

*Decoding the Heavens: Solving the mystery of the world's first computer* by Jo Marchant (William Heinemann, London, 2008) is a book about the *Antikythera Mechanism*.

A recent Greek translation of this book was published together with a list of explanatory or corrective footnotes. The following is an extended list of comments, compiled by members of the *Antikythera Mechanism Research Project*, who were co-authors of two papers about the Antikythera Mechanism in the science journal *Nature*:

**T. Freeth; Y. Bitsakis; X. Moussas; J. H. Seiradakis; A. Tselikas; H. Mangou; M. Zafeiropoulou; R. Hadland; D. Bate; A. Ramsey; M. Allen; A. Crawley; P. Hockley; T. Malzbender; D. Gelb; W. Ambrisco; M. G. Edmunds**, Decoding the ancient Greek astronomical calculator known as the Antikythera Mechanism. *Nature* **444**, 587-591, November 30<sup>th</sup> 2006.

**Freeth, T., Jones, A., Steele, J. M. & Bitsakis, Y.**, Calendars with Olympiad display and eclipse prediction on the Antikythera Mechanism. *Nature* **454**, 614-617, July 31<sup>st</sup> 2008.

## Prologue

p.1 “Three flat pieces of what looks like mouldy green cardboard are delicately suspended inside a glass case.”

The fragments of the Antikythera Mechanism are not suspended, they are supported by stands.

## Chapter 1: I see Dead People

p. 5 (Referring to the sponge divers), “...another crew of Greek sailors was trying to pass Cape Malea, on the way home to The Aegean island of Symi”.

p. 10 “...Captain Dimitrios Kontos and his crew were sailing home...”

p. 11 “The way home took Kontos and his men northeast from Tunisian waters and up to Cape Malea.”

Although Derek de Sola Price (1974) states in his classic work “*Gears from the Greeks*” that the divers were on their way home, this is still an open question: if the discovery took place at Easter (as we read in Price), then the sponge divers had to be on their outward voyage (always starting in spring, ending in autumn). After the 2006 publication of the AMRP, there has been an extensive discussion in Greece about the divers and the circumstances of the discovery. This discussion culminated with an official lecture in the National Archaeological Museum and a special event in the island of Symi.

p.19 “The salvage expedition lasted ten months, until September 1901”

There were two expeditions: One in 1900 and one in 1901

p. 23 “*Emm. Lykudis, one of the archaeologists present*”

The author probably means Emm(aniel) Lykoudis, who was not there as an archaeologist, but was following the expeditions as the legal representative of the Ministry of Education.

p. 26 “One of the divers, Giorgios Kritikos, surfaced too fast and died of the bends, leaving his family without a pension”

“Kritikos” means “Cretan” and this was not an actual surname for the poor diver, but rather a kind of nickname: he was a Turk and ottoman citizen originating from Crete (this people were called “Tourkokritikos” = “Turk Cretan”). So it seems difficult for his family to have an official pension (from which state?), even he had survived.

## Chapter 2: An Impossible Find

p. 47 *“From the scraps of lettering deciphered by Svoronos and Wilhelm, Rediadis suggested that the inscriptions were operating instructions, and put great importance on one particular and very unusual Greek word: Μοιρογνωμόνιον.”*

It is clear from Svoronos’s publication (and later, in Price) that the actual transcription was “gnomo”, wrongly completed by Svoronos (or his colleagues) into [moiro]gnomo[nion] (the “degree scale”). The difference is essential, since the correct reading, “gnomonion”, means “pointer”.

p. 49 *“...but the Sun (because we are going round it) appears to us to move slightly faster than the stars through the sky, gaining on them by a few degrees each day.”*

In fact the Sun moves in the opposite direction relative to the stars. In addition, if the Sun moved “a few degrees per day”, the year would be very short. It moves 360° in about 365¼ days—in other words, just under a degree per day.

p. 51 *“More fundamentally, although astrolabes had scales and pointers, they didn’t have any need for gearwheels”*

Although for their primary function astrolabes do not need gearing, in *Gears from the Greeks* (1974), Derek de Solla Price features a geared astrolabe dating to 1221, which is in the Museum of the History of Science at Oxford University. The author mentions this astrolabe at a different place in the text.

p. 55 *“...a large ring had been revealed on the front face of the main fragment of the mechanism with a graded scale round its circumference.”*

The evidence for this “large ring” is not in the main fragment, Fragment A, of the Mechanism, it is in Fragment C.

p. 55 *“Theophanidis also confirmed that the big cross-shaped gearwheel engaged the rotation of several smaller gearwheels.”*

This gearwheel, as far as we know, did not engage with any smaller gearwheels. It has a gear attached behind it, which engages with two smaller gearwheels.

## Chapter 3: Treasures of War

p. 63 *“one of the sailors on the Syros”*

Most probably one of the sailors of the “Mykale”

p. 64 *“...the bronzes still had traces on their feet of the lead that once attached them to their bases... They had already been on display for some time, before being wrenched from their pedestals in a hurry. In other words the statues were stolen”.*

The fact that the statues were removed from their plinths does not necessarily imply that they were stolen. Reducing the weight of the ship's cargo might have been a priority with an already overloaded ship. Removing bronze statues from their plinths would have been a very effective way to lose weight and the plinths could easily be replaced at their destinations. We are not aware of evidence that they were "*wrenched from their pedestals in a hurry*".

p. 65 "*...the ship bearing the Antikythera mechanism was probably a Roman vessel, loaded with artworks and other treasures looted from Greek cities.*"

It may be that the artworks were looted, but there is no real evidence for this.

p. 89 "*Pergamon, where the ship most likely set off from...*"

There is as yet no definite evidence to determine the ship's likely point of departure.

#### Chapter 4: Rewriting History

p. 101 "*It was a lesson in the use of the astrolabe by one of the biggest names in medieval literature, Geoffrey Chaucer, the author of the Canterbury Tales.*"

As Marchant acknowledges later on p. 102, Chaucer's authorship is not certain.

p. 107 "*Price read the papers of Svoronos, Rados and Rehm*"

And also the subsequent papers of Theofanides.

*"Now, here was evidence that they had been masters in mathematical gearing"*

"Evidence" in terms of an actual object, since written sources about mathematical gearing (for example in Heron's *Dioptra*) were known for centuries.

p. 111 "*Only the top portion of the dial had survived...*"

It was the *bottom* left-hand portion of the dial that survived in Fragment C.

p. 113 "*the dawn rising of the constellation Sirius*"

Sirius is a star, not a constellation.

#### Chapter 5: A Heroic Reconstruction

p. 140 "*Although the calendar we use today divides years into exactly twelve months, the Moon doesn't go round the Earth exactly twelve times for every time the Earth goes round the Sun.*"

Although true, it is the non-concurrence of twelve lunar (synodic – i.e. full moon to full moon) months with a year that is the real problem, not the non-concurrence with the lunar sidereal (return to same position relative to the stars) months.

p. 146 "*The Earth inches its way round the clock face as the Moon circles around the Earth in turn. At full Moon, all three fall into a straight line with the Earth in the middle...*"

At full Moon, the Sun, Earth and Moon only fall into a straight line at a total eclipse, since the Moon's orbit is tilted with respect to the Earth's orbit.

- p. 148 “*The first differential gear known in the West—and the first used anywhere for mathematical purposes—was in the eighteenth century.*”

Wikipedia is not correct on this. The *Antikythera Mechanism*, made in the second century BC, uses a differential gear in its lunar phase mechanism. In addition, the use of differo-epicyclic gearing was employed in Giovanni de’ Dondi’s *Astrarium* in the 14<sup>th</sup> Century and became commonplace in astronomical clocks of the fifteenth and sixteenth centuries.

- p. 148 “*In the Antikythera fragments Price saw the remnants of a triangle of three little wheels, all mounted on a bigger turntable.*”

Price only observed the remnants of two wheels. He was quite clear that the third wheel, which he called Wheel J, was conjectural. We are confident that Price did not observe this wheel because we are sure that it didn’t exist. Price’s *differential*, which included Wheel J, is now discredited.

- p. 156 “*Michael Wright) thought that it was odd that the inscriptions suggesting that the mechanism might have shown the movements of the planets, which Price had discussed in his earlier Scientific American article, were now hardly mentioned.*”

Price was very confused in his *Scientific American* article about the planetary inscriptions. At one point he writes, “*On the upper dial the inscriptions are much more crowded and might well present information on the risings and settings, stations and retrogradations of the planets known to the Greeks (Mercury, Venus, Mars, Jupiter and Saturn).*” As we now know, the inscriptions on the upper back dial are in fact month names and year numbers and have nothing to do with the planets.

## Chapter 6: The Moon in a Box

- p. 167 “*Price had thought that the upper back dial showed a four-year cycle.*”

The author omits to say that Price also suggested with great foresight in *Gears from the Greeks* that this dial might be a 19-year, 235-month *Metonic calendar dial*. He wrote that he couldn’t choose between the two ideas, only to favour the more simplistic (and wrong) idea of a *Four-Year Dial* in his model.

- p. 170 “*Even Price’s name for the device—a ‘calendar computer’—seemed designed to distract attention from the fact that his reconstruction of the mechanism corresponded to no known instrument, and didn’t have any obvious practical use.*”

There is nothing wrong with the description of the Antikythera Mechanism as a ‘calendar computer’. Why should Price want to ‘distract attention’ in the way the author describes?

- p. 177 “*There was an unwritten rule with Greek antiquities that when access to an artefact was granted to one researcher it was withheld from others until that person had published their results.*”

This is quoted as being Michael Wright’s viewpoint. In normal scientific research the idea of reserving an area of research would be contrary to good practice.

- p. 178 “*He knew his stuff, and he was better equipped to tackle the Antikythera mechanism than this man (Bromley) was.*”

In fact, Bromley was a professor of computer science with expert knowledge of the work of the computer pioneer, William Babbage.

## Chapter 7: Mechanic's Workshop

This chapter deals with the breakdown of Bromley and Wright's relationship, and is apparently told from Wright's point of view. Bromley died in 2002. We believe that the views of Allan Bromley's widow, Anne Bromley, on these events is rather different.

- p. 189 “Wright had seen that there is an extra wheel at the end of this train, which Price had missed.”

This observation was first published by Professor Allan Bromley in 1993 in an article in *Bassernet*, the in-house journal of the Basser Department of Computer Science at Sydney University. This was after Bromley, by the account of this book, had taken all of Bromley and Wright's *linear tomography* X-rays to Australia, denying access to Wright. It is therefore not clear whether this was Wright's or Bromley's discovery.

- p. 191 “... (Bromley) had dreamed that his name—and his name alone—would be attached to the final solution of the Antikythera mechanism.”

It seems impossible to know if this is true.

- p. 194 “In his (Price's) reconstruction there wasn't room for any extra mechanism here, because his second big wheel—his Sun wheel—had turned directly in front.”

In *Gears from the Greeks* (1974), Price proposed that in this space there might have been “a block of planetary gearing if this is to be conjecturally restored”. Later in the same paper he wrote, “Alternatively there is a possibility that this space between the large wheels may have held a gearing system, now totally vanished, which served to exhibit the rotations of all of the planets other than the Sun and Moon.”

- p. 197 “The inscriptions that Price had originally noted (but passed over) in *Gears from the Greeks* were a hint in this direction – Venus was mentioned by name, and there were several mentions of ‘stationary points’, the moment at which a planet appears to stop and change direction”

Although the inscription (incomplete) for Venus appears in *Gears from the Greeks*, we have only been able to find Price's reference to stationary points in his 1959 *Scientific American* article.

- p. 200 “The epicyclic gearing fitted into the mechanism so naturally that he knew he was right.”

Wright's planetary mechanisms are highly ingenious, but purely speculative due to lack of surviving physical evidence. Some experts disagree that they “fitted into the mechanism so naturally”. For example, the bearings of some of his gears need to be carried by a support structure that must be constructed to fill the gaps in the four-spoked Mean Sun Wheel. Why make a four-spoked gear, if you then have to fill in the gaps?

- p. 201 The wording here could unfortunately be interpreted as suggesting that Professor Mike Edmunds stole Wright's idea of planetary mechanisms, gave it to a student and then published the results without due credit. This would be a serious allegation, but is easily dispelled. Edmunds and Wright did briefly discuss the possibility of a planetary function, but the idea far pre-

dates Wright. It was first suggested by Albert Rehm in about 1905, it was considered in at least two papers (including *Scientific American*) by Price in the 1950s and was explicitly described in *Gears from the Greeks* (see comment to the quote on p. 194). The 2000 paper by Edmunds and Morgan refers to Price's mention of planetary possibilities in his *Scientific American* article, acknowledges communication with Wright, and included the passage "It should be emphasised, though, that despite several claims (e.g. Lattin 1969, Dyson 2000) there is – as yet – no *prima face* evidence for planetary prediction". The original idea of planetary mechanisms was neither Wright's nor Edmunds'.

- p. 203 *"Besides there was no need for new images. His (Wright's) own radiographs were perfectly adequate and he knew he could solve the puzzle, if only everyone would leave him alone long enough to do so."*

The discovery of the wealth of new inscriptional material in the new images, even without the advance in understanding the gearing, is sufficient demonstration of their value.

- p. 205 *"The upper spiral had five turns and by measuring the marks on it he (Wright) calculated that each revolution of the pointer represented 47 divisions, making 235 in all. He realised that the spiral must have displayed the 235 months of the Metonic 19-year cycle, as calculated by the gear train under the front dial."*

This was not Wright's idea, it was Price's and the possibility is clearly expressed in Price's *Gears from the Greeks* (1974). Wright published a paper proposing this idea, *Counting Months and Years: The Upper Back Dial of the Antikythera Mechanism* (2005), but gave no direct credit to Price.

*"The Callippic period, made up of four Metonic periods"*

The correct length for the Callippic period is four Metonic periods minus one day.

- p. 206 *"On the front of the mechanism Wright also made sense of a strange circular arrangement that seemed stuck on to the front of the dial. Price had seen it and thought that it might be the remains of a folding crank handle, but from knowledge of later astronomical clocks Wright recognised it as a Moon phase display."*

Wright's full recognition of this was indeed a significant advance. Price also made some other suggestions about this feature—for example, proposing in *Gears from the Greeks* (1974) that it might be connected with the position of the Moon.

- p. 210 *"October comes and Wright arrives in Athens with his finished model, grimly triumphant as Freeth's team completes its imaging"*

Tony Freeth writes: *"The team carrying out the X-rays in Athens was not "Freeth's team", we were led by Professor Mike Edmunds, who had inspired the whole upsurge of interest in the Antikythera Mechanism."*

*"On the day of his talk he demonstrates the workings of his device to a small but captivated audience."*

The conference at the War Museum was in fact the big "Second Congress on Ancient Greek Technology", and the audience was indeed "captivated", but not small at all.

**Chapter 8: The New Boys**

- p. 217 *“First, he (Freeth) saw on Nature’s front cover a colourful picture of a goldfish’s inards...”*

The picture that Freeth saw was reproduced in *New Scientist* magazine, not *Nature*.

- p. 222 *“...so he (Freeth) set about putting together a collaboration that would be influential enough to push his plans through.”*

It was Mike Edmunds who put together the collaboration.

- p. 223 *“He (Freeth) would lead them to victory.”*

The research team was led by Mike Edmunds.

- p. 223 *“John Seiradakis and Mike Edmunds, as the most senior scientists on the team, applied to the National Museum with the full force of their joint academic reputations.”*

Professor Xenophon Moussas was an equal partner in the application, as is evident both from the application document and the permission that was eventually granted.

- p. 223 *“After several unsuccessful, frustrating attempts the team finally won its money early in 2005.”*

The team’s application for money was to the Leverhulme Trust. The first application to the trust was successful. This grant from the Leverhulme Trust was crucial in enabling the scientific investigations.

- p. 223 *“Freeth refused to consider defeat, so he changed his plan of attack. The only organisation with the power to override the National Museum’s decision was the Greek Ministry of Culture. Xenophon Moussas took over the fight.”*

The team worked collaboratively to develop a strategy for furthering plans for new scientific investigations. The initiative to approach the Ministry came from Moussas not Freeth.

- p. 225 *“Not to the entire delight of the National Museum staff, Tatoulis arranged a two-week slot for the team to study the fragments in September 2005”*

The two-week slot was arranged by the Museum staff in close collaboration with the members of the Research Project. This arrangement was made possible thanks to the permission granted by the Deputy Minister; this permission was based on a positive response from the National Archaeological Museum to the Central Archaeological Council. There is no time-slot mention in the permission; in fact, the data gathering phase lasted three weeks.

- p. 231 *“Tom Malzbender, along with colleagues Dan Gelb and Bill Ambrisco, flew across the sea from California with their flashbulb dome packed in a crate”*

The PTM Dome was already in Athens, long before the HP Labs team arrived in Athens, carried by a couriering company.

*“Malzbender was the only one allowed in the room with the Antikythera fragments (watched over by a museum official)”*

As one can see in photos available online, Tom Malzbender was not “watched over” by a museum official, but assisted in displaying the fragments by a museum conservator.

p.237 “with resolution in some places down to just a few thousandths of a millimetre”

The best resolution obtained was about 40 microns, i.e. 1/25<sup>th</sup> of a mm.

p. 241 “the epigrapher Agamemnon Tselikas”

A. Tselikas is philologist and palaeographer.

## Chapter 9: A Stunning Idea

p. 241 “Tony Freeth has hired Bitsakis to work through the thousands of computer images of the Antikythera mechanism...”

Xenophon Moussas engaged the services of Yanis Bitsakis and he was hired by the National and Kapodistrian University of Athens.

p. 242 “And it confirms what Michael Wright has been saying about his measurements of the upper back dial.”

This referred to the discovery of an inscription, “*spiral subdivisions 235*”, that confirmed Price’s idea of a Metonic Dial and Wright’s idea of a spiral dial. Again, it was Price, not Wright, who first proposed the Metonic Dial.

p. 243 “On the front dial, Bitsakis and Tselikas read... ‘Scorpio’ further proof of the zodiac scale running clockwise round the dial... They are also able... to see more reference letters on the dial...”

Freeth discovered the word “Skorpios” on the zodiac dial as well as the additional reference letters.

p. 245 “The first task was counting the gear teeth. Instead of counting by eye, Freeth used a computer programme to crunch the maths for him, making the tooth counts more certain than ever before.”

Tony Freeth gathered data on the gear teeth from the X-ray CT. Mike Edmunds developed the mathematical method for taking into account the uncertainty of the centres of the gears, and “crunched the maths”.

p. 246 “...Bitsakis and Tselikas identified 16 blocks of characters or ‘glyphs’...”

“Two of them (the glyphs) were visible and had been seen by Price as well, but all the others were hidden under the surface.”

By the time of Price’s article, *An Ancient Greek Computer* (Scientific American 1959), Price had already identified three of the glyphs and in *Gears from the Greeks* (1974) he had identified four. He did not understand them as eclipse predictions. Freeth identified the rest of the known glyphs and identified them as eclipse predictions.

p. 247 Caption for Diagram of the Antikythera Mechanism: “Possible dial showing the Callippic cycle (54 years).”

The Callippic cycle is 76 years, not 54 years.

p. 250 “The numbers inscribed in two sections of the subsidiary dial - 8 and 16 - indicated that this number of hours had to be added to the predicted eclipse time during that particular Saros cycle.

That was when Freeth knew he had the breakthrough that would make the whole project worthwhile...”

The first “breakthrough” by Tony Freeth, which identified the *Lower Back Dial* as an eclipse prediction dial based on the *Saros Cycle*, was reported in



the first paper in *Nature* in 2006. The discovery by John Steele of the significance of the numbers 8 and 16 inscribed in the subsidiary dial came after this publication and was published in *Nature* in 2008, as can be seen in the *Author Contributions* section of this second paper.

- p. 251 “Where Price had presented a calendar computer and Wright had described a planetarium, Freeth saw an eclipse predictor.”

Freeth has never asserted that the mechanism is simply an eclipse predictor—just that eclipse prediction is one of its functions. It is also a calendar computer and very likely also showed the planets. So the trichotomy described by the author makes no sense.

- p. 251 “The best clue had to be the big turntable with 223 teeth... Wright—without benefit of Fragment F—realised that the number 223 was linked to an eclipse cycle...”

It was Price, not Wright, who first discussed the possibility in *Gears from the Greeks* (1974) that the large ‘turntable’ might have had 223 teeth (based on Karakalos’ tooth count of 222 teeth) and suggested that this could be linked to the Saros eclipse prediction cycle—though he dismissed the idea. Wright found no function for this gear in his model, published in 2005, and suggested that it was evidence that the Antikythera Mechanism was made up of “spare parts from the scrap bin”

- p. 252 “Freeth phoned Mike Edmunds to tell him the latest. Mike Edmunds thought for a moment. Couldn’t the wobble be sent through to the front of the mechanism...”

The timing of events is wrong here. Freeth had told Edmunds and the rest of the team about the mechanism modelling the lunar anomaly a few weeks before his ‘phone call in which Edmunds suggested how the output might be displayed.

- p. 253 “Freeth now had direct proof that the device’s gears were used to model not just circular motion, but elliptical motion, and a slowly precessing ellipse at that.”

This could be seriously misinterpreted. As far as we know, the ancient Greeks were not aware of the elliptical orbits of astronomical bodies. The intention of the gearing was *not* to model elliptical motion, but to model epicyclic or eccentric motion. Today we would think of the motion of the moon as a precessing ellipse, and the geocentric view of that motion would be equivalent to what is seen in the Mechanism’s prediction.

- p. 254 “His quest completed, Freeth hurriedly wrote up the team’s results”.

All of the members of the team who had discovered new results wrote an account of their research. Mike Edmunds incorporated all this into a draft of an academic paper. After submission, this paper was deemed too long by the journal *Nature* and Tony Freeth then shortened it with help from John Seiradakis, so that it met *Nature*’s requirements (because Mike Edmunds was away.) The authorship is clearly laid out in the “Author Contributions” section of the paper.

- p. 255 “But Freeth had much bigger plans. He sent it to *Nature*.”

This is incorrect. Mike Edmunds sent it to *Nature*, as can be inferred from the fact that he is credited by *Nature* as *Corresponding Author* on the paper.

- p. 255 *“Freeth set about organising a conference in Athens.”*  
 Tony Freeth contributed to the conference in Athens but had little to do with the organization and the invitations, which were carried out by Yanis Bitsakis and the Cultural Foundation of the National Bank of Greece, with input from Mike Edmunds, Xenophon Moussas and John Seiradakis.
- p. 256 *“...(Wright) knew that if he had only known about Fragment F he would have got the rest as well.”*  
 The data on the lower back dial in Fragment F, which was the starting point for Freeth’s investigations, were very similar to the data on the same dial in Fragment A, which had been visible on the surface since at least Price’s work in the 1950s. In 2005, Wright published a model, where the lower back dial was divided into 218 half-days. The pattern of scale divisions on Wright’s model was in direct contradiction to the pattern of scale divisions that are visible in Fragment A. As Freeth pointed out, the pattern of divisions in Fragments A, corresponds to a total number of divisions of the form  $4n + 3$ , whereas Wright’s 218 was of the form  $4n + 2$ —so it must be wrong on the simple basis of the evidence in Fragment A. In addition, the Fragment F data was not needed to deduce that the dial had 223 divisions and so must be a Saros eclipse prediction dial: all the necessary data is visible at the back of Fragment A.
- p. 259 *“Afterwards, Alexander Jones and John Steele... noticed something from the slides that Freeth and the others had missed: mysterious letters at the bottom of the eclipse glyphs that Freeth had been unable to interpret ran alphabetically round the dial.”*  
 This observation was made by Alexander Jones.
- p. 260 *“For the first time in history it was possible to revisit the past and to predict the future. It was possible to control time itself.”*  
 No.

## Chapter 10: Old Man of Syracuse

- p. 265 *“We know that the wrecked ship on which the Antikythera mechanism was found probably sailed from Pergamon...”*  
 The word “probably” is too strong. It is simply a possibility.
- p. 267 *“Of particular interest to us, he (Hipparchos) was the first to describe mathematically the varying motions of the Moon and Sun, and the pioneering equation he used for the Moon is almost exactly reproduced by the undulating pin-and-slot in the Antikythera Mechanism. We don’t know of any other astronomer of the time that could have thought of it.”*  
 It is not known that Hipparchos was the first to propose an epicyclic model for the lunar anomaly. This theory is in any case based on the ideas of his predecessor Apollonios of Perga (ca 262 – 190 BC) and his contemporaries. So there are other astronomers who might have been the first to think of it.
- p. 284 *“After Tony Freeth’s Nature paper was published in 2006 he called in Alexander Jones, a historian of astronomy from the Institute for the Study of the Ancient World in New York.”*  
 It was not “Tony Freeth’s Nature paper”, there were 17 co-authors. Tony Freeth did not call in Alexander Jones. He was visited by Mike Edmunds and

asked to speak at a conference to coincide with publication of the *Nature* paper (see note to p. 255)

- p. 284 “Michael Wright had originally shown that this spiral was divided into 235 sections, depicting the 235 synodic months of the 19-year Metonic cycle...”

Wright’s great contribution was to show that the dial was a spiral. The idea that it was Metonic was Price’s (*Gears from the Greeks* (1974)), which was taken up by Wright and proved conclusively by an inscription discovered by Tselikas and Bitsakis.

- p. 285 “Alexander Jones was able to read the month names inscribed on the surviving sections of the main spiral...”

The decipherment of the text characters that make up the month names was carried out by Tony Freeth and Alexander Jones, as is evident from the *Author Contributions* at the end of the *Nature* paper published in 2008. Most of the month names were identified by Alexander Jones.

- p. 290 “Running water isn’t powerful enough to drive large numbers of wheels (for this reason the Antikythera mechanism was almost certainly turned by hand!”

Water was powerful enough to drive mills in classical times, and a water drive for the gear trains of the Antikythera Mechanism cannot be ruled out on this account. But it probably *was* turned by hand.

## Epilogue

- p. 297 “Steele has now identified 18 eclipse glyphs in total...”

John Steele did not identify any of the eclipse glyphs. All the glyphs that were not observed by Price were identified by Tony Freeth.

- p. 297 “Steele also found that as well as the letters indicating whether each event was a lunar eclipse or a solar eclipse, the glyphs were labelled with either ‘H’ or ‘N’ to indicate whether the eclipse occurred during the night or during the day.”

John Steele claims no credit here. The ‘day’ or ‘night’ indications are not ‘H’ or ‘N’, they are ‘H<sup>M</sup>’ and ‘N<sup>K</sup>’, as is reported in the paper published in *Nature* in 2008. That H<sup>M</sup> “may be the standard abbreviation of “day” (hemera) possibly indicating that the (predicted lunar) eclipse was diurnal” was included on page 6 of the Supplementary Notes of the 2006 *Nature* paper, and we believe it was John Steele, with help from Alexander Jones and Tony Freeth, who subsequently identified N<sup>K</sup>.

- p. 297 “Finally, he (John Steele) has worked out why the spiral of the eclipse had four rings.”

The suggestion as to why the Saros Dial has four rings was made by Tony Freeth, not John Steele, as is evident from the *Author Contributions* at the end of the *Nature* paper published in 2008.

- p. 298 “Fragment D contains the only wheel (or possibly two identical wheels, one above the other) that doesn’t fit anywhere in the latest reconstruction of the mechanism.”

Both Price and Wright proposed that Fragment D contains two wheels, but neither suggested that they are identical. The X-ray computed tomography

carried out by X-Tek Systems establishes that there is only one wheel in Fragment D.

- p. 299 *“Wright still thinks that the mechanism could have been put together from the pieces from two or three other devices—partly because of the way that the wood in the case is jointed.”*

Wright has not in our view made a convincing case for this.

- p. 299 *“He (Wright) is convinced that—hidden under an overhang of limestone—he saw the edge of a character in the third sector. If he’s right, it would be the first known Greek use of a symbol for zero...”*

We have not found any good evidence to support this speculation. In particular, there does not appear to be any evidence in the X-ray CT that endorses a symbol for zero.