THE BOOKS OF AUTOLYKOS

ON A MOVING SPHERE

AND

ON RISINGS AND SETTINGS

Translated and Edited

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9. *If on a sphere the large circle defining the visible and invisible (part) of the sphere is oblique to the axis, those points which when rising are closer to the visible pole set later, and those which when setting are closer to the visible pole rise earlier.*

Indeed, let on a sphere (fig. 10) the large circle ABC be oblique to the axis, and define the visible and invisible (part) of the sphere. Let two points C and E, rising simultaneously, be taken. Let the one nearer to the visible pole be C, and the one farther away E.

(*Proposition*): I say that points C and E will not set simultaneously, but that C will set after E.

(*Proof*): Indeed, let CFZ and EKH be parallel cirles on which are carried points C and E. Since the horizon ABC is oblique to the axis it is also oblique to the parallel (circles). Therefore arc CZ is larger than, or the same, as arc EH.
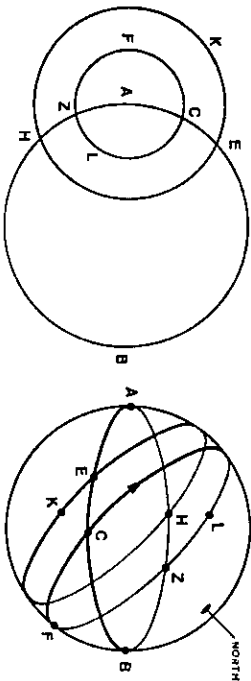

FIGURE 10

Let CL be similar to EH. Therefore in equal times point C comes onto L and E onto H. But when E has come onto H, E is setting. However when C has come onto L, C is still not setting, but is above the earth. Therefore E sets before C, so that C sets later than E.

(Q.E.D.)

Again, let us assume that stars Z and H set simultaneously.

(*Proposition*): I say that they will not rise together, but that Z will rise before H.

(*Proof*): Since arc CZ is larger than or the same as arc EH, the remaining arc ZFC is smaller than or the same as the remaining arc HKE. Let ZFC be the same as arc HK. Since arc ZFC is similar to arc HK, it follows that, by rotating the sphere, Z comes onto C while H comes onto K. But H comes earlier onto K than onto E. Therefore also Z comes earlier onto C than H onto E. But when Z comes onto C, point Z rises, and when H comes onto E, point H rises. Therefore Z rises earlier than H.

(Q.E.D.)

3. *During the time of one night the arcs of eleven zodiacs are seen, (namely) six that have risen before and five that are rising (after sunset).*

Let AB be (fig. 18) the circle of the zodiacs, and CD the horizon. Let CE, the arc of a zodiac, be selected, and the sun be in about the middle Z. Since indeed, when (the sun) lies under (the earth) in Z, a star (in C) escapes the sun's bright light, so that it is clear that star C makes an apparent evening setting.
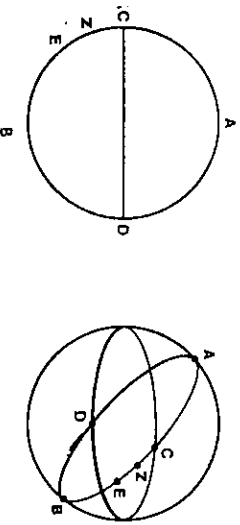

FIGURE 18

The whole of semicircle CAD which has six zodiacs can be seen rising. Of the remaining six zodiacs which exist in semicircle CBD, one, CE, occupied by the sun (cannot be seen). The remaining five are seen rising, so that (altogether) eleven zodiacs are seen.

4. *Of the non-wandering stars, for those that are within the zodiacs towards the Bears or in the parts towards the South, from the (apparent) evening rising it takes five months.*

Let (circle) AB define (fig. 19) the visible and invisible (part). Let CD and EZ be the tropics. HF be the equator. KHLF be the circle of the zodiacs. Let three stars M, F, N be rising.
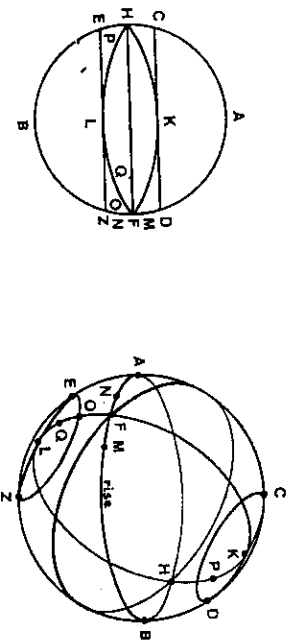

FIGURE 19

(*Proposition*): I say that for M, F, N from an (apparent) morning rising to an (apparent) evening rising it takes five months.

(*Proof*): Indeed, let me take an arc PQ of one zodiac and let me bisect it in O. Let the sun be in O. Then, surely M, F and N will make an (apparent) morning rising. Certainly, when the sun has moved to the opposite zodiac, it has moved further through an arc of five zodiacs. Let it be position P. Therefore, from position O the sun will move along an arc of five zodiacs, whereas from point H (it is) an arc of half a zodiac. When H is setting, stars M, F, and N go from an (apparent) morning rising to an (apparent) evening rising.

(Q.E.D.)