tempted low-frequency radio observations from the ground by trying to time their observations to coincide with the lowest possible ionospheric activity, combining diurnal, solar and seasonal cycles. It was a valiant effort, says Papagiannis, but the results were ambiguous. Ellis, at the University of Tasmania in Australia, is enthusiastic about the potential of the Skylab effect. Papagiannis quotes a letter from down under: "There is no doubt that the ability to create an ionospheric window over our telescopes [a 2,000-foot-square, 64-row, east-west array equipped for 2-20-MHz observations and a 1-km instrument with 24 simultaneous beams spaced 5 degrees apart now being rewired for 1-MHz listening] on even a few selected nights would speed up enormously the mapping of the southern sky between 2 and 10 MHz, and would be essential below 2 MHz."

A likelier candidate for a first test, however, would be the huge Arecibo dish in Puerto Rico, the Boston astronomers suggest, since it already has rocket-launching facilities. The idea, they maintain, would be to carry about 100 kilograms of molecular hydrogen aloft in liquid form, then inject it a point 50 to 100 kilometers below the F2 layer, since the hydrogen will diffuse upward.

Carried out at night, the astronomers calculate, such an injection ought to produce a window in the shape of a vertical tube about 200 kilometers across and perhaps 1,000 kilometers high. As the tube forms, the free electron density should drop about 95 percent in less than half an hour, and last for several hours.

A proposal for the Arecibo test is being sent to the National Science Foundation—at NSF request—and the authors are already thinking well beyond that, to the possibility of periodic hydrogen releases in the 1980's from the space shuttle. □

A blooming desert project

Two living organisms—a desert plant and a marine mammal—have evolved the same unique capability: the production of an unusually structured and valuable oil. By exploiting this evolutionary coincidence, impoverished American Indians in the Southwest's Sonoran Desert may ensure their own economic survival and the survival of an endangered species.

This is the conclusion of a report just issued by the National Research Council. It assesses the scientific and economic feasibility of cultivating the oil-bearing desert plant as a cash crop on the Indian reservations of the Sonoran desert. This arid area stretches for hundreds of miles across southern Arizona and California, and the Indians living here, where farming is difficult and industry virtually nonexistent, are among the poorest people in the United States.

The plant is the native desert shrub jojoba (pronounced ho-HO-ba). It is a scrubby bush that sports small, leathery leaves and bears hard, brown seeds that contain 50 percent oil. Its evolutionary "cousin" is the sperm whale, the largest of the toothed whales, reaching 60 feet or more in length. Up to a ton of oil is carried in the huge spermaceti organ in the animal's gigantic head. It is not yet known what carrying around a one-ton spermaceti organ does for the whale, although there are some guesses. Some think it might function as an acoustic lens for picking up the whale's self-made sonar readings. Some say the organ may help generate the sonar "clicks" themselves. And others believe the oil may be an efficient nitrogen absorber and help prevent the "bends." But one thing is known for sure about the spermaceti organ: It contains a highly valued oil with hundreds of industrial uses. It is for this reason that the sperm whale is hunted unceasingly.

Sperm oil and jojoba oil are nearly identical structurally, but only sperm oil has been used industrially, due to its past availability and the difficulty of harvesting jojoba beans from wild desert plants spread over millions of arid acres. Both are liquid wax esters. Unlike normal animal and vegetable oils (which contain one molecule of glycerol and three molecules of fatty acids), jojoba and sperm oils contain one molecule of a long-chain alcohol and one molecule of a long-chain fatty acid. This structure makes them stable over long periods of time and under extreme conditions of pressure and temperature. At the height of its availability during the late 1960's, U.S. industry used 50 to 55 million pounds of oil per year for a variety of purposes—among them, as a lubricant in automotive and tractor transmission fluids and as an additive in metal-working oils.

The United States in 1970 banned the importation of sperm oil because of the animal's endangered status. Since then, stockpiles of the precious oil have dwindled. The chemical similarity between sperm and jojoba oils has been known for 40 years, but until sperm oil importation was banned, there was little incentive for development of a jojoba-based agriculture. Indians, in need of an economic base within their reservations, have been interested for years in developing jojoba, and in the summer of 1972 harvested 87,000 pounds of seed from wild jojoba to facilitate scientific and economic testing (SN: 7/14/73, p. 26). The NRC jojoba committee was organized that year, headed by chemist Milton Harris, president of Harris Research Laboratories, Rockville, Md. It was charged with determining whether jojoba could be cultured on large plantations and whether Indians could reap both marketable oil and profits. The answers seem to be yes.

In addition to scientific studies on the jojoba plant, oil and wax (the hydrogenated form of the oil), the committee reviewed the initial results from three small pilot plantation projects, one at the University of California at Riverside, one at the Barona Indian Reservation and one in the Negev desert in Israel. Cultivation of the desert bush looks very promising. Because it is a native plant, it is well suited to the desert climate. It can withstand daily summer highs of 110 to 115 degrees F., and needs only about 12 inches of rainfall a year—and little or none of that in the summer. It needs a modest amount of water in the winter and spring when it is most available. After five years, a mature cultivated plant can produce on the average five pounds of seeds per year, and a plantation, the report estimates, could yield 1,000 to 2,000 pounds of oil per acre. The committee recommends that the Government subsidize the planting of 2,000 acres of cultivated jojoba, 400 acres per year for five years, and foresees a lucrative jojoba-based industry.

No one is claiming jojoba culture will definitely save the sperm whale, but it might be a modifying influence. Jojoba oil would have to be plentiful enough and priced to compete with sperm oil on foreign markets. Sperm whaling is a lucrative industry in certain countries such as Japan, and overfishing a species even to the point of extinction can remain profitable (SN: 4/19/75, p. 26).

Jojoba oil, tests show, can be used to replace sperm oil as a high-pressure lubricant, and jojoba wax has a chemical structure and properties like carnuba wax. Carnuba and other similar waxes are used in floor and paper finishes, polishes, candles, soaps and cosmetics. Jojoba oil could also become a source of straight chain unsaturated alcohols and acids used in many chemical products. And, as if the wonder bean did not have promise enough with these potential markets, a high protein meal remains after the oil is pressed out, and it contains an unusual material called simmondsin which acts as an appetite suppressant in laboratory animals. □