Physical Sciences Notes

RADIOACTIVE DATING

Ionium in Igneous Rocks

The use of ionium dating for volcanic rocks leads to reliable results, according to a Japanese physicist reporting in the May 19 SCIENCE. Ionium had previously been used to measure the time of formation of marine sediments and carbonates.

Ionium is a radioactive isotope of the element thorium with an atomic weight of 230. It occurs naturally and also is produced from the radioactive decay of uranium 234. Once formed, it lasts a long time, with a half-life of 80,000 years.

According to Kunihiko Kigoshi of Gakushuin University, Tokyo, the amount of natural ionium has to be proportional to the amount of thorium 232 in each mineral of the rock, while the ionium resulting from uranium decay has to be proportional to the uranium 234 or thorium 234.

By using these relationships, Kigoshi calculated the amount of ionium that had decayed since the rock had been formed. Knowing that, and its rate of decay, he was able to tell how old the rock was.

In one case, the ionium dating matched the figure obtained from radiocarbon dating, a method used on organic materials. The rock was a pumice that was associated with a wood sample estimated by carbon dating to be about 35,700 years old. The ionium method gave the pumice's age as 37,600 years.

COSMIC RADIATION

Cruise Ship Carries Detector

A luxury ocean liner is being fitted with a new kind of detector for the study of cosmic radiation in the South Pacific.

The instrument, called a neutron multiplicity monitor, has been in use by Lockheed Missiles and Space Co. to measure the energy of radiation reaching its observatory, 12,500 feet above sea level near Bishop, Calif. For scientists to compute the radiation's energy before it penetrates the atmosphere, however, the monitor must be moved over the earth's surface to take advantage of the energy variations due to latitude.

This variation is based on the way charged particles move in the earth's magnetic field. This field may be pierced easily by cosmic rays in the polar regions, but is harder to penetrate at the equator.

By taking continuous readings as the Matson liner Monterey crosses latitudes from San Francisco south to the equator and on to Sydney, Lockheed scientists will be able to relate the energy distribution of the rays as they enter the top of the atmosphere to the observations made at sea level.

POLYMER CHEMISTRY

High-Temperature Plastic

Development of a new family of high-temperature polymers was announced by Olin Mathieson Chemical Corp. The new plastics, compounds of silicon and boron, are called polycarboranesiloxanes.

These polymers stay flexible for long periods at up to 800 degrees F., and also down to minus 80 degrees F. They have applications in pressure seals and wire insulation where high heat resistance is needed.

HIGH ENERGY PHYSICS

Strong Absorption Theory

According to modern theory, nuclear forces are transmitted by the exchange of particles called pions. In accelerators, where various types of particles collide at high energy, the forces create new particles, the pion-exchange theory states.

Recent experiments at the Cambridge (Mass.) accelerator indicate that a simplified model of nuclear forces, called the one-pion-exchange model, may not hold up. Instead, a more complicated picture, the strong-absorption model, appears to fit the facts better.

The experiments involved striking hydrogen nuclei—protons—with electromagnetic photon particles. The photons were produced from the six Bev beam of electrons of the accelerator. Some of the collisions resulted in a shortlived particle called omega-zero. It was the omega-zero production mechanism that seemed to fit the strong-absorption model. Earlier experiments with another particle, the rho-zero meson, also supported the more complex model.

The experiments, reported in the current PHYSICAL REVIEW, were carried out by the Cambridge Bubble Chamber Group, made up of scientists from six U.S. and foreign universities. The omega-zero experiments were part of a larger series of observations, the first major study of photon-proton collisions above one Bev energy.

ASTROPHYSICS

Star Gap Explained

Stars are classified according to two variables—brightness, or luminosity, and surface temperature. Astrophysicists believe that stars evolve through several stages, each stage having a different luminosity and surface temperature.

There are gaps in the evolutionary path where astronomers haven't been able to find stars.

The explanation for one such gap, that of the "ultraviolet dwarfs," is probably that stars pass through that stage quickly, says Dr. Richard Stothers of the Goddard Institute for Space Studies, New York.

In order to pass through the ultraviolet dwarf stage, a star would have to eject matter by some other means than pure thermal cooling, which the sun does. The only other known means is the emission of neutrinos, an elementary particle, says Dr. Stothers.

In an article in the ASTRONOMICAL JOURNAL, Dr. Stothers calculated the maximum time ultraviolet dwarfs could exist and still be undetected. He came up with an upper limit of 500,000 years.

He then found that without neutrino emission, the stars would last more than 2 million years. With neutrino emission, he said, they would last less than 400,000 years.