

gists believe methanation will be feasible and that coal gasification is clearly the best way to augment natural gas supplies.

The hearings were aimed primarily at describing what is happening today in coal gasification; they also dispelled the notion, hinted at by Sen. Henry Jackson (D-Wash.), that because companies plan early commercial coal gasification using proven technology, there is no need for large-scale R&D. It became obvious that the proven technologies will not be adequate for many purposes and that the new ones must be developed.

The two commercial ventures, now in the late planning stages, will both use the proven Lurgi process, developed first in Europe. El Paso Natural Gas plans to have a plant in operation in New Mexico by 1976 producing 88 million cubic feet daily. Additional stages will be built for a total capacity of 264 million cubic feet in 1978. A consortium of Texas Eastern Transmission Corp., Pacific Lighting Service Co. and Utah International Inc. (the coal supplier) plans a 250-million-cubic-foot plant for possible startup in late 1975. Eventual capacity of the plant, also in New Mexico, might be 1.2 billion cubic feet daily. El Paso vice president Edward Walsh admitted that the methanation step for the process is still not proved. But even without it, he said, the lower-BTU gas produced by the Lurgi process could be added to natural gas without marked detriment to its quality. Texas Eastern vice president George H. Ewing, however, said his company is confident that methanation is feasible.

But witnesses stressed that the Lurgi process is applicable only to certain types of coals—such as those in New Mexico—and that new processes for other parts of the nation are desperately needed. The first large-scale Federal-industry R&D program (with the gas industry) was announced in August (SN: 8/7/71, p. 90). Another joint program, this time with the coal industry, was announced two weeks ago when the industry's Bituminous Coal Research Inc. signed a contract with the Interior Department's Office of Coal Research for a \$25 million pilot plant.

Ewing estimated that Lurgi-process gas will cost about \$1 per thousand cubic feet, compared with 35 cents for natural gas in the pipeline. But some of these cost differences will be offset in large Eastern cities where gas can be made from nearby coal and where other fuels are even higher priced. And the FMC Corp. reported at the hearings that it has a process that may bring the price down by producing synthetic petroleum along with the synthetic gas. □

Synthesis of amino acids from gases known in space

The discovery of an increasing number of organic molecules in interstellar space has led a number of scientists to suggest that the first chemical steps in the evolution of life may have taken place in the interstellar clouds. A most significant next step beyond the compounds now known would be the formation of amino acids. So far no amino acids have been discovered among the interstellar gases, but from the Lamont-Doherty Geological Observatory of Columbia University comes a report that amino acids have been synthesized from gases known to be in interstellar space.

Goesta Wollin and David B. Ericson took a mixture of methanol, ammonia and formaldehyde and a mixture of ammonia, methanol and formic acid and subjected them to ultraviolet radiation. Without being cooled or condensed the gases reacted to form liquids, which then crystallized after different periods of irradiation. The ammonia-methanol-formaldehyde reaction yielded chiefly glycine and glutamic acid with small amounts of aspartic acid, threonine, serine, proline, isoleucine and leucine. The other mixture gave an even larger number of amino acids including aspartic acid, threonine, serine, glutamic acid, proline, glycine, alanine, valine, isoleucine, leucine, tyrosine and phenylalanine.

Wollin and Ericson stress that this is the first time that amino acids have been produced in an experiment that started out with all reactants in the gaseous state. In earlier experiments in which similar mixtures generated amino acids, one or more of the reactants was in the liquid state. (The earlier investigators were trying to mimic conditions that might have existed on earth early in its history; they were not aware of the existence of the interstellar gases.) Of course the density of the gases used in the laboratory is many orders of magnitude greater than the density in the interstellar clouds. Wollin says that instead of days a similar reaction might take thousands of years in space, but showing that it can be done starting from gases indicates that it is possible there.

The two investigators also point out that this is the first time that amino acid synthesis has been accomplished without water; previous experiments were all conducted in the presence of water. The accomplishment raises the suggestion that life could have evolved in the absence of water and increases the number of places in the universe where life might hypothetically be present. Wollin and Ericson suggest that ammonia, which has solvent properties similar to those of water, could assume

the function of water in some alien life system. Ammonia has chemical properties that are toxic when it is introduced into the physiology of life as we know it. Therefore a life form with ammonia as its general solvent, says Ericson, would be a somewhat different form of life with a different metabolism, but it could be based on amino acids we know here. □

Australopithecus, a long-armed short-legged, knuckle-walker

The eastern shore of Lake Rudolf in Northern Kenya has been the site of many fossil finds that are helping to document the evolution of early man. Richard E. Leakey, son of archaeologists Louis S. B. and Mary Leakey, has completed his fourth season there. Speaking in New York last week about the most recent finds at Lake Rudolf, he said they will shed new light on interpretations of man's past.

Leakey believes two distinct hominid populations, *Australopithecus* and *Homo*, co-existed at Lake Rudolf from 1 million to 2.6 million years ago. Sufficient data are now available to begin to consider possible evolutionary trends among these populations.

Australopithecus limb bone fossils have been rare finds, but Leakey now has a large sample. They portray *Australopithecus* as long-armed and short-legged. He was probably a knuckle-walker, not an erect walker, as many archaeologists presently believe. "There is a vast area of study," Leakey says, "to be gone into before definitive conclusions can be made but there is now material available for such a study and evidence to suggest that previously held notions on australopithecine locomotion are subject to review."

In addition to these finds, Leakey has *Homo* fossils that he says make "clear that the hominid form and the australopithecine form at East Rudolf are contemporary." The *Homo* specimens have a uniformity of morphological traits so different from the uniformity within the australopithecine material that Leakey feels confident they must be included within genus *Homo*.

Leakey's confidence, however, is somewhat limited. He had previously suggested that two Rudolf skulls were more than 4 million years old. But in his talk last week, he said that preliminary reports on the geology of the area were incorrect and that the skulls were now dated at only 2 million years.

Not wanting to make a similar mistake and not wanting to start any arguments, Leakey emphasized that all his statements were based on preliminary reports. □