

‡1 Ancient Accuracy Vs History of science Society

To *Isis* Editorial Board:

2017 March 20 & April 1

[closely based on www.dioi.org/islg.doc's improvement of www.dioi.org/isle.doc original]

Two recent **upfront** *Isis* papers have misunderstood or unattributedly repeated researches of *DIO: The International Journal of Scientific History*, which I publish.

Your 2015 March issue's *lead* paper "The Two Earths of Eratosthenes" by C.Carman & James Evans [University of Puget Sound] *Isis* 106.1 pp.1-16 [advised by *JHA*'s Jones], www.dioi.org/cev.pdf, is founded totally (abstract-to-conclusion) upon the theory that, though Eratosthenes' legendary Aswan-Alexandria experiment yields Earth-circumference $C = 250000$ stades for the Sun at infinite distance, it yields $C = 252000$ stades if parallaxically adjusted for Eusebius' finite Sun-distance of c.100 Earth-radii. But this result had already been published in uncited "Eratosthenes' Too-Big Earth and Too-Tiny Universe", *DIO*, 2008, 14 ‡1 fn 6, www.dioi.org/vols/we0.pdf, explored as an alternate explanation, even though reasonable traditional theory is that, whatever its origin, C was finally adjusted to 252000 stades so that $1^\circ = 700$ stades, Eratosthenes' standard scale (Strabo 2.5.7).

Your 2016 December *lead* paper, www.dioi.org/shc.pdf, "The Accuracy of Ancient Cartography Reassessed: The Longitude Error in Ptolemy's Map," by D.Shcheglov, *Isis* 107.4 pp.687-706, is the most recent in a 4-decade succession of post-Robert-Newton attempts at "rehabilitating" thoroughly-exposed (below §G items [1]-[4]) 2nd century AD mathematician-fabricator-astrologer Claudius Ptolemy ("The Greatest Astronomer of Antiquity" to influential astronomy-historians O.Neugebauer, Evans, & O.Gingerich), by unwittingly-ironic demeaning of physicists Newton and Rawlins (robbing both of credit for their discoveries), latest of those scientists who've since Tycho (1598) revealed fraud in Ptolemy's corpus.

Rawlins' contribution to the 1984 Greenwich Centenary concluded that, ere astrologers mangled them, accurate maps existed in antiquity with longitudes based on lunar eclipses. Shcheglov calls such maps a "delusion" since eclipse-use is "impractical", citing in support "badly overestimated" (Shcheglov 2016 n.8) eclipse-based longitudes of Kleomedes, Heron, and Pliny. But Heron is long known to be irrelevant, and Shcheglov miscomputes (§D below) the other two by treating a Pliny solar eclipse as lunar and by putting Kleomedes' Spain in the wrong hemisphere (likewise for Xi'an & Luoyang: see *POSTSCRIPT* below).

Shcheglov, particularly on his p.693, imputes several failings to DR's and *DIO*'s work (the less spectacular are reserved for a footnote):¹

A Effectively libeling scientists' standard theory-testing criteria (by which one looks for the simplest theory consistent with the most data), Shcheglov calls us "deluded" for Occamly choosing the popular, simple, datafitting hypothesis: that the 1.4-factor error (40% overestimate) in Ptolemy's Earth-longitudes was from just multiplicatively stretching them to shift from Eratosthenes-*Almajest*'s 700 stades/degree to Marinus-Ptolemy's 500 stades/degree. Shcheglov discards the 1.4-stretch theory by claiming that his true explanation for the 1.4-exaggerated longitudes "proves to be much more complex and intricate" than 700/500 simplicity. But nothing approaching the promised "proof" of the need for complexity ever actually appears in the article, where most complications are gratuitously, artificially injected, by his own myriad diversions from Occamite simplicity, and in his 20pp *he never derives his 1.4-grail any other way* (than a plain stretch), so he finally urges "further studies." Whose results can never work as efficiently as plain, raw multiplication.

¹Curious examples of Shcheglov mischarges: [a] The simple-stretch idea is alleged (Shcheglov p.693) to bear logical fallacies; none are produced. [b] The stretch-solution is said (*idem*) to follow R.Newton's criminal charges versus Ptolemy. Though I agree Ptolemy faked I've never said his stretch was anything but a bad mistake (end of §F below). [c] Ignorance of alternate theories is implied (vs *DIO* 6 [‡1] fn 47, *DIO* 20 [‡1] fn 2). [d] I'm mis-said (p.693) to claim accurate land-surveying underlay Ptolemy's longitudes. (My spare proposal was a simple longitude-multiplication, without any connexion to Shcheglov's amazing & valuably complete reservoir of centuries of stadlength guesses.)

B Shcheglov (p.705) calls early accurate geography “a quaint illusion” — & his Abstract [catnipped *Isis* by promising] “Ptolemy’s reputation is rehabilitated in part, and the delusion of high-accuracy ancient cartography is dispelled.” The dispelling is effected by arguing that Greeks couldn’t use eclipses for longitude, skipping all the evidence they did (Rawlins 1984 Greenwich). Shcheglov’s [Muffian fantasy] of bumbling Greeks also **defies the broad context** of their high physical science as revealed by us [e.g., www.dioi.org/j109.pdf, for decades]. Our ordmag-estimates of Greek accuracy (check out each for yourself):

1’ for big cities’ geogr. latitudes *L* (Strabo 2.5.7; *Isis* 73.2 p.264; *DIO* 16 †3 §§C1-C2)
 1’ for scientists’ *L* (*Isis* 73.2 p.263; *Centaurus* 27 p.280; *DIO* 4.1 †3 §F; *JAHH* 17 p.326)
 0°.1 for star declinations (ditto)
 1% for Earth-circumf. precision (*ArchiveHistExactSci* 26 p.216; *DIO* 14 †1 §A & eq.28)
 1’ for Earth’s tilt or “obliquity” (*Klio* 27 p.266; *DIO* 16 †3 §§A-B eq.2 and Tables 1&2)
 1% for lunar mean distance (*Almajest* 5.13-17; *DIO* 8 †1 §H4: 59 Earth-radii vs really 60)
 10^m for lunar-eclipse-prediction (*DIO* 1.1 †6 eq.32)
 1^m for time of lunar eclipse (Greenwich 1984 in *Vistas in Astronomy* 28 pp.258&265)
 0°.1 for lunar limb vs Sun separation (*DIO* 16 †1 fn 24)
 ditto or even 1’ for star-vs-eclipsed-Moon gap (*DIO* 1.3 fn 288; *DIO* 16 †1 §A fn 22)
 1^h for solstices (*Bull.A.A.S.* 17.2 p.583; *DIO* 20 †2 eqs.21&25&Table 3; *P.Fouad* 267A)
 1’ for –145/3/24 equinox on Alexandria Palaestra polestar-set ring (*Isis* 73.2 p.263 n.17)
 10^s for sidereal year (*DIO* 6 †1 fn 38&§17; *DIO* 9.1 †3 Table 2; *DIO* 11.1 †1 fnn 14-15)
 1’/century for mean motion of Mars and arguably Venus (*DIO* 11.3 †6 fn 26)
 0°.1 for synodic month (*DIO* 6 †1 eq.2 & fnn 12&18; *DIO* 11.1 †1 eqs.1-8)
 1^s for anomalistic month (*DIO* 6 †1 eq.13 & fn 12; *DIO* 11.1 †1 §A3 & eq.2)
 0°.1 for draconitic month (*DIO* 6 †1 eqs.2&19 & fn 12; *DIO* 11.1 †3 eqs.1&3)

Most historians-of-astronomy are, like Shcheglov, unaware of these symptoms of high Greek science, some, e.g., Gingerich&Swerdlow, **speculating without attestation** [†2 §M2] that scientists kept only theory-accordant data [**flatly contradicted by Hipparchos’ record**: †3 fn 8], thus unwittingly modeling all ancient science on a blundering *astrologer*, Ptolemy. QUESTION: *how could the above-listed measures have ever progressively evolved into accurate achievement by following a tradition of just keeping on confirming prejudice?* [Classic projection from own behavior? See below *POSTSCRIPT*’s final line.]

C That ancient geographers’ longitudes were based on eclipses is doubted by Shcheglov p.690 as “too impractical”. I’ve outdoor-eyeball-timed enough lunar eclipses to know their accuracy is ordmag 1^m [anciently somewhat vitiated by sundial graduation limitations, ordmagly] agreeing (at 4^m/1°) with the well-under-1° accuracy of pre-stretch *Geography* longitudes, D.Rawlins 1985, “Ancient Geodesy: Achievemen and Corruption”, *Vistas in Astronomy* 28:255-268; p.265 (1984 Greenwich paper). Though eclipses are common (Ptolemy experienced 3 in 3 years: 133-136 AD, *Almajest* 4.6), Shcheglov’s n.8 accepts **INDOOR** (Rawlins *op cit* §10) astrologer Ptolemy’s giveaway-incredible claim (*Geography* 1.4.2) that few eclipse data were available. But outdoor Hipparchos (Strabo 1.1.12 or Shcheglov, n.7) says nothing for rarity or impracticality. Instead recommending eclipse-comparison as the best method for scientific longitude-difference determination. Yet, revealingly, the sole eclipse-pair Ptolemy provides (*Geography* 1.4.2), to illustrate this central method, is *half a millennium old*, the –330/9/20 “Arbela eclipse”. Ptolemy’s reported time (longitude) gap is 4/3 too big, so Shcheglov’s n.8 tries alibiing Ptolemy and simultaneously attacking ancient eclipse-longitude-measure by asserting that, of four other ancient eclipse-pair reports, three’s longitude differences “also give badly overestimated results”: Kleomedes 4^h Spain vs Persia; Heron 2^h Rome vs Alexandria; Pliny 3^h Campania vs Armenia (4^h pair: Pliny’s correct 2^h Sicily vs Arbela).

D But Heron didn’t even try to gauge longitude-gap by eclipse (Neugebauer, *History of Ancient Mathematical Astronomy*, 1975, p.848). Kleomedes’ 4^h gap is virtually correct since Cadiz at 25^mW longitude and Persepolis at 3^h32^mE are 3^h57^m apart. Shcheglov just mis-signed Cadiz and found 3^h07^m (comfortingly consistent with Ptolemy’s false 4/3 factor

for his Carthage-Arbela gaffe-gap). As for Pliny 2.72.180, Shcheglov knows Campania & Armenia are c.2^h apart. [Longitude gaps between Naples & the *Geography*’s Armenian cities (Diller *DIO* 5 Table 17; 1984) Dioskourias, Artaxata, Gaggara are 1^h47^m, 2^h01^m, 2^h23^m, respectively, all indeed about 2^h.] So Shcheglov concluded that Pliny’s 3^h is too high. Yet Pliny doesn’t say the Campania-Armenia longitude gap is 3^h but that the eclipse was seen 3^h of local time differently. [Ancients recorded the time of an eclipse’s start: Neugebauer *op cit* p.844 n.12.] For a **solar** eclipse, one can’t just equate time-difference and longitude-difference. Local Apparent Time for the eclipse differed in Naples from that at the 3 Armenian cities, by 2^h29^m, 2^h48^m, 3^h14^m, respectively, mean 2^h50^m. So Pliny’s 3^h was not “badly over-estimated”. (Neugebauer, *op.cit.*, p.668, had verified Pliny, educationally adding, “Solar eclipses are, of course, without value for longitudinal determinations.”) So, ironically, both of Shcheglov’s eclipse-examples for ancient inaccuracy have backfired.²

E Shcheglov’s other Pliny record is the same Arbela lunar eclipse Ptolemy mis-reports as 8 P.M. at Carthage, 11 P.M. at Arbela. But Pliny has the same event 6 P.M. at Sicily (west Sicily was under Carthage then), 8 P.M. at Arbela, resp, both times correct within minutes. Shcheglov n.8 doesn’t connect the two Arbela-eclipse reports; & neither he nor any other historian-of-science has noted that “authoritative” (§G) scientist Ptolemy has accidentally misassigned Arbela’s 8 P.M. to Carthage! A check of his probable source, Pliny *loc.cit.*, reveals how: by grammatical accident, Pliny’s Latin sentence places 8 P.M. nearer Sicily than Arbela, while 6 P.M. is expressed as a word (“moonrise”) not a number. Unequal to the Latin, Ptolemy thought 8 P.M. was Carthage time. Since his 4/3-stretched map already had Arbela 3^h east of Carthage (real gap 2^h 1/4), he faked Arbela thusly: 8 P.M. + 3^h = 11 P.M. This, THIS! is the prime astronomical observation in the *Geography* of Neugebauer-Evans-Gingerich’s Greatest Astronomer of Antiquity? Ptolemy’s times mega-disagree with not just reality but *his own tables*: 2^h-3^h! [Error about as big as quantity sought: like †3 fn 42.] Shcheglov notes none of these discords nor the Arbela-Carthage mixup, though all are at †3 fn 45 of the same *DIO*, www.dioi.org/vols/we0.pdf, he is consulting in his nn.12&15.

F On p.705, Shcheglov’s varied attempts at “rehabilitation” include his pure guess that Ptolemy’s sources were bad (as if The Greatest couldn’t better discriminate): “it would be unfair to blame Ptolemy for his errors, because the whole tradition he relied on was a chain of errors.” Yet we’ve just-above seen how a reliable source, non-astronomer Pliny, was farcically bungled by “astronomer” Ptolemy, all by himself. If he was this *dimonstrably* unreliable on his own, why doubt that, when switching to 500 stades/degree, he was so isolated from scientists (see above §§C&D) innocence of ordinary eclipse data and use thereof) as to believe that his source map’s longitudes were overland-distance-based, so that he needed to multiply by 7/5 a traditional 700 stades/degree globe’s longitude-degrees? Any real astronomer knew the degrees were based on eclipses and should be left alone.

G So Shcheglov’s n.16 calling Poseidonios a dilettante but Ptolemy an “astronomer” and (p.694) a **geographical authority** is Quaint at best. Unmentioned in Shcheglov’s attempt to convince historians-of-science that Ptolemy should be somewhat “rehabilitated” (p.687): [1] He “usurped” Hipparchos’ 1025-star catalog (Tycho Brahe, *Omnia Opera* 3, p.337). [2] “Astronomer” Ptolemy’s four allegedly outdoor solar observations are **fifty times** closer to his 280^y-old indoor Hipparchan tables than to the sky. (Hipparchos’ ratio is less than 3.) [3] His adopted latitude 30°58’ was –14’ off reality, vs just 0’, 3’, 0’, 3’ errors for adopted

²Shcheglov’s solar-eclipse misadventures [are similar to NGS-NavFou’s at *DIO* 21 †5 §§B3-B4, www.dioi.org/vols/wl0.pdf, also] reincarnating a backfired attempt to empirically justify demeaning Greek accuracy: Evans’ 1987 claim that his 1981 measure of a star’s distance from the eclipsed Moon was ordmag 1° off, like Hipparchos’ two bad measures of Spica. But undoing mis-signed parallax lowers all three 0°.6 errors to 0°.1 or less; same for Hipparchos’ –35’ Regulus error, so odds against **all four errors**’ being outdoor are astronomical. Evans won’t reveal his 1981 data; but his 1998 book repeated his 1987 analysis, a non-observed 1977 eclipse quietly subbed for the 1981 event! Sly details at *DIO* 16 †1 §A & fn 7. [Shcheglov, NavFou, & Evans have in common that all 3 are self-torpedoed by innocence re parallax, as was early Hipparchos (vs his consistently accurate later work: †3 §B8).]

latitudes of real observers Timocharis, Aristyllos, Hipparchos, & Ptolemy's Anonymous. [4] *Almajest* 10 reported Venus' 136 greatest elongation for two different dates, 37^d apart.

H Such disasters warn of peril in history-of-science's long-persistent glorification of Ptolemy as a scientist, while viewing his authorship of astrology's bible, the *Tetrabiblos*, as a factor that only culturally and historically narrow scientists would be benighted enough to raise. *Analyses to follow here reveal that astrology is intimately involved in destroying, probably forever, most of the latitudes in ancients' now-lost competent maps of the Earth.*

I Shcheglov admires *Geography* latitude-accuracy (p.689, emphasis added): "Methods for determining latitude, being rather simple, had [long] been known in Greece By Ptolemy's time, latitudes of a number of the most important cities had been determined (e.g., Alexandria, Rhodes, Athens, Rome, Massalia) Ptolemy calls such cities . . . 'foundations' that should be used as reference points for developing the rest of his map." No mention that all five "foundation" cities' *Geography* latitudes are seriously wrong (rms 26' = ordmag 1°): errors -14', -30', -43', -14', -14' (mostly quarter-degree negative, from astrologers' amateurish use of asymmetric gnomon). Meanwhile, statistical stellar analyses by Rawlins (1982; & DIO 1994, thrice cited in "Secrets", which Shcheglov read), Y.Maeyama (*Centaurus* 1984), & J.Brandt (*JAHH* 2014) show that all 4 **real, non-amateur Greek scientists** cited above at §G [3] knew their latitude to ordmag 1'. This twice-confirmed Rawlins discovery undoes Shcheglov's entire inaccurate-geography thesis. He doesn't mention it. Nor does he mention the contradiction it obviously creates versus the *Geography's* **mean latitude error of ordmag 1°**. In response to the disjunct, one *JHA* Editorial Boredperson has offered that geographers must have ignored astronomers! (So, did astronomer-geographer Hipparchos ignore himself?) DR mathematically contends ("Achievement" pp.260-264) these hitherto-unexplained errors were instead from forced latitude-uniformization-herdings, for astrologers' convenient access to tables at each key latitude or "klima" (for horoscopes' Ascendant and other "house" boundaries: "Secrets", eqs.2-3), corruption inconsistent with the astronomer-scientist Shcheglov sees Ptolemy as.

J "Achievement" p.262 lists 17 cities where, in the *Geography*, latitude matches klima. Dropping notoriously-flawed Bithynia (*DIO* 20 ‡2 §L4) & way-south Meroë leaves 14 cities.

K Selling or owning klimata tables for every latitude-degree was impractically voluminous. [Thus, if *Almajest's* 1^h/4 klimata-interval was adopted, then each city whose longest-day was closer than 1^h/8 to a klima was grouped under it, its latitude made equal to exactly that klima's latitude.] Such groupings of cities under ONE latitude is explicitly attested at *Geography* 1.4.2 (even while justly criticized at *ibid* 8.1.1; different authors, in all likelihood). Effects of such data-tampering are obvious from errors found [in §J's sample], which aren't ordmag 1' (as expected if due to real astronomers, like those of §G [3]): 64', -43', -251', -30', -26', 148', -40', -59', -84', -108', 38', 204', 10', 124'. Dropping -251' (confused Carthage mis-latitude: *DIO* 16 ‡3 fn 43; 2009), rms error is 93'; but the (more reliable) median is 59', hinting both are skewed high by a few goofs.

L Given this mess, one might ask: who says there ever were accurate ancient maps? We reply by turning to the same 14 latitude-awful cities' longitudes, and receive a shock. (Sample originally compiled in 1984 for another purpose so not prebiased for longitudes.)

M Shcheglov ignores that, besides 7/5, "Achievement" tests longitude-stretching by 4/3. Poseidonios is connected to 240000 stades by Kleomedes 1.10; 180000, by Strabo 2.2.2. Was the pre-stretch globe Poseidonios'? How fruitful is the 4/3-stretch theory?

N Dividing 4/3 into §J's 14 *Geography* degree-longitudes vs Alexandria, to unstretch them: those 6 cities within 30^m of Alexandria show rms longitude-error c.2^m, or about half a degree. The other 8 cities, several of them ordmag 1000 miles from Alexandria, likewise show rms error 2^m. Same 2^m appears from 8 cities' *Geography* Book 8 hour-longitudes (some overlap with above sample), already published at *ibid* p.265, though neither the informatively small errors nor their implication is remarked by Shcheglov.

O Errors' small size is apt (*ibid* p.258) to longitudes based on accurate eclipse timings. **As is their remoteness-independence** (§N), since the error in local-time difference for

eclipse observers longitudinally 1° apart is no more or less accurate than for 100° apart. Which is why the unstretched 42° from Carthage to Persepolis is correct to ordmag 1%.

P It should be noted that sampling here has ignored some civilized areas (e.g., the western Mediterranean) that are not even close to according with 4/3. But this anomaly can perhaps help date the original map through testing when nonfitting regions came under the rule of Alexander's successors: was the original earlier? But that would not explain why London is in perfect accord with 4/3-stretch. I leave these tantalizers to other investigators.

Q So, do Ptolemy's longitudes show a scientific origin while his latitudes simultaneously prove the very reverse?! Are we left in hopeless contradiction? No, "Achievement" showed otherwise 1/3 of a century ago, at the 1984 Greenwich Meridian centenary, the Longitude Zero Symposium, held at the National Maritime Museum, Greenwich.

R Contra *Isis*, the data are consistent with early currency of astronomically-constructed, accurate pre-*Geography* maps, which professional astrologer Hipparchos semi-randomly ruined through doctoring latitudes by lumping them into discrete klima-cubbyholes where all cities in a cell are force-assigned the same latitude (§K; [*Geography* 1.4.2]; "Achievement" p.261; "Secrets" §D) for handy astrologer-access to inevitably-too-widely-spaced klimata tables: *Almajest* 2.6. (Three centuries later, professional astrologer Ptolemy ruined longitudes **systematically**, stretching them by factor 4/3 or 7/5. Summary: ‡3 §II1.)

S Given those *Almajest* tables' Mediterranean 1^h/4 klima-spacing: we can compute that the forced latitude-shifts would, for flawless cubbyholing, theoretically produce 0° 3/4 rms error, ordmag-consistent with the 59' median already found above (§K) for 13 major cities' *Geography* latitudes, so providing the 1st (**and so-far only available**) explanation consistent with the size of their degraded state, applying attested ancient klima-clumping practice.

T The history-of-science enterprise is proud of being nonjudgemental, e.g., of superstition. It rejects any implication by astronomers that Ptolemy's occult profession lessens him. Ironically, this well-intended discipline has long blinded the field to the obvious: just as his *Tetrabiblos* was his religion's handbook for horoscopic interpretation, his *Almajest* and *Geography* were also world astrologer-handbooks. (The 1st fully competent translations of *Almajest* and *Geography* called each a "handbook". Ptolemy's exact title of what most now call the *Geography* was actually *Geographical Directory*, as *DIO* routinely calls it.)

U Each handbook was compiled for the then-incipiently-cosmopolitan Serapic religion, in whose most famous temple Ptolemy lived and worked: near Alexandria, at Canopus, known for "medical" cures by dream and astrology. (D.Rawlins 1984, "Astronomy vs Astrology: The Ancient Conflict", *Queen's Quarterly* 91.4:969-989, p.973.) Every professional astrologer today uses parallel handbooks, one for natal celestial positions, the other for victims' geographical locations. The damage (§R) which astrology visited upon astronomy and geography is, however, partly compensated-for by its preservation of non-occultist ancient mathematics, science, and observations that would otherwise be lost.

V World maps interested navigators (Marinos: ‡3 fn 105) & an expanding theocratic empire's plagiarizing priests (e.g., Ptolemy) more than most commercial travelers. The huge factor by which astrologers outnumbered astronomers, helps explain why our only extant ancient world map was most widely distributed by data-distorting occultists. Modern reconstructions can undo some of the harm visited upon the largest, rarest maps, originating from scientists for royalty; but not all can be repaired, e.g., the loss of all competent exact ancient latitudes except, e.g., north Egypt (Giza, Alexandria) & Phoenicia (Tyre, Sidon).

W Both *Isis* papers cite D.Rawlins 1982, "The Eratosthenes-Strabo Nile Map. Is It the Earliest Surviving Instance of Spherical Cartography? Did It Supply the 5000 Stades Arc for Eratosthenes' Experiment?", *Archive for History of Exact Sciences* 26.2 pp.211-219. But both fail to mention 3 unmissably central and intensely relevant discoveries in that paper and/or "Too-Big" which *Isis* readers need awareness of:

[i] The Nile Map shows that Eratosthenes' original circumference *C* was 256000 stades (later nudged to 252000, perhaps for 700 stades/degree-convenience).

[ii] Eusebius' Sun-distance, 4080000 stades, is thus 100*r* (Earth-radii), in the Aristarchos-

Archimedes-Hipparchos-Poseidonios tradition that too-big-for-precision Sun-distance is a power of 10: their 1000 r or 10000 r , likely origin of the very idea of order-of-magnitude. [iii] By the correct (now generally-accepted, but still sniped-at) 185 meter stade, 256000 stades is 19% high, near 6/5 of real C ; Poseidonios' & *Geography's C*, 180000 stades, is 5/6 low. All the three Rawlins papers which *Isis'* authors have profitlessly consulted explicitly stress that air's bending of horizontal light renders high by 6/5 the C gauged by lighthouse-flame-visibility, while the same air-refraction will make C obtained by timing sunsets (at different terrestrial heights) come out 5/6 low — the double-sunset method. See D.Rawlins, "Doubling your sunsets or how anyone can measure the earth's size with wristwatch and meterstick." *Am.J.Physics*, 1979, 47.2:126-128, p.127. Cited to discoverer Rawlins for years in the 1990s in the well-known textbook, Halliday, Resnick, & Walker, *Fundamentals of Physics*, as its kickoff example of applied science, illustrated by diagram (plus frontispiece sunset-photo). See also J.Gerver and Rawlins in *Scientific American* 1979 May. But uniformly silent Historians-of-science will not so much as admit the existence of the airbend solution, not even when they have provably read it (e.g., J.Dutka at *AHES* 46 p.64, 1993; F.Ragep, *Archimedes* 23 p.124, 2010; *Isis* 2015 & again in 2016). But, as we've seen already, *Isis* & Shcheglov in 2016 exceed their predecessors, by showing that all the above-noted scientists & forums are Deluded in finding precise ancient geodesy credible. [Above paragraph's conclusion added 2017/5/24&6/22.]

X Shcheglov's n.15 cites fn 13 of "The Ptolemy GEOGRAPHY's Secrets", *DIO*, 2008, 14:33-58, which describes this solution. And "Secrets" seven times cites "Too-Big", our dedicated explanation of the refraction theory, right in the SAME volume 14 of *DIO*. (Also bearing the 2008 *DIO* parallactic derivation [above] of $C = 252000$ stades, which Shcheglov n.14 credits to 2015 runnerups Carman-Evans, never citing "Too-Big" at all.)

Y Though $C = 256000$ stades is unignorably prominent in all Rawlins material *Isis* cites, none of the authors ever mentions that number or *DIO's* 1982 discovery of it, nor do any mention that it's 2π times Eusebius' Eratosthenian implicit Earth-radius $r = 40800$ stades: §W [ii], above, finally realized 26 years later in 2008's *DIO* 14 †1 eq.11.

Z None notes *DIO's* refraction solution (6/5, 5/6) their own citations prove they know of. No historian-of-science has ever shown grasp of its physics [‡3 §126]. Its triple-consistency (to 1%) with both 40%-disparate C (Eratosthenes-*Almajest* vs Poseidonios-*Geography*) AND the 185 meter stade (above), should be known, so that scholars can make up their own minds if it should at last mercifully end-the-endless, the ancient-Earth-circumference debate. If so, the vast literature Shcheglov has unexceedably compiled chronicles 2 centuries of pursuit of a METROLOGICAL-solution chimera, while the ultimately-accepted solution should turn out to be not a complex spliced "chain" (p.705) of stade-juggling ad-hocery, but one natural (zero stade-manipulation) unifying PHYSICAL theory: refraction by air.

Following the December paper, may we propose a 2017 New Year's Resolution to end the tradition of publishing papers promoting Ptolemy as a scientist by simply omitting all the massive evidence he wasn't? Persisting in doing so can only degrade our discipline.

POSTSCRIPT [Below items originally "Not for publication" but: why shield shunners?]: At least 6 "experts" (p.693) vetted Shcheglov. Besides the foregoing weightier problems, how'd the following mostly-minor but mostly-obvious slips elude 6 putative readers?

n.4 line 1: Xi'an & Luoyang are located in China not Montana (wrong hemisphere again). p.693 line 2: Eratosthenes' Earth-circumference is not 25 miles.

n.19: Engels' central *Am.J.Philol.* vol.106 1985 article is pp.298-311 (as in our ‡3 fn 110). p.703: Publication date of Pliny's 77 AD *Natural History* is confused with his deathdate.

p.689: Blest Isles' location matches Cape Verde Islands, not the 800-MILE-DISTANT Canary Islands (one called "Kerne" at *Geography* 4.6.33); mistake followed by all for centuries since Ptolemy called one Blessed Isle "Kanaria". (Language over coordinates!) Try a modern map vs *Geography* 4.6.34; or 2008's *DIO* 14 ‡3 §F, which Shcheglov read. *DIO's* Cape Verde Islands discovery just might be cited somewhere, sometime, in *Isis*. What does it say of tradition's grip on the field that this simple fact wasn't noted before?

Afterword: The History of science Society Hunkers and Bunkers

Due to cultish historians-of-astronomy, Greeks' patiently-won accuracy is unknown. (Perverse-ironically: it's widely believed that semi-literate Mesoamericans were better!) Given Editor H.F.Cohen's haughty rebuff (‡3 p.45), a Letter-to-the-Editor (pp.3-8), with cover letter www.dioi.org/isa.pdf, was sent 2017/3/20 to the 30-person *Isis* Editorial Board; separate emails to ordmag 10 board-members (requesting all 30 be informed of the letter), including Maria Portuondo (history of astronomy), head of Johns Hopkins University's History of science Department, plus a message left on her answering machine 2017/6/11. No response. (Asked later to review these doings, her JHU colleague R.Kargon [history of physics] pled too "rusty": 2017/9/5.) Having heard from neither Editor nor Board, DR wrote the latter 2017/4/1, www.dioi.org/isb.pdf, hoping (emph in original)

to encourage communication while correcting [*Isis* 107.4's] unfortunate December misinformation, unwary *Isis* publication of which might have been avoided, had Cohen possessed the humility to recognize he didn't understand Shcheglov's [2016 December *Isis*] paper *except that it enticingly attacked one who was upsetting³ Cohen by asking Isis to publish too-accurate criticisms of his fellow polys*. For Shcheglov, Cohen should've sought refereeing from not just the usual suspects but from *DIO* (re, after all, a huge attack on *DIO*&DR) during a period when Cohen was actually exchanging emails with *DIO*, but preferred secrecy. Now, instead of owing to errors, he's coverupping for not just Ptolemy but for Cohen, taking you all into hiding with him.

The *Isis* board's non-reply so far risks being interpreted as . . . doing nothing — about mere plagiarism, and miscomputed demeaning of accurate *and scientifically refereed* [p.45 below] Greenwich-Centenary scholarship Less speculatively, we know exactly what Cohen was up to, when he did not tell us he was sending the large paper [www.dioi.org/qjo.doc; now less diplomatically transformed into paper ‡3 below, here] to a referee *until he got a negative report safely in hand* [a report again not evaluating any scholarship]. Does he imagine such transparent tactics are not noticed by serious academe?

Truthseeking institutions communicate. And will not hide their demonstrated miscalculations. And don't doubly (2015/3 & 2016/12 n.14), knowingly appropriate credit for a (needlessly) rival journal's discovery. If *Isis* does not acknowledge receipt of this letter . . . it will be reasonable for previously unenlightened observers to conclude that your society is unprincipled,⁴ and you will not hear directly from *DIO* again.

Out of dozens of potential HsS respondents, *Isis'* sole burp was a 2017/4/2 email from former HsS chief Lynn Nyhart (Vilas-Bablitch-Kelch Distinguished Achievement Professor) of the Univ.Wisconsin History of science Department, reading (in its entirety):

I received your note and have read the attachments. In my view, the decision of what to publish (or not) in any specific case is the prerogative of the editor. So I'm afraid I cannot help you out here. Sincerely yours, Lynn Nyhart

So: what exactly does HsS' windowdressing "Editorial Board" DO? Why have one? Since nothing in Nyhart's note is responsive to *DIO's* scholarship or *Isis'* above-documented sneers at elementary academic ethics, the History of science Society evidently doesn't even care that critics will notice that its board is complicit in Editor Cohen's display of how brave its journal is, and just might conclude that the Society is more political than ethical.

³Cohen email to *DIO* 2016/9/27: "Never ever is *Isis* going to publish a paper which already in its very first sentence . . . contains the phrase 'smothered by a chauvinist battery of destructive, data-disrespecting — even *data-fudging* — papers' ". (See ‡3 p.46 below.)

Whether the charge was accurate? The point held no visible interest at all for *Isis*.

⁴History-of-science archons' principledness glimpsed: www.dioi.org/vols/w13.pdf, *DIO* 1.2 fn 172.