environment

DDT a long-term menace

It has been known for some time that much of the DDT that gets into the environment after crop spraying does so through the atmosphere. The process is apparently a long-term one, and two Agricultural Research Service scientists report that it will probably pose environmental hazards long after DDT use is halted.

Mark Claith and William Spencer of ARS in Riverside, Calif., report in the October ENVIRONMENTAL SCIENCE AND TECHNOLOGY that a breakdown product of DDT called DDE (and implicated in eggshell thinning) is eight times more volatile than DDT. Thus DDE has far greater tendency to escape into the atmosphere. The conversion of DDT to DDE goes on for several years. They say much of the DDT now in soils will probably be degraded to DDE—which will then enter the atmosphere.

Coal gasification progress

Coal gasification techniques now at the pilot plant stage promise to turn a dirty fuel into a clean one. The basic chemistry is simple and long-known: Coal is reacted with steam to form methane, carbon monoxide, hydrogen and carbon dioxide. The product can be upgraded to nearly pure methane. But there are problems in both steps. Some coals tend to cake, some need pretreatment and some coals produce pollutants that get into the gas.

General Electric Co.'s vice president for research and development, Arthur M. Bueche, reports that GE has overcome some of the problems. Use of inert diluting agents prevent caking in GE fixed-bed gasification reactors; an extrusion process makes possible the use of a variety of coals without pretreatment; and new GE membranes, designed for medical applications, are effective for removing certain pollutants selectively from gas.

Biological pollution monitors

The lag in feedback of information on water quality can result in a hazardous situation not being detected till aquatic life is already damaged. Or it can result in overprotection and wasted money for effluent treatment.

Three researchers at the Virginia Polytechnic Institute and State University's Environmental Studies Center report that monitoring of fish responses, along with computerized collation of the responses, could provide a near-instant gauge of changes in industrial or other effluents.

Using bluegills, they measured changes in fish movement, respiration and reproduction when the fish were exposed to various concentrations of zinc sulfate. Changes in reproduction are detectable only over a long period, however, and they result from much lower concentrations of the pollutant than do the behavioral responses. So the scientists determined the ratio between the threshold level of pollutant concentration causing the reproduction responses and the level causing the behavioral responses. In practice, they say, the amounts of effluent that monitored fish are exposed to (taking into account the dilution of the effluent in the waterway) can be increased by this ratio. Then the movement and respiration responses will show when effluent contamination is high enough to cause the much more subtle reproduction difficulties. The researchers are John Cairns Jr., Richard E. Sparks and William T. Waller.

physical sciences

Splotchy pulsars

One explanation of the pulsing of pulsars is the so-called lighthouse effect: The radiation comes from a spot on the pulsar body, which rotation carries periodically across the line of sight. Now an examination of the substructure of pulsar pulses gives some indication of what the sizes of such spots may be. It is reported in the Oct. 1 ASTROPHYSICAL JOURNAL LETTERS by T. H. Hankins of the University of California at San Diego.

Intensity fluctuations with timescales from 8 microseconds to tens of milliseconds were found. Characteristic times were 175 microseconds for CP 0950 and 575 microseconds for CP 1133.

The region that emits a subpulse can be no larger than the space over which matter can communicate with matter during the time the subpulse lasts—no bigger than the timescale multiplied by the speed of light. For 8 microseconds this means that there are emitting regions smaller than 2.5 kilometers in diameter. The typical size ranges up to 50 kilometers for CP 0950 and 170 kilometers for CP 1133. The large over-all pulses would be the sums of many such little regional pulses.

More on the solar neutrino problem

The Brookhaven solar neutrino experiment (SN: 9/25/71, p. 210) at Lead, S.D., has not been able to find the flux of neutrinos that theory predicts should come from the sun. Explanations tend to the exotic: for example that neutrinos may decay radioactively between the sun and the earth (SN: 2/26/72, p. 138).

In the July 5 JETP LETTERS, Yu. S. Kopysov and V. N. Fetisov of the P. N. Lebedev Physics Institute in Moscow propose an explanation that would change the rates of certain nuclear-fusion processes in the sun. Those processes begin with hydrogen becoming deuterium by gaining a proton and emitting a positron and a neutrino. Deuterium gains a proton, emits a gamma ray and becomes helium-3. Here the chain branches. Helium-3 can fuse with helium-3 to yield helium-4 plus two protons, or it can fuse with an alpha particle and become beryllium-7, which then has two routes for fusion, each of which produces neutrinos.

The two Russians propose that an energy resonance in the non-neutrino-producing helium-3—helium-3 reactions enhances the probability of its occurrence relative to the other routes. Taking the suggested resonances into account could decrease the expected neutrino flux by a factor of 16, they say. This reaches about the sensitivity limit of the instrument at Lead.

Quasars or not?

Quasars look like very blue stars. Filtered photographs usually show that quasars emit more ultraviolet than stars usually do. In the Oct. 16 NATURE PHYSICAL SCIENCES, I. W. A. Browne and N. J. McEwan of the University of Manchester report that they have identified 11 radio sources with stellar-looking objects that do not have the ultraviolet excess. Considering the question whether quasars necessarily should have the excess, they conclude that quasars with redshifts between 0.5 and 0.8 or more than 2.3 need not. The objects may be such quasars; they may be compact blue N galaxies; or they may be none of the above. Further investigation may tell.