GEOLOGY

A new social science

Geologists see their profession as embarked now on one of the most exciting periods of its relatively brief history.

But while basic discoveries and unifying hypotheses about the earth (SN: 11/8, p. 419) accumulate with pleasing rapidity, a number of geologists along with scientists in other fields, are finding themselves less than what the current sociological jargon calls "relevant." They see the need for geology to become a more human-oriented, problem-centered enterprise.

This trend, expressed during this week's meeting of the Geological Society of America in Atlantic City, could all be an intentional response to cuts in Federal spending for programs that are neither military nor social.

More likely, though, the new orientation represents a more subtle response to generally shifting social attitudes.

"I think this is the greatest time for the earth sciences since the exploration of the American West," says Dr. William T. Pecora, director of the U.S. Geological Survey. Yet he and other speakers took pains to point out that geology is going to be interacting more and more with human affairs. More attention, they emphasize, will have to be paid toward applying geological knowledge to mankind's needs.

One such area is the relatively new field, variously described as environmental or urban geology. The Geological Survey and many scientists are striving to focus attention on the need for the growth of this as a new scientific discipline, dealing with the application of the knowledge of geology to a more enlightened involvement of man with his physical environment.

The redefinition of geology as a kind of social science is not easy. But ther are examples offered of where it might be done.

For example: Population pressures are encouraging construction in areas where the geology is less stable. Geologists have the knowledge the architects, engineers and planners need to accommodate to a site's danger signals.

By the time the final design of a structure is completed, says Dr. Richard H. Jahns of Stanford University, the geologist should already have made his contribution. "Characterization of geologic hazards is one of the great challenges to geologists today," he says.

Engineering projects along coastlines are another area where geologists' foreknowledge of fast-paced geologic change could be valuable. Dr. Peter T. Flawn and his colleagues at the University of Texas' Bureau of Economical Geology are making an effort —represented so far by an Environmental Geological Atlas of the Texas Coast now being prepared. This will identify features such as areas of wide-scale erosion of soil into coastal waters as a result of human activities, and it is expected to be a valuable tool to land use planning in the coastal zone.

So far only a few universities are offering courses in environmental geology. But GSA president Dr. Morgan J. Davis would like to see the day when every university in the country offers environmental geology.

"Usually, geology has been more interested in the pre-Cambrian than the present," says Dr. Davis. "But as professional geologists we have or should have the prime responsibility for upgrading the quality of our terrestrial environment." □

SPACE SCIENCE

Plea for more astronomy

If the National Aeronautics and Space Administration is going to do any science, that science will most naturally be astronomy. But space astronomy, which involves costly hardware to launch observatories, leaves a minimum of science for the money spent.

For a $40 million investment in a single orbiting observatory, for instance, $6 million comes off the top for the rocket, and another $17 million for the satellite. That leaves less than half for the scientific instrumentation itself.

So the National Aeronautics and Space Administration's Astronomy Missions Board—an assembly of 19 astronomers under the chairmanship of Dr. Leo Goldberg of Harvard, is advocating a sharp increase in NASA's astronomical programs. The board has put forth two programs for future astronomical work by the space agency: "a minimum balanced program" and an optimum one. The minimum program would cost about $250 million per year in five years; the optimum about $500 million a year. Present astronomy expenditures by the space agency average about $125 million a year.

In general the board recommended increased observations in ranges impossible or difficult from the ground. These include long-wave radio, infrared, ultraviolet, X-ray and gamma ray astronomy. It asked for more sophisticated satellites and probes for solar, planetary and cosmic ray studies and it endorsed construction of a large space telescope by the middle 1980's.

VACCINES

Paying the cost

Vaccination has all but eliminated such infectious diseases as diphtheria, whooping cough and tetanus, and has brought about the gradual disappearance of polio. Nevertheless, with world travel as easy as it is now, protection against communicable diseases remains a problem, and vaccines have had to be made more potent to increase their effectiveness.

As the potency increases, the adverse reactions—especially in infants—also increase.

The problem has become so serious that risk-benefit ratios are being re-evaluated.

According to the Nov. 8 BRITISH MEDICAL JOURNAL, the British, for example, had considered discontinuing the whooping cough vaccine, but concluded that if it were abandoned the disease would be prevalent within a few years. Dr. David J. Sencer, head of the U.S. National Communicable Disease Center, Atlanta, and chairman of the Public Health Advisory Committee, agrees, and insists that the advantages of vaccination far outweigh the disadvantages.

But the problem may not be an entirely medical one. A recent court decision, holding Parke, Davis and Co. liable to the tune of $651,783, for injury to a vaccinated infant, raises an issue which, if it does not tip the scales, will certainly influence the future of vaccinations.

The case, brought before the Second Circuit Court of Appeals in New York, involved a two-month infant vaccinated with Quadrigen, a vaccine combining diphtheria, tetanus, whooping cough and polio. After the vaccination, the infant was unable to walk or talk, was incapable of toilet training and extremely mentally retarded.

The law allows a patient to bring suit against drug manufacturers based either on negligent manufacturing or guarantee of the purity of and fitness of the product. The judge in the Parke, Davis case ruled that Quadrigen was defective, thus causing a high fever which in turn caused brain damage in the baby, and the damages award was made. No proof of an allergic reaction to Quadrigen was found, but, says Dr. William J. Curran, professor of legal medicine at Harvard School of Public Health and adviser to the National Communicable Disease Center, the reaction didn't have to be caused by a defective vaccine, although the court ruled that way.

The Parke, Davis case does not create precedent, but it is the latest in a series of assaults against drug com-

panies; there have been three other such suits involving whooping cough and at least 65 involving polio vaccines.

The trend of the law apparently is becoming firmly established, and the drug companies are paying, despite what may be a greater difficulty in establishing scientific fact.

Dr. Sencer, for instance, feels the courts cannot prove that disability in an infant is caused by a vaccine. "It is virtually impossible to know whether reactions are due to a manufacturing failure or an allergic reaction," he says.

A key polio case involved Wyeth Laboratories, and an alleged paralysis due to Sabin Type 3 vaccine. The court, in addition to a settlement, ruled that notices warning of the possibilities of risk or harm that may occur should be extended to all who participate in the program. "When a court goes beyond a simple judgment in a single case, this is especially serious," says Dr. Curran. This type of procedure may be damaging for the immunization program as a whole, he feels, because it can frighten the population. □

CHEMICAL LASERS

Continuous, but not portable

One problem with the laser, besides low efficiency, is the need for a large power supply, which ties it down to a source of considerable electric power. To take full advantage of the unique light produced by lasers, they should be made portable.

If the laser is to be portable, it will have to be a chemical one, and so far, chemical lasers, in which the output is derived directly from a chemical reaction, have been slow to develop; the only type of chemical laser has been a pulsed laser with an outside power source to start the chemical reaction. That sends out bursts of high intensity light rather than a continuous beam.

Now three teams of scientists, aware of each other's work but working separately, have come up with continuous-wave chemical lasers which are not self-contained and, so far, are only way-stations to the portable continuous-wave chemical laser.

According to reports of two of the groups, in the current INTERNATIONAL JOURNAL OF CHEMICAL KINETICS, scientists from the Aerospace Corp., El Segundo, Calif., heated nitrogen with an electric arc. Dilute quantities of gaseous sulfur hexafluoride were introduced to react with the hot nitrogen. The result was that the bonded fluorine atoms of the sulfur hexafluoride dissociated into individual atoms, which were then shot out through an expansion nozzle at supersonic speed. Molecular hydrogen was introduced and reacted with the fluorine atoms to form a vibrationally excited, or pumped-up, hydrogen fluoride, which then lased to emit the familiar thin beam of light.

Aerospace scientist Donald Spencer points out that the reason why the sulfur hexafluoride wasn't heated in the arc heater directly was that it is too reactive and would have destroyed the electrodes.

The second group, that of physical chemist Dr. Richard Airey at Avco Corp., Everett, Mass., did essentially the same thing as the Aerospace researchers, except that a shock tube was used instead of an electric arc to supply the heat. In this device, the shock wave travels down a tube and heats the fluorine gas, dissociating it into fluorine atoms.

The third group, led by Prof. Terrill A. Cool of Cornell University, went about it quite differently. Cool's group passed chlorine gas through a flow tube containing an electric discharge. This produced chlorine atoms, which were later reacted with hydrogen iodide molecules; this results in hydrogen chloride and iodine. It was the vibrational energy in the hydrogen chloride, transferred to carbon dioxide, that produced the laser action.

These chemical lasers and conventional lasers share a common feature: They both require outside energy for their operation. The difference between the two is that the energy for the chemical laser goes into producing chemical reactants, whereas in conventional lasers, electrical energy pumps substances such as carbon dioxide, ruby or neodymium up to higher energy levels.

But the next step is coming. Prof. Cool expects to announce momentarily the details of the development, by himself and Ronald R. Stephens, of "two purely chemical lasers, two continuously operating lasers that work without any external energy source." All that need be done, he says, is to mix gases together and out comes light.

This development could open the door to the first truly portable laser as well as miniaturization of the laser. Dr. Cool feels that the first portable laser would have to be carried by a vehicle, but later it would be possible, depending on the power output, to make one small enough to be carried by a person.

The chemical laser promises greater efficiency in terms of energy output. The amount of power obtained at present, however, is small. For example, the Aerospace and Avco lasers generated respectively only one watt and 30 milliwatts, compared to the thousands of watts of a conventional continuous-wave laser.

NEWS BRIEFS

Awards, pollution, uranium

The work of Dr. George C. Cotzias, who demonstrated that large, daily doses of L-Dopa (L-3,4 dihydroxyphenyl alanine) can reverse the crippling effects of Parkinson's disease (SN: 3/1, p. 213), was rewarded this week when the scientist received the 1969 Albert Lasker Award for clinical medical research. Dr. Cotzias is senior scientist and head of the physiology division of Brookhaven National Laboratory.

Dr. Bruce Merrifield, professor of biochemistry at Rockefeller University, won the Lasker Foundation's basic medical research award for his new concept and method of synthesizing polypeptides and proteins.

Dr. Merrifield's method keeps the peptide chain attached to a solid—as opposed to conventional methods where all reactants are in solution. By this technique, the numerous chemical operations involved in synthesizing complicated molecules can be alternated.

The Lasker awards carry a $10,000 honorarium; twenty-one Lasker winners have gone on to win Nobel Prizes in the last 24 years. □

Water pollution in the United States is so serious a problem that both Houses of Congress agree that several times as much money as the President asked for should be spent to curb it. The House of Representatives passed a bill granting $600 million to be used as matching funds to help the states build water treatment plants.

The Senate this week was pushing for the full $1 billion appropriation that conservationists in the House couldn't push through (SN: 10/18, p. 350). The difference will be settled by a conference of the two Houses. Wherever the final amount falls between the two figures, it will be several times the $214 million President Nixon requested. □

To comply with a White House decision this week, the Atomic Energy Commission will set up a directorate to handle the sale of enriched uranium to private industry. This decision postpones the sale of gaseous diffusion plants to the private sector. However, it is made in the hope that eventually the private sector will be permitted to buy the plants and thus make its own enriched uranium.

The new AEC office, although continuing the present policy of public ownership and private operation, will keep financial records that will provide valuable information when the time comes for considering the sale. □