physical sciences

Polarized galactic centers

It appears more and more that the centers of galaxies are places where unusual physical processes are taking place. Exactly what processes is not yet known but astrophysicists are trying to narrow down the possibilities by recording and characterizing the different kinds of radiation that come from them.

Some of the nearby giant elliptical galaxies have weak radio sources associated with their nuclei. The question arises whether these galaxies may also have sources of polarized optical emission in their centers. Polarized light is produced by nonthermal sources. D. S. Heeschen of the National Radio Astronomy Observatory did observations to find out using the 2.1-meter telescope at Kitt Peak National Observatory.

In the Jan. 15 ASTROPHYSICAL JOURNAL LETTERS (just received) Heeschen reports positive results for NGC 4486 (M87) and NGC 5444. For other galaxies measured results are inconclusive although there is a suggestion of polarization for NGC 1052, NGC 4278 and NGC 4552. In the same issue, T. D. Kinman of Kitt Peak confirms the result for NGC 4486 and suggests that the polarization may vary from time to time.

Probing the deuteron

Electrons are used as probes to study the detailed electromagnetic structure of larger bodies such as protons and deuterons. (A deuteron consists of one proton and one neutron.) The amount of momentum transferred from the electrons to the deuterons governs the fineness of the structure observed, and this has lately been pushed to a level where the distances measured are as small as one-sixth of a fermi. (A fermi is 10^{-13} centimeters, the average nuclear radius.)

In the Feb. 19 PHYSICAL REVIEW LETTERS J. Gunion and Leo Stodolsky of the Stanford Linear Accelerator Center warn that determining structure from the electron-scattering data is straightforward only if the scattering is the simplest (lowest-order) electromagnetic effect. They point out that instead of scattering simply once off the deuteron as a whole, the electron may scatter in two bounces, involving exchange of two photons with the deuteron instead of one. This multiple scattering, they conclude, may even come to dominate events at high levels of momentum transfer. If so, the deduction of deuteron structure will not be as straightforward as at low momentum transfer.

Microwaves from sodium hydroxide

The new science of molecular astronomy, which is the study of the chemical compounds found in the interstellar clouds, depends on a knowledge of the radio spectra of such compounds, especially lines in the microwave range. Such spectra first have to be measured in the laboratory; astronomical observations have often run ahead of the laboratory because before the beginning of molecular astronomy there was not great interest in these microwave spectra.

In the Feb. 1 ASTROPHYSICAL JOURNAL LETTERS Edwin F. Pearson and Max B. Trueblood of Southern Illinois University at Carbondale report laboratory measurements of the spectrum of sodium hydroxide. They observed lines at 175,899.37, 201,014.01 and 226,123.23 megahertz and derived from them constants that allow the calculation of the frequencies of other lines associated with rotation of the molecule.

medical sciences

Prostaglandins enhance sickle cell anemia

Sickle cell anemia, a blood disease, afflicts 50,000 American blacks. During a sickle cell crisis, red blood cells become elongated, like sickles, and have trouble passing through the body's smaller blood vessels. A crisis can last several days or weeks. During that time the victim suffers excruciating pain and is often disabled.

For several years scientists have been searching for chemical cofactors that may trigger sickle cell crises. Paul L. Wolf and his team at the Stanford University School of Medicine now have evidence that they have found such a cofactor. It is a kind of prostaglandin. Prostaglandins, hormone-like substances, play many roles in the body.

In tests they conducted during the past eight months, small concentrations of the prostaglandin E_2 were added to the red blood cells of sickle cell anemia patients. "We found that the prostaglandin induced increased sickling in the red cells of the sickle cell anemia victims," Wolf says. "On the other hand, no changes were observed when it was added to normal cells."

The next step, Wolf asserted at the annual meeting of the American Association of Pathologists and Bacteriologists this week, is to find a drug that keeps prostaglandin E_2 from sickling. Such a drug might provide a much-needed treatment for sickle cell anemia.

Cyclic AMP and hypertension

Cyclic AMP is a go-between for various hormones and various cell activities. It may contribute to hypertension (elevated blood pressure), which in turn can trigger a heart attack.

Hypertension is known to be due to the smooth muscles of blood vessels being too primed, too supertoned. Since concentrations of cyclic AMP are inversely correlated with the smooth muscle tone of blood vessels, M. Samir Amer of the Mead Johnson Research Center in Evansville, Ind., decided to see how much cyclic AMP is present in the blood vessels of hypertensive rats. He reports in the Feb. 23 SCIENCE that he found the vessels of the hypertensive rats had a lot less cyclic AMP than did the vessels of control rats. So it looks as if cyclic AMP may contribute to hypertension. Perhaps cyclic AMP is not present in large enough amounts to make blood vessels lose some of their tone, to relax. As a result the supertoned vessels raise blood pressure.

How environment shapes vision

If newborn infants were exposed only to checks, stripes or polka dots, is that all they would be able to see later in life? No one knows. But researchers are finding that in the cat at least, early visual experiences do shape vision.

In 1970 Colin Blakemore of the University of Cambridge, England, reared two kittens in the dark except for a few hours' exposure each day to black-and-white stripes slanted in one direction. After 300 hours of such visual exposure, the kittens could see only things that slanted in the same direction.

In the Feb. 16 NATURE, Blakemore and Donald E. Mitchell of Dalhousie University, Nova Scotia, report that such environmental shaping of vision happens quickly. They kept six kittens in the dark until they were six weeks old. Each kitten was then exposed to vertical stripes for 1, 3, 6, 18, 27 or 33 hours respectively. After exposure all the kittens, even the one that had seen vertical stripes for only one hour, could see nothing but vertical angles.