XXIII. *A Letter from the Rev. Mr.* George Coſtard *to Dr.* Bevis, *concerning an* Eclipſe *mention'd by* Xenophon.

Dear Sir,

Read April 12, 1753. OF what uſe the doctrine of eclipſes is in hiſtory and chronology, you know too well for me to tell you. The earlieſt account of any in the Greek hiſtory is that ſaid to have been foretold by Thales to the Ionians. Of this I ſhall ſay nothing more at preſent, for fear of repeating what I have already obſerved to you upon that ſubject. The next, that is generally taken notice of by writers, is, that in the firſt year of the Peloponneſian war mentioned by Thucydides. But there is another before that, as I apprehend, equally remarkable, which, as Mr. Jackſon (Vol. I. p. 426.) hath quoted me for, may deſerve ſome farther conſideration.

It is well known, that Herodotus and other writers make Cyrus to have depoſed Aſtyages. On the contrary, Xenophon ſays, that Aſtyages was ſucceeded by his ſon Cyaxares, who left the kingdom to Cyrus by will. The truth, I believe, is, that Cyrus did not depoſe Aſtyages, and therefore ſo far Xenophon is right, but depoſed Cyaxares; in which he was deſignedly wrong. That he knew the Perſians forced the empire from the Medes, I think, appears from ſome no very obſcure hints even in the *Cyropædia* itſelf. But that argument I ſhall not enter into farther at preſent. In his *Anabaſis*, which is nothing

but a journal of his march, and where he relates things as he found them, he expreſly aſſerts it. For he ſays, that the Greeks in their return home, came down to the river Tigris, where had formerly been a large but at that time deſerted city called Lariſſa, inhabited formerly by the Medes. Ταύτην, continues he, βασιλεὺς ὁ Περσῶν, ὅτε παρὰ Μήδων ΕΛΑΜΒΑΝΟΝ τὴν ἀρχὴν, πολιορχῶν, ἐδένι τρόπῳ ἐδύναντο ἑλεῖν. ΗΛΙΟΝ δὲ ΝΕΦΕΛΗ προκαλύψασα ἠφάνισε, μέχρις οὗ ἄνθρωποι ἐξέλιπον, ᾗ ἔτως ἑάλω.

Tho' Xenophon calls this a cloud, yet the word ענן *anan*, probably made uſe of by thoſe, from whom he received his account, not only ſignifies a cloud, but any obſtacle in general. That ſuch effects could be owing to no common cloud, I imagined muſt be evident enough. And as the year before Chriſt 547, from a number of arguments, too long to be here inſiſted on, appeared to me to be the year, when Cyrus finiſhed his reduction of the Median empire, I was naturally led to try, whether there was any ſolar eclipſe that year, that could be the cauſe of ſo remarkable a darkneſs.

The geography of the eaſt is ſo very imperfect, that it may be difficult to determine the ſituation of this Lariſſa. For Xenophon hath given no other account of it, than that it lay on the banks of the Tigris. It is not improbable however, as Bochart thinks, that Xenophon inquired upon the ſpot, What ruins thoſe were? And was anſwered לרסן *Lareſen*, i. e. *Reſen's*, or the ruins of *Reſen*. But this he eaſily miſtook, or changed into *Lariſſa*, a name he was much better acquainted with.

Reſen

Reſen is a place mention'd *Gen.* x. 12. and there ſaid to lie between Nineveh and Calah. This perhaps may help us in ſome ſort towards its ſituation. *Mauſil* (ſays Abulfeda) *metropolis eſt regionum Meſopotamiæ. Impoſita eſt Tigri, a latere ejus occiduo. Ex adverſum, a latere ejus eoo, eſt civitas Nineveh ruinis ſepulta. Ad auſtrum Mauſilæ effundit ſeſe Zabus minor in Tigrim.*

In Abulfeda, the longitude of Mauſil is 67°, and its latitude north 36° 30′. But in Ulugh Beigh, and Naſſir Ettuſi, it hath longitude 77°. The laſt of theſe two authors agrees with Abulfeda, as to its latitude, but the former of them aſſigns it 34° 30′; which makes a difference of two degrees, or 120 geographical miles. Chryſococca, in his tables, hath ΜΟΥΣΟΥΛΙΝ, to which he aſſigns longitude (ξθ) 69, and latitude (λε) 35. This author reckons his longitudes ἀπὸ τῆς ἄκρας δυτικῆς θαλάττης, as Abulfeda doth his. But Naſſir Ettuſi and Ulugh Beigh begin theirs از جزایر خالدات from the Fortunate Iſlands. The difference between the two computations is 10 degrees, according to Abulfeda, tho' others make it 17° 30′. Varenius, and modern geographers, place Mouſol in longitude eaſt from London 43°, and in latitude north 34° 32′: And this, I ſuppoſe, is as exact as any.

In the year before Chriſt, therefore, 547, the apparent time of the true conjunction was at Greenwich, October 21^{d} 23^{h} 39′ 18″.

	°	′	″
The place of the luminaries	6 24	9	0
Moon's latitude north		46	24
Semidiameter of the earth's diſk		61	18

Semidiameter

Semidiameter of the penumbra 33′ 11″
Beginning of the central eclipſe, 22h 39′ 7″.
End of the central eclipſe 22d 0h 55′ 55″.
Duration 2h 16′ 48″.
Angle of the moon's way with a circle of latiude, 84° 25′.
Moon's ſemidiameter 16′ 50″.
Sun's ſemidiameter 16′ 21″.
Angle of the moon's way with a circle of latitude, 84° 25′.

	°	′	″
The ſun roſe centrally eclipſed, in longitude weſt from Greenwich,	54	46	10
In latitude north	71	44	40
The ſun ſet centrally eclipſed, in longitude eaſt from Greenwich,	91	6	50
In latitude north,	23	9	40

The place of the center was at the following times, as computed at Greenwich, thus,

	Times. d	h	′	″	Longitudes. °	′	″		Latitudes. °	′	″	
October	21	23	39	47	23	7	30	E	39	48	40	N
		23	47	31	28	36	40		34	20	50	
	22	0	2	31	37	13	30		30	24	30	
		0	17	31	57	19	40		26	56	40	

By this table it is eaſy to ſee, that the center of the ſhadow croſſed the deſerts of Arabia, and then paſſed over the Perſian Gulph below the mouth of the Euphrates. But if you will make the ſame allowance, as I did in my laſt, for the moon's acceleration,

or

or the ſmall retardation of the earth's diurnal motion, the place of the center will be found at the following times, as reckoned at Greenwich, thus,

Times.				Longitudes.			Latitudes.		
	d	h	′	″	°	′	″	°	′	″
October	21	23	2	31	39	1	40E	34	20	50N
		23	17	31	47	38	30	30	24	30
		23	32	31	68	9	40	26	56	40

By this table then it appears, that the center of the ſhadow paſſed more northward than the former track, and went over Kerkiſia, not improbably, the Carchemiſh of the prophet Jeremiah, and a ſmall matter to the north of Bagdad. It is not improbable therefore, that it croſſed the Tigris not far from the place where, it ſeems by Xenophon's account, Lariſſa was ſituated, and where, conſequently, it would cauſe ſuch a darkneſs, as might well be attended with the effects he mentions.

This eclipſe is, I take it, no inconſiderable acquiſition to hiſtory and chronology, and is at the ſame time a confirmation of the ſuſpicion, that, in theſe very antient ones, there is ſome allowance or other to be made for the influence of ſome cauſe, whatever it may be, hitherto not fully determined. This muſt be left for future obſervations. In the mean time however it may be of ſervice to the ſcience of aſtronomy, to examine all the paſt eclipſes, that can be come at, and compare them with circumſtances in the beſt manner we are able.

I have three more by me, which may ſome time or other make their appearance in the ſame manner

with the preſent one. In the mean time I ſhall add, that in Ebn Younis's eclipſe, in the year after Chriſt 979, the time of the mean oppoſition was, by my calculation, May 14^{d} 3^{h} 50′ 30″.

	°	°	′	″
The ſun's place	1	27	53	0
The moon's place in the ecliptic	7	27	53	0
Moon's latitude north			37	42
Place of her apogee	4	13	50	46
Place of her node	2	5	4	14
Sun's mean anomaly	11	1	29	47
Place of his apogee	2	25	29	30

Digits eclipſed 8^{d} 4′.

Theſe numbers are ſomething different from thoſe, which, I think, I gave Dr. Bradley ſome time ago. For I had made, ſome how or other, a ſmall miſtake in the place of the ſun's apogee, which was kindly hinted to me by Mr. M. I have, ſince that, gone over the whole calculation again, and believe it is pretty exact, and agrees well enough with what Ebn Younis relates, that *Spatium, quod eclipſatum fuit de diametro ejus* (lunæ) *fuit amplius quam octo digiti, et minus quam novem.* And afterwards, *Et erat luna, in hac eclipſi, in propinquo diſtantiæ ſuæ mediæ.*

I have been led inſenſibly farther than I intended at firſt, which was only to explain the grounds of what I had ſaid to Mr. Jackſon. But your love to the ſcience will excuſe the trouble I have given you, and make any farther apology needleſs. I am, dear Sir,

Oct. 3, 1752. Your very affectionate, *&c.*

G. Coſtard.

XXIV.