

THE ECLIPTIC

CLASS 2

- ▶ Discussion - Brand, Asimov, Kairos/Chronos, memorial days...
- ▶ Discussion Facilitator sign up
- ▶ HSNY - planning
- ▶ Sundial experience
- ▶ Ecliptic presentation
- ▶ Look ahead at week 2 homework, reading, etc.

"AZIMUTHAL GRID"



"EQUATORIAL GRID"



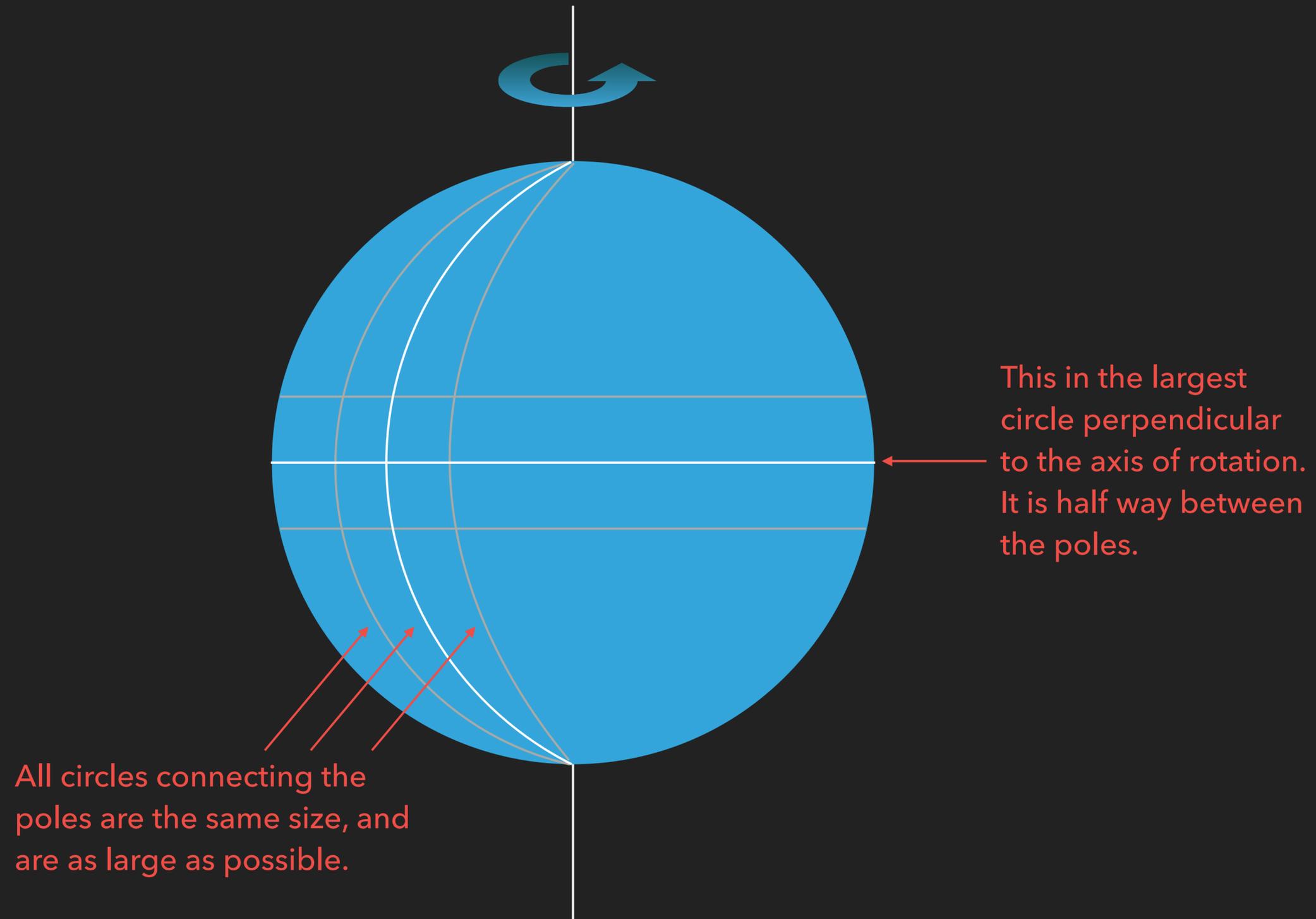


SPACE

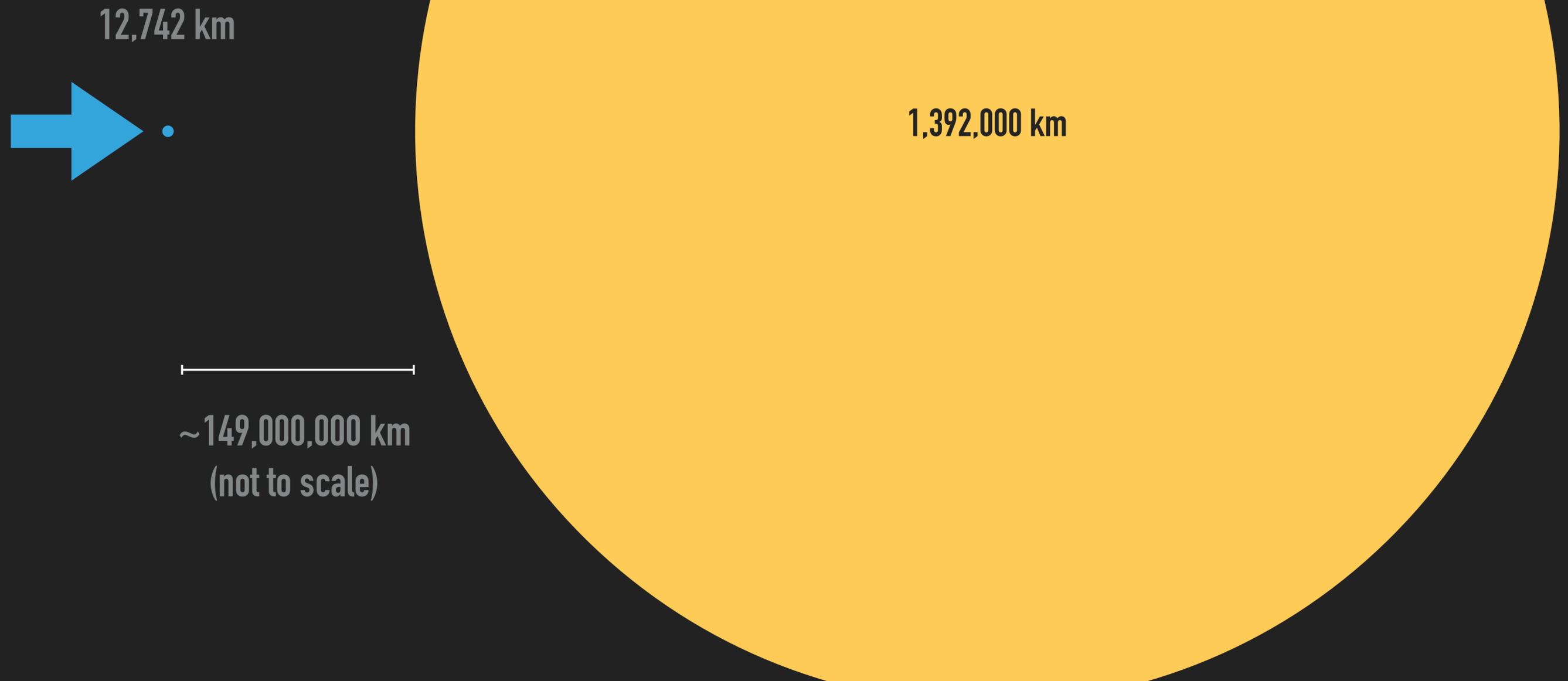
A SPHERE IN SPACE



A SPHERE IN SPACE, SPINNING

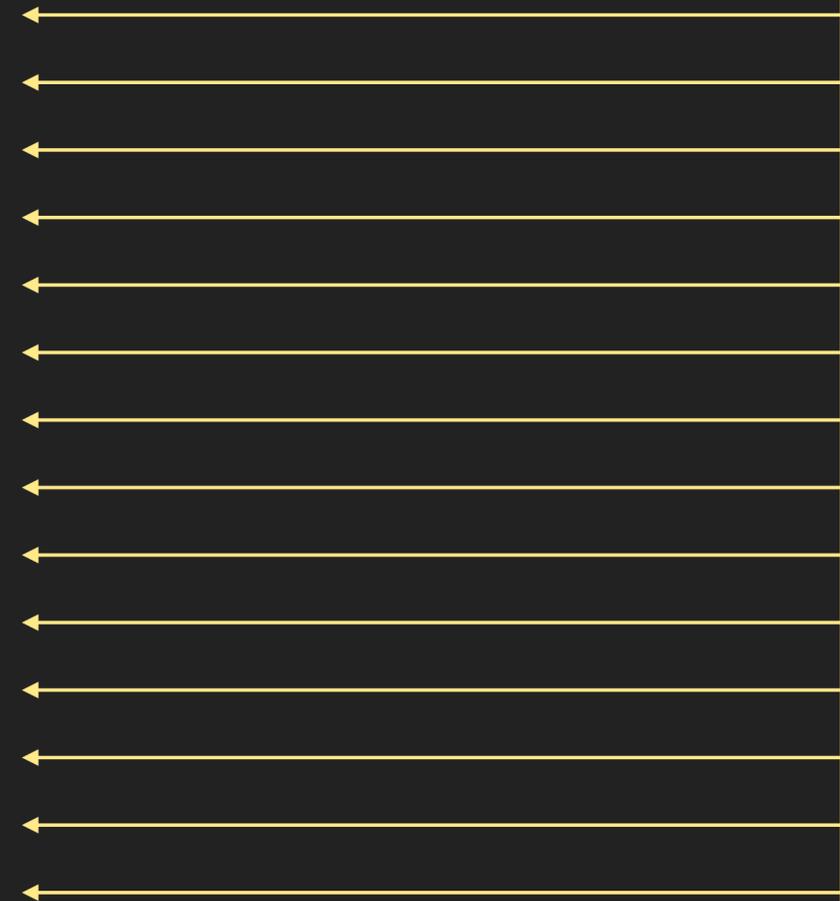
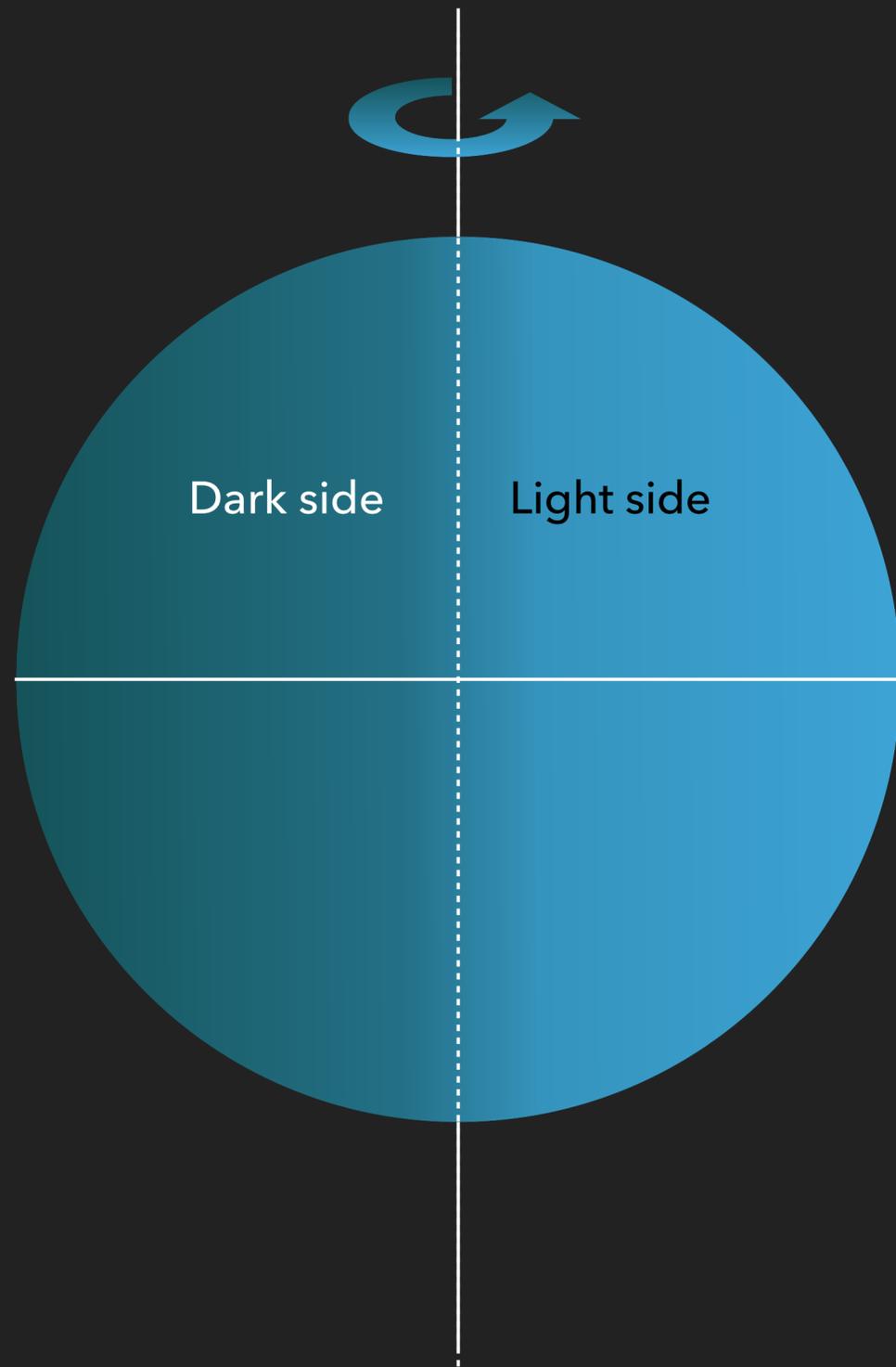


RELATIVE SIZE, SUN 109X EARTH'S DIAMETER

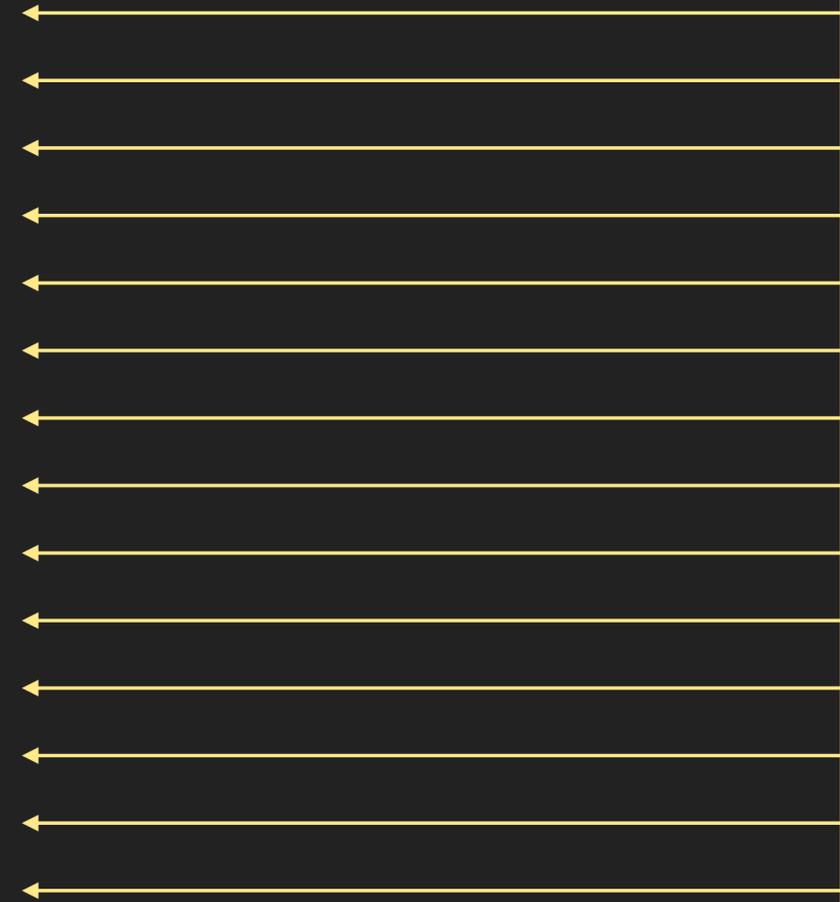
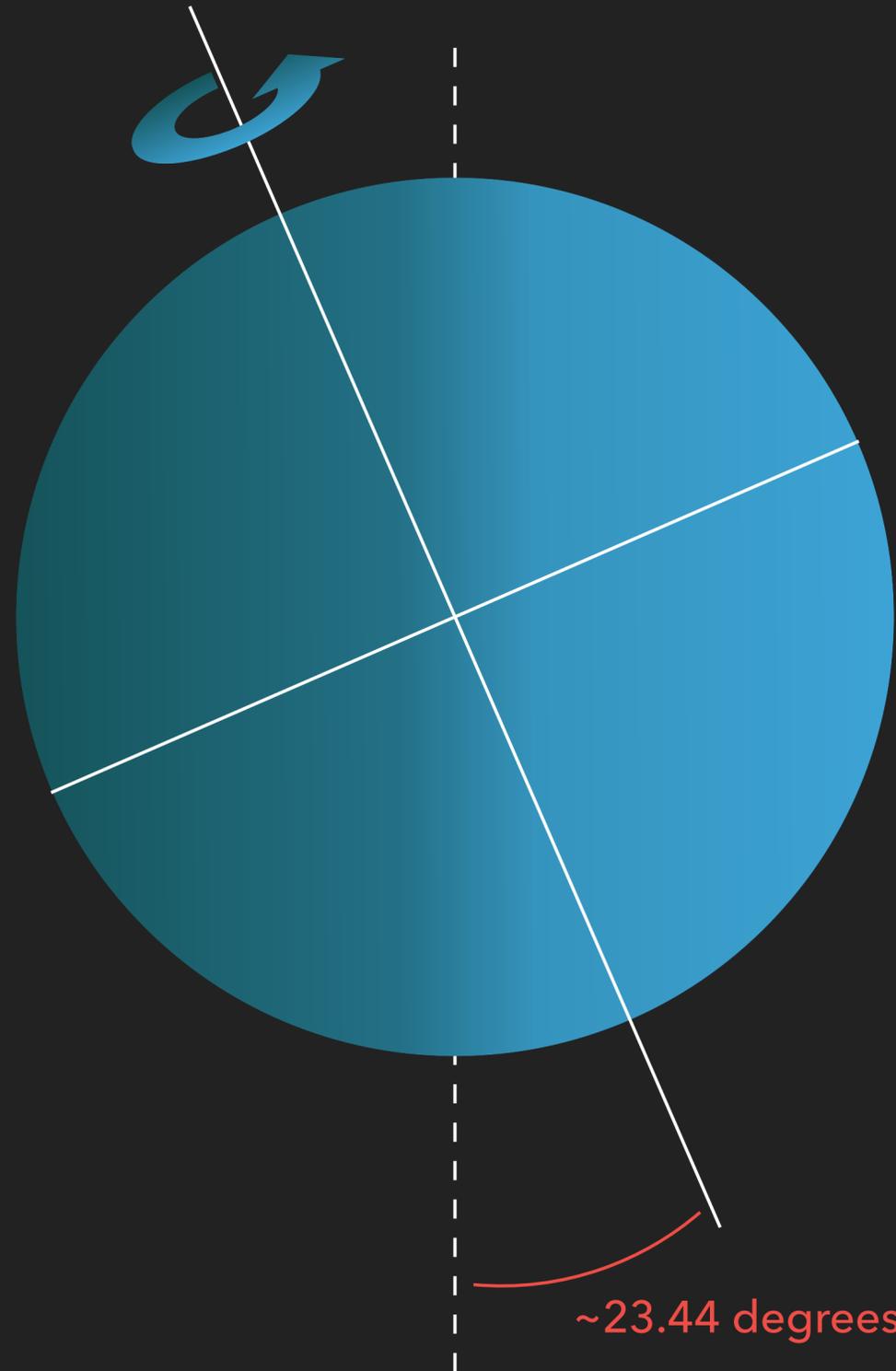


RELATIVE DISTANCE, EARTH NOT VISIBLE



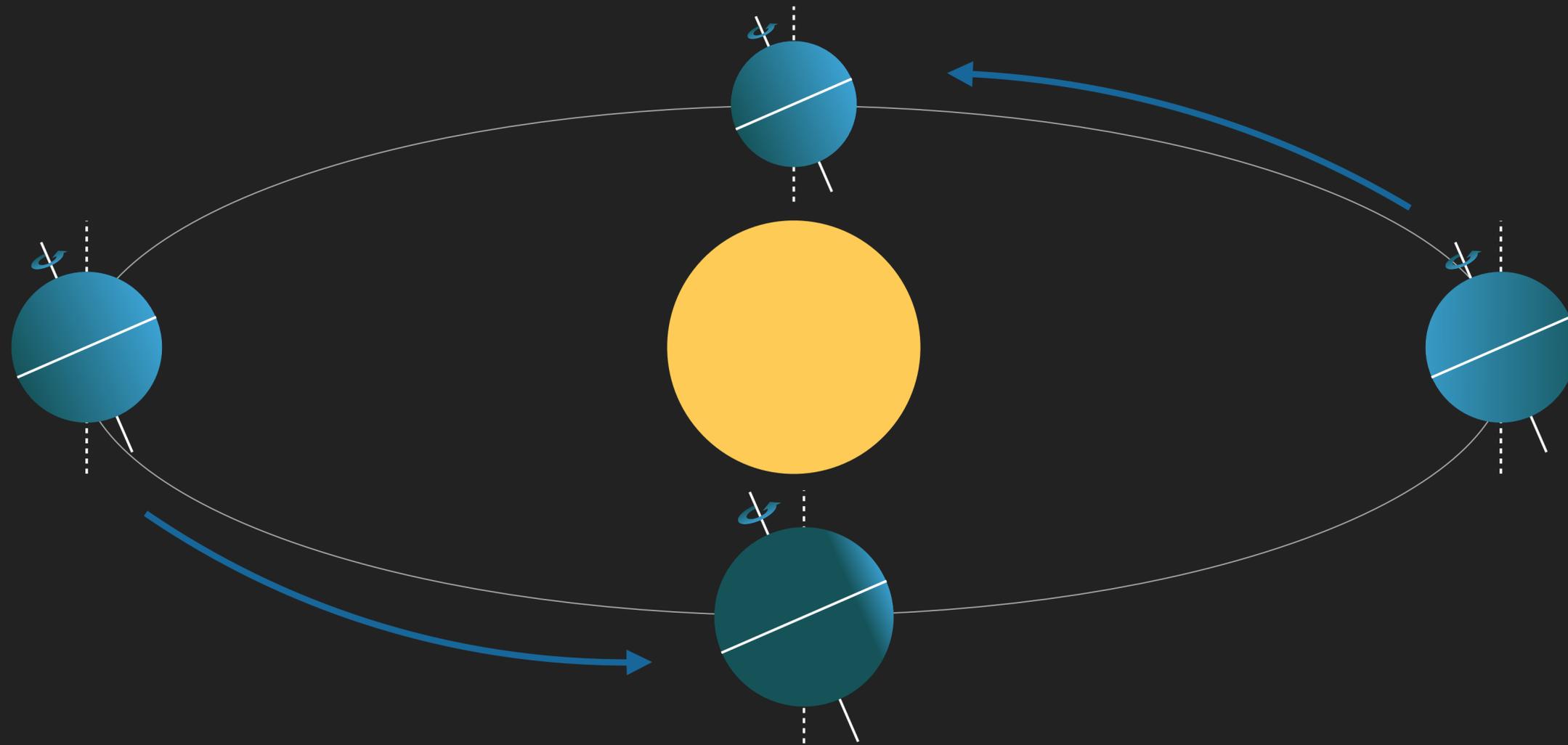


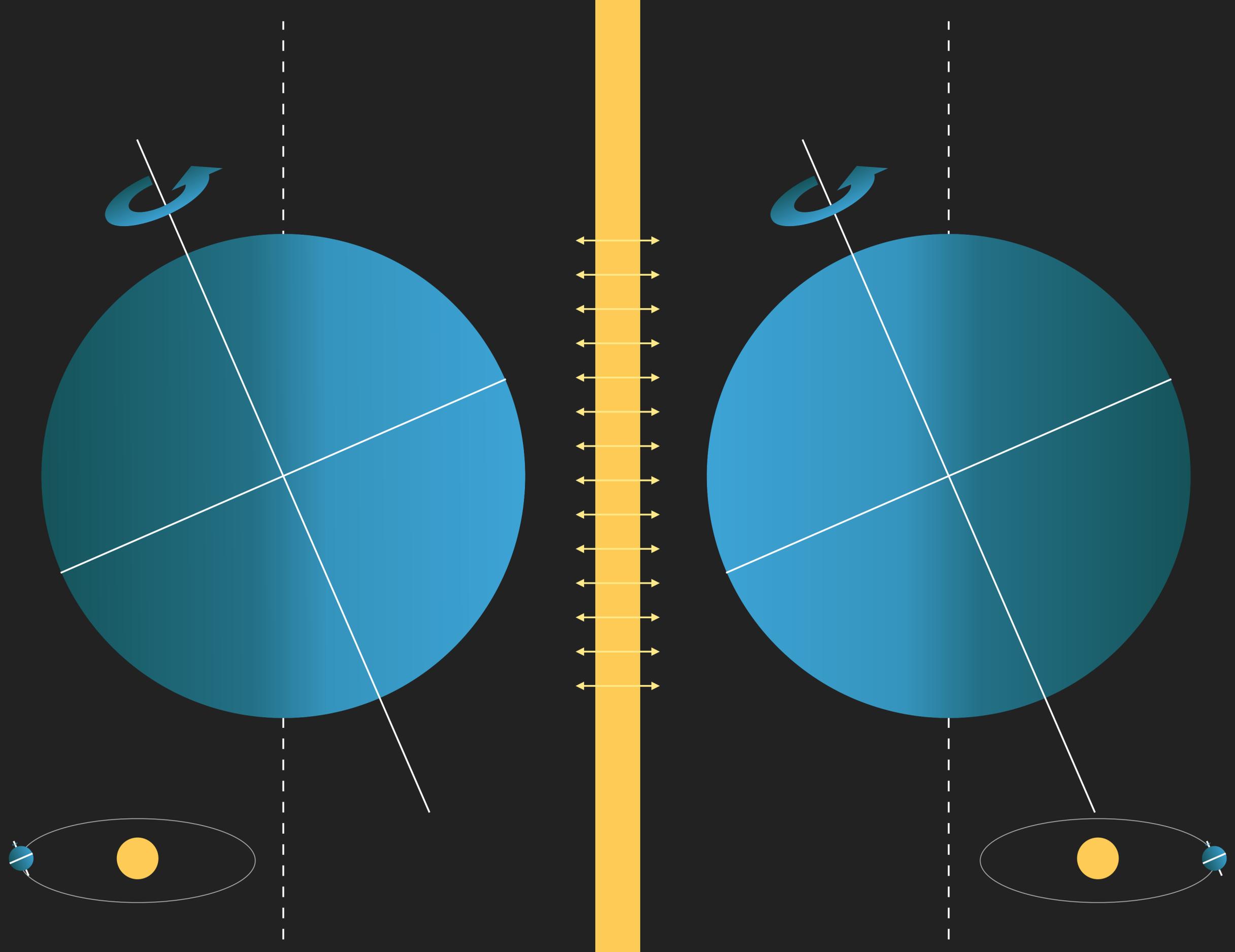
A SPHERE IN SPACE, SPINNING, TILTED

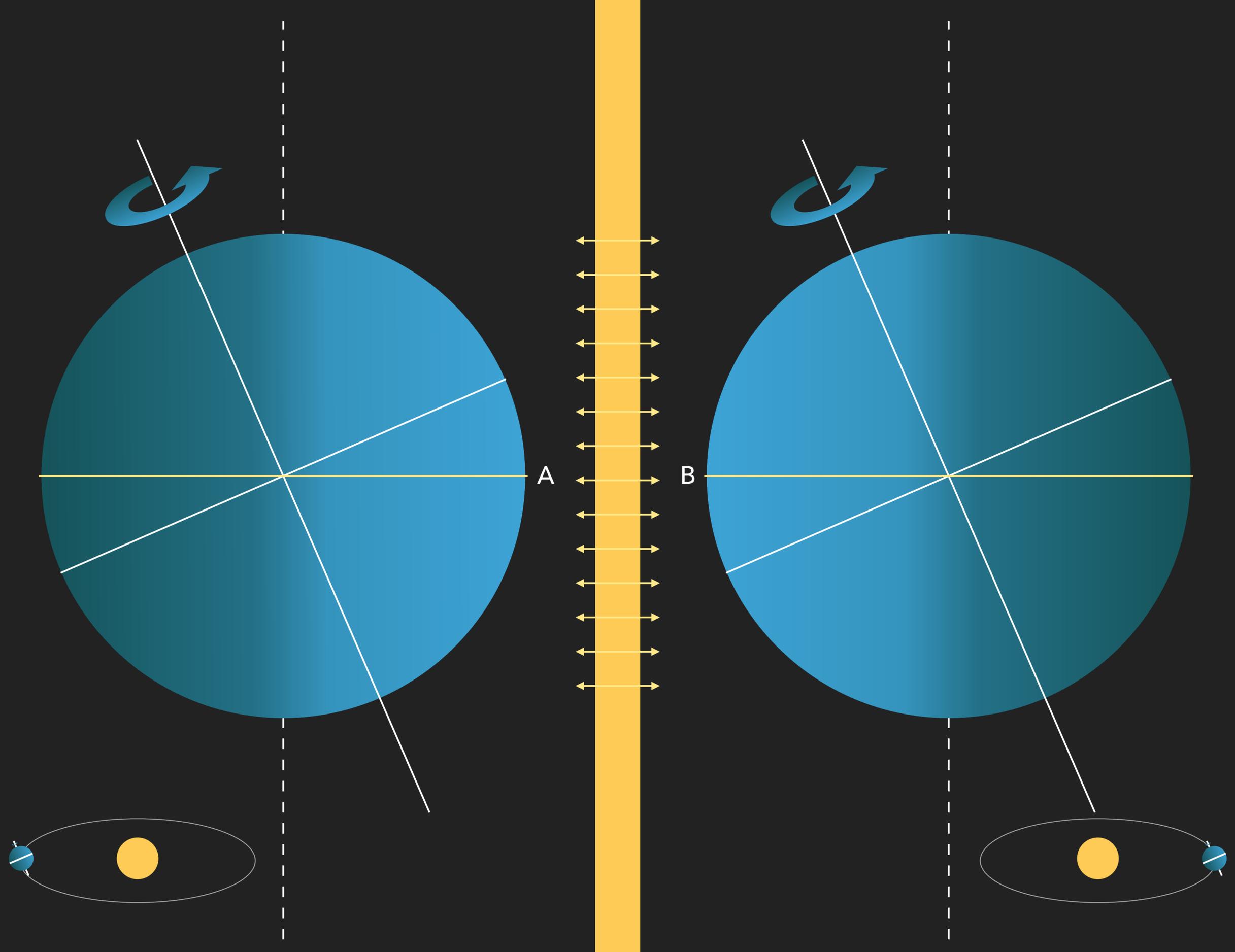


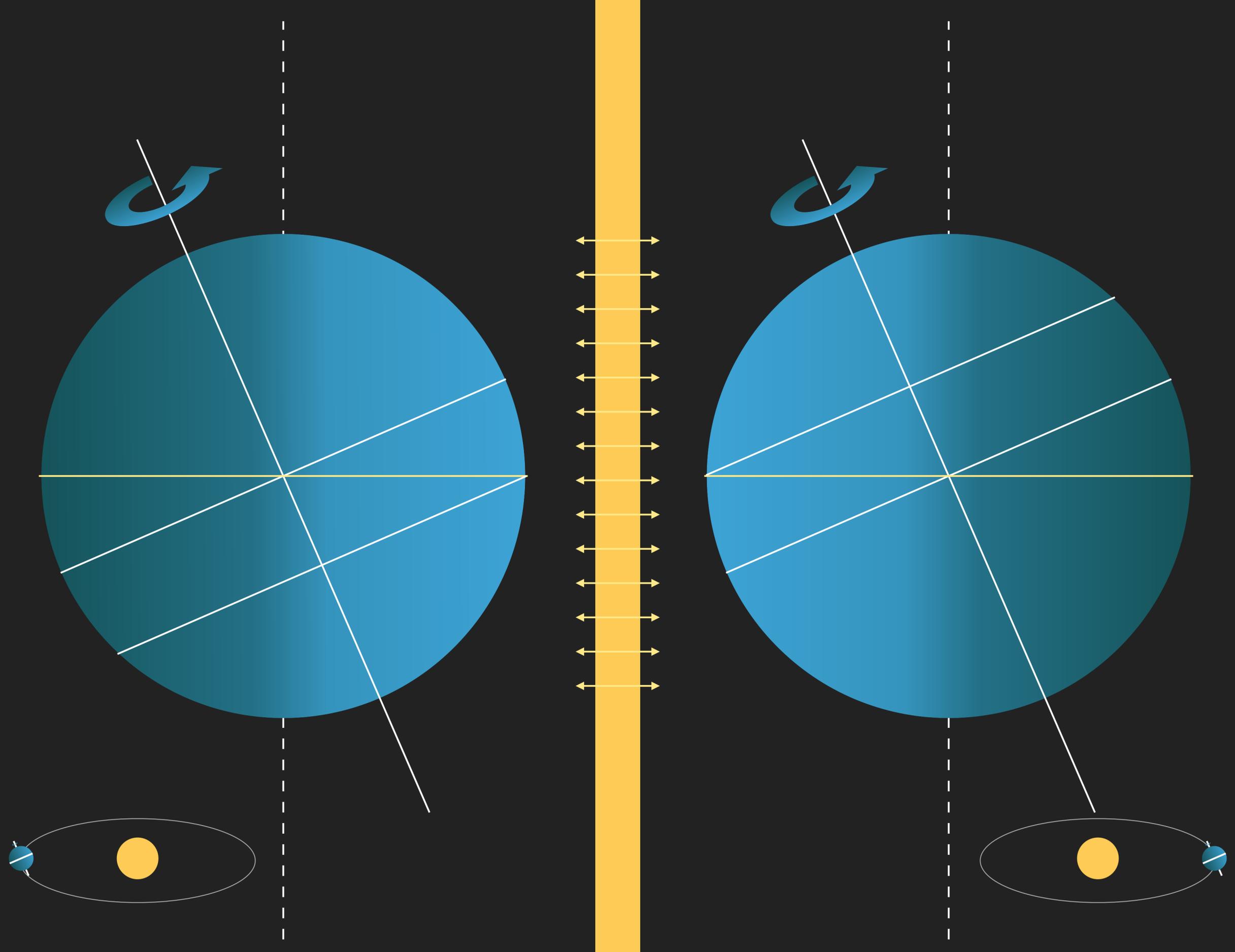
A SPHERE SPINNING, TILTED, AND ORBITING

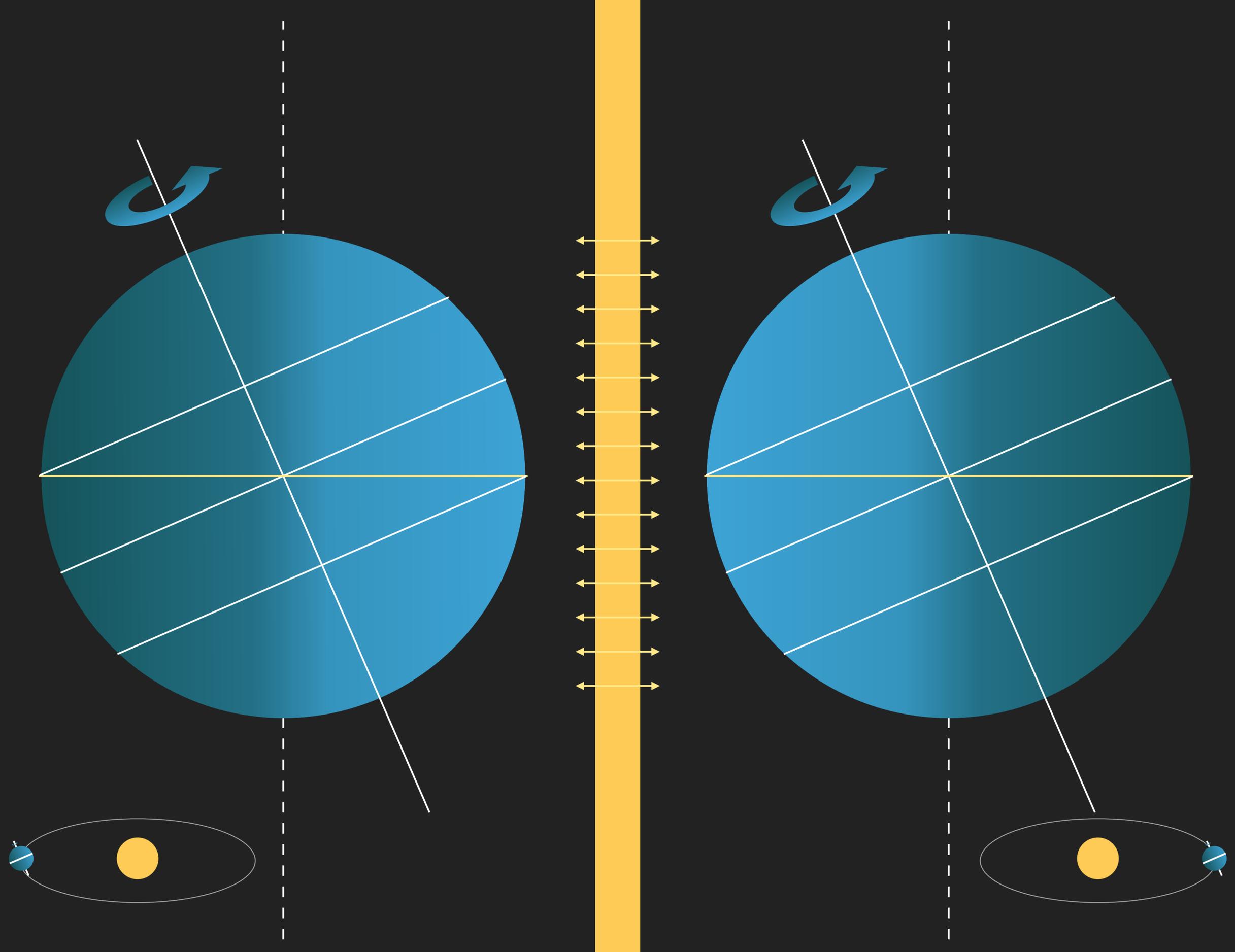
WITH CONSTANT TILT

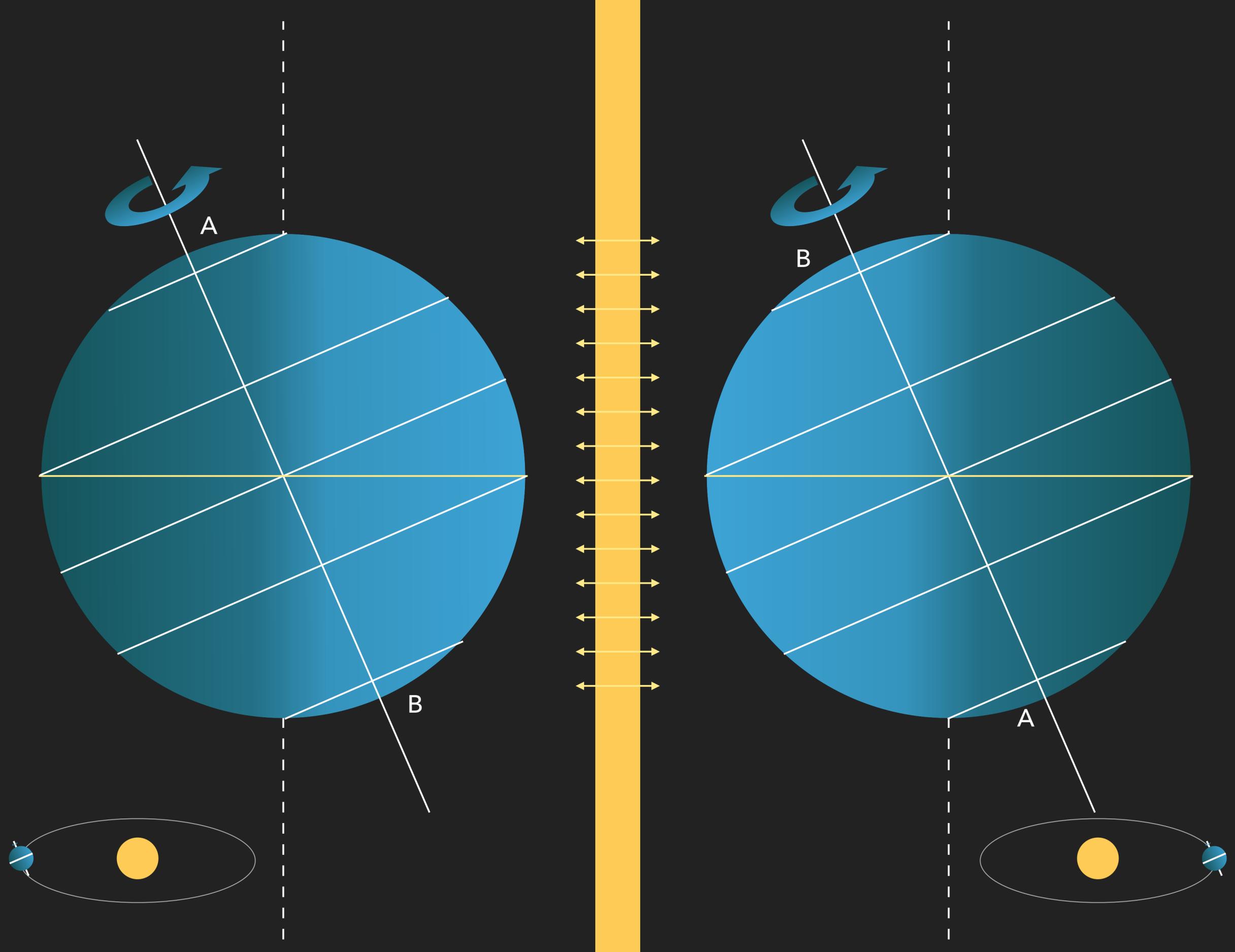


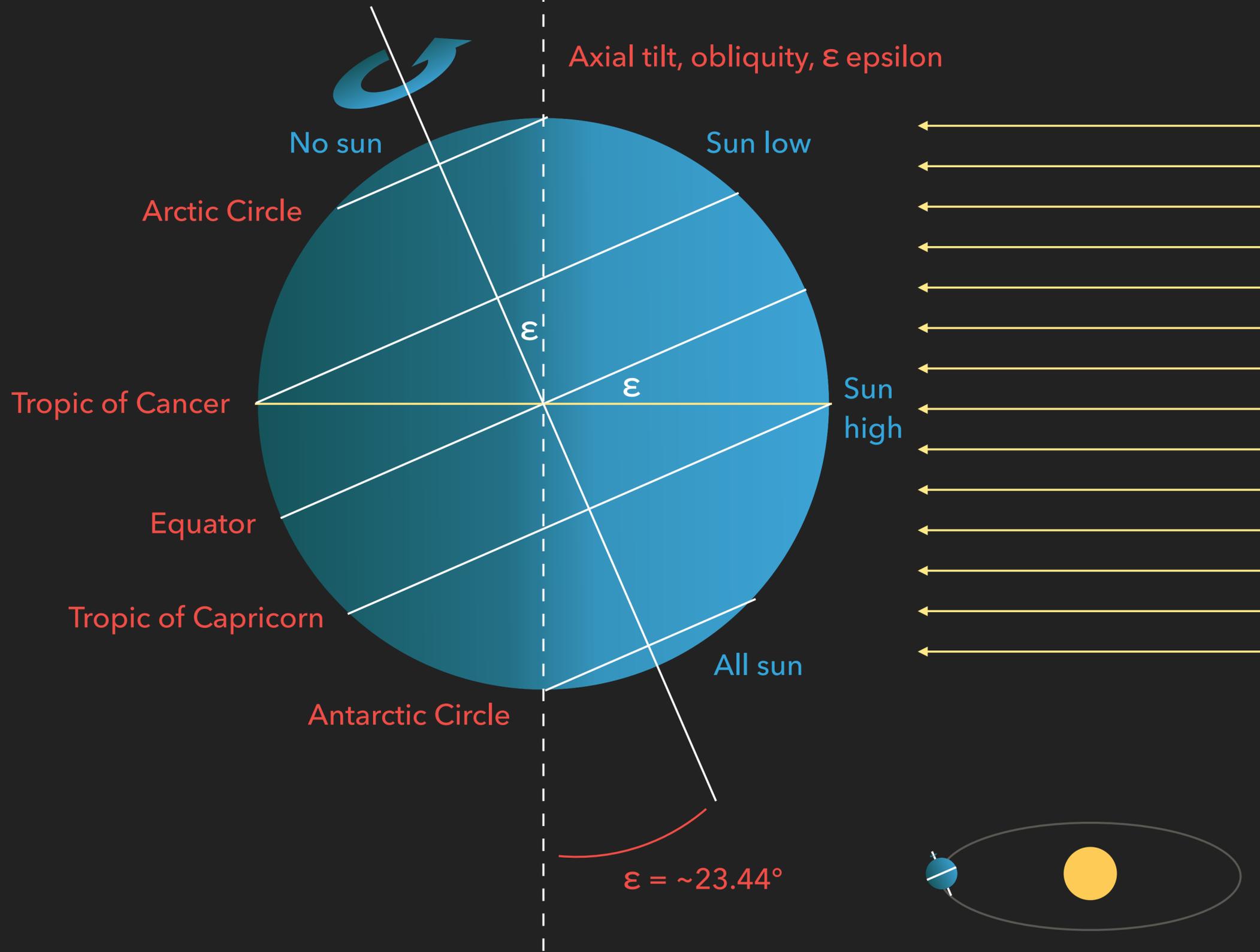


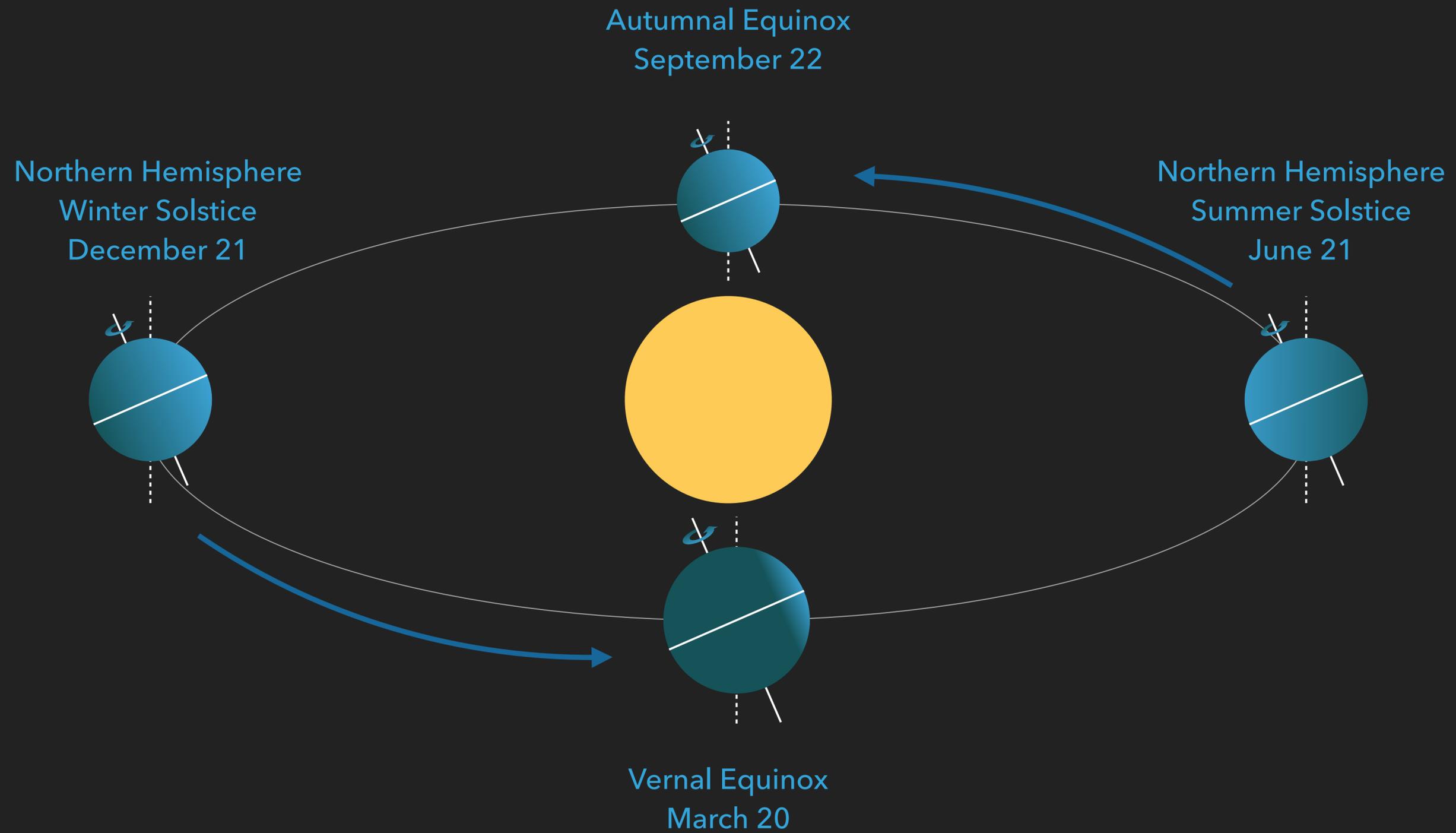




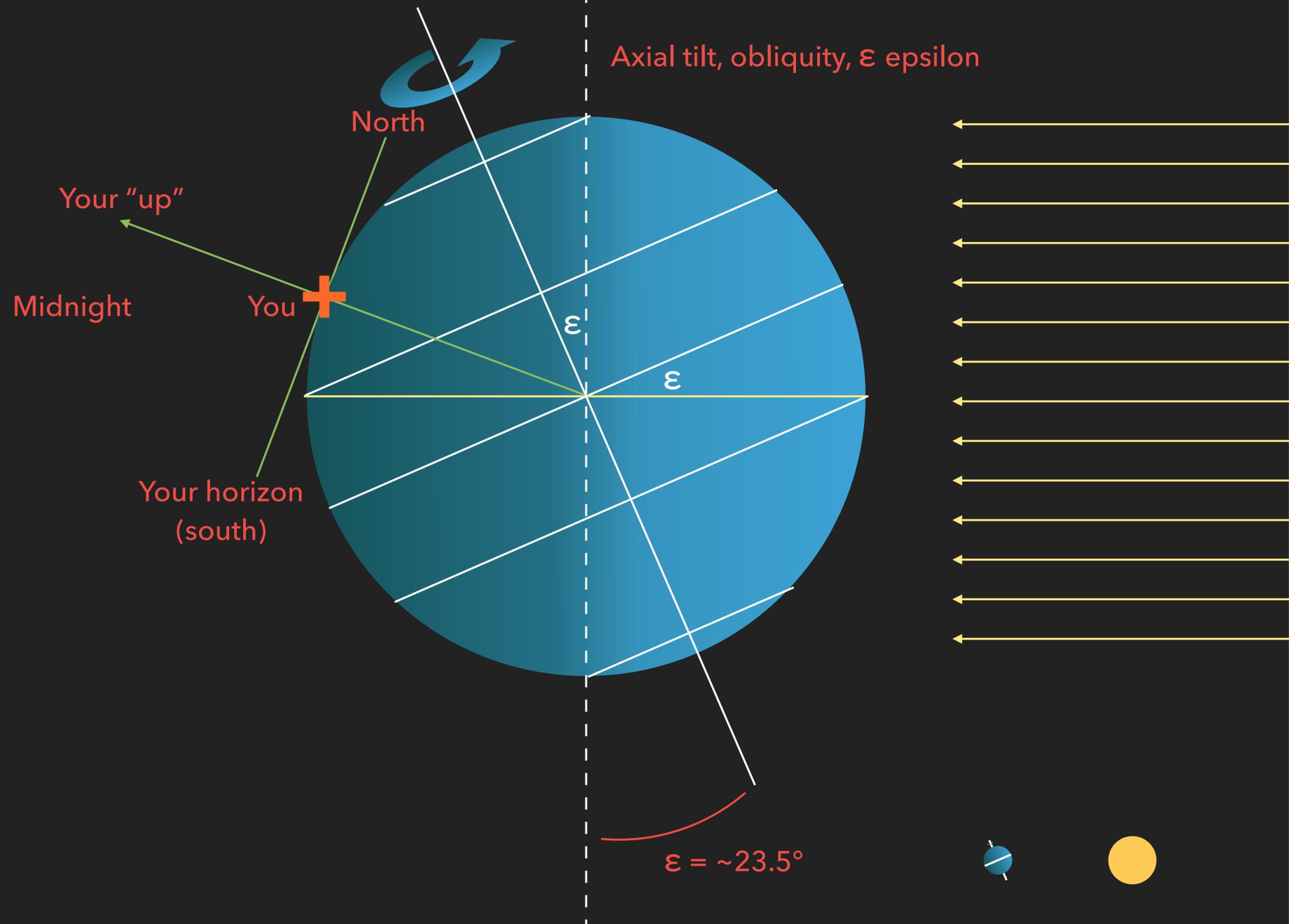




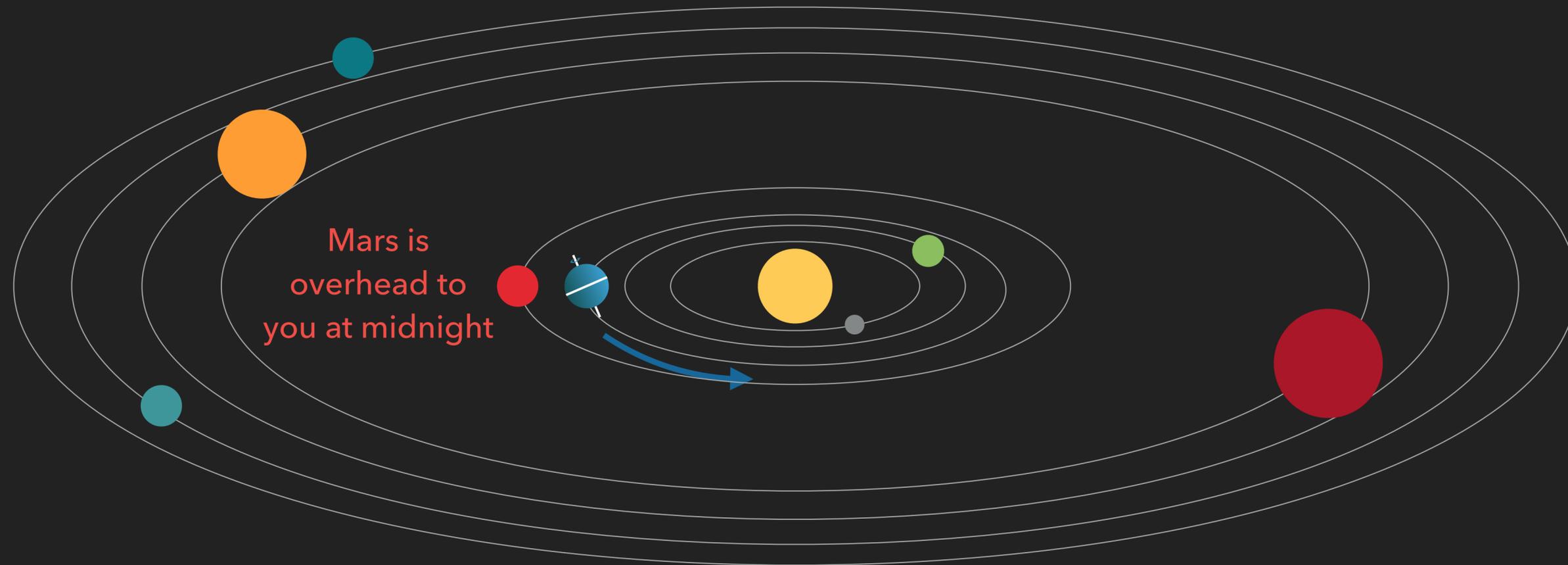




(PHEW)

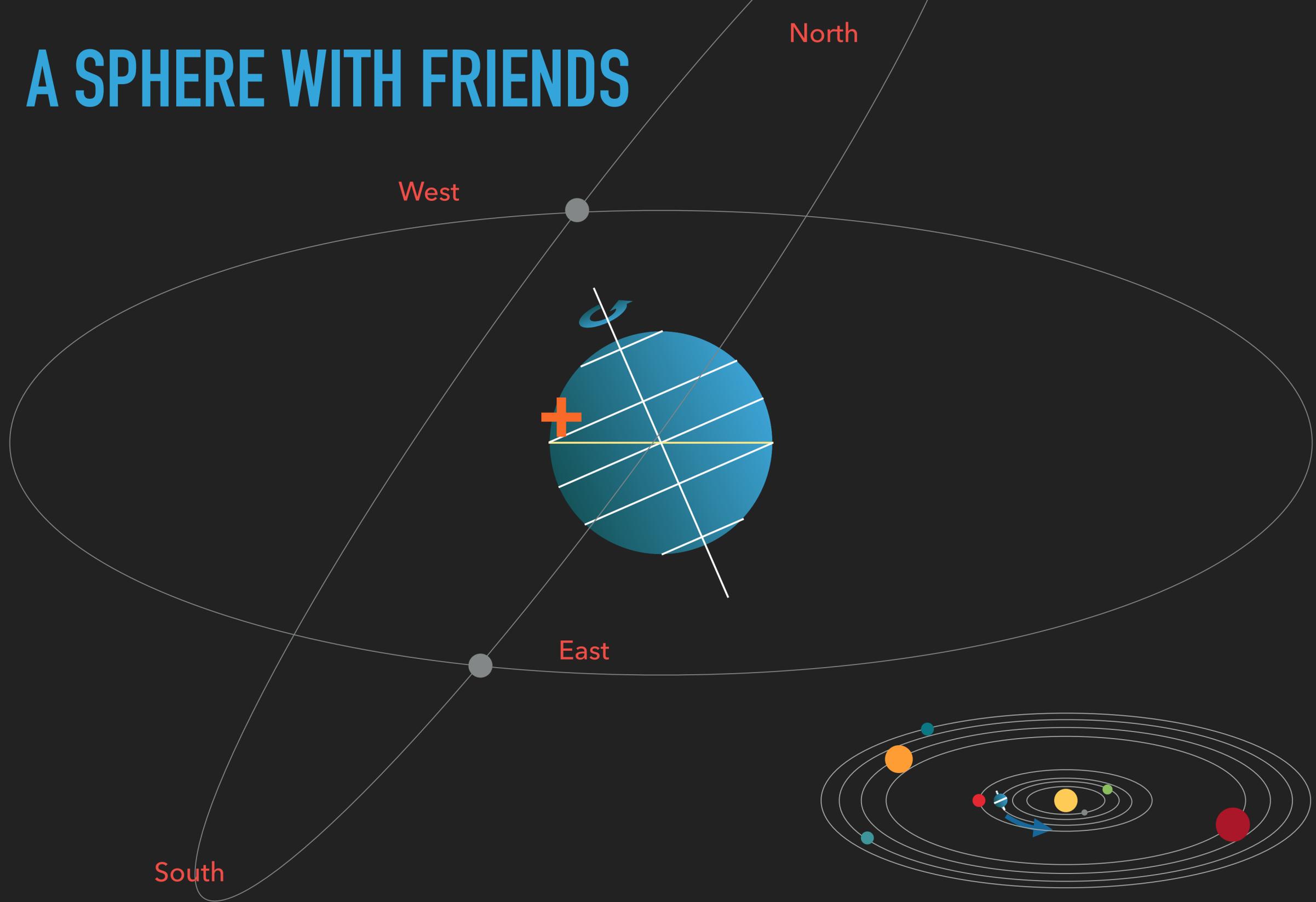


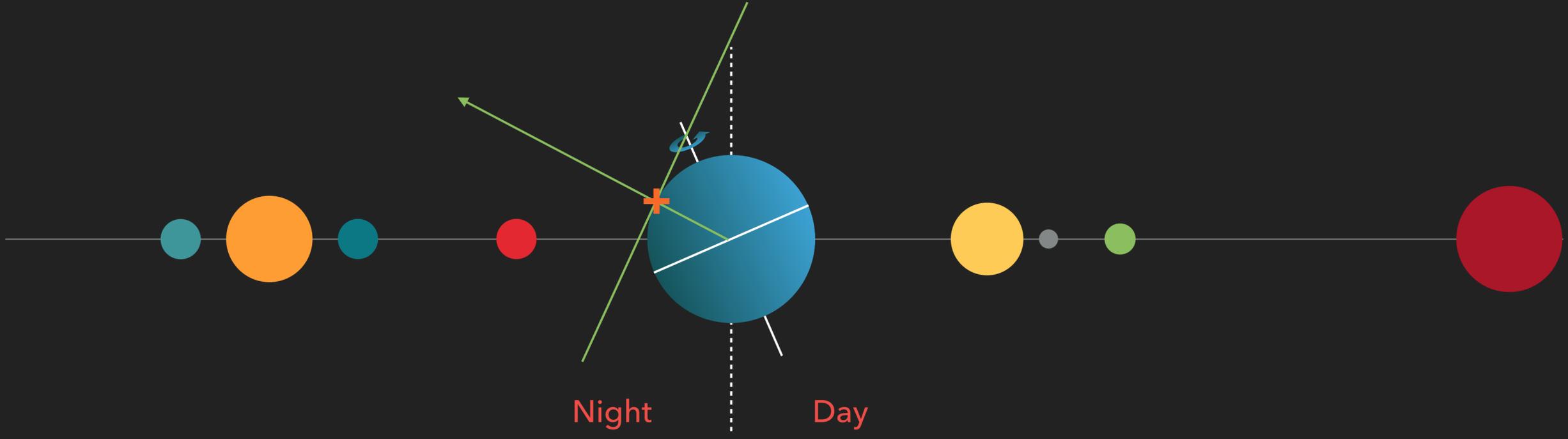
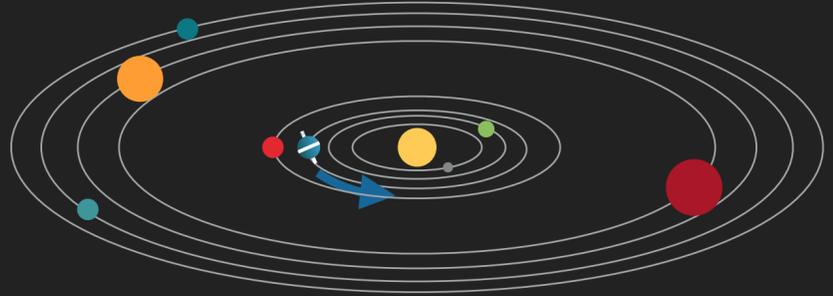
A SPHERE WITH FRIENDS



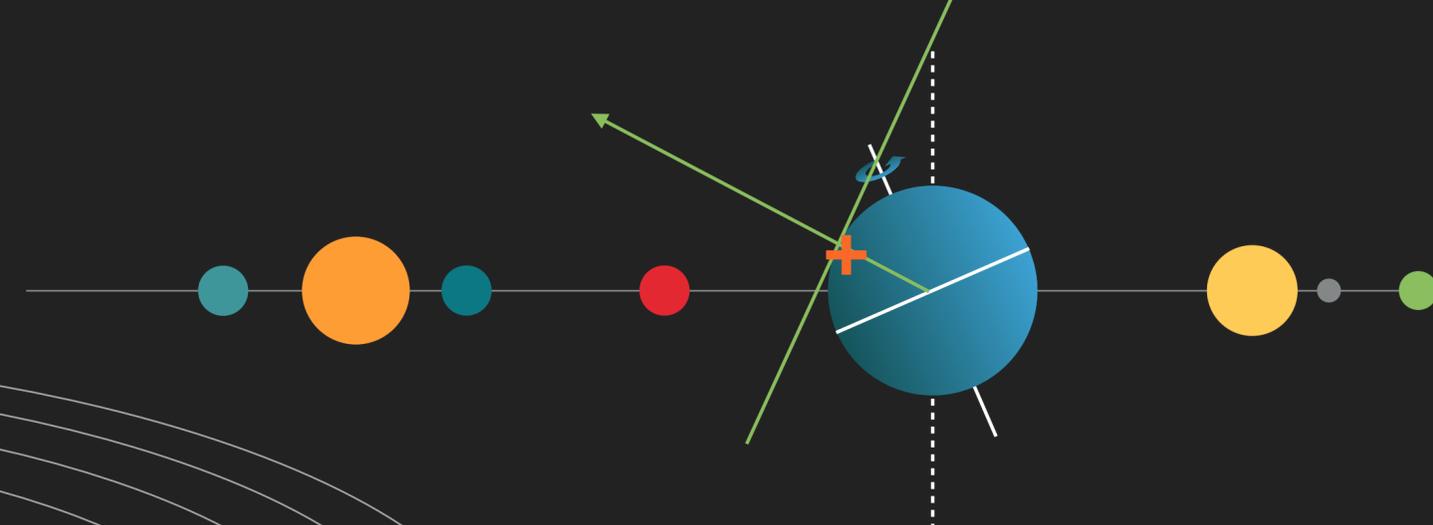
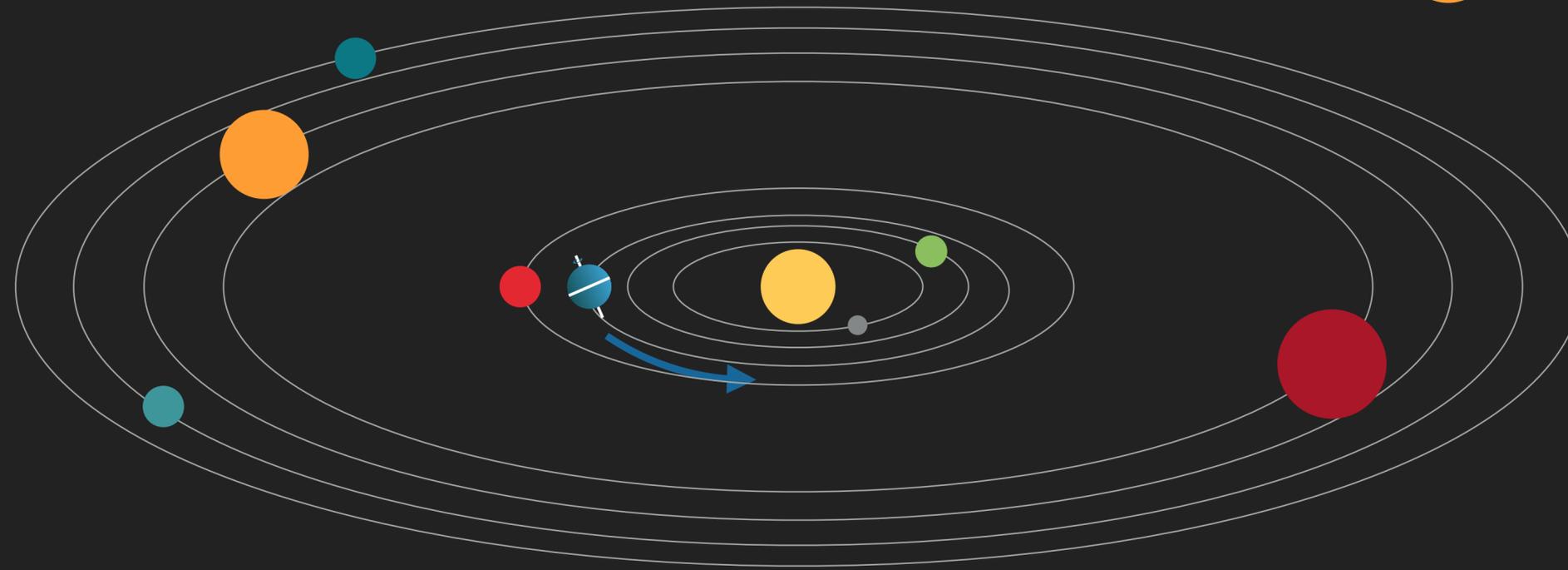
* Most orbits are close to but not strictly on the same plane

A SPHERE WITH FRIENDS





ECLIPTIC



View from "outside" =
Orrery

Mars is overhead

View for you =
Planetarium

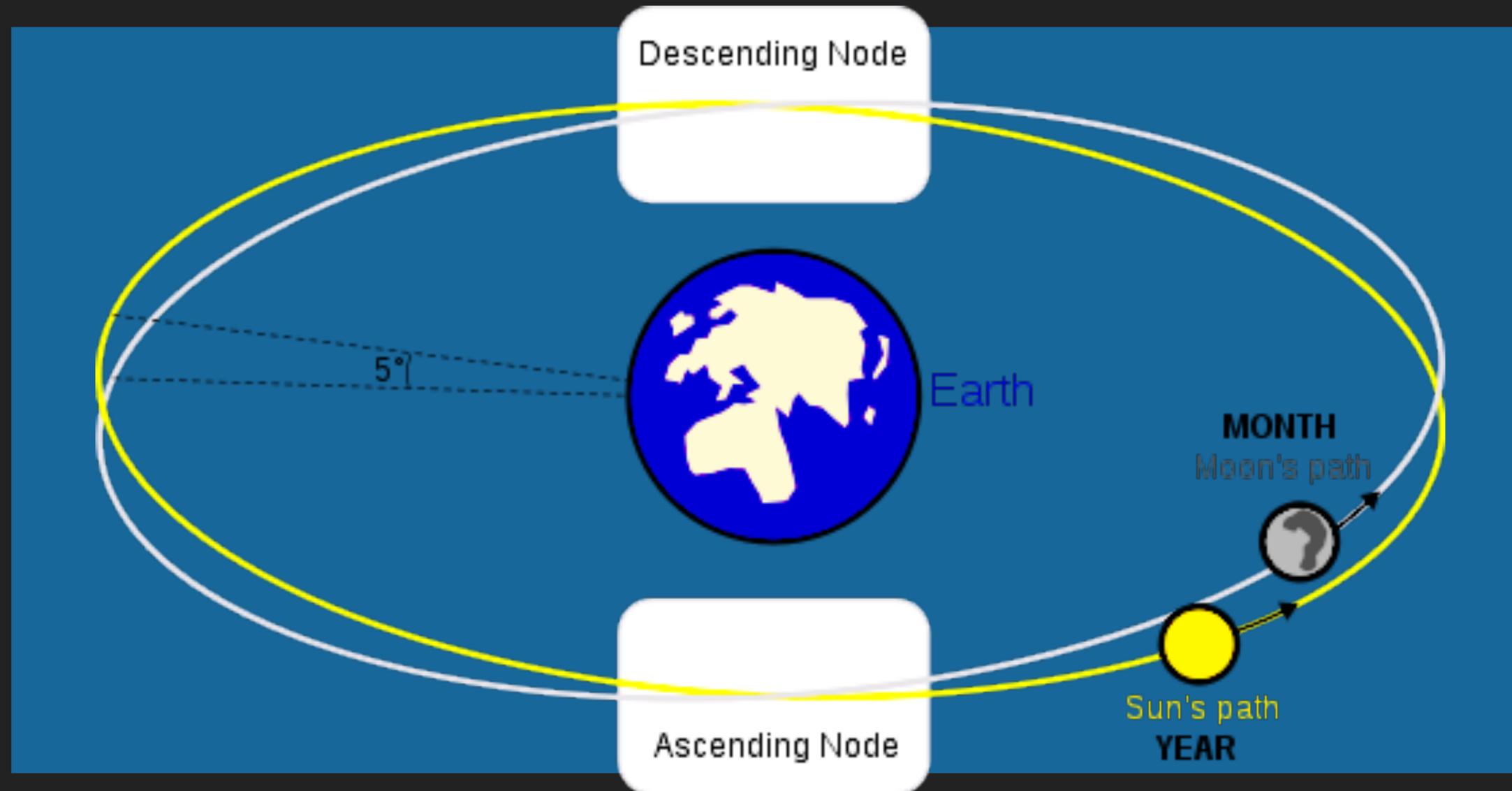
East

South



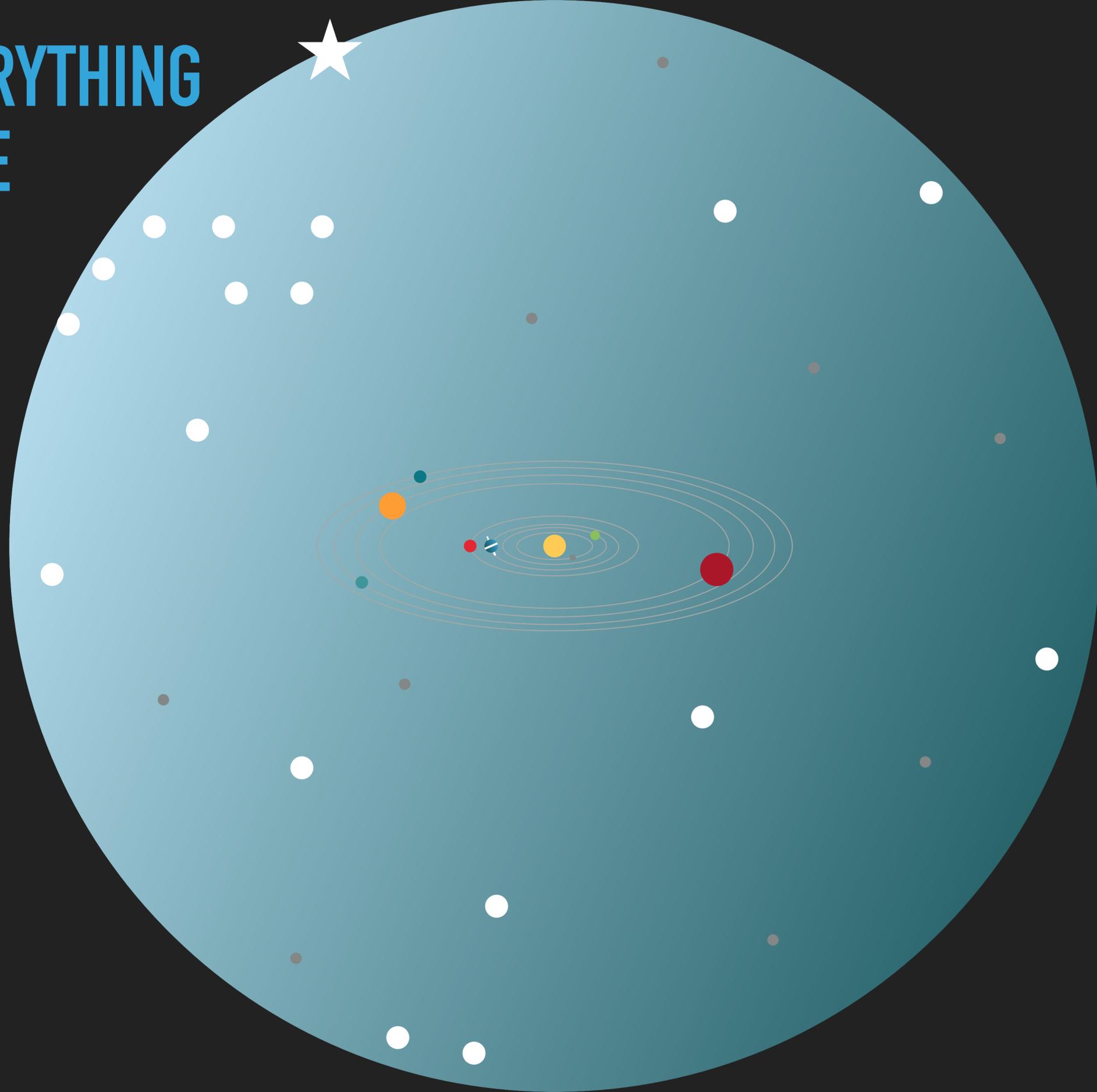
West

WHY "ECLIPTIC"

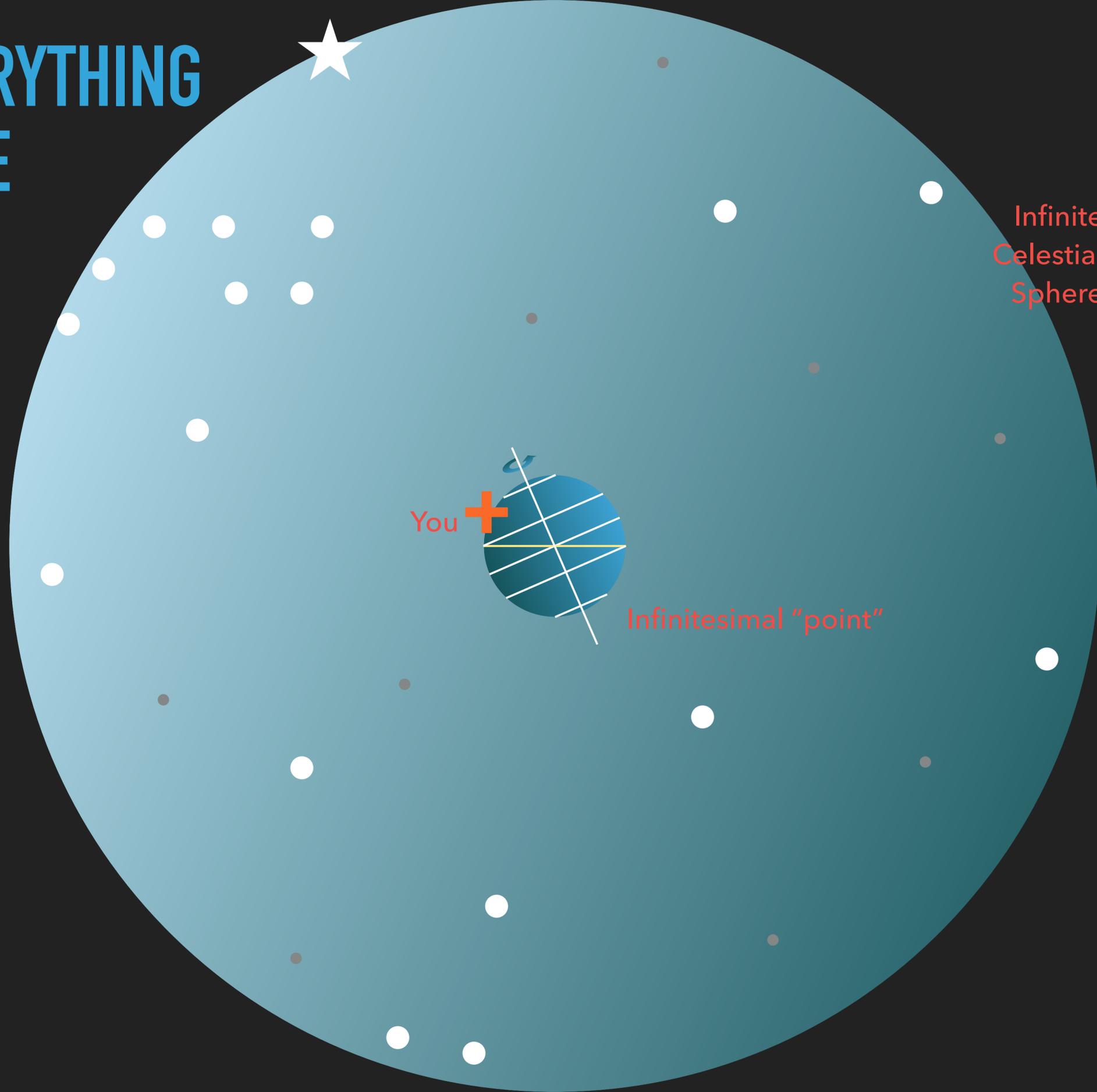


(PHEW X 2)

EVERYTHING
ELSE



EVERYTHING
ELSE

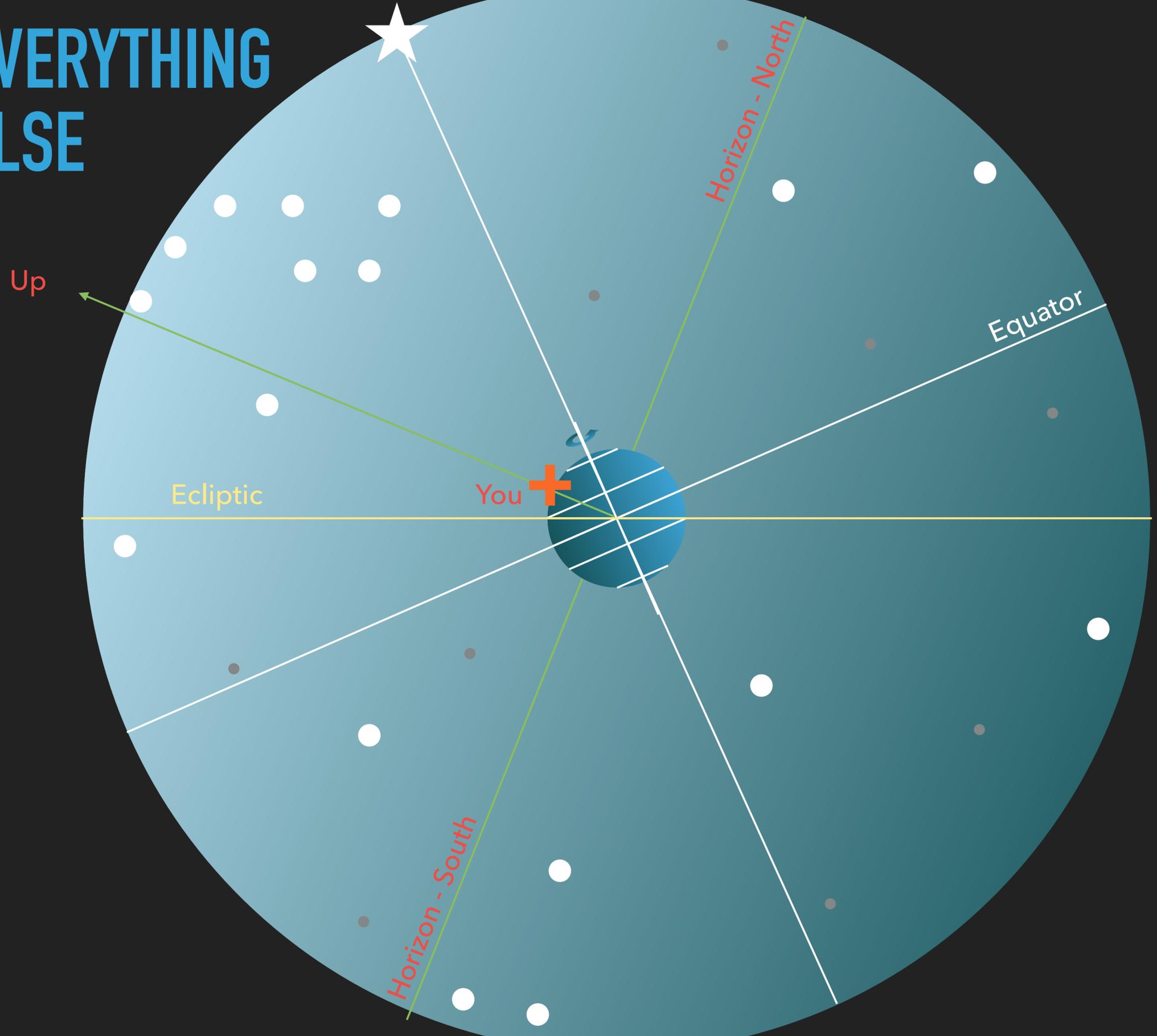


Infinite
Celestial
Sphere

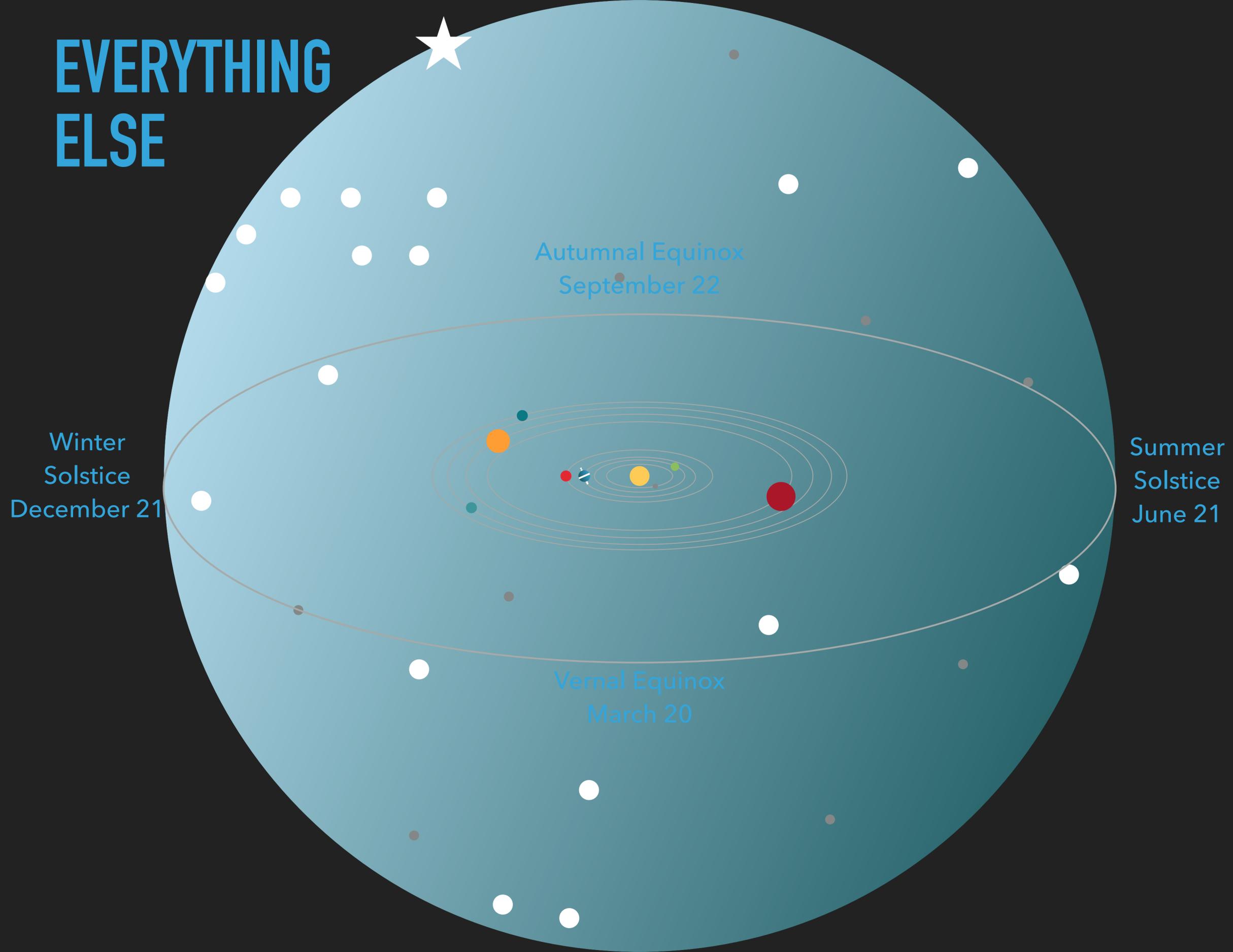
You +

Infinitesimal "point"

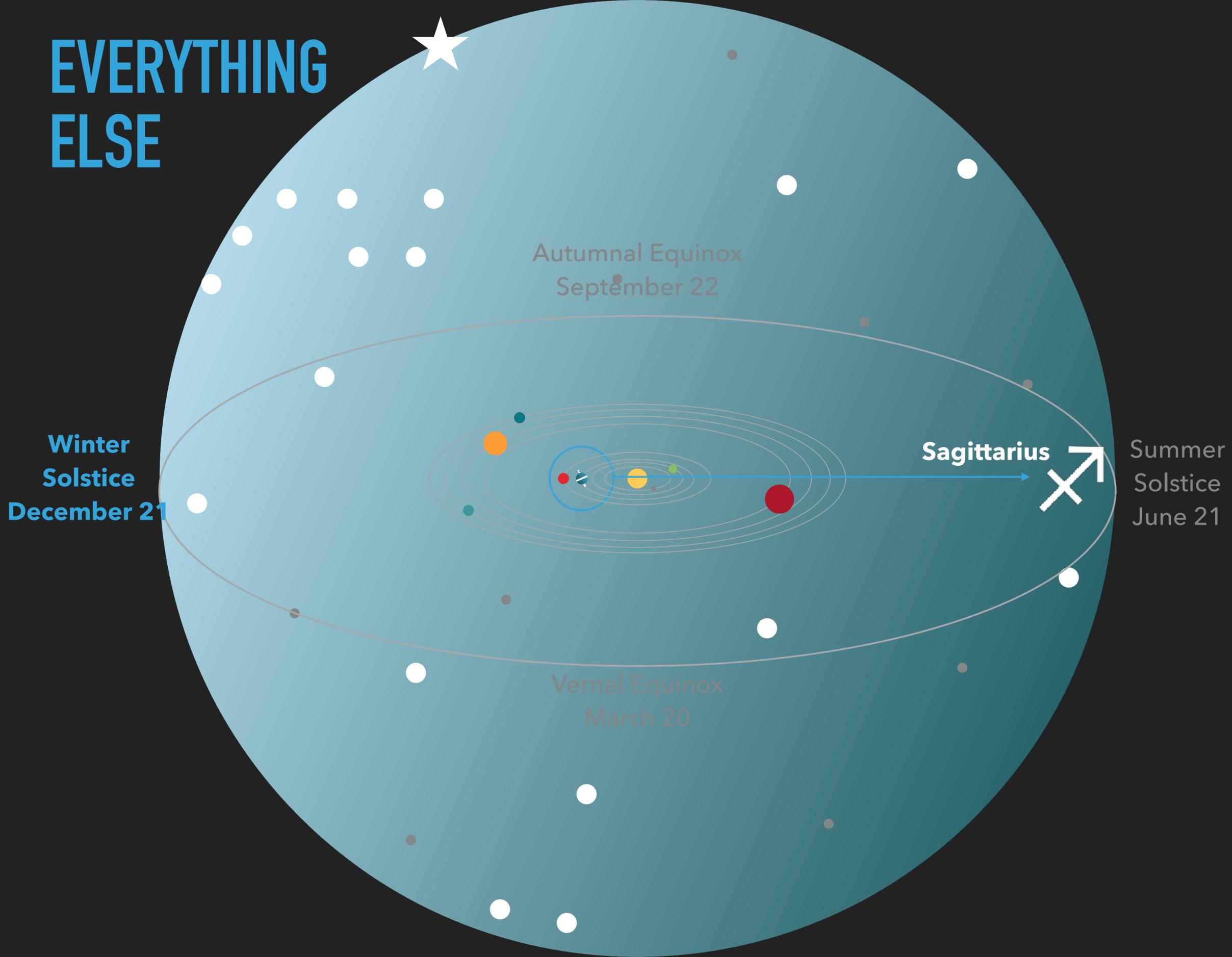
EVERYTHING ELSE



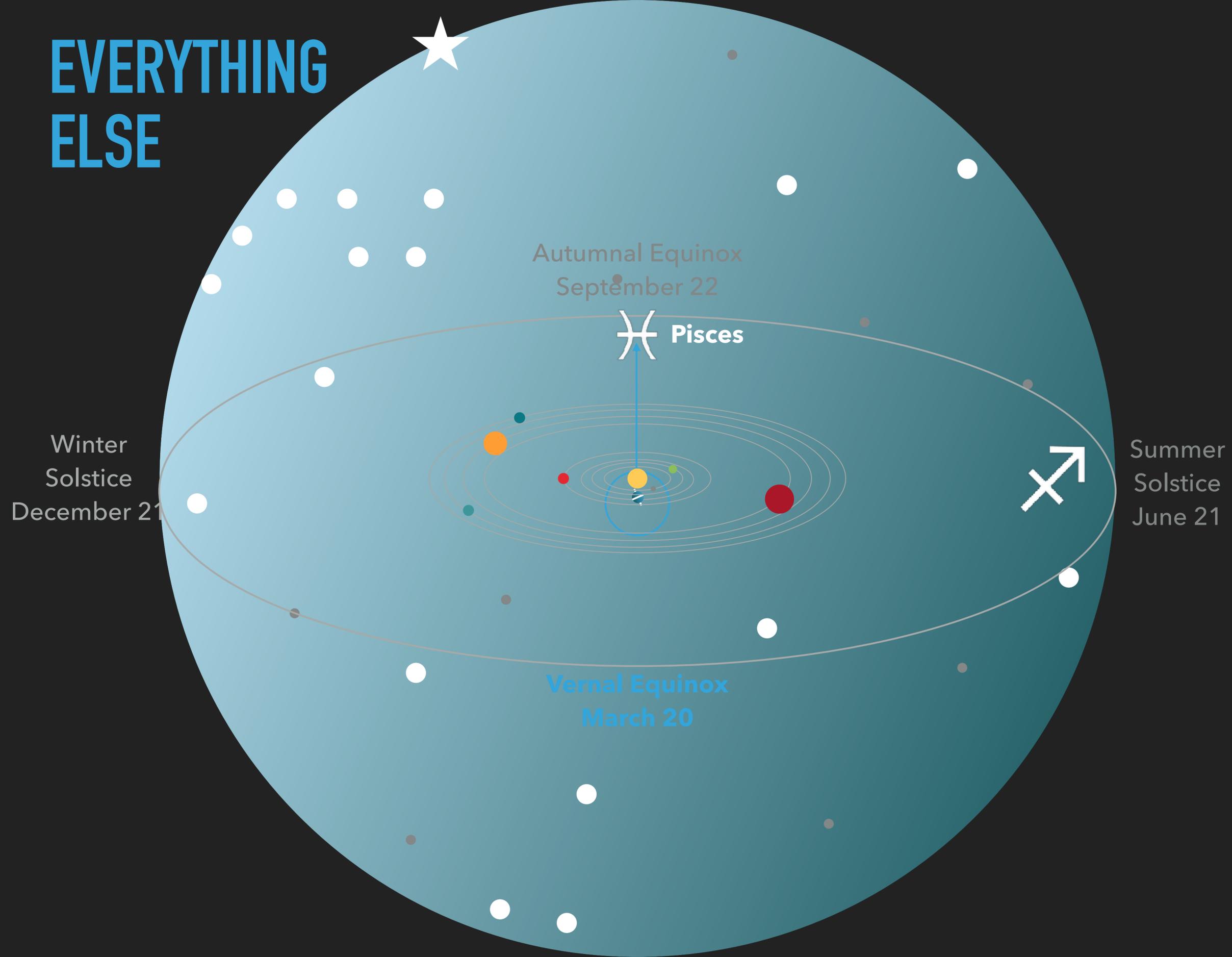
EVERYTHING ELSE



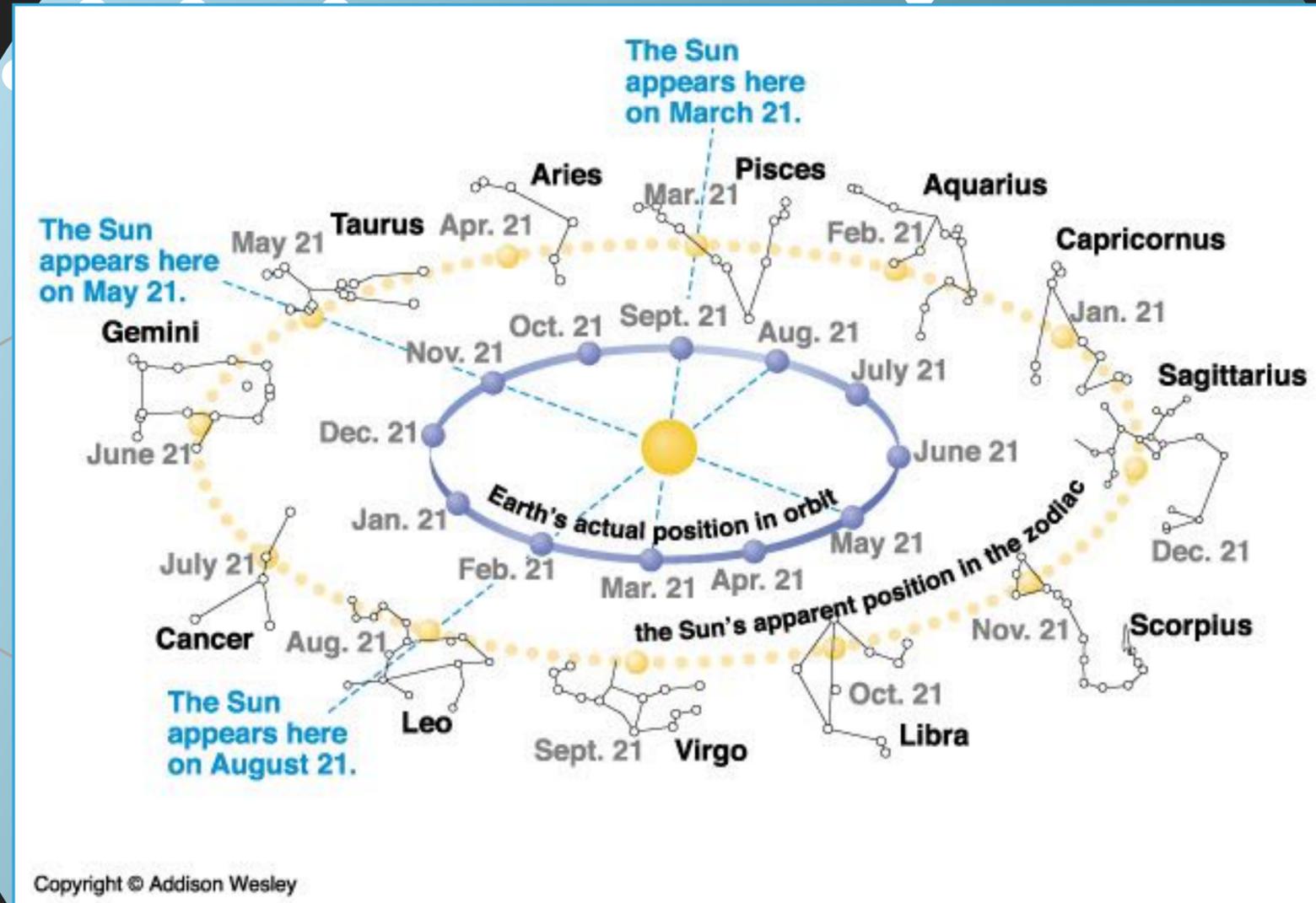
EVERYTHING ELSE



EVERYTHING ELSE



EVERYTHING ELSE



Winter
Solstice
December 21

Summer
Solstice
June 21

Prompt: "I've heard astronomers say that the expansion of the universe means that at some point in the future, an intelligent species looking out into their sky would see only darkness, with no stars. When would this be, and explain the expansion in more detail." ChatGPT 5.0 response: (edited)

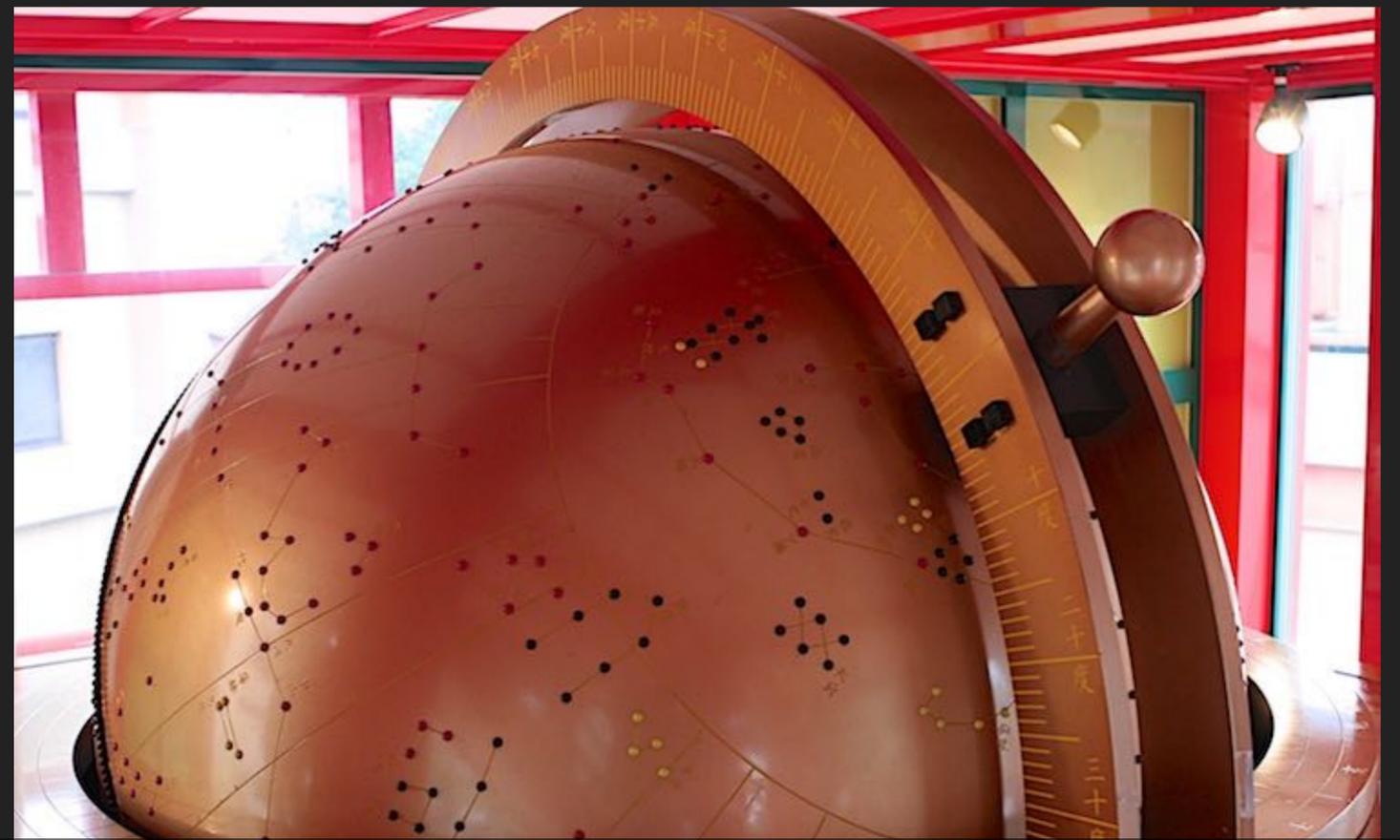
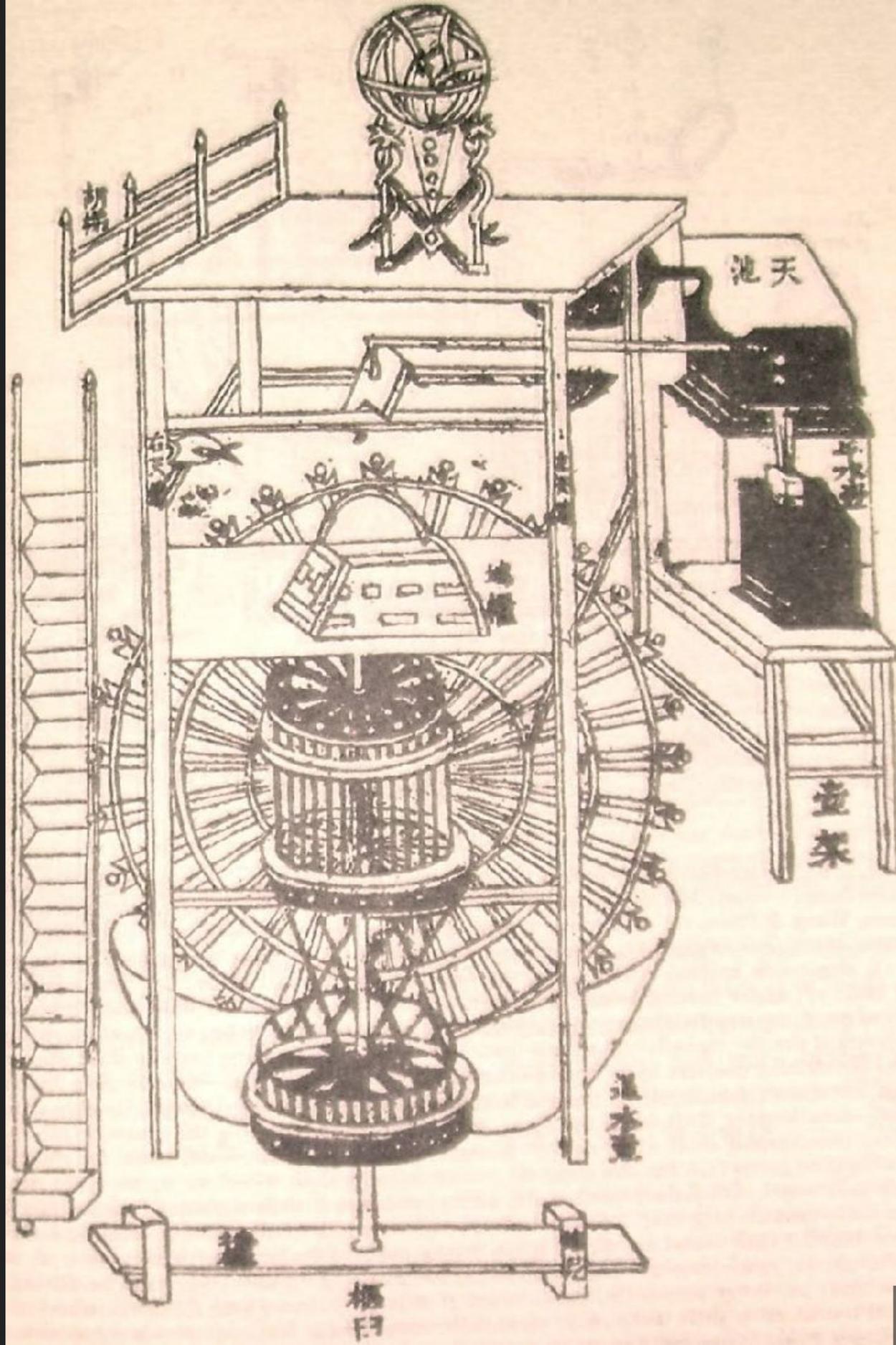
Space itself is stretching . . . Galaxies aren't flying through space so much as new space continually appearing between them. . . . This expansion is accelerating, driven by "dark energy."

Because the expansion [of space itself] is accelerating, the distance at which light can ever reach us (the cosmic horizon) shrinks in relative terms. Galaxies beyond ~16 billion light years today are already lost to us; their light can never arrive. Over tens of billions of years, more and more galaxies cross that horizon.

The "dark sky" future

- **To a civilization living 100+ billion years from now, astronomy would suggest they live in a lone island galaxy surrounded by infinite darkness.**
- **They would not see the cosmic microwave background, nor evidence of expansion. The great cosmological story we know now would be hidden from them.**

(PHEW X 3)

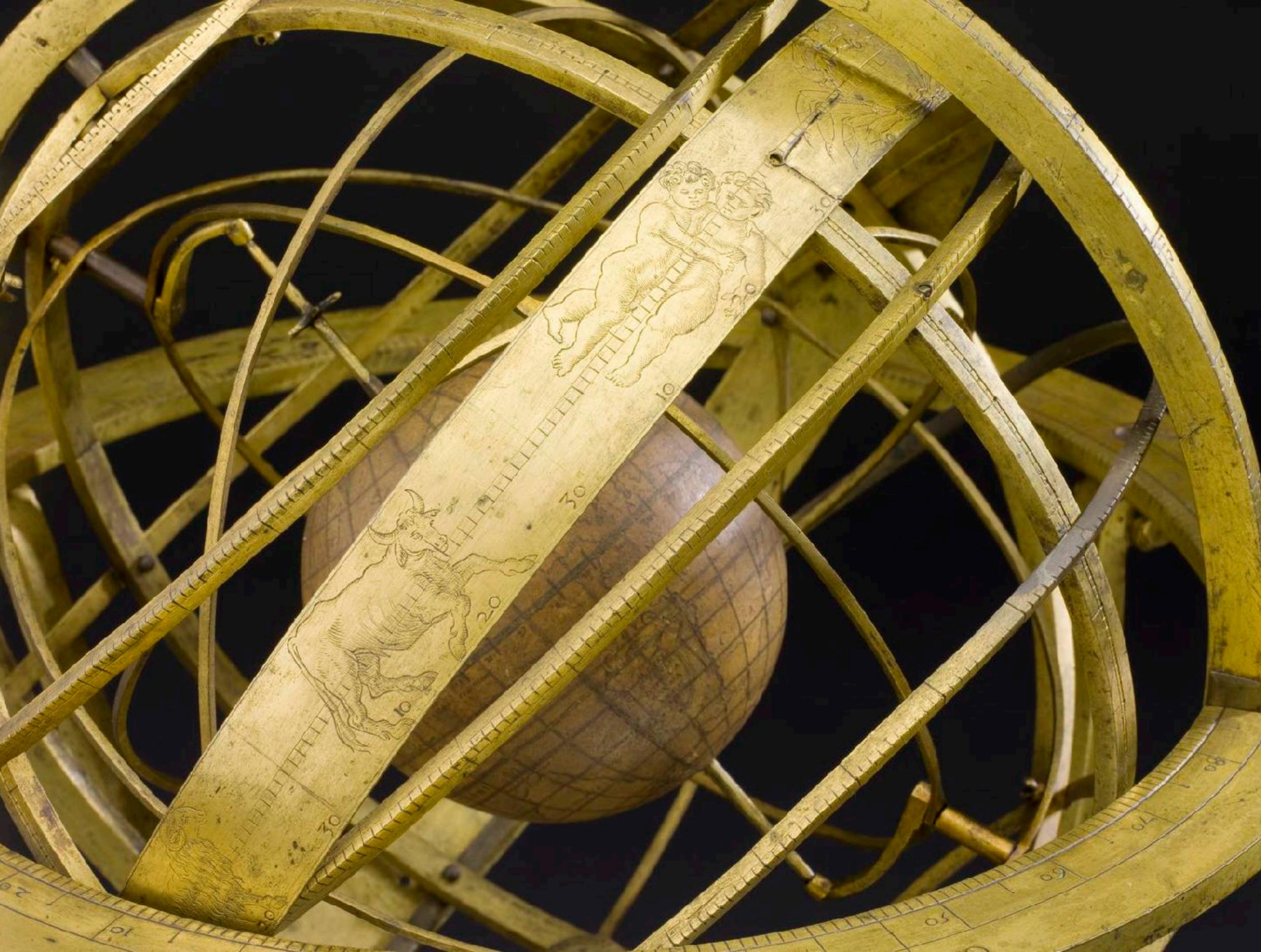




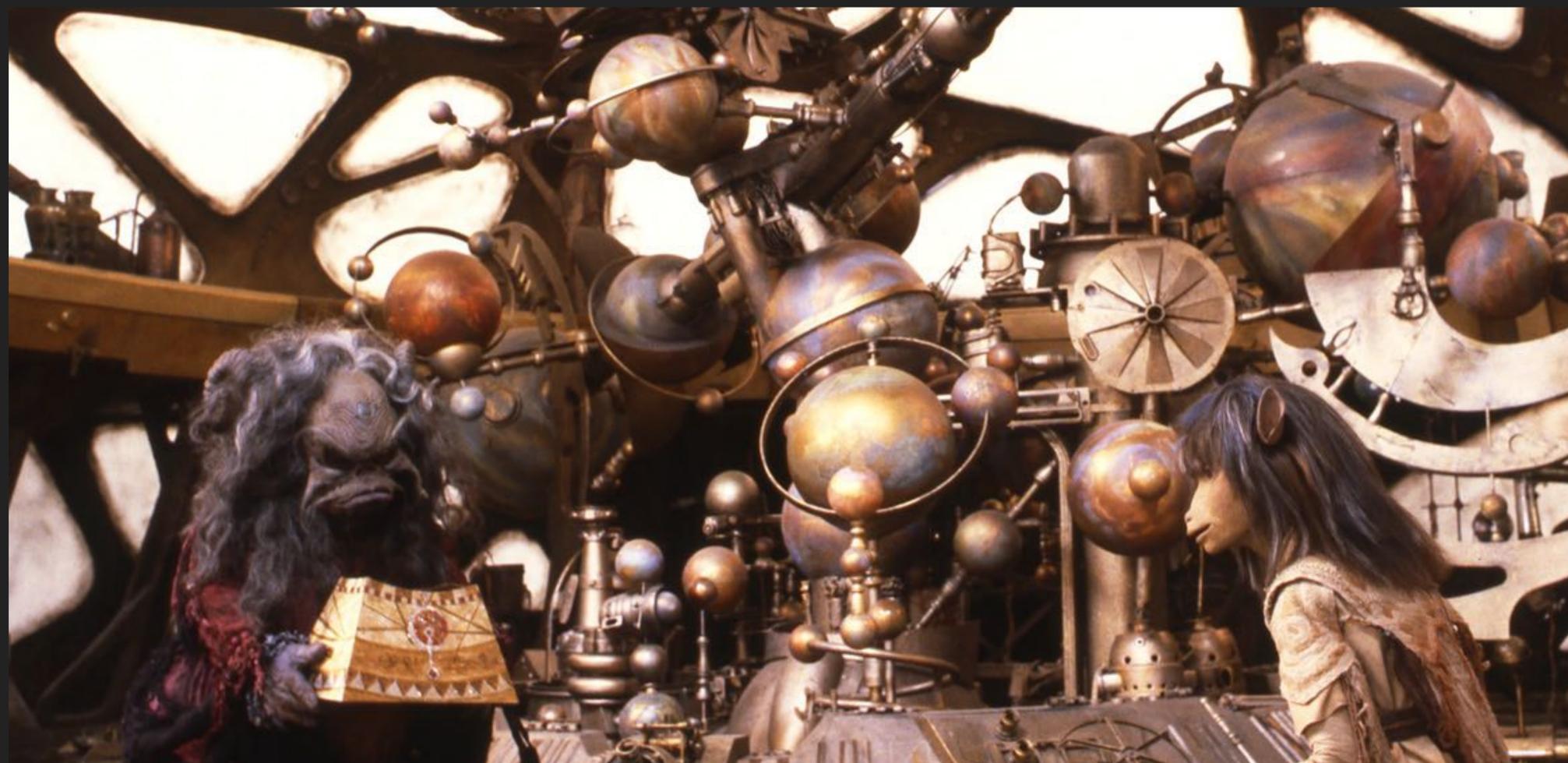
SU SONG ASTRONOMICAL WATER CLOCK

01094 CE, FIRST ESCAPEMENT

“Thus if the water is made to pour with perfect evenness, then the comparison of the rotary movements (of the heavens and the machine) will show no discrepancy or contradiction; **for the unresting follows the unceasing.**”



**ARMILLARY
SPHERE MADE
BY GIROLAMO
DELLA
VOLPAIA,
FLORENCE,
ITALY, 01554**



AUGHRA'S ORRERY

Dark Crystal

ASTRONOMICUM CAESAREVM

Petrus Apianus 1540



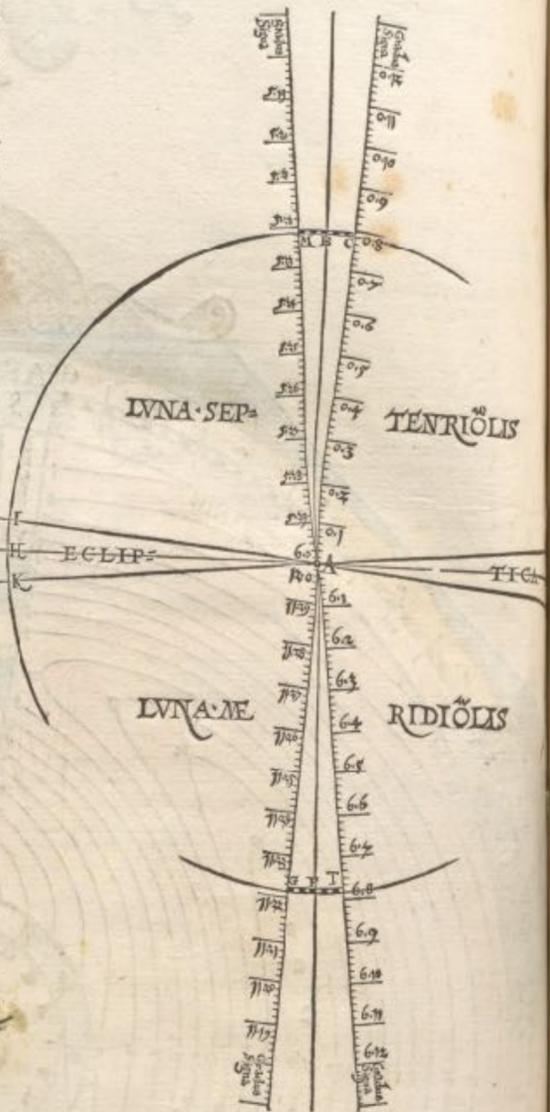
possibilitas, tam Solis quam Lunæ haberi potest, & melius q̄m prior, hoc modo: Vbi indicem capitis draconis rite locaueris, ad tempus scz veræ oppositionis vel coniunctionis, locum quoq; Lunæ in Zodiaco contueberis, per quem filum directū si inter d & a (Luna iuxta caput draconis morante) vel inter g & e (Luna caudæ draconis vicina) ceciderit, fateri aude Lunam in illa oppositione defecturam. Vicissim Solis defectum conspicias in e ne quadā hæc lege. Tempora nis veræ cum filo signa, quod si inter b & c iuxta caput draconis, vel inter f & g iuxta caudam draconis fetatur, contingens est Solis deliquit in hac coniunctione. Verū Solis obscuraciones propter aspectum diuersitates non ita ad ynquem, sine calculandi opera, sicut Lunæ haberi nobis potuerunt, eas tamen, deo volente, in posterum quoq; in instrumenti formam redacturos nos, quo ad licebit, nō diffidimus. Possibilitate eclipsis Lunaris agnita, lineam in plano aliquo præscribe, quam H D nō mina, cuius medium A sit. Huic alia perpendicularis inducta B F dicatur. Pedem nunc circini alterum in A litera fige, extensus alter circulum occultum pro Arbitrio scribat, qui idem in linea B F & punctis B F fecetur. Eo facto Lunæ latitudinem considera, quæ si Septentrionalis fuerit, tum oportebit Argumentum eius verum esse 5 Signorum & 18 graduum ad minus, vsq; in 6 Signa etiam, vel Signi nullius, graduumq; 12. Iam si Argumentum sit Signi nullius, diuidatur quarta B D in 18 partes sic, primo in tres, deinde singulas in alias tres, postea quamlibet in duas, & habebis 18 portiones, quarum singulæ 5 gradus continent. Proximo B literæ puncto C ascribe, tectamq; lineam à centro A per C educito. Si vero Argumentum latitudinis Signorum sit 5, tum B H quartam dispelce, primæ autem post B literam sectioni, M literam appone, perq; M & A centrum lineam, vt antea diduc. Quod si meridionalem Lunam conspexeris, Argumentum habens 6 Signorum, & insuper aliquot graduum, tum ab F litera D versus p̄roximum punctum elige, eundem cum T litera signans. Argumento 11 Signorum existente, ab F versus M cum puncto huiusmodi digredere, cui ascribe G. Hac in parte nō mouearis quicquā, si gradus aliquando Signis non adiunctos vides, obseruatis diligenter Signis tanrummodo.

Quomodo eclipsis Lunæ in plano sit formanda.

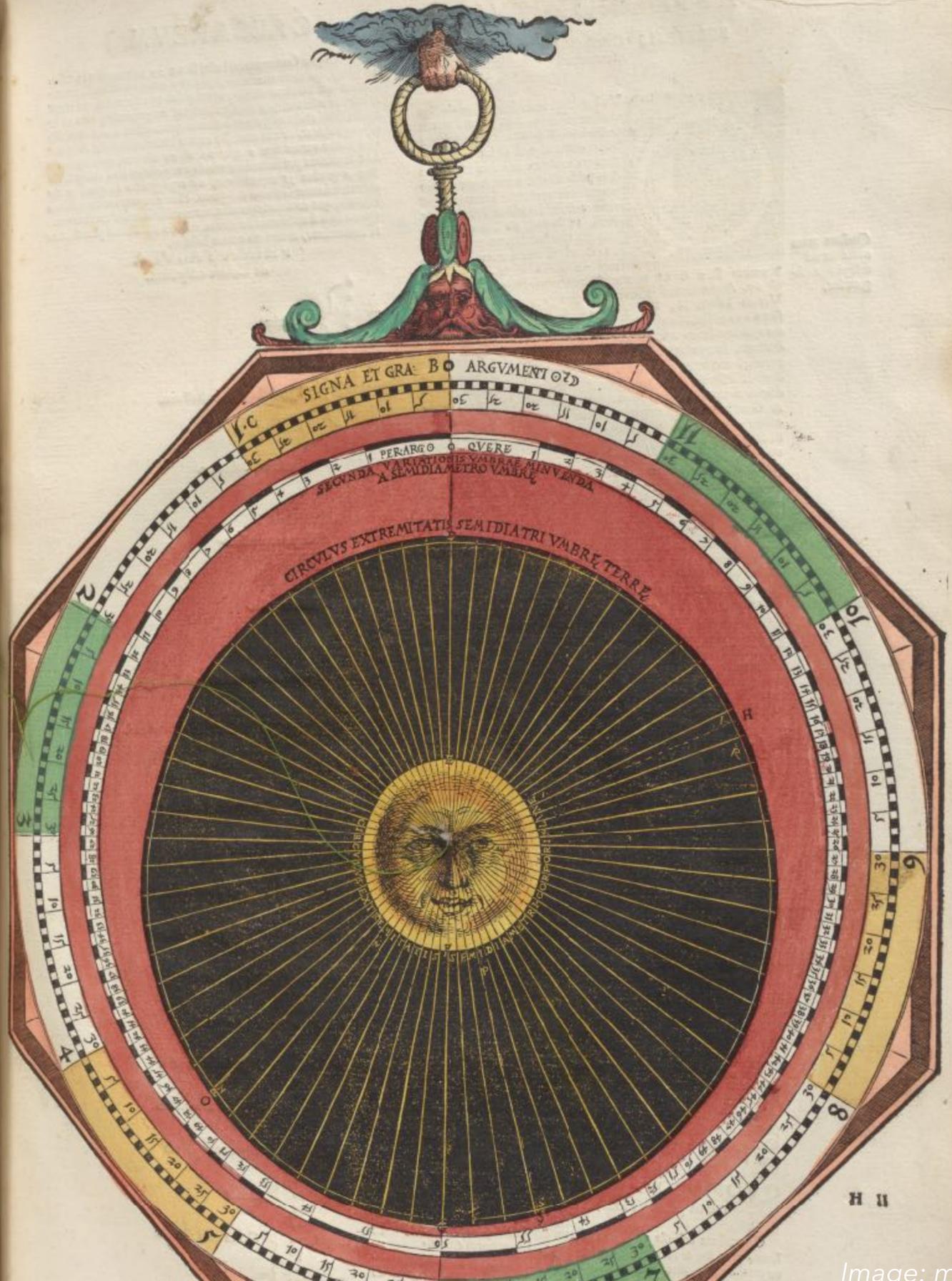
Deinde in limbo exteriori sequentis figuræ, quæ post hac, instrumentum Semidiametrale vocabitur, Solis Argumentum vestigia, cui filum vbi superposueris, nota eiusdem, & limbi interioris (quæ umbrarum varietates per secunda metitur) contactum, secunda vero illa à filo abscissa, seorsum excipe. Argumentum deinde Lunæ perquirens, cum filo pariter transmissio signa, quod filum binas tibi corporis vice Lunæ & umbræ terræ, semidiametros aperit. Filo sic durante, circinum in centro fige, pede altero in punctū vsq; in quo nigrior area à filo tangitur, extenso, illa enim extensio semidiameter corporis Lunæ est, quam ita inuariatam referua. Alium post hac circinum fini prioris diametri iam habiti infige, Pedem alterum eiusdem circini vsq; ad areæ fæcæ terminum protendens, semidiametrum quoq; umbræ terræ habebis. Aream hanc circumferentia quadam eandem circincirca includi vides, vltra quā aliam, calami latitudine, superficiem cernis, quæ in 00 secunda distributa est. Sed cum iam antea secunda varietatē umbræ didiceris, pedes

CAESAREVM

Hæc omnium præfens figura iterat, posterius DISPOSITORIVM dicenda.



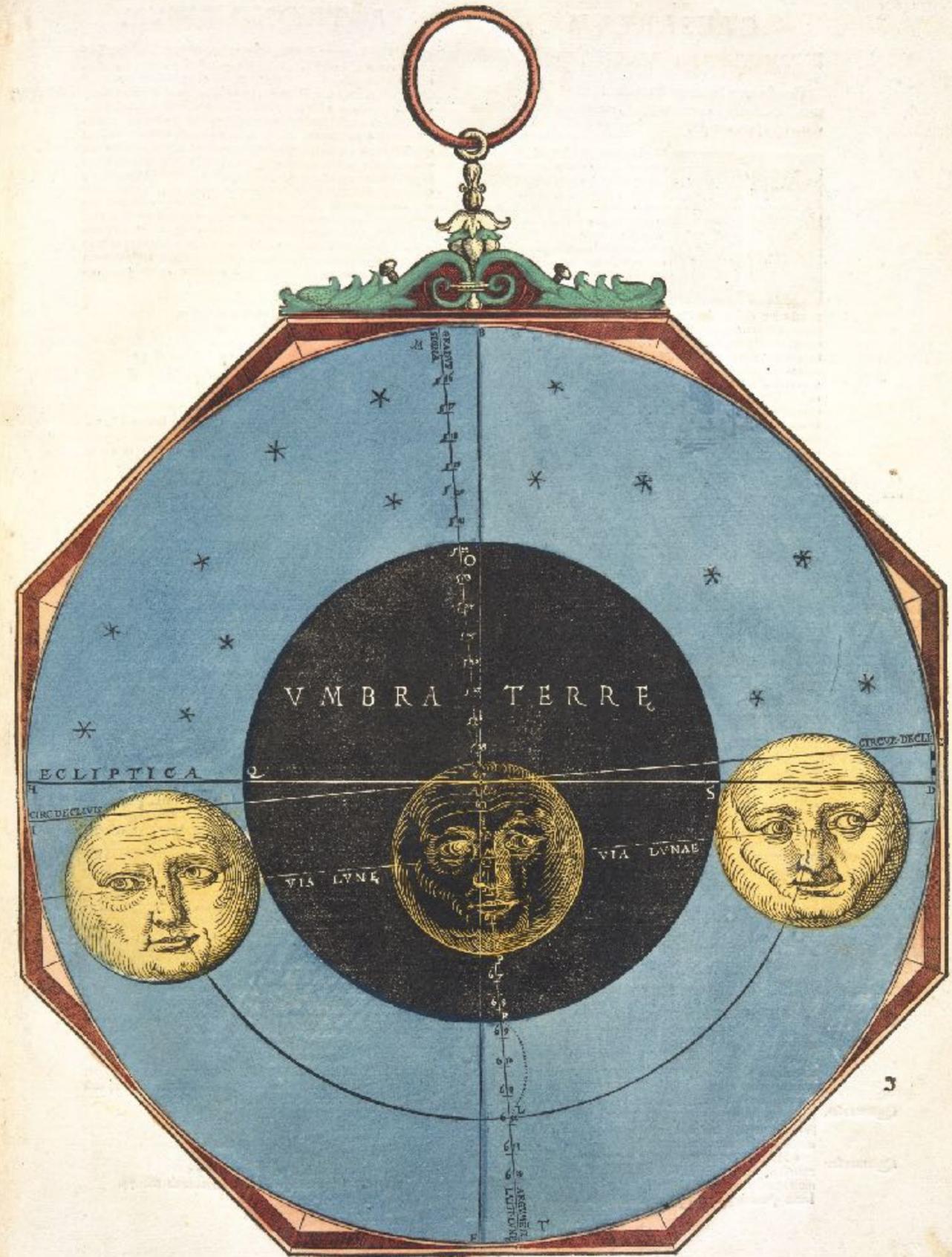
des circini pro tot secundorum distantia contrahi debent, & vera umbræ semidiameter habebitur. Talem postea circinum in A plano prius ad hoc præparati, vbi firmaueris, circulumq; describeris, veram umbræ quantitatem cernis, umbræ inquam terræ, quæ in Lunæ transitu, oppositionis illius tempore fit. Mox in instrumento cui nomen dispositorio, Lunæ Argumentum in lineis, siue A C siue A M, siue A G, siue A T sit, contemplantor. Loco oblato pedem circini inferre, extendatq; alterum in argumenti punctum, Eandem postea circini extensionem parato plano infer, pedesq; altero in A fixo, cum altero punctum in linea paulo antea, huic rei deputata, exprime, literaq; M signa. Iam circinum require, extensum, iuxta corporis Lunæ semidiametrum, quem vbi fixeris in M, cumq; eodem circulum describeris, corpus Lunæ te habere putara. Ex illis nunc demum certus esse potes, de contingenti huius oppositionis eclipsis, deq; quantitate eiusdem. Si enim corpus Lunæ totum sub umbram concesserit, vniuersalis, si partim, particularis, in omnino non nulla eclipsis euenit.



H II

ASTRONOMICUM CAESAREUM

Petrus Apianus 1540



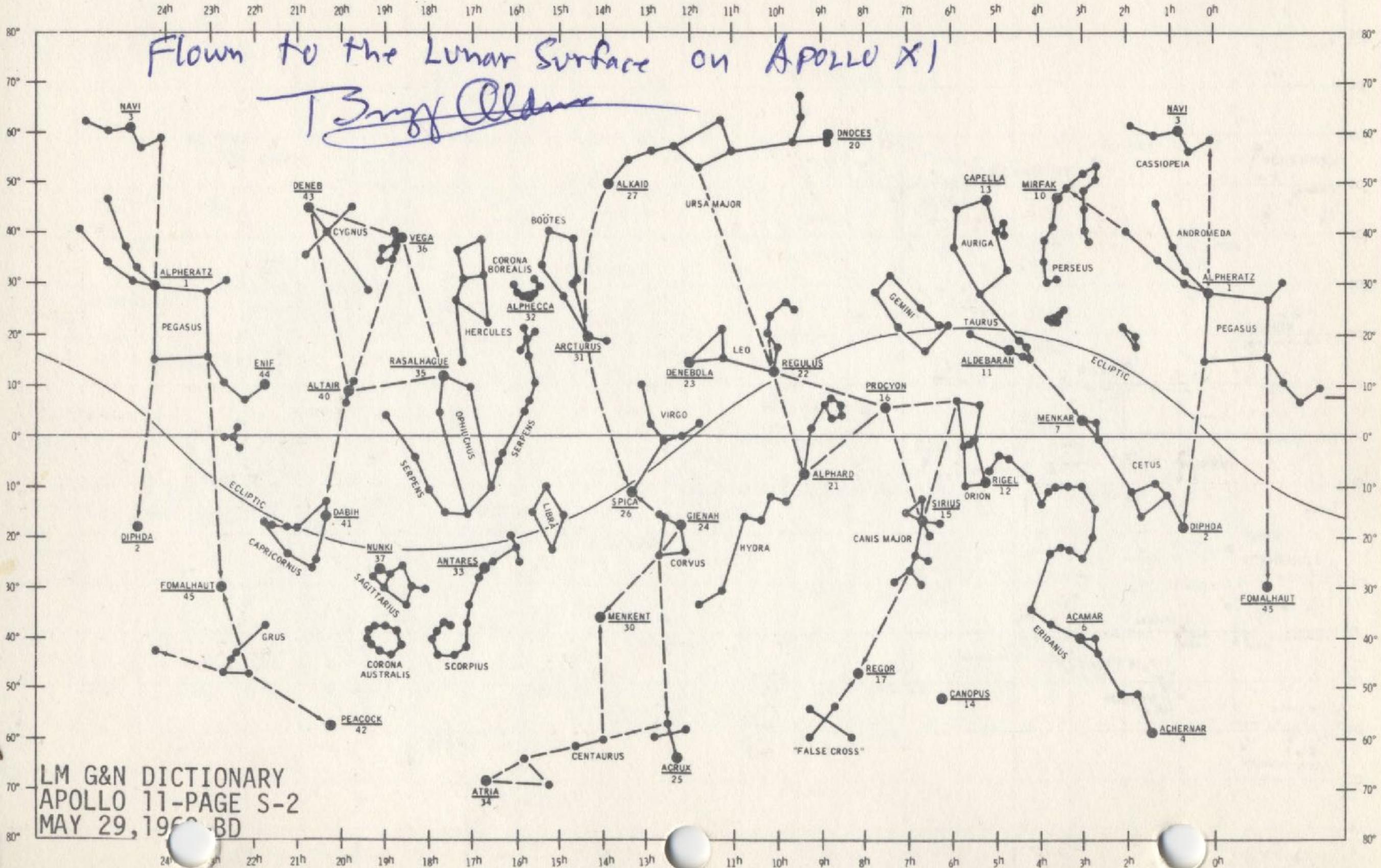
PLANISPHERIC ASTROLABE

Maker: Muhammad Zaman al-Munajjim al-Asturlabi (active 1643-89)



Flown to the Lunar Surface on Apollo XI

T. Buzz Aldrin



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MAY 29, 1969-BD

SOYUZ CELESTIAL NAVIGATION GLOBE



ZEISS STAR PROJECTOR

