

RESOURCES & ENVIRONMENT

the leftover sludge is rich in plant nutrients and can be used as fertilizer.

Pollard foresees the day when "farmers will derive nearly as much income from the sale of their annual product to an energy-conversion industry as they do from the sale of food and fibre, when forest management will yield an annual income from energy feedstocks comparable to that from logging and pulpwood production."

**Quantities of Quads
Beneath the Gulf**

"A Huge New Reserve of Natural Gas Comes Within Reach" by William M. Brown, in *Fortune* (Oct. 1976), 541 North Fairbanks Ct., Chicago, Ill. 60611.

With public debate focused sharply on the potentials and hazards of atomic power, American scientists are now quietly investigating a vast new domestic source of energy that could surpass the nation's immense coal reserves.

This energy is in the form of methane— CH_4 , the simplest natural hydrocarbon and the chief constituent of natural gas. It lies dissolved under pressure in reservoirs of hot salt water deep beneath the Gulf of Mexico and coastal areas of Texas and Louisiana. Brown, a staff member of the Hudson Institute, reports that the U.S. Geological Survey estimated in 1975 that geopressurized salt water in onshore reservoirs alone contained 24,000 quads of methane within normal



Adapted from Fortune map by Joe Argenciano based on one prepared by Paul H. Jones of Louisiana State University.

Vast quantities of natural gas dissolved under pressure in reservoirs of hot salt water lie deep beneath the Gulf of Mexico and coastal areas of Texas, Louisiana, and northeastern Mexico.

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drilling range. (A quad is an energy unit equal to one quadrillion Btu's. The United States currently consumes about 70 quads of energy a year.) Other energy specialists have concluded that the energy locked into the geothermal methane zone beneath the Gulf may total a phenomenal 105,000 quads.

The oil and gas industry is aware of the methane-laden water but has long considered it merely an expensive nuisance. The 1973 oil embargo and subsequent price increases for all forms of energy suddenly made methane commercially interesting; the hot water in which it is contained is also a potential source of geothermal power.

The technology for drilling and completing wells and separating the natural gas from the water already exists. The environmental problems arise from the probable subsidence of the land as water is withdrawn and from the need to dispose of great quantities of hot salt water drawn from the earth.

A Lawyer Looks At Outer Space

"Earth Exposure to Martian Matter: Back Contamination Procedures and International Quarantine Regulations" by George S. Robinson, in *Columbia Journal of Transnational Law* (vol. 15, no. 1, 1976), Box 8, School of Law, Columbia University, New York, N.Y. 10027.

As the Soviets demonstrated with their unmanned lunar program, the technology exists to recover soil samples from alien planets by means of unmanned spacecraft. NASA is now planning a Mars Surface Sample Return mission; by the early 1980s, the earth's biosphere could be subjected to extraterrestrial organisms with the potential for creating a serious "biological accident," according to Robinson, assistant counsel of the Smithsonian Institution and author of the first interdisciplinary study of the scientific, legal, and administrative steps taken by the United States to protect the earth's biosphere from extraterrestrial contaminants.

With space exploration evolving almost totally for reasons of national prestige and commercial exploitation, it is not at all clear that the legal problems involved in warding off biological contamination can be resolved in an international forum before the first NASA launch date in 1980. For one thing, quarantine and its application to persons (e.g., an astronaut exposed to contamination while conducting earth orbital space-lab tests of Martian material) "can shatter the integrity of basic provisions in the United States Constitution if authority to quarantine is not drafted with care and precision," says Robinson. What official, for example, has authority to apprehend, detain, and quarantine indefinitely a person exposed to Martian matter?

Since Martian contaminants would first be introduced into international airspace and waters, the United States should take the lead