

virus vaccine in military men. If a vaccine can be developed, it might be useful in the Armed Forces where considerable man-hours are lost among young men because of infectious mononucleosis." Whether or not a vaccine would ultimately be useful in treatment of patients with clear cases of cancer is a moot point. Some researchers feel that by then it may be too late to change cell behavior, but it would almost certainly be a prophylactic agent.

Already, researchers at Roswell Park are working to develop a vaccine that would eventually be produced by a drug company, but Dr. Grace's prediction of success within a year is, he ad-

FORMALDEHYDE

Life's building blocks in space

In the rarefied conditions of interstellar space, getting two atoms close enough together to form a molecule is difficult. Getting four together is several times harder.

Yet the chemistry of interstellar space is getting rapidly more complex and most recently definitely organic. The discovery of the first polyatomic organic molecule, formaldehyde (H_2CO), in interstellar space has been made by Drs. Lewis E. Snyder and David Buhl of the National Radio Astronomy Observatory; Benjamin Zuckerman of the University of Maryland and Patrick Palmer of the University of Chicago.

Formaldehyde joins a growing list that started years ago with single atoms. Within this decade astronomers progressed to the identification of diatomic radicals, and in recent months found stable compounds, notably ammonia (NH_3) (SN: 12/28, p. 639), and water (H_2O) (SN: 3/8, p. 234).

Because it is an important factor in the chemistry of life, formaldehyde lends a new dimension to astrochemistry. Its discovery lends support to theories of how life began on planets.

" H_2CO is the first organic polyatomic molecule ever detected in the interstellar medium," say the four astronomers, "and its widespread distribution indicates that processes of interstellar chemical evolution may be much more complex than previously assumed.

"We now know that polyatomic molecules containing at least two other atoms than hydrogen can form in the interstellar medium," they say. "Their formation apparently does not require extremely unusual interstellar conditions. . . . Hence large regions of the galaxy may be filled with clouds containing formaldehyde."

The formaldehyde was found by its characteristic absorption of radio signals coming from sources behind it. Seeing an absorption line that might be

mits, more ideal than practical. "It is the best of times; it is the worst of times," he told the seminar, declaring that this is the moment when scientists are beginning to see the sunlight at the end of the road of 15 years of concentrated basic research, and it is the time when money to support studies that could produce real answers within a decade is at its lowest.

"Biomedical science is in serious crisis, and I say that flatly," he says. If the President's budget for fiscal 1970 is accepted by Congress, \$186 million will be allocated for cancer experiments, \$500,000 less than in fiscal 1967.

Even if the Roswell Park attempts to

develop the anti-cancer vaccine proceed without many unexpected stumbling blocks, the beginning of long-range observations of its effectiveness will be delayed while researchers do the studies of effectiveness and toxicity required before the Government approves its experimental use, Dr. Grace points out. And then it would be a matter of 15 years before the data could be evaluated. What scientists would hope to find, though, is that the incidence of leukemia-like cancers among persons who had received the vaccine would be far lower than the incidence in the same number of controls in the general population.

formaldehyde and that seemed to be associated with certain interstellar gas clouds, the astronomers subtracted from the observed frequencies the shifts that would be brought about by the known velocity of the clouds. The rest frequencies so calculated matched very closely an absorption line of formaldehyde determined from a sample of the compound at rest in the laboratory.

"We regard the close coincidence of astronomical and laboratory rest frequencies as a strong argument in favor of the identification with H_2CO ," the four astronomers say, "since we find no other molecule composed of astrophysically abundant elements that has a microwave line with a rest frequency that lies within our error bars."

Formaldehyde has been found so far in the directions of 16 out of 27 sources of continuous broad-band radio emanation that the four astronomers have looked at. In many cases the presence of formaldehyde seems to be associated with clouds of other interstellar molecules, notably the hydroxyl radical (OH).

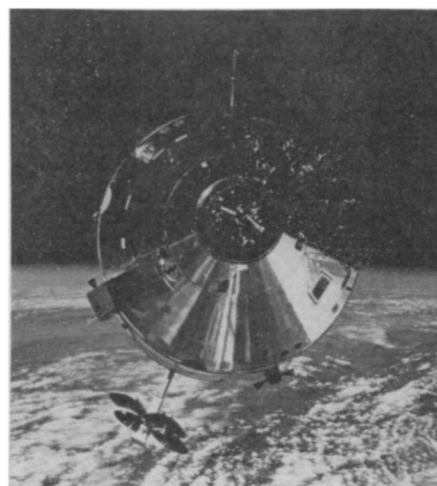
There is a possible relation of such abundance of formaldehyde to the origins of life. Various theories of the origin of life have postulated mixtures of methane, ammonia, hydrogen and water in planetary atmospheres acted upon by ultraviolet radiation or lightning to produce the beginnings of living beings. Mixtures of these elements have been used to produce artificial amino acids in the laboratory.

But the problem in such theories is how these gases could have gotten into planetary atmospheres where life could have formed. Ammonia, water and hydrogen are now known to be in interstellar space, and formaldehyde is good indirect evidence for methane since one way to make formaldehyde is to react methane with hydroxyl.

Thus if all these gases are present in interstellar clouds, and if stars and planetary systems are formed by condensation of these clouds, as many astronomers assume, then the mystery of how the gases got into planetary atmospheres is solved. ◇

SUCCESS STORY

NASA budget booms



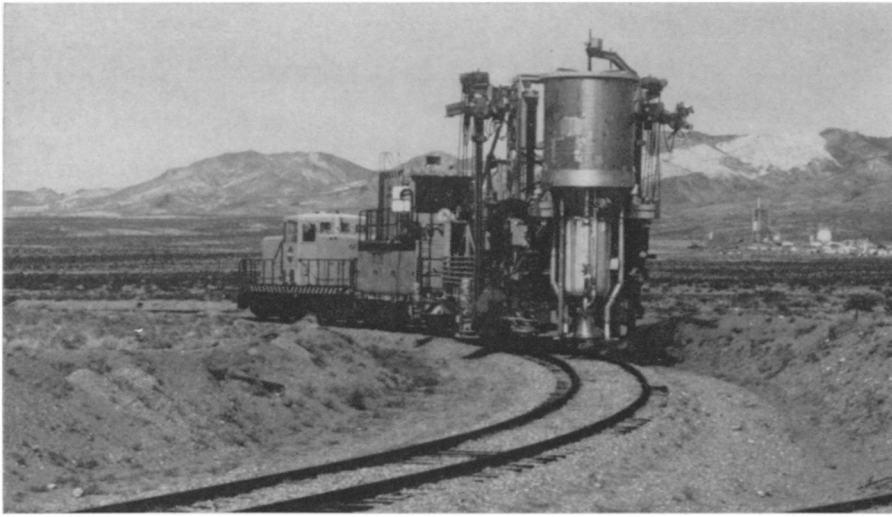
NASA

Apollo 9: success spells more money.

Nothing succeeds, judging by early handling of the National Aeronautics and Space Administration's fiscal 1970 budget request, like success. The space agency's fortunes have been declining ever since their 1966 peak, but three successful manned Apollo flights out of three attempts have had a strong influence on the Congressional climate, and may loosen the purse strings.

Once a Federal agency has submitted its request for funds for an upcoming fiscal year, the first indicator of the success it will ultimately have is often the changes made in the request by the appropriate subcommittees of the

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NASA

NERVA test engine, now with a brighter future, moves to its Nevada test stand.

House of Representatives. Last month, subcommittees that had chopped more than \$120 million from NASA requests for fiscal 1969 added almost a quarter of a billion dollars to similar items for fiscal 1970.

The biggest bonus came from the House Space Committee's Subcommittee on Manned Space Flight, which not only elected to leave the agency's manned flight request intact, but voted to add an additional \$230.45 million. Last year the same subcommittee trimmed the fiscal 1969 request by \$60.3 million.

Most of this year's addition—\$167.9 million of it—is for development of scientific experiments and equipment for an expanded number of manned Apollo landings (SN: 3/29, p. 303), as well as for Saturn 5 boosters to handle the flights. Another \$66 million was added for "space flight operations," including the Apollo Applications Program's orbiting workshops, along with planning and long-lead hardware development for large orbiting space stations and an earth-to-orbit shuttle craft. The only cut made by the manned space flight subcommittee was a \$3.45 million reduction, scarcely one percent of the requested amount, in funds for program management.

If approved, these changes would give the space agency more than \$2.44 billion for manned space flight, compared to about \$2.21 billion requested.

As the manned flight subcommittee was passing out potential dollars, similar activity was taking place on a smaller scale at the Subcommittee on Advanced Research and Technology. The biggest boost was a \$13.5 million addition to step up production of the NERVA nuclear rocket engine, seen by NASA as important to such missions as exploration of the outer planets in the solar system. Other small additions, plus minor cuts in tracking expendi-

tures and administration, yielded a total addition of \$11.8 million, for a total advanced research and technology allotment of \$830.6 million.

Last year, the ART subcommittee cut \$60.4 million from the NASA request, five-sixths of it from NERVA.

The subcommittee recommendations for fiscal 1970 were expected to be brought before the full House space committee last week, and in the past, the committee has generally accepted its subcommittees' budget markups almost without change.

This is an unusual budget, however, because the lunar landing that has motivated NASA almost since its inception will presumably have been an accomplished fact by the time 99 percent of the money is to be spent. The uncertainties in planning the agency's future course have made budgetary second-guessing difficult.

The committee's version of the bill may go before the full House as early as next week, upon the Representatives' return from their Easter recess. At the same time, the Senate space committee will be preparing to launch hearings of its own before marking up the space budget into a Senate version.

Just how well NASA will have fared after all that processing is an open question. The success of Apollo has had an obvious effect on legislators, who could quite reasonably be expected to be more willing to pour money into a program that has proven that it is now unlikely to burn up on the launch pad. However, this may be tempered by the desire for a balanced program that does not put all of its eggs in any one basket, as NASA has been doing with the manned lunar landing since 1961. This desire, at least according to Presidential Science Adviser Lee A. DuBridge, should be the space agency's guiding principle in planning for the coming decade.

NUCLEAR EXCAVATION

Australian plans gang agley

Cape Keraudren had all the requirements for a successful site for the world's first nuclear-blasted harbor. Only two studies stood between the dream and the official go-ahead for construction: one to determine the hazards to man and ecology in the remote corner of northwestern Australia, and another to work out the excavation details (SN: 2/15, p. 159).

But last week, the project was canceled, the U.S. and Australian Atomic Energy Commission jointly announced. A lack of profit reared its stubborn head.

The decision stemmed from a pull-out by the U.S.-owned Sentinel Mining Co., which had planned to use the harbor to export iron ore from newly discovered fields near the desert coastline.

Sentinel was hoping to sell Cape Keraudren's low-grade iron ore to Japan.

When Japanese buyers refused to pay Australia's price, Sentinel gave up the scheme, and there was no reason to devote funds from the American and Australian atomic budgets to the creation of the harbor.

However, the Australian Government is rising above its dismay and pushing for other possible sites for a nuclear project.

The Australian AEC has its eye on Cape Lambert, near Dampier on the west coast, where a shallow outlet hampers the shipment of iron ore from the nearby iron-containing mountains. Officials from Plowshare and the Lawrence Radiation Laboratory, Livermore, Calif., have already made preliminary studies of the possibilities of the Dampier site.

Another possibility is an Australian Gasbuggy operation, where a natural gas reservoir is created by an underground nuclear explosion. The best site is in oil fields located in central Australia. Geologists estimate 500 million barrels of oil and great quantities of gas which are locked up in rocks 3,000 feet down. The site is thought to be better than the U.S. Gasbuggy test site in New Mexico.

Other applications for nuclear engineering include underground water caverns for water storage in case of drought, dam construction and shaping a new inland sea.

David E. Fairbairn, minister for national development, says, "Both we and the U.S. AEC are still keenly interested in the use of atomic blasts for harbor projects. We will go on with a review of practical applications of other harbor sites in this region." ◇