BIOLOGY

New uses crop up for tropical weed

It is a renewable source of lumber that defies the woodcutter. It is a palatable, digestible, nutritious cattle feed. It thrives on steep slopes, in marginal soils and in areas with extended dry seasons. It needs no fertilizer, but rather enriches the soil. What is this spectacular plant? Leucaena, a tropical weed, which with some concentrated research may become the Cinderella of tropical crops.

A report from the National Academy of Sciences extols the possibilities for this leafy evergreen native to Mexico. Leucaena strains range from bushy shrubs to 65-foot trees. "Of all tropical legumes, leucaena probably offers the widest assortment of uses," says the report. "Although individual leucaena trees have yielded extraordinary amounts of wood—indeed, among the highest annual totals ever recorded—and although the plant is responsible for some of the highest weight gains measured in cattle feeding on forage, it remains a neglected crop, its full potential largely unrealized."

Some of the legume's versatility and vigor comes from its unusually long taproot that draws moisture from deep in the soil. Association with the nitrogen-fixing bacteria Rhizobium allows the plants to grow in nitrogen-poor soils.

There are challenges, of course, in initiating this plant's use. One is that leucaena contains an uncommon amino acid, mimosine, that is toxic at high doses to animals (although ruminating animals, such as cattle, are less sensitive than others). Also, leucaena will grow vigorously only in lowland areas with a reasonable mineral balance in nonacid soil. The NAS panel suggests that breeding new strains of leucaena could minimize these limitations.

The report points out that experience with leucaena is limited in most cases to a few sites. The panel recommends establishment of seed-producing orchards to ensure an abundant supply of high-quality leucaena seeds and extensive trials to compare and improve varieties and match them with local needs and conditions.

Not so fast on seeing through vision

That crucial flip around a double bond may still be quick enough to be the first step in vision. Recently, scientists at Princeton University and Bell Laboratories suggested a proton transfer as the initial response to light, arguing that rotation around a double bond would simply take too long (SN: 9/17/77, p. 183). Now other vision researchers report that such a flip actually can take place in picoseconds.

Researchers at the City University of New York used laser light at room temperature to examine the reactions of two molecules: the visual pigment rhodopsin and the related isorhodopsin, which has the characteristic double bond at a different location. Because both those molecules convert to the same structure, prelumirhodopsin, after absorbing light, a part of at least one, and probably both, must rotate around the double bond. Bruce H. Green, Theresa G. Monger, Robert R. Alfano, Bea Aton and Robert H. Callender report that the conversion to prelumirhodopsin takes less than 6 picoseconds for rhodopsin and less than 9 picoseconds for isorhodopsin. "Our results remove any uncertainity from these arguments due to picosecond isomerization times," they conclude in the Sept. 8 NATURE.

Monger and Callender both point out that the proton transfer described by the New Jersey researchers might be peculiar to their low (4°K) experimental temperature or might be movement of protons in another part of the molecule. Alternatively, proton transfer may be simultaneous, or even associated, with the flipping reaction in some as yet undetermined manner. "I see no reason to doubt that isomerization [the rotation around the double bond] is taking place," Callender says.

ASTRONOMY

Interstellar DNC

The latest chemical species to be discovered in the clouds of interstellar space is deuterium isocyanide (DNC). It was observed in the directions of the clouds called L134, NGC 1333, Orion A and NGC 2264, by Ronald L. Snell and H. Alwyn Wootten of the University of Texas at Austin using the Millimeter Wave Observatory at Ft. Davis, Texas. They report in the Sept. 15 ASTROPHYSICAL JOURNAL LETTERS.

The corresponding compound of light hydrogen, HNC, had already been discovered. An important question to solve is the ratio of DNC to HNC in various places. It can tell a good deal about the chemistry of the clouds, because the relative amounts of different isotopes of a given element that enter into the same compound are related to the mechanisms of compound formation. Comparing the ratios of various deuterated and hydrogenated compounds can tell a lot about conditions in the clouds. It can also help elucidate the complex question of the ratio of the two isotopes, D and H, themselves. This ratio is of cosmological importance because, according to theory, deuterium is not made in stars, and so all that there is must have been made at the beginning of the universe. Knowledge about how much of it there is can reveal a good deal about the nuclear-physics and chemical history of the universe and give information on the total amount of matter in the universe. By knowing the total amount of matter, one can answer the question of whether the universe will expand forever or eventually stop and collapse back.

Snell and Wootten determine the HNC/DNC ratio for NGC 2264 to be less than or equal to 3.2, but they say this is probably more reflective of conditions in that cloud than in the universe as a whole.

Neutrinos as astrophysical evidence

For years now Raymond Davis and colleagues at the Brookhaven National Laboratory have had a large tank of cleaning fluid (perchlorethylene) set up deep in a mine near Lead, S.D. The purpose of the installation is to detect neutrinos coming from the sun by the changes the neutrinos make in chlorine 37 nuclei that absorb them. Standard theory says the sun should yield a measurable flow of neutrinos, but in about 15 years of watching Davis and co-workers have seen nothing they want to claim is a flux of solar neutrinos.

Meanwhile, John N. Bahcall of the Institute for Advanced Study in Princeton, N.J., has been doing some theoretical calculations of the probabilities of neutrino absorption by chlorine 37, and in the Sept. 15 ASTROPHYSICAL JOURNAL LETTERS he suggests that Davis's tank may be able to detect neutrinos from a couple of other kinds of celestial events—neutrinos from a cosmic background flux and from the sudden collapse of a star. A couple of years ago, the Davis experiment recorded a run of high data that caused some excitement at the time. Bahcall suggests that this could have been representative of the collapse of a star that was too faint to be optically observed.

Supernova remnant in LMC

The Large Magellanic Cloud is one of the nearest galaxies to our own. One of the objects observed in it is an extended source of X-rays called LMC X-1. Some astrophysicists have suggested that this X-ray source represents a cloud of matter reflecting X-rays emitted by a central source, but studies with the Uhuru satellite lead A. Epstein of the Center for Astrophysics in Cambridge, Mass., to the conclusion that it is a supernova remnant, consisting of hot matter thrown out by a supernova explosion that happened 4,200 years ago at a distance of 20 parsecs from us with an energy of 3×10^{52} ergs. If it is a supernova remnant, it is the first found by X-ray.