BIOMEDICINE

Mountain climbing and eye damage

If you're planning to scale some peaks this summer, keep in mind not only the well-documented risk of mountain sickness (hallucinations that lead to stepping off a cliff), but the lesser known one of retinal hemorrhage, leading to lasting visual defects. Three scientific studies documenting this danger are reported in the June ARCHIVES OF OPHTHALMOLOGY.

Drummond Rennie and James Morrissey of the Rush-Presbyterian-St. Luke's Medical Center in Chicago took photographs of the retinas of 15 Americans before and after they climbed Dhaulagiri, part of the Himalayas and the seventh highest mountain in the world (26,810 feet). Five of the climbers (33 percent) had retinal hemorrhaging as a result of the climb. Although the cause is unknown, Rennie and Morrissey suggest the lack of oxygen at high altitudes dilates the blood vessels of the retina, making the vessels vulnerable to pressure.

William T. Shults and Kenneth C. Swan of the University of Oregon Medical School examined the vision of six survivors of an ill-fated climb to Mt. Aconcagua, Argentina, the tallest mountain in the Western hemisphere (22,834 feet). Four survivors had retinal hemorrhages, and two had permanently damaged vision.

High-altitude retinal hemorrhage is also being observed with increasing frequency in climbers, hikers and skiers who engage in their sports above 10,000 feet, reports Michael Wiedman of Harvard Medical School.

'Drowning' without death

How long can people remain submerged in water without drowning, or at least without suffering irreversible brain damage? Although there is no definitive answer, one case of survival without brain damage after 40 minutes' submersion is reported in the June 7 LANCET by Norwegian physicians.

On Feb. 6, 1974, at 11:30 a.m., a five-year-old boy walked out into a partially frozen river in Norway and plunged into the water. Three people saw the accident and called the police. The boy was submerged for 40 minutes until the police finally rescued him. The boy was given mouth-to-mouth resuscitation, rushed to the hospital, then given other lifesaving treatments.

By afternoon a pulse rate was detected; by evening he could move his eyes and limbs. Two days later he was conscious and talked intelligently. On Feb. 14 he was discharged from the hospital. Throughout the rest of 1974 and until the spring of 1975 he was tested for brain damage and found normal.

The reason the boy survived such a lengthy submersion, Harold Siebke and his team at the Akerhus Central Hospital in Nordbyhagen conclude, was probably due to the rapid cooling of his body in cold water. At 24 degrees C. the oxygen requirements of the brain are considerably reduced.

Measuring cadmium in the body

Along with lead, cadmium is probably the leading trace pollutant that endangers human health (SN: 7/21/73, p. 44). It is rife in food, water and air and has been linked with cancer, heart disease and other chronic diseases.

Until recently, there was no way to measure the buildup of cadmium in the tissues of industrial workers and other people. Now a rapid, noninvasive technique that can measure levels of cadmium in the liver has been designed by T.C. Harvey and his medical and physics team at the University of Birmingham, England. The technique, described in the June 7 LANCET, uses the principle of neutron-activation analysis where the specific changes produced by the interaction of nuclei and neutrons are analyzed.

PHYSICAL SCIENCES

Polarized electrons in the pipe

Spin is one of the most important characteristics of elementary particles. It is especially important in the interactions between particles because many of the details of the behavior of the forces involved depend on relations between the spins of the particles.

One of the most elegant tools for studying spin-dependent effects is a beam of polarized particles, a beam in which all or nearly all the spins are oriented in the same direction. A collection of random particles will generally have their spins oriented in random directions, so it takes a bit of technological doing to get them all in the same direction and keep them there. Such a facility for high-energy electrons has been completed and successfully tested at the Stanford Linear Accelerator Center, according to an account in the June 23 PHYSICAL REVIEW LETTERS.

Known as PEGGY, the apparatus produces a beam that is 76 percent polarized over an energy range from 6.47 billion to 19.40 billion electron-volts. The polarization is reversible and does not depend on the energy of the electrons, provided experimentation is restricted to multiples of a base energy of 3.237 billion electron-volts. The facility is expected to be very useful in studies of electromagnetism and the weak interaction. The experiment that determined its characteristics was done by P. S. Cooper of Yale University and 17 other physicists from Yale, the University of Bielefeld in West Germany, the University of Tokyo and SLAC.

Heating up the nucleus

The advent of heavy-ion physics, experiments in which large atomic nuclei are made to collide with each other, has resulted in the importation into nuclear physics of concepts that were hitherto thought to be properties only of gross matter, of large collections of atoms and molecules. To understand results of these experiments, physicists now speak of such things as viscosity or friction of nuclear matter.

In the June 16 PHYSICAL REVIEW LETTERS R. Weiner and M. Weström of Philipps University in Marburg an der Lahn, West Germany, propose a thermodynamics of nuclear matter. Traditional nuclear physics had regarded an atomic nucleus as being in a state of thermodynamic equilibrium, so that speaking of such things as heat conduction through a nucleus was meaningless.

Weiner and Weström propose that it is not meaningless. They assume that a projectile striking a nucleus produces a local hot spot on the surface just as a cannonball striking a battlement produces a local hot spot. They proceed to set up equations for such things as thermal conductivity of the nucleus and the direction of heat propagation in it. They find that such ideas enable them to explain some of the previously unexplained characteristics of the particles ejected from such excited nuclei. A large part of those ejecta apparently come off before thermodynamic equilibrium, is reached, if it is reached at all.

A cool organic conductor

Organic compounds that conduct electricity are one of the more arresting recent discoveries of solid-state physics. Those so far known are conductors only over a limited temperature range—below a certain critical temperature they are insulators. In the June 23 PHYSICAL REVIEW LETTERS, a group from Johns Hopkins University (A.N. Bloch et al.) reports one that is a conductor from 300 degrees K. down to 45 thousandths of a degree, almost absolute zero. It is hexamethylene-tetraselenafulvalenium tetracyanoquinodimethanide (HMTSF-TCNQ).