years in pursuit of their degrees. Candidates in the physical and biological sciences—where Washington directs almost all of the $2 billion a year it spends in support of university research—are through in five.

"The key to the reform," said the Foundation announcement, "will be the establishment of patterns of continuous full-time study and apprentice teaching, in most cases by a regular four-year program leading to the Ph.D. degree."

Some 10,500 doctoral candidates will be affected directly during the seven-year period.

How much and what kinds of reform the money buys, however, is up to the individual university. Harvard, for instance, plans to incorporate teaching into the doctoral program. Since most candidates eventually become professors, the teaching experience should be a valuable part of their education, "not a chore imposed by financial need," notes Dean J. Peter Elder of the Graduate School of Arts and Sciences.

At the same time, undergraduates deserve the best tutors and assistants, says Dean Elder.

Assistant teaching is often described as "slave labor" by unwilling, penny-poor graduate students.

The new grants will cover 25 percent of the humanities and social science candidates at Harvard. But Dean Elder expects the program to have "rub-off value" for other students, and especially for faculty. A classicist himself, Dean Elder views as outdated the "genteel, 19th century tradition" that a student should spend years in study.

Whether or not the grants cover behavioral sciences depends on the university. The Foundation expects they will; Harvard however, plans to include only social psychology, along with sociology, anthropology, economics, political science and history. The University of Chicago is aiming its grants at economics, political science and history among the social sciences.

The eight other universities are the University of California, Berkeley; Cornell, University of Michigan, University of Pennsylvania, Princeton, Stanford, University of Wisconsin and Yale.

Pre-life on Jupiter?

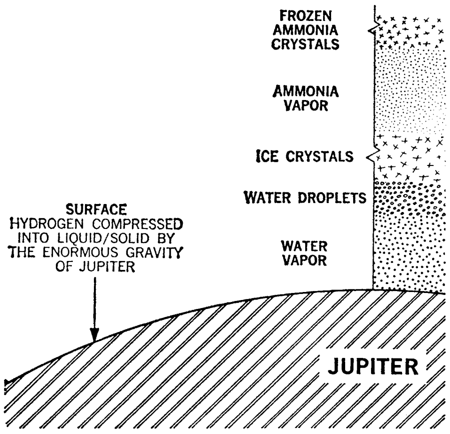
The planet Jupiter has an atmosphere of ammonia, methane and water, believed similar to that of earth some four and one-half billion years ago.

The largest planet of the solar system, with a diameter of 87,000 miles, was long thought to be completely hostile to any form of life.

No one knows exactly what hides underneath its impenetrable deep cloud cover. However, scientists simulating Jupiter's atmosphere in a laboratory have produced many of the building blocks of life, lending support to the possibility that life may exist on the planet.

The experiments were reported to the American Chemical Society meeting in Miami by Dr. Cyril Ponnamperuma and Fritz Woeller of the National Aeronautics and Space Administration's Ames Research Center.

They found that energy transfer and chemical processes in the turbulent



atmosphere of the huge planet may produce organic compounds found in amino acids and living cells. These processes are similar to those believed to have produced life on earth.

The scientists used electrical discharges, simulating lightning, as the energy source to produce the pre-life molecules from an atmosphere of ammonia and methane. Only water was needed to turn these particles into even more complex organic molecules.

The extremely low temperature of the top of Jupiter's atmosphere, estimated at 356 degrees below zero F, did not interfere with the production of organic compounds.

The laboratory simulations of Jupiter's atmosphere drew on the work of Drs. P. E. J. Peebles of Princeton University, Roger M. Gallet of the National Bureau of Standards, and E. J. Opik of the Armagh Observatory in Northern Ireland, among others.

They proposed models of Jupiter's atmosphere based on gravitation studies and behavior of the planet's moons, and on spectroscopic analyses of sunlight reflected from the planet.

Jupiter is believed to have a stratified atmosphere. All its layers are believed to contain substantial amounts of methane, hydrogen, helium, ammonia and neon.

Despite its huge size, Jupiter rotates once every 10 hours. This produces a rapid alternation of warm and cold and is believed to produce added atmospheric mixing and electric discharge.

Scientists have previously found that certain common bacteria and fungi can multiply on earth in an artificial atmosphere having high concentrations of both ammonia and methane.

The simulation experiments add further evidence to the possibility that life might exist on the most massive planet in the sun's family.

Fingerprinting the Moon

When astronauts bring back pieces of the moon, the samples will be identified in much the same way as the FBI identifies a burglar. A "fingerprint" file will be built in Houston, Texas, containing the radioactive prints of earthly and extraterrestrial material. Scientists will check the emissions of the lunar samples against the file.

The technique, in addition to identifying the minerals in a sample will also tell much about the origin and history of the moon.

These plans were outlined to some 9,000 chemists and chemical engineers from around the world last week in Miami Beach during the spring meeting of the American Chemical Society.

Dr. G. Davis O'Kelley of Oak Ridge National Laboratory described the lunar "fingerprint" technique, already working in prototype in his lab. The amount and energy of radioactive decay particles leaving the lunar samples will be measured by their impact on crystals of sodium iodide doped with 0.1 percent thalium. The patterns will be compared with those of earthly material as well as with meteorites.

Radioactivity from the fission of heavy atoms, and that induced by high energy cosmic rays, will be compared to learn the approximate age of the moon, and whether it was torn from the primordial earth or captured in its travels by earth's gravity.

The analyses will be done in NASA's Manned Space Flight Center in Houston where the samples will be quarantined for a month after arrival from the moon.

During the week-long session, the chemists also heard about more earth-bound matters, including unwanted human fat.

Dr. Eli Seifter, of the Albert Einstein College of Medicine at Yeshiva University, New York, reported on a bodily substance that breaks down stored fats. Called a lipid mobilizer, it might be used, he said, to slim obese people. Currently, he is testing the hormone-like substance, reclaimed from cow and pig pituitary glands, on rabbits, to see if it adversely affects their livers. If no damage is done, human experimentation is possible.