The chances of contacting extraterrestrial civilizations seem poor

The possibility of life, and especially intelligent civilizations, on other planets has stimulated many people's imaginations. Science-fiction writers have made it a stock of their trade. Technology is now capable of sending or receiving interstellar messages, and the possibility of intelligent civilizations on other planets now stirs the imaginations of sober scientists as well. In 1971 both a summer study group at the Ames Research Center in California and an international conference at Byurakan in the Armenian Soviet Socialist Republic (SN: 10/2/71, p. 223) recommended that a search be made.

In the Feb. 9 NATURE James C. G. Walker of Yale University studies the possible parameters of such a search and comes to some pessimistic conclusions.

One way to search is entirely passive. Antennas are set up to listen for signals produced by other civilizations. Walker supposes, however, that a more active form of search would be tried: that of sending out a signal in the hope of a reply.

Our present technology could not send out a signal in all directions with the hope of its being heard 100 light-years away; it would take more than the earth's total energy production to do it. So, Walker concludes that the search would be done by beaming signals toward stars that appear to promise the possibility of inhabited planets.

The chances of getting a reply would depend on the number of habitable planets within a given distance and on whether all or only some of them were occupied by intelligent civilizations. Walker provides estimates of the average distance between communicative civilizations under different assumptions about the fraction of habitable planets that are occupied. If all habitable planets are occupied, the average separation of civilizations is 24 light-years and the probable duration of the search is 1,400 years. If only one planet in a thousand is occupied the separation is 240 light-years and the probable duration of search 14 million years.

Walker concludes that these figures may limit any search for extraterrestrial civilizations to passive listening for signals from a super-civilization, one with a technology advanced far beyond ours and capable of blanketing the galaxy with a recognition signal.

material between the galaxies.

One way out of the dilemma is to look for plausible means of deuterium production that could have been at work during the history of the galaxy. If there were such production, the deuterium injected by it into the interstellar medium would be part of what is now seen. This would lessen the amount attributable to primeval production and in turn permit a more dense universe.

In the Feb. 9 NATURE Fred Hoyle and William A. Fowler of California Institute of Technology propose a method involving energetic outbursts in helium-rich celestial bodies. Bursts of radiation with tremendous energies of 10^{55} or 10^{56} ergs would come out of the centers of such bodies. The helium in the outer portions would be driven by the radiation and form a shock wave proceeding at very high speed. Within the shock the helium would be shaken apart into its constituent neutrons and protons. The protons would then capture neutrons to form deuterium. Free neutrons decay radioactively in a time on the order of 1,000 seconds. Crucial to the operation is that the density in the shock be not so small that the neutrons decay before being captured by protons and yet be small enough that the deuterium formed can get out of the shock wave before it too is shaken apart.

Hoyle and Fowler calculate that such conditions could in fact exist. If the deuterium abundance of 1 in 33,000 is characteristic of the galaxy, then this method could have produced all the deuterium in interstellar space. The deuterium dilemma would be solved. □

Environment message: A middle path

In the first of his series of State of the Union Messages, President Nixon last week lashed out at what he called the "advocates of defeatism" who take a "doomsday attitude" toward environmental issues. By radio he told the American people to stop "sanctimonious hand-wringing" and in his message to Congress urged them to stick to a "sensible middle ground between the Cassandras and the Pollyannas."

The President's environment program centers on resubmission of 19 bills that died in legislative limbo during the last Congress. These include a $170 million National Land Use Policy Act, a controversial proposal to establish new Federal requirements and guidelines for strip mining, an incentive tax ("charge") on sulfur oxide polluters, and legislation aimed at providing early identification and protection of endangered species.

Additional, newly submitted legislation includes a drastic reworking of farm subsidies toward an eventual free-market system for agricultural products, revision of the Federal Highway Trust Fund to allow use of these funds for mass transit, and establishment of Federal Wilderness Areas in ecologically restored regions of the eastern United States. Most of the nation's current wilderness areas are in the west.

The President pointed out that Federal spending for protection of the environment and natural resources has increased four-fold during his first term in office, and industrial spending for pollution control increased 50 percent last year alone. In America, he said, we are "well on the way to making our peace with nature."

Even before the message was released publicly, critics declared the President was not going far enough in providing environmental protection. Rep. John D. Dingell (D–Mich.) released a letter he had sent to Russell E. Train, chairman of the Council on Environmental Quality stating that the mining bill would "appeal to the mining interests, but not to the public." He accused the Administration of ignoring criticism by Environmental Protection Agency head William Ruckelshaus that "Congress will again set aside the Administration's bill if we fail to take a stronger stance." At a White House press briefing, Ruckelshaus denied his advice had gone unheeded. Secretary of Interior Rogers Morton added, "I don't see how this bill could be made much stronger than it is." □

NAS calls '75 standards technologically feasible

When Congress required automakers to meet strict new pollution standards in their 1975 and 1976 models, it assigned the National Academy of Sciences the job of determining whether or not the standards were technologically feasible in the time allowed. The Committee on Motor Vehicle Emissions of NAS has now released its report and finds that the 1975 standards are "technologically feasible" and that eventual achievement of the 1976 standards is "likely, but may not be attainable on the established schedule."

Automobile manufacturers disagree.

Ford Motor Co. President Lee A. Iacocca told an environmentalist meeting in New York that rigid enforcement of the standards could cause "a complete shutdown of the U.S. auto industry." He called for a year's postponement of the 1975 regulations and a period of feasibility testing of new antipollutant systems in California before requiring nationwide implementation. The automobile industry, he said, "has been backed to the cliff edge of desperation."

Much of the controversy centers over the choice of device used to control emissions. So far, most automakers have chosen the "dual-catalyst system," which eliminates pollutants through catalytic reaction after the gas has already burned in the cylinder. The NAS committee found this method "the most disadvantageous with respect to first cost, fuel economy, maintainability and durability."

In its place, the committee recommended intensive evaluation of an unconventional motor developed in Japan, called the "dual-carbureted stratified-charge engine." In this engine components of gasoline are separated before entering the cylinder to promote more efficient burning with less pollution. American auto manufacturers counter that the engine has not yet been proven in large cars and that the switchover would involve costly retooling.

The committee and the auto manufacturers do agree on one point, however: that the original standards of the 1970 law should be reviewed in light of new knowledge and technological developments. Nevertheless, the committee scored the industry for not doing enough development in this area until pressured by the Government. "A relatively modest investment," they concluded, "could have precluded the crisis that now prevails in the industry and in the nation."

The Environmental Protection Agency is already under court order to hold a series of hearings to review the standards and the dates set for their implementation. The order, issued Feb. 10, resulted from a suit brought by auto manufacturers against the agency in response to a denial for extension of the deadline by agency Administrator William Ruckelshaus. New hearings are expected to begin in mid-March. □

L.B.J. Space Center

From now on, the Manned Spacecraft Center in Houston will be known as the Lyndon B. Johnson Space Center. Texas Democrats Olin F. Teague and Lloyd M. Bentsen Jr. introduced the name-change bill in the House and Senate, respectively. It passed on voice votes Feb. 6 and 7 and was signed by President Nixon this week. □

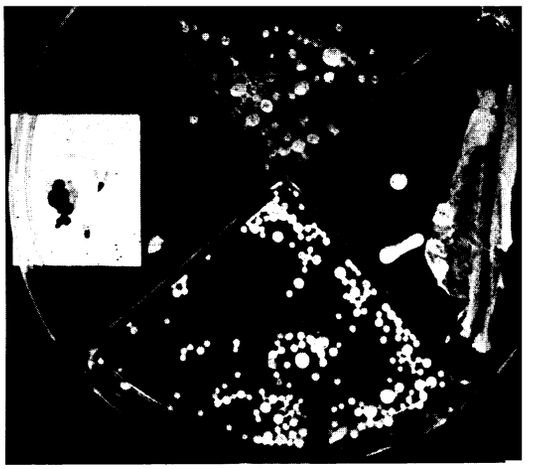
Oily seas and plastic waters of the Atlantic

Like a great highway befouled with the debris of civilization, the North Atlantic is becoming littered with floating plastic and smeared with tar.

Along a swath of open sea, stretching from the Caribbean to Cape Cod, scientists from the National Oceanic and Atmospheric Administration (NOAA) have found massive amounts of floating bunker oil globules and 12 kinds of plastic, while conducting the first large-scale study of ocean-borne refuse. Having started out to assess distribution of fish eggs and larvae, the scientists soon found their research nets mired with tar balls and collecting bits of plastic ranging from minute polystyrene spheres to a child's toy lamb.

More ominously, they found that more than half the plankton samples, (young fish and their food) were contaminated with oil. Many of the young fry had swallowed the indigestible tiny polystyrene balls, raising fears that the survival of some commercial fish may be endangered.

"Clearly more work should be done," the NOAA program's coordinator Ken Sherman told SCIENCE NEWS. "We are concerned immediately about the resource species off New England where the contamination is heavy." He said



NOAA

Tar balls and plastics from ocean.

laboratory work has already begun to see what effects tar and plastic can have on the small fish.

Reflecting international concern over the pollution, the 180-foot Polish research vessel Wieczno (VYECH-no) began last Saturday to collect data in cooperation with NOAA.

The NOAA research confirms observations made by Thor Heyerdahl on his 1970 Ra expedition, during which he found large areas of the ocean covered with "enormous quantities of brown and black clots of asphalt, floating in something that looked like soap suds." He concluded, "There was still some life left in the ocean, but there were far more oil lumps than fish." □

Soviets and Americans tackle heart disease

Heart attacks and heart disease are as common in the Soviet Union as they are in the United States. So are the conditions that lead to heart ailments: high blood pressure, large amounts of cholesterol in the blood, smoking, obesity and lack of physical exercise. So when the Soviets and Americans signed science and technology agreements last May (SN: 6/3/72, p. 357), heart disease was one of the health problems they decided to cooperate on.

In September, Theodore Cooper of the National Heart and Lung Institute, accompanied by several other American heart authorities, visited Moscow to set up cooperative studies there. Last week and this week, Soviet heart experts led by Igor K. Shkhvatsabaya, director of the Myasnikov Research Institute of Cardiology in Moscow, are visiting the United States to get the studies under way here.

The Soviet and American heart scientists are evaluating each other's methods of treating different aspects of heart disease and trying to see which methods are best. While using essentially the same drugs for heart disease as do Americans, the Soviets still bring special expertise to this area. The Americans, for example, are keen on examining the Soviets' beta blocking agents, which are believed to influence the heart's metabolism of sugar. The Americans, on the other hand, have outstanding experience in the surgical treatment of heart disease although, as Cooper points out, surgery is used only after drugs have failed.

Russian heart scientists will come to the United States for some months at a time and work at one of several dozen centers that do outstanding work in coronary artery surgery. American heart scientists will work months at a time in Moscow's Myasnikov Research Institute of Cardiology. These extended visits, unprecedented in Russian and American medical research, will give the investigators a chance to compare different kinds of heart treatment that lend themselves to ongoing evaluation.

Says Shkhvatsabaya: "The value of the research is greatly enhanced by the fact that foremost experts will participate in it on both sides." The exchange, he adds, should also "include young scientists, young experts, those who work with their own hands. This is an important aspect indeed."

The Soviet scientists are ready to come to the United States at any time, Shkhvatsabaya says. The studies are slated for completion in December 1973. □