

and that the process was going on elsewhere in the universe as well.

For example, Dr. Gustav Arrhenius of the University of California, San Diego, proposes that the earth coalesced from interstellar dust particles, and that these already contained all the materials common to terrestrial life.

His theory holds that the dust particles condensed from clouds of plasma spewed into space from stellar surfaces. These particles, Dr. Arrhenius says, could act as catalytic surfaces for the formation of organic substances from such basic components as hydrogen, ammonia, and other interstellar gases.

The dust particles later aggregated under electrical polarization and gravity, he says, to form planet-sized bodies, having available all the elements needed for living organisms.

A differing theory, but also based on organic matter in space, is proposed by Dr. Edward Anders here at the University of Chicago. Dr. Anders suggests that organic compounds were made in the earliest days of the solar system, when meteors and planets separated from the solar nebula—the hot cloud of gas and dust that is believed to have formed the sun and planets.

Dr. Anders points to his "solar-nebula-condition" experiments that have reproduced all the organic compounds thus far found in meteorites. These materials include DNA-building-blocks adenine and guanine, other amino acids, porphyrins, aromatic hydrocarbons, polymers, and so on.

Elements observed in meteorites also give clues to their origin. For example, a team led by Robert Clayton (also at the University of Chicago), recently uncovered almost

pure oxygen-16 contained in dust grains from the Allende meteorite (this fell in Mexico in 1969).

"The isotope in the meteorite is almost pure oxygen-16," Clayton says, "the kind of oxygen you'd find in a primitive star." Since our sun is a third- or fourth-generation star, and since oxygen-16 doesn't occur in the solar system in such a pristine state (small amounts of stable oxygen-17 and -18 are always mixed in), it appears the material did not evolve from our solar nebula but "came from a different environment. From just exactly where, will probably remain a mystery," he says.

Dr. Anders contends that meteorites containing organic material may have even given life on earth a "head start" by contributing to the planet's early endowment of organic matter. Larger bodies would explode on impact with the hot, primitive earth, causing any organic matter in them to revert to CO and hydrogen. But these gases, he says, could recombine on expansion and cooling of the fireball, producing a fresh crop of organic matter.

Hah! And you thought the stork brought you! □

ENERGY & POWER

U.S.-U.K. coal linkup suggested

LONDON—A plea for the British and American coal industries to pool future research has been called for by Derek Ezra, chairman of Britain's National Coal Board.

Addressing the American Chamber of Commerce in London, Ezra said the two countries had a real

chance of overcoming their energy problems within a few years. "The common link between us is our energy potential and, because plentiful supplies are essential to keep living standards rising here and across the Atlantic, both countries are taking vigorous steps to ensure that they are available in the years ahead."

Britain also has ample coal reserves, new sources of offshore oil and natural gas, and is continuing to develop nuclear power—"a combination of complementary fuels that could lead to self sufficiency in energy supplies by the 1980s." This is the same target date as set by "Project Independence." □

ECOLOGY

a starchy way to save metals

PEORIA, ILL.—A corn starch compound may give industry a new way to recover metals dissolved in water.

Recovering these expensive metals at the industrial plants where they are used would conserve them as a limited resource and reduce the danger of toxic levels in public water supplies and city sewage sludge. Metals in sludge have also been found to limit its usage as fertilizer.

Robert E. Wing, a chemist at the USDA's Northern Regional Research Laboratory, says the new process "offers industry a way to reduce concentrations of almost all heavy metals to below strict discharge limits." While his new process is not yet in use, it offers advantages over other methods that are currently available.

In the process, an insoluble

a fishy monitor—or—'gesundheit' under water

DULUTH, MINN.—Everyone expects fish to swim, to jump and, occasionally, to get caught. But who would expect a fish to cough?

Fishy "coughs," although not the kind to which one would respond with a "gesundheit," are naturally-occurring phenomena that have stirred the interest of scientists here at the EPA's National Water Quality Laboratory.

The coughing, which is actually a normal gill-clearing process to remove debris, is a natural action of bluegill, sunfish, fathead minnows, and all trout and salmon.

Robert A. Drummond, an aquatic biologist, says a study on the coughing is providing basic data on the effects of water pollutants on freshwater fish. But as an impor-

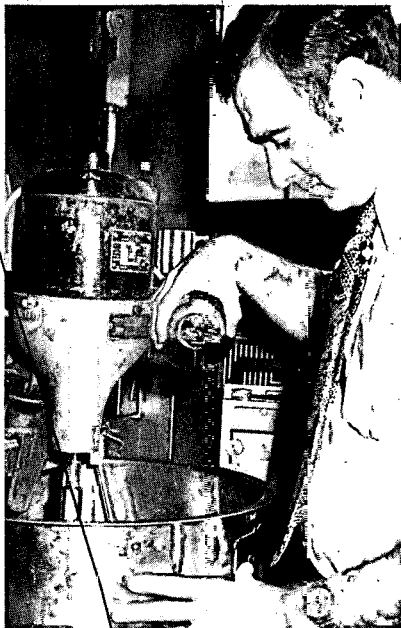
tant spinoff he says, it may also be possible to monitor the quality of lakes and streams by using the fish as watchdogs (no, not dogfish).

In tests with copper and mercury, it was found that pollutant concentrations that increase the frequency of coughing significantly are approximately of the same levels that have been found to be damaging to natural fish life.

"The ultimate use of our findings," says Drummond, "could be a system for keeping tabs on concentrations of complex industrial wastes entering lakes and streams. A sudden increase in fish coughs within a given body of water could trigger an alarm to warn plant personnel that potentially damaging effluent is leaving the plant." □



Glaser



ADDING TO METAL ECONOMY
starch compound saves resources

starch compound—crosslinked-starch xanthate—is mixed with the water containing dissolved metal. Negatively-charged xanthate groups draw the positively-charged metal ions out of solution to form a sludge. Metal and starch are recovered from the sludge by treatment with nitric acid.

The starch-xanthate process is said to be effective over a pH range from 3 to 11, and in the presence of up to 10% salt. It removes metals quickly, including lead, silver, mercury, and copper, and its greatest effect is within the first minute.

After five minutes in laboratory trials, starch xanthate lowered concentrations of copper from 31,770 to 20 parts per billion. Lead was reduced from 103,630 to 25 ppb, and mercury from 100,000 to 3 ppb. Further tests gave similar results on nickel, cadmium, chromium, silver, zinc, iron, and manganese. □

SCIENCE & SOCIETY

radio waves: more harm than expected"

WASHINGTON, D.C.—The electromagnetic radiation that permeates our atmosphere may exert subtle influences on our brains and behavior—and at lower levels of intensity than previously believed.

This not-very-pleasant information comes from a report to Congress by the White House Office of Telecommunications Policy. The report is

the second annual message from a five-year OTP study, representing the first serious effort to define potential risks of radiation exposure in the radio frequency range.

The basic objectives of the study, which involves 35 universities and 62 separate government departments, are to determine what effects radiation at radio frequencies have on living organisms under different conditions of exposure, to assess the clinical significance of any hazards that emerge, and to establish means of overcoming such hazards.

The researchers are interested in three basic regions of the spectrum:

- Microwaves—produced by radars, microwave radio, medical diathermy units, and microwave ovens.
- Medium to ultrahigh frequencies—produced by radio and television transmitters, radars, and similar equipment.
- Extra-low to low frequency radiation—from communications systems and radio navigation gear.

Researchers know that high intensities of microwaves and other radio frequencies can harm living tissue by heating it drastically. However, the effects on human behavior, health, and genetics of long-term exposure to low intensities of the radiation is more or less unknown territory. The present safety standard of 10 milliwatts per square centimeter is based strictly on the possibility of heating damage.

At present, most of the research involves animals in the laboratory, but later in the five-year program experts plan to look at actual human effects of the electromagnetic radiation.

Typical of the studies now under way is a series of experiments by psychologist Susan Korbel at Harper College, Illinois. When exposed to microwaves at power densities of 0.5 to 1.5 mW/cm², she has found rats tend to become more sluggish, more emotional, and slower at learning simple tasks.

In another study sponsored by OTP, W. Ross Adey of UCLA has found that monkeys trained to press a lever every 5 seconds, press every 4.6 seconds when exposed to a weak 7-Hz field, such as might be produced by power lines. Another of Adey's experiments has shown that the brain biochemistry of new-born chicks changes in response to certain electromagnetic frequencies.

In a facet of the OTP investigation even further removed from humanity, researchers have discovered that exposure of garlic root tips to

electromagnetic radiation appears to alter the chromosomes of the roots.

Making any sort of jump from these results to human conditions obviously requires a great deal of caution. Nevertheless the OTP concludes in its second report that "There are a few tentative and preliminary indications which, at present, suggest that effects may occur (as a result of electromagnetic radiation exposure)—in the nervous system and behavior, normal developmental and growth processes, and possibly in some metabolic and biochemical parameters—at lower levels than anticipated in the past." □

AUTOMOTIVE ENGINEERING

stretching fuel supplies with rare earth additive

WRIGHT-PATTERSON A.F.B., OHIO—In addition to the various factors (contrived and otherwise) responsible for the "energy crisis," there has been a different kind of "squeeze play" affecting the fuel industry (and therefore prices) for some time.

On one hand, the federal government's stricter regulations regarding lowered lead emissions from motor vehicles are phasing-out leaded gasoline. This phase-out is based on the observation that lead seems to "poison" the new catalytic converters. Within a short time then, only low-lead, and eventually unleaded, gasoline will be available.

On the other hand, this reduced lead content (and therefore octane number), say Ethyl Oil Corp. of-



"I'm afraid there's been some mistake. According to our computer, you are not supposed to arrive here until 9/18/74."

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