The atom's expanding role in the humanities*

Radioactive dating

One of the earliest applications of radioisotopes in the humanities was that of radiocarbon dating, first developed and demonstrated by former Atomic Energy Commissioner Willard Libby in the late 1940's. The principle of carbon dating is based on the fact that radiocarbon (carbon-14) is produced in nature by a nuclear process involving the interaction of cosmic rays from outer space with the nitrogen in the earth's atmosphere. All living matter contains a small quantity of radiocarbon, and the proportion of this activity remains constant through the life of the organic matter. When plants, animals, and men die, the radioactivity slowly fades away. Since the half-life of carbon-14 is about 5700 years, a piece of wood of that age is only half as radioactive as it was when first formed. Using the decay rate of carbon-14 atoms as a nuclear timepiece, we can make measurements by taking a known amount of carbon from the sample, converting it to gas, and then counting the carbon-14 disintegrations in the gas.

By using the most-sensitive analytical methods available today, scientists find it possible to give fairly accurate dates to the products of man's activities (Figure 1). By employing this technique, we learned that the Dead Sea Scrolls are nearly 2000 years old, not from the scrolls themselves but from the linen in which they were wrapped. The linen contained enough carbon-14 to indicate that it was alive as a flax plant about the time when Christ was born. By radiocarbon dating of charcoal materials found near the great monuments at Stonehenge in England, scientists found that they were erected about 3700 years ago. Further information about these structures was generated when geologists identified the rock of which they were made; the nearest such deposit is in Wales, 180 miles away.

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