos, who had laid out the Peiraeus (Athens' harbour town) on a grid pattern, is the most famous town-planner of the classical period; in this passage we learn that he was not the only one. The old cities of Greece had grown up in a haphazard, labyrinthine fashion; when the chance came along to build from scratch, the natural Greek tendency to think in neat patterns asserted itself in both these builders. In reality Meton was probably a useful man to have around, and a maker of important discoveries; but an unfortunate mishap resulted in a less flattering reputation and an unwelcome kind of immortality in a play of Aristophanes.