

handed forms. One of the great mysteries in molecular biology is that living systems contain only left-handed molecules. However, once death occurs, these left-handed molecules slowly change into right-handed ones.

This curious process is called *racemization* and occurs at a known rate. By comparing the quantity of left-handed molecules with the quantity of right-handed molecules in a sample, it is possible to determine how many years have passed since death occurred. The drawback to using this method is that heat is known to speed up the process, and therefore samples subjected to unknown sources of heat in the past would give erroneous dates. Nevertheless, *racemization* is generally useful in dating organic specimens that are from 40,000 to several hundred thousand years old.

AGE OF THE EARTH

The oldest unequivocally dated Earth rocks are located in southwest Greenland. They have radiometric age of 3.76 billion years. Reports from Russia and South Africa have indicated rocks as old as 4 billion years. Yet the Earth is thought to have originally condensed from the nebular cloud of gas and dust 4.6 billion years ago. Scientists have dated some moon rocks at ages approaching 4.6 billion and all meteorites also yield this date. Sophisticated comparative residual lead isotope analysis from deep sea cores on Earth also indicates an age of 4.6 billion years. But why are the oldest dated rocks on the Earth itself only 3.76 to 4 billion years old?

In Chapter 4 we discussed the great melting and subsequent cooling of the Earth. It is only when a rock cools and crystallizes from its melt that it is, in effect, born. In its molten state it has not come into being as a solid rock. Its age begins and the clock in its radioactive nuclides only starts when its minerals solidify and crystallize. Since the oldest dated rocks on the Earth are approximately 3.8 billion years old, it is assumed that the Earth's crust did not finish cooling (and water condense from the great outgassing) until that time.