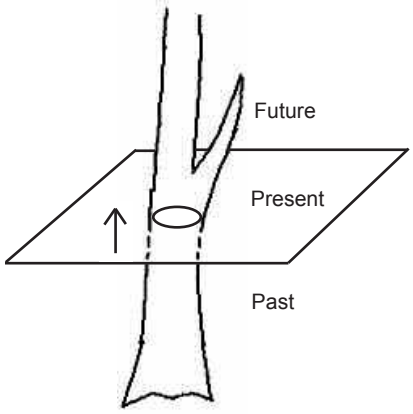
LETTERS TO THE EDITOR

Measuring Time, Deducing Dimensions

IN RESPONSE to the "Eternity Now" article in the Nov/Dec 2002 *Rays*: The question was asked whether our measure of time changes if the earth changes its rate of rotation on its axis or its rate of revolution around the sun. Because the rotation and revolution of the earth are not precisely constant, scientists now use another standard of time. When Cesium atoms make the transition from their next to the lowest to their lowest energy state, they emit radiation of a specific frequency. One second is defined as 9,192,631,770 cycles of this radiation.

The statement was made that time is "dependent on...the location of the observer." This is not true. Suppose two observers at different distances from a star observe the star explode. Even though one observer is closer than the other, they will both take into account the time which it took the light to travel to them, and thus they will both agree on the time when the star exploded. The situations in which there begin to be disagreements about time are when there is relative motion between the observers.

In response to "The Fourth Dimension is Not Time," in the Nov/Dec 2002 *Rays*: The fact that fourth-dimensional perception involves "throughness" is not inconsistent with the fourth dimension being related to time. The best way to understand this is by analogy. Suppose we picture some beings who live on a large plane (like a large sheet of paper, laid flat). The creatures cannot leave their plane and cannot see outside their plane. Now picture this plane as intersecting a tree (see picture). The 2-D beings on the plane (which we will call Flatlanders) will perceive only the part of the tree which intersects their plane, which is a circle. If the plane has an upward motion, the Flatlanders will see the various cross-sections of the tree in sequence. The cross-sections which are below the plane are, for the Flatlanders, past and cannot be seen again. The cross-sections which are above the plane are, for the Flatlanders, future and will only be seen later. We with our 3-D vision, however, can simultaneously see the Flatlanders past, present, and future. For the situation shown in the picture, we could predict that the Flatlander's circle will split into two circles, one larger than the other,



and that the smaller one will disappear before the larger one. Note that for the Flatlander, a 2-D being, his time is in the third dimension. By analogy, the time for us 3-D beings will be in the fourth dimension, and those with fourth dimensional vision will be prophets to us.

How does "throughness" tie into the picture? For a Flatlander, a rectangle is a box. If all four sides are in place, the Flatlander cannot see what is inside. However, we 3D beings can see the inside of the box. In fact, we can see everything in all of Flatland, inside and out, at a glance. By analogy, one with 4-D perception will be able to see all in our 3-D world, inside and out, at a glance.

An excellent book on this subject is *Flatland* by Edwin Abbott. ❒

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