FRIOT'S EXPLANATION
OF THE TIP OF THE EARTH'S CONTRIBUTION
TO THE EQUATION OF TIME

For this explanation it has been assumed that the reader is knowledgeable of certain facts and scientific understandings. Such as, some plane geometry, some solid geometry, some physics, knowledgeable of the equation of time, that the sun moves approximately 386 million miles in one year, that the earth orbits the sun in a helical pattern, that the measurement of a second in time has been arbitrarily established to give man a relatively fixed 24 hour period which is supportive of some astronomical observances, that the lines of latitude are parallel the equator and are measured in plus angles going north and minus angles going south starting with zero at the equator, that the tropic of Capricorn is 23 degrees 26 minutes south latitude and the tropic of Cancer is 23 degrees 26 minutes north latitude, that the sun is directly overhead at high noon at the tropic of Capricorn on Dec. 21, that the sun is directly overhead at high noon at the tropic of Cancer on June 21, that on the two days of the equinox Mar. 20, and Sept. 22 the sun is directly overhead at high noon on the equator, that the lines of longitude run north and south through the poles, that when viewed from the sun all points on the earth move to the right, that when viewed from the sun the earth moves to the left about the sun, as well as other basic things which I will be glad to explain to you personally if you so desire.

Throughout this explanation the angular velocity of the earth about the sun will be assumed to be constant, thus this motion would make no contribution to the equation of time. The line of longitude to be used throughout this explanation will be the zero degree line unless otherwise specified and all measurement will be made when it is high noon along this line of longitude. The three points of interest along the line of longitude are at the tropic of Capricorn (TP), the tropic of Cancer (TN), and the equator (E).

First I would like to establish a plane in space, which I will call Friot's Synodic Plane. See figure 1. This plane is established by a line through the center of the sun pointed in the direction that the sun is traveling and the center of the earth. The point on the surface of the earth intersected by a line between the centers of the

earth and sun, is the closest point on earth to the sun at that instant in time, by definition this point lies in Friot's Synodic Plane. At that point on the surface of the earth the sun is directly overhead (DOHP), therefor it is high noon at all points along the line of longitude which passes through that point.

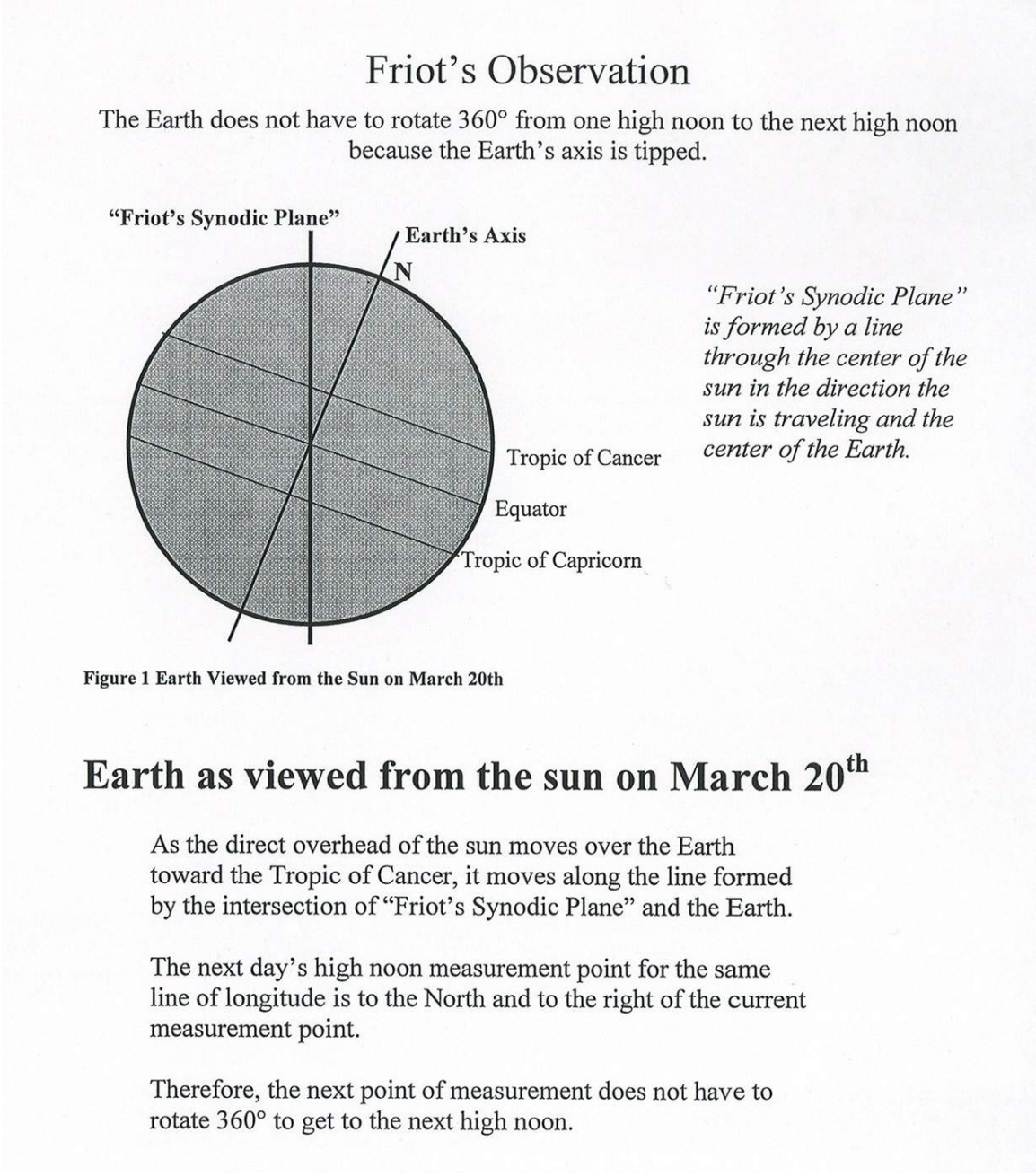

Figure 1

There are four positions of the earth in its orbit about the sun that I wish to discuss in more detail. These are Dec. 21, Mar. 20, June 21, and Sept. 22. (See figure 1) On Dec. 21 the DOHP is at the TP and every point on the zero longitude will be in Friot's Synodic Plane. On Mar. 20 the DOHP is at the E. When viewed from the sun the TP is to the left of Friot's Synodic Plane and the TN is to the right of Friot's Synodic Plane. On June 21 the DOHP is at the TN and every point along the line of zero longitude lies in Friot's Synodic Plane. On Sept. 22 the DOHP is at the E. When viewed from the sun the TN is to the left of Friot's Synodic Plane and the TP is to the right of Friot's Synodic Plane.

When we compare the Mar. 20 positions of the three points with their position on Dec. 21, we see that the DOHP position has moved to the right along the line of longitude. The DOHP has moved from the TP to the E so that by Mar. 20 the TP has not yet reached Friot's Synodic Plane. This means the time interval between successive high noons has gotten less each day. This time difference has reached the cumulative difference shown by the time lag between when the E and the TP points along the line of longitude reach Friot's Synodic Plane. When we look at the positions of the three points on June 21, we see that they are all back in Friot's Synodic Plane at the same time. The negative difference between consecutive DOHP from Mar. 20 to June 21 has lessened each day to become zero by June 21. When we compare the Sept. 22 positions with the June 21 positions, we see that the DOHP position has moved to the right along the line of longitude. This means the time interval between successive DOHP has gotten less each day. This time difference has reached this cumulative difference shown by the time lag between when the E and the TN points along the line of longitude reach Friot's Synodic Plane. When we look at the positions of the three points on Dec. 21, we see that they are all back in Friot's Synodic Plane at the same time. Between Sept. 22 and Dec. 21 the negative contribution lessened each day to become zero by Dec. 21.

Were the tip of the earth the sole contributor to the equation of time, what would the effects be on our timing system? There would be two effects. One is that it would take years before high noon on the sundial and 12 o'clock on our watches would agree. The second is that twice a year there would be no loss in time between two successive days

(or at least it would be a minimum loss) on Dec. 21 and June 21.

While the contribution is always negative from this phenomenon, the rate at which it contributes is always varying. The contribution is the least around the times of Dec. 21 and June 21, and the greatest around the times of Mar. 20 and Sept. 22.

THE FRIOT THEORY ON THE COMPONENTS OF THE EQUATION OF TIME

The equation of time is the result of the difference between two readings taken each day. The two readings are the noon sundial reading, which is the instant when sun crosses that meridian that day, and the clock reading at that same instant. There are only four days each year when the sun dial reading and the clock reading agree for the high noon reading. These are Dec. 24, April 15, June 15, and Sept. 1. The two primary components that contribute to the equation of time are the varying velocity with which the earth orbits the sun, and the apparent motion of the sun between the tropics of Capricorn and Cancer. The Friot theory says that the contribution due to the orbiting velocity change is always positive. And the contribution due to the apparent motion of the sun is always negative.

Using the "Astronomical Phenomena For The Year 1992" as a source on pages 18 & 19 are two sets of data. The equation of time and the declination of the sun are each recorded for each day of the year. This absolute value is not in dispute, but whether its sign is positive or negative depends upon which is subtracted from which. The way the equation of time is established in this report is the following. If when the sun dial indicated high noon and the clock read 12:10 the data would be recorded as a positive 10 minutes. If when the sundial indicated high noon and the clock read 11:55 the data would be recorded as minus 5 minutes. When compared with the equation of time data on pages 18 & 19 their data as recorded has a negative sign where we have a positive sign and a positive sign where we have a negative sign.

The declination reading for December 20,21,22, & 23 is constant at minus 23 degrees 26 minutes. The declination reading for June 20,21,22, & 23 is constant at plus 23 degrees 26 minutes. Since there is no apparent motion of the sun, for each of these 4-day periods, all contributions to the equation of time are due solely to the rotation of the earth about the sun. In December when the earth is approaching its fastest motion about the sun the change between each successive day is plus 30 seconds. In June when the earth is approaching its slowest motion about the sun the change between each successive day is plus 13 seconds. It seems obvious that if the contribution is positive when the motion about the sun is near the slowest velocity or near the fastest velocity than the contribution is positive at all other times as well.

Equation of Time and The Contributing Components

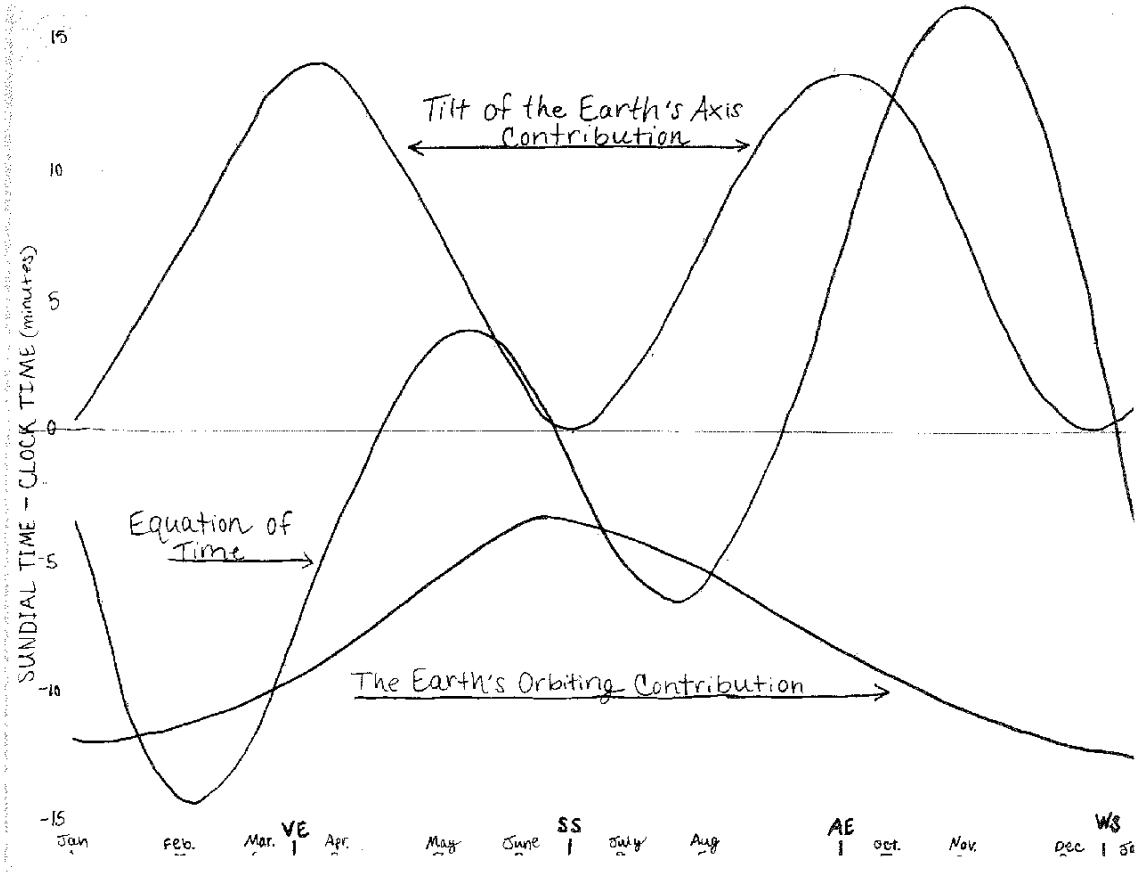

Figure 2

In Figure 2 the ET plot has been made to scale. The curves for the contributors to the ET depict all that is currently known about then. Namely their general form and the times through out the year when they are at their maximum and minimum values.