environment

Computer model for emission controls

A major problem in devising air pollution control programs is arriving at cost-benefit ratios that will tell state and Federal agencies where they can most effectively put their limited funds for air pollution abatement.

The Coordinating Research Council announces it has completed a mathematical model that will give this kind of information to state agencies in relation to automobile-caused pollutants: hydrocarbons, nitrogen oxides and carbon monoxide.

If a particular city has, say, a serious ambient carbon monoxide problem, but a less serious ambient hydrocarbon problem, the most cost-effective approach can be calculated with the model. Because inspection and repair costs for hydrocarbon emissions are higher than for carbon monoxide, the model might indicate that less stringent controls of hydrocarbons would be acceptable.

A monkey wrench could be thrown into the model by a recent Federal court decision, however. The decision says that even if a jurisdiction would still meet ambient air goals, it nonetheless has no right to allow any addition pollution of any kind.

Toward a policy of 'adequate' power

Since World War II, the more progressive portions of the electric utility industry have seen growth as a source of never-ending prosperity for the industry and the nation. Keep electric rates low, these utilities reasoned, and demand will grow; then increased demand will allow construction of larger and more economical power plants, and rates can be lowered again in a never-ending cycle. But in the past few years, there has been increasing awareness of both technological and ecological limits to this process.

William R. Gould, senior vice president of the Southern California Edison Co., told an international seminar recently that "growth as we have known it in recent decades cannot continue indefinitely. . . . An emerging and major need of our society is to find ways to maintain economic health without reliance upon the present ethic of exponential growth."

Gould said future power planning will have to stress "adequate" instead of "abundant" electrical energy.

Process for recycling plastics

Plastics are a particularly intractable part of solid wastes (along with nonreturnable cans and bottles) because they generally are not biodegradable.

The Interior Department's Bureau of Mines reports that a research program at its Rolla, Mo., Metallurgy Research Center promises a feasible recycling process.

The major problem was that the four basic types of plastics in municipal garbage must be separated before they are usable. After cleaning and shredding the undifferentiated plastics, the bureau's researchers used a "float-sink" separation technique based on the differing densities of the four plastics. The shredded plastics are rotated through baths of liquids of differing specific gravities; in each bath, one of the plastics floats and the others sink. Thus plastics are separated into groups of polypropylene, low- and high-density polyethylene, polysterene and polyvinyl chloride (PVC), all of which can then be re-used.

physical sciences

X-rays associated with gravity waves

The bursts of gravitational radiation that Joseph Weber of the University of Maryland records apparently come from a source where very violent processes occur. If so they may be accompanied by bursts of other radiation (X-rays, radio) from the same source. In the May 15 PHYSICAL REVIEW LETTERS G. A. Baird of Simon Fraser University in Burnaby, B.C., and M. A. Pomerantz of the Bartol Research Foundation report that equipment flown on a balloon from McMurdo Sound in Antarctica failed to find such X-rays. Since the minimum detectable flux was a billion times lower than the energy flux calculated for the gravitational source, the result argues that the X-rays are not there and makes the source of the gravitational radiation harder to explain.

A model of the galactic center

The center of our Milky Way galaxy is invisible. Large clouds of dust obscure it. But the dust is penetrable to infrared radiation, and data taken at infrared wavelengths now indicate that there are sources of infrared in the galactic center and give some information about its possible structure.

Among the theoretical models that are being worked out is one presented by Robert H. Sanders and Thomas Lowinger of Columbia University in the May ASTRONOMICAL JOURNAL. They address themselves first to the bright extended source that covers a sizable volume. Calculation of the probable mass distribution and dynamics leads to a rotation similar to that of neutral hydrogen in the inner regions of the galaxy—therefore a light diffuse medium is likely. They conclude that the extended source represents reemission of starlight absorbed by the cosmic dust. At the very center of the galaxy is a point source of infrared. This, Sanders and Lowinger suggest, is a light cusp produced by the combined radiation of stars trapped in the gravitational field of a condensed massive body—perhaps a black hole 600,000 times as massive as the sun—and forced to be its satellites.

Measuring the neutron's lifetime

The neutron is an almost stable particle. Flying free, it will decay radioactively under the influence of what physicists call the weak interaction, but its lifetime is fantastically long compared to that of any other unstable particle. Most particle lifetimes are measured in millionths or billionths of a second; the neutron's is many minutes.

Inside an atomic nucleus, neutrons are usually stable. In some cases some of the neutrons remain unstable, and the nucleus is subject to transmutation by beta decay: The unstable neutron turns into a proton, emitting an electron and an antineutrino.

Experimental determination of the half-life of the free neutron against beta decay is thus important for theories of the weak interaction and of nuclear structure and, through them, of cosmology. In recent years the trend of the experimentally determined number has been downward. In the past values as high as 30 minutes were quoted. In the April 1 PHYSICAL REVIEW D (just received) a group working at the Danish Atomic Energy Commission Research Establishment Risö at Roskilde reports the lowest number yet: 10.61 minutes.