

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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