What's New In Science And Technology

By Norbert Yasharoff

SYNTHETIC membranes that can simulate the photosynthetic processes of green plants should become feasible within 5 to 15 years as a major source of energy, according to Nobel Prize-winning chemist Melvin Calvin. Until this is achieved, Dr. Calvin says, alcohol made from sugar and gasoline derived from tree products should be exploited as a means of saving fossil fuels.

Dr. Calvin, who won the Nobel Prize for his work in photosynthesis, has spent several years concentrating on how to synthesize this process.

In green plants, sunlight is used to break down water into hydrogen and oxygen by means of some very complex catalysts. In an artificial device, the process would probably involve the use of a special membrane, possibly having catalysts mounted on it. "We are currently in the process of constructing such a synthetic membrane," Dr Calvin says in a recent issue of Chemtech magazine, "and we know what one side (hydrogen-producing) will probably be, but we are still not certain as to the events on the oxygen-producing side."

The advantage of being able to control such photochemical processes, he points out, is that they could convert solar energy with 75 per cent efficiency, compared with 1 per cent efficiency of plants in the field or 16 per cent theoretical efficiency for photovoltaic cells. Hydrogen produced by this method could then be used directly as fuel or as a feedstock for other chemicals or fuels.

In the meantime, according to Dr. Calvin, several conventional biological sources of solar energy should be further investigated. Some petroleum derivatives, such as ethylene (a raw material for many industrial chemicals), should soon become economically available as products of alcohol fermented from sugar cane. Also, certain plants related to rubber trees, which Dr. Calvin calls "gasoline trees," could be used—in his words—"for harvesting economic amounts of crude-oil-like hydrocarbons from land....which today cannot be easily used for food or fiber production."

UNDERGROUND LABORATORY FOR SPACE COLONIZATION

A professor at the Massachusetts Institute of Technology (MIT) has suggested that the construction of an underground ecological laboratory might be useful in the perfection of the controlled growth of plant and animal life that will be necessary if man is to survive in space.

Dr. Michael Modell, a chemical engineer who is an expert on life-support systems for manned spacecraft, said such a research facility would also benefit earth-bound agriculture and might provide a means of survival in the event of nuclear war. His article, "Sustaining Life in a Space Colony," is one of two devoted to space colonization in the July/August issue of **Technology Review**, a journal of science and technology published at MIT.

In the second article, MIT graduate student Edward Crawley details the design of a space colony capable of housing 1,000 people for 30 years. The proposed colony, Crawley says, is technically feasible using current technology.

Professor Modell, who has participated in a number of studies for the National Aeronautics and Space Administration (NASA), said the state-of-the-art for life-support systems is represented by submarine and space-flight technology, but in applications to date the essential ingredients—air, drinking water, food and wash water—have been brought on board before the flight and wastes have been either dumped overboard or stored for later disposal.

Long flights, he said may require a completely closed system in which the carbon present in the food consumed is ultimately returned to the food cycle from which it originated.

In order to support the agricultural activities, the underground research facility envisioned by Dr. Modell "would have....to include an extensive analytical chemistry laboratory, a disease control center, as well as a complete medical and hospital facility. Add to that the engineering component for waste treatment and recycle and we are probably in the range of thousands of inhabitants."

What might be learned from such an earth-based laboratory could be extremely valuable and might justify the experimental facility on its own, the MIT professor said.

"Learning how to close the recycle loop is clearly one of our major priorities in the decades ahead," he continued. "As the nuclear club continues to expand we will undoubtedly face nuclear threats in the future. Learning what it takes to survive a nuclear holocaust may well be one of the least expensive forms of self-defense."

Crawley'd article on the space colony reports on a study undertaken by a class in advanced systems engineering in the MIT Department of Aeronautics and Astronautics.

"The objective of our study was to investigate the engineering feasibility of a 1,000-person prototype colony," he wrote. "Our prototype is much smaller than other full-scale designs, yet larger than some already proposed earth-supported space stations. It is intended

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as the first step in demonstrating the viability of the colony concept.

"Since the design incorporates many of the features of larger colonies, it could be used to verify the technology of such space structures through a project of relatively (compared to larger projects) lower cost and more rapid investment return," he said.

The study decided that the colony structure—consisting of two steel hulls about five meters apart and about as long as a football field—would be built in space using material transported from the moon. The steel parts of the colony would be carried into space aboard the space shuttle, the existence of which was one of the assumptions made by the study. Among the other assumptions were that the colony would be located in a stable orbit equidistant from the earth and the moon and that a transport linear accelerator would be in place and operating on the moon. The study concluded that the colony could be built in 16 years at a cost of 147 billion (147,000 million) dollars.

SCIENTISTS STUDY ROLE OF SALT IN BLOOD PRESSURE

Physicians at the University of Iowa College of Medicine and Hospitals, Iowa City, report that some individuals may be very sensitive to the deleterious effects of salt on blood pressure, while others may be resistant.

The report is the result of studies on young adults at the University of Iowa Clinical Research Center, one of 82 such units located at medical institutions throughout the United States and funded by the U.S. National Institutes of Health.

The Iowa studies involved two groups of young adults—one with normal blood pressures and another with slight or early hypertension. For 10 to 30 days, the six individuals in each group ate diets with either high or low amounts of salt.

Because the individuals were studied in the Clinical Research Center, research dieticians were able to vary the salt intake and keep all other ingredients in their diets constant. In order to insure the safety and accuracy of the diets, the blood pressures, body weights, kidney and hormonal functions, and general physical condition of the patients were assessed daily by research nurses and by a physician who specializes in the treatment of hypertension.

As the research neared its conclusion, detailed studies of circulatory control were performed on the patients by cardiologists from the University of Iowa Cardiovascular Research and Training Center.

These studies helped determine the effect of salt on the blood pressures and blood vessels.

According to Dr. Allyn Mark, Programme Director for the University of Iowa Clinical Research Center, the surprising and important finding of the study was a distinct difference in the effects of high salt diet on the patients with normal blood pressure as compared to those with slightly elevated blood pressures.

"Excessive salt raised blood pressure and constricted blood vessels in patients with slight hypertension but it relaxed the blood vessels and failed to elevate blood pressures in the individuals with normal blood pressure," Dr. Mark says. "This indicates that some individuals may be very sensitive to the deleterious effects of salt on blood pressure, while others seem to be resistant.

"The research raises the intriguing possibility that sensitivity to salt may be a factor in predisposing to hypertension. This finding may have important implications in the prevention and treatment of hypertension."

Dr Mark reports that additional research studies evaluating the relationship between salt and hypertension are in progress at the University of Iowa Clinical Research Center and Cardiovascular Center.