Jetsetter news

2–7 July – BICENTENNIAL (Boston, New York, Philadelphia, Washington, D.C.)

20 August (Friday) – WINE & DINE CRUISE. Sip a delightful glass of champagne and dance from fabulous Fisherman's Wharf to historic Jack London Square where you will dine at your choice of two exciting restaurants. You will be sailing under the San Francisco Bay Bridge and up the world famous Oakland Estuary by moonlight. Cost – $21 per person. Cost includes: Motorcoach transportation from Moffett Field and return (departs 5:30 p.m., returns 1:30 a.m.), Bay Cruise, Dinner, Complimentary Wine on return trip, and a California Host escort on board. Cost also includes restaurant tax and tip – you may tip the bus driver and California Host if you desire to do so. RESERVATIONS DEADLINE – 13 August 1976.

Restaurant choice and menu:

BOW & BELL – Your seat is on the 50-yard line as you watch the huge ocean-going ships on the fabulous Estuary. Your cruise dinner features a mixed green salad, potatoes au gratin, rolls, butter, beverage and entre: Special Sirloin Dinner Steak, or Pan Broiled Mahi Mahi, or Grilled Sea Bass.

SEA WOLF – Dinner in a historical and nautical setting. Dinner features crisp green garden salad with seafood, potatoes du jour, French bread, butter, fresh vegetables, beverage and entre: Petite Sirloin Steak, or Veal Cutlets, or Baked Seafood Newburg.

CHECK YOUR BULLETIN BOARDS FOR THIS NOTICE (Sorry, the dinner cruise is only offered on Friday nights.) CONTACT MARIAN DAVIS, Ext. 5832/3, M/S 206-3.

The trip scheduled for Vienna, Austria on 11 September, as announced in the last issue of the Astrogram and flyers which were distributed to all personnel a few months ago, *has been cancelled.* This was because of two increases in the cost of the trip as offered by the travel agency.

'76 Stanford NASA-ASEE Seminars

The partial schedule for the 1976 summer Stanford NASA–ASEE Aerospace Technology seminar is as follows:

July 7 "Magnetohydrodynamic Energy Co- sion – What Is It and Can It Help S In the Near Future?"
Speaker – Charles H. Kruger

July 14 "Solar Activity and Terrestrial Weather"
Speaker – John M. Wilcox

July 21 "Who Invented the Airplane"
Speaker – Nicholas J. Hoff

The remaining topics will be printed in the next issue.

This seminar wil be at 8 p.m. in the Skilling Building, Room 080 (Auditorium) and is open to the public. The seminar (AA2985) is also available to registered Stanford students for one unit of credit (call 497-3079).

"The Viking search for life" *(Continued from last issue)*

However they acquire their energy, all Earth organisms exchange chemical materials with their environment. The photosynthetic plants, for example, consume carbon dioxide and water from the environment and use the carbon, oxygen and hydrogen to build up larger energy-rich molecules. They emit oxygen gas as a waste product. Oxygen users release carbon dioxide as they break down energy-rich food.

The Viking biology experiments can detect these kinds of chemical changes produced by living organisms on Mars. Chemical signs then, rather than visual signs, will tell us if our neighboring planet supports life.

Pyrolytic Release Experiment

Since the Martian atmosphere is rich in carbon dioxide and also contains trace amounts of carbon monoxide, Martian organisms might be able to convert the carbon in these gases into organic matter. They might also use Martian sunlight to power this process of assimilation.

One of the biology experiments, known as the Pyrolytic Release experiment, incubates a 0.25 cc sample of Martian soil in a small chamber and exposes the soil to simulated Martian sunlight and a Martian atmosphere with radioactively labeled carbon dioxide and carbon monoxide added. If soil organisms exist that can assimilate carbon from these compounds, then they will assimilate the radioactive carbon in the chamber atmosphere. Principal investigator for this experiment is Professor Norman Horowitz of the California Institute of Technology.

After five days of incubation the sample is heated, or pyrolyzed, at 625°C. This breaks down any organic material that soil organisms have produced during incubation. The pyrolyzed material is driven out of the chamber and into the Organic Vapor Trap (OVT) where the larger organic fragments are trapped.

Then the OVT itself is heated to 650°C to release the organic fragments. In this process, the organic fragments are converted to carbon dioxide which is flushed into a radioactive detector.

This gas should contain radioactively labeled carbon if organisms assimilated carbon dioxide during incubation.

As with the other biology experiments, if results suggest that life is present, a "control" experiment will be run. This is identical to the original experiment except that the soil sample is heated to 160°C for three hours before the experiment begins to ensure that any soil organisms are killed. Only if the experiment with this heat-sterilized soil proves negative can the positive results from the original experiment be interpreted as evidence of life on Mars.

Labeled Release Experiment

A second experiment, the Labeled Release analysis, also uses radioactively labeled carbon to test for the signs of life. But this experiment is designed to detect, not assimilation of carbon, but release of carbon dioxide as soil organisms metabolize food. Dr. Gilbert Levin of Biospherics Incorporated in Rockville, Maryland is the principal investigator of this package.

A 0.5 cc soil sample is sealed in a test cell containing Martian atmosphere. A few drops of radioactively labeled nutrients in a water solution moisten the soil and an 11-day incubation begins. The atmosphere above the sample is continuously analyzed for radioactive gases. Presence of these gases will indicate that soil organisms have broken down the radioactive carbon compounds in the nutrients and released some gases as waste products.

Gas Exchange Experiment

The Gas Exchange experiment measures the production or uptake of simple gases like carbon dioxide, nitrogen, methane, hydrogen and oxygen in a Martian soil sample which is either exposed to water vapor or partially submerged in a solution of amino acids, vitamins, other organic compounds and inorganic salts. Vance Oyama of the Life Detection Systems Branch at Ames is the principal investigator of this third and final experiment. Other team members include Professor Joshua Lederberg of Stanford University and Professor Alex Rich of MIT.

Only carbon dioxide and two inert gases compose the atmosphere above the soil sample as incubation begins.

The soil sample is held in an inner cup within the incubation cell. During the first stage of the experiment, 0.5 cc of nutrient solution is added to the bottom of the cell; the solution doesn't come in direct contact with the soil.

After seven days in this "humid mode" an additional two cc of nutrient solution can be added – enough to partially submerge the soil in the complex nutrient medium.

The disappearance or release of certain gases in the chamber will reflect growth and metabolism or organisms in the Martian soil sample. A gas chromatograph will measure gas composition in the chamber every few days. By plotting results, analysis by analysis, changes in gas composition will be determined.

The Experiments Compared

The three biology experiments represent three different approaches to the search for life. The Pyrolytic Release experiment detects organis[ms that] can use the carbon dioxide and carbon mo[noxide] present on Mars to build the complex mole[cules] they need to survive. This experiment also detects photosynthesis, the ability to tap the energy from Martian sunlight to build these molecules.

The Labeled Release and the Gas Exchange experiments search for organisms that can only obtain their energy by metabolizing nutrients. The Labeled Release experiment is designed to measure the carbon dioxide released during this metabolism while the Gas Exchange experiment detects the production or release of a number of gases including carbon dioxide.

The Pyrolytic Release experiment most closely simulates average Martian conditions. Either little or no water vapor is provided and no nutrients are added to the Martian soil. A small amount of radioactively labeled carbon dioxide/carbon monoxide gas is vented into the Martian atmosphere of the test cell. The simulated Martian sunlight source filters out the ultraviolet radiation normally hitting the surface of Mars.

The Gas Exchange experiment offers the most Earth-like conditions, providing a solution of over 50 organic and inorganic compounds which many Earth microorganisms need to survive. Mars organisms, if they exist, may or may not thrive on these nutrients. The nutrient solution only partially submerges the soil, so soil organisms requiring a drier environment can survive.

The Labeled Release experiment provides the soil sample with only a few drops of a nutrient solution containing radioactively labeled compounds. The nutrients are very simple organic compound[s that] might today be formed on Mars by the a[ction of] solar ultraviolet light on the Martian atmosphe[re].

The Pyrolytic Release and Labeled Release experiments search only for carbon-based life – like life on Earth. The Gas Exchange experiment can detect changes in non-carbon gases and thus may be able to indicate the presence of organisms which have non-carbon based chemistry.