Physical Sciences

Hyperfine structure of CN

Usually scientists measure the spectrum of radio emissions from a given chemical compound in the laboratory and then use the information to identify substances present in the clouds in interstellar space. In the case of the hyperfine structure of a line of the cyanogen radical (CN), three astronomers from Bell Telephone Laboratories, A. A. Penzias, R. W. Wilson and K. B. Jefferts, reversed procedure and used the CN in the Orion nebula to determine the spectrum.

Hyperfine structure is the result of interactions among the various circular motions and magnetic fields in the molecule. These interactions split what would at first approximation be one energy level into several closely spaced ones and thus split a single spectral line into several nearby ones. In the $N = 1$ line of CN seven appear.

It takes high-resolution spectroscopy to see the seven. Because of its chemical reactivity, cyanogen cannot be kept long enough in a terrestrial laboratory to make the measurement so recourse was had to the great chemical laboratory in the sky.

The seven frequencies measured range from 113,145 megahertz to 113,508 megahertz with intervals from 2 to 300 megahertz between adjacent lines. The report is in the April 1 PHYSICAL REVIEW LETTERS.

A 'metallic' organic

A certain school of solid state physicists, of which a prominent member is W. A. Little of Stanford University, believes that a properly structured, long-chain, quasi-one-dimensional organic compound may be found or manufactured that will be electrically superconducting at room temperature. This belief is based on theory that seems to show that the relationship between electrons characteristic of superconductivity can occur in such compounds. And not only superconductivity: Such organics may exist in metallic, dielectric and antiferromagnetic, as well as superconducting states depending on the details of the electron-electron relationship.

In the March 29 NATURE E. J. Seykora and R. A. Klein of East Carolina University in Greenville, N.C., report that while investigating a number of organic compounds in which this electron-electron interaction is expected to be important, they found an organic layer compound that exhibits electrical conductivity like that of a metal over a wide temperature range. The compound is graphite layered with a triphenylmethane dye (malachite green). It exhibits conduction properties similar to those of a metal between 77 degrees K. and 250 degrees K.

The sun as the source of comets

In the March 29 NATURE Hubert Reeves of the Saclay Laboratory in France suggests that the sun may be the ultimate source of the matter in comets. Material streaming out in the solar wind will reach a place of turbulence where the interplanetary magnetic field comes into contact with the interstellar one. The turbulence will build the matter into lumps. As the lumps grow, the gravitational attraction of the sun will overcome the drag force that tends to push them farther away, and they will start back toward the sun. To check the hypothesis, Reeves advises measuring the deuterium-to-hydrogen ratio in comets. His model predicts virtually no deuterium.

Medicine

Smoking and gum disease

As if smokers aren't bedeviled enough by lung cancer, heart disease, emphysema, weakened immune responses, increased risk of giving birth to low-weight infants and spouses who complain they're being done in by the noxious chemicals in cigarette smoke, they can now add a new sin to their consciences: gum disease. Gum disease—not cavities—is the leading cause of tooth loss in adults.

Edward R. Loftus and his dental colleagues at Harvard University and at West Roxbury Veterans Administration Hospital in Boston studied 684 healthy male patients seeking dental care at the hospital. The scientists found that the formation of calcified particles around the teeth, bone loss in the jaw and the numbers of loose (movable) teeth were much higher in smokers than in nonsmokers. The research also showed a relationship between leukoplakia (the formation of white, horny-surfaced abnormalities on the membranes lining the mouth, the lips and the tongue) and smoking.

High-protein diet and cholesterol

Obsessed with losing weight, some five million Americans have purchased a copy of *The Doctor's Quick Weight Loss Diet*, by Irwin M. Stillman, a physician, and by science writer S. S. Baker. The Stillman diet is basically a carbohydrate-restricted diet, rich in protein and animal fat. Many people who followed the diet have reported quick and drastic weight losses.

The diet may be harmful, however, in that it raises blood levels of cholesterol, a major factor in heart disease, Frank Richman and his team at the Harvard Medical School and the Peter Bent Brigham Hospital report in the April 1 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

The Boston cardiology team put 12 healthy volunteers on the Stillman diet for 3 to 17 days (average, 7.6 days). The volunteers experienced a transient weight loss that averaged 3.1 kilograms (seven pounds). The researchers found that the volunteers' blood levels of cholesterol increased in every case, from an average base line of 215 milligrams per 100 milliliters to 248 milligrams per 100 milliliters during the diet.

"The use of the Stillman diet with its resultant hypercholesterolemia," the researchers conclude, "presents potential risks, particularly to patients with overt or subclinical coronary artery diseases."

Mongolism and prenatal deaths

Scientists would like to know how many fetuses with chromosomal-causing birth defects spontaneously abort and how many survive to birth. Now that chromosomal-banding techniques are available (SN: 9/25/71, p. 200), investigators can distinguish individual chromosomes enough in fetuses to determine what percent of various chromosomal abnormalities lead to spontaneous abortions.

Some 65 percent of fetuses with extra chromosome No. 21 spontaneously abort, M. R. Creasy and J. A. Crolla of Guy's Hospital Medical School in London report in the March 23 LANCET. If infants with the extra chromosome 21 are born, they have mongolism—the single most common cause of mental retardation. Maternal age or the length of pregnancy did not affect whether fetuses with the extra chromosome 21 aborted or not. However, more female fetuses than male fetuses aborted.