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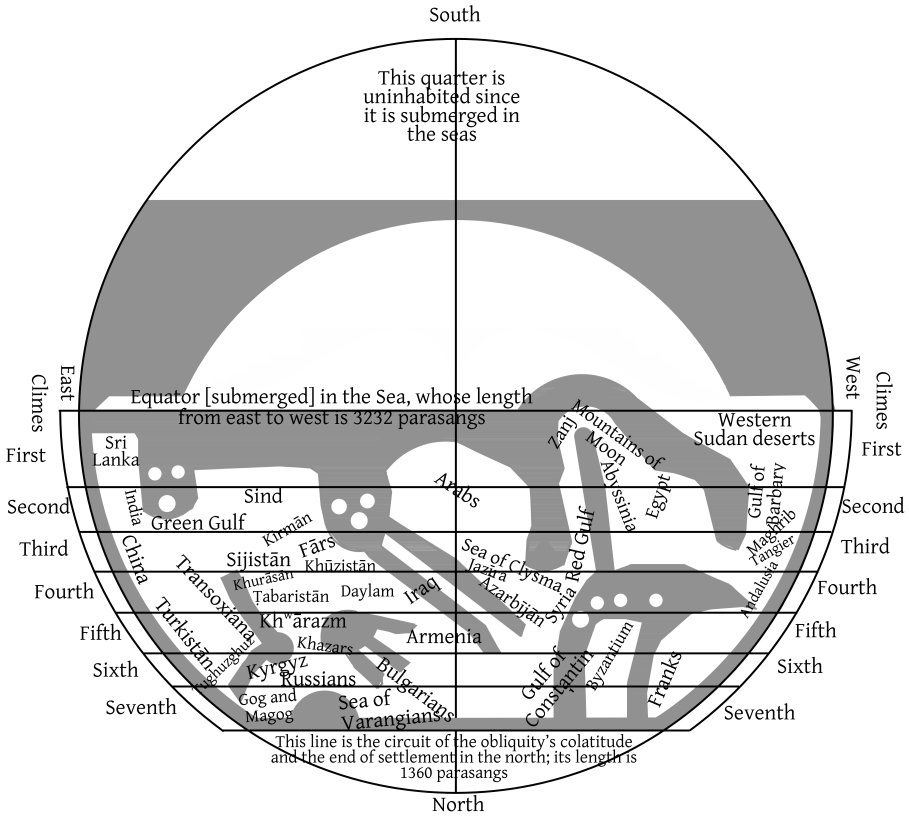

[Figure 1]

CHAPTER TWO

On the Characteristics of Localities That Are on the Equator

[1] In localities that lie on the equator, the equinoctial circle passes through the zenith; the intersection of the equinoctial and the horizon is at right angles; the equinoctial and the circle of the initial azimuth [prime vertical] are the same circle; and two poles of the equinoctial are on the horizon. The horizon circle bisects the day-circuits into two halves, one visible half and one invisible half. No part of the [celestial] orb is permanently visible or permanently invisible, but [the period of] invisibility of each part is equal to [the period of] its visibility. The ro-

tation of the orb [there] is wheel-like. The Sun in a year will pass twice over the zenith, once at the beginning of Aries and another [time] at the beginning of Libra. For one half of the year, shadows of objects fall toward the north and for one half toward the south; and shadows [cast at] the beginning of Cancer and beginning of Capricorn are equal. At the beginning of Aries and beginning of Libra, no shadow is cast [at all] at noon.

[2] There are eight seasons during the year. When the Sun reaches Aries and passes over the zenith, there is extreme heat and thus it is the season of summer. At the middle of Taurus, when [the Sun] is away from the zenith, autumn begins. At the beginning of Cancer, when [the Sun] is at the greatest distance from the zenith, it is winter. At the middle of Leo, when [the Sun] is headed back toward the zenith, it is [the beginning of] spring. Then once again summer begins at the beginning of Libra as the Sun reaches the zenith, and so on up to the full revolution. There are therefore eight seasons in a year, unlike other localities.

[3] One of the poles of the zodiacal orb is always above [the Earth], and one is [always] below the Earth. The periods of visibility and invisibility of the two [poles] are equal, except when the two equinox points pass through mid-heaven, at which time the poles of the zodiacal orb along with the equinoctial poles are on the horizon, and the solstitial colure coincides with the horizon circle.

[4] The Grand Master Abū ʿAlī Sīnā said that the [equator] is the most temperate of all localities, because the heat of day and the cold of night are balanced due to [their] equality, and because the Sun does not linger long over the zenith, because at the equinox point the Sun comes from one direction, headed in the other direction, and passes swiftly. [He also said] that the hottest localities are those that are parallel to the circuits of the head of Cancer or the head of Capricorn,

where daytime is very long, and the Sun lingers while being directly overhead. The most learned of the moderns, Fakhr al-Dīn Rāzī, raised objections to him and said that despite the fact that the Sun does not linger long over the zenith of those who dwell at the equator, nonetheless it never gets farther from their zenith more than 23 degrees and a fraction, and it always remains closer [than this amount to their zenith]. We see how hot the summer is in localities where the maximum altitude of the Sun is near this amount, which is its minimum altitude at the equator. An example [of a hot summer] is Khʷārazm, where the altitude at the beginning of Cancer is 71 degrees, with a 5-degree difference compared to [places with] the minimum altitude at the equator. Therefore, in places where the Sun's altitude is always more than this amount, the heat of winter is greater than the heat of summer in a place like Khʷārazm, because in Khʷārazm, the Sun's altitude is always less than its altitude at the beginning of Cancer, while on the equator it is more [than that]. What we see in the appearance and color of people of Zanj, whose habitations are near the equator, is a confirmation of this statement. Therefore, the equator is the hottest locality.

[5] When one considers these two statements [of Ibn Sīnā and Rāzī], it is obvious that "temperateness," in the sense of uniformity of conditions, is more at the equator than at any other locality. Due to this uniformity, [the difference in] quality of hotness [of weather] may not be so perceptible, because any perceptible thing is not felt so strongly when it is continuous, while any [perceptible] that comes suddenly after its opposite is greatly felt. Nonetheless, at the same time the extreme hot weather condition is also more there [i.e., at the equator], and therefore temperateness in the sense of balance between heat and cold is disproved for that locality. Therefore, based on the first interpretation, Master Abū ʿAlī's statement is correct, while based on the second interpretation, the statement of the latter scholar is also cor-

rect.

[6] The midpoint of the equator is called the Cupola of the Earth, where the longitude is 90 degrees. This is because west of that location is the western part of the settled world, and east of it is the eastern part of the settled world—God is all-knowing of the Truth.

CHAPTER THREE
On the Characteristics of Localities Whose Latitudes Are Less Than or Equal to the Obliquity

[1] Every locality that has latitude is reckoned among the "oblique horizons," because the turning of the equinoctial there is slanted. The right sphere does not occur anywhere other than the equator. When a latitude is assumed for a horizon, one pole of the equinoctial that is in the direction of the latitude stays above the horizon by the amount of the latitude, and the other pole is depressed [below the horizon by the same amount]. The day-circles whose distance from the equinoctial pole is equal to or less than the local latitude neither rise nor set, but rather those that are about the visible pole are permanently visible, and those that are about the invisible pole are permanently invisible.

[2] The year has four seasons as usual, except in locations whose latitude is less than the obliquity, where the Sun passes over the zenith twice, and thus the heat will be intense at these two times. Between these two times, when the Sun is closer to the visible pole in the direction of the solstice, there is a lessening in the heat of the air. During this time, the shadows of objects at noon fall toward the invisible pole, [whereas] during the rest of the year the [noon] shadow falls toward the visible pole. On those two days when the Sun passes over the zenith, there will be no shadow [at noon].