physical sciences

The lifetime of beryllium 10

Beryllium 10 is an important member of the group of long-lived radioactive isotopes whose concentrations are used to determine the ages of lunar, meteoritic, paleontological and cosmic-ray samples. In the Aug. 7 PHYSICAL REVIEW LETTERS F. Yiou and G. M. Raisbeck of the Centre National de la Recherche Scientifique at Orsay, France, raise a question about its currently accepted half-life, 2.7 ± 0.4 million years.

They had started out merely to improve the accuracy of the determination without any suspicion that the accepted value was wrong. To achieve better accuracy they had avoided the usual method of measuring life-times too long to be directly observed: finding the decay rate and then determining the number of decaying nuclei by comparison with a stable isotope. Instead they measured the rates of production of two radioactive isotopes, beryllium 7 and beryllium 10, as protons were struck against carbon 12 nuclei. One of these production rates depends directly on the beryllium 10 half-life; the other does not. The half-life can thus be found by comparing them. It came to 1.5 ± 0.3 million years, a figure, which, if it stands up, will cause a number of dating revisions.

Weak force and electromagnetic masses

Theorists are beginning to think that the electromagnetic force and the weak subnuclear force may be closely related, perhaps two aspects of the same thing (SN: 10/9/71, p. 252). Steven Weinberg of the Massachusetts Institute of Technology believes such a linkage may solve difficulties about the mass differences between members of isotopic multiplets, groups of particles like the neutron and proton, which seem to be aspects of the same particle except for different electric charges.

There are small differences in mass between charged and uncharged members of a multiplet, and the usual explanation is that these represent energy generated by the charged particle's electromagnetic interactions with itself and the fields it generates. But Weinberg points out in the Aug. 7 PHYSICAL REVIEW LETTERS that whenever this idea is worked out according to current electromagnetic theories the differences turn out either zero or infinite. He suggests that adding in the effects of the weak force can make the differences come out more realistically, and he presents mathematical arguments to show how this can be done.

Argon ions accelerated at PPA

The acceleration of heavy ions (essentially the nuclei of heavy elements) to high energies is important to a wide variety of studies, including nuclear physics, astrophysics and radiobiology. The Princeton Particle Accelerator was the first to bring ions (nitrogen) to billion-volt energies.

Now in the Aug. 4 SCIENCE a PPA group (M. V. Isaila et al) report success with argon ions, which the machine accelerated to 11.7 billion electron-volts. The beam contained at most a few particles per second because the vacuum was not good enough. An improvement in vacuum would permit a much more copious beam (better for experimenting with) but the trial cannot be made since the accelerator has been put into mothballs (SN: 4/29/72, p. 279).

medical sciences

The pill: A vitamin C depleter

Drug interactions are becoming a subject of increasing concern to physicians, pharmacologists and biochemists (SN: 6/29/71, p. 365). In the Aug. 4 NATURE, two biochemists at the University of Zambia, Michael and Maxine Briggs, report that women using birth control pills experience bodily depletion of vitamin C.

Last year, animal experiments showed that estrogens (steroid hormones) increase the breakdown of vitamin C. So the Briggs looked at vitamin C levels in 88 women. Thirty-one were controls, 18 were pregnant and 39 were taking steroid contraceptives. Each group contained European, African and Asian women. The results showed that vitamin C was significantly lower in women on the pill compared with the control and pregnant women.

The Briggs conclude that many women receiving oral contraceptives have an induced deficiency of vitamin C and require supplementary vitamins. "It is possible that some of the reported side effects of 'the pill' may be a consequence of this vitamin lack."

Lead toxicity and enzyme deficiency

Since atmospheric exposure to lead has been correlated with accumulation of lead in the bloodstream, might genetic factors predispose certain individuals to greater lead accumulation, or to lead toxicity? With this question in mind, two pediatricians at the University of Nebraska College of Medicine—Matilda S. McIntire and Carol R. Angle—found that black children deficient in a particular enzyme had more lead in their blood than did black children with the enzyme. The enzyme, located in the bloodstream, is glucose-6-phosphate dehydrogenase (G-6-PD). Some 10 percent of all blacks are estimated to be deficient in it.

How the enzyme deficiency might cause more lead to accumulate in the bloodstream needs further examination. But as the authors point out in the Aug. 11 SCIENCE, there is reason to believe that the enzyme deficiency, coupled with high lead levels, might trigger lead toxicity. People deficient in the enzyme have been known to experience acute breakdowns in hemoglobin if the lead content in their blood was only slightly increased.

Matching antigens for transplants

Most immunologists concur that organ donors should be chosen on the basis of immunological compatibility with organ recipients. But much still has to be learned about which antigens (substances in the organ that the recipient's body takes as foreign) are crucial, and how they might be determined.

In the Aug. 2 NATURE NEW BIOLOGY, J. Dausset and J. Hors of the Institute of Research into Blood Disorders in Paris report they found that of 416 kidney transplants performed in France since 1959, 96 percent were successful when a complex of antigens known as the HL-A antigens were identical in donor and recipient. When antigens were partly identical, transplants were 71 percent successful. When antigens were altogether different, the transplants had been 47 percent successful. They concluded the HL-A antigens largely determine the success or failure of many kidney transplants.

Then they looked into the genetic source of the antigens and found that one or possibly two genes in man give rise to the crucial antigens.