# From forest to fuel: The mounting crisis

While America frets over the price of oil, another fuel crisis is accelerating over much of the developing world. One third of the human race still relies on firewood as its principle source of fuel, and the wood they use accounts for half the timber cut in the world. Now the rising price of petroleum and ever-increasing numbers of people have exacerbated the assault on the planet's forests, bringing long-range consequences for food production and the environment that will increasingly affect developed countries as well.

In the first formal paper issued by the Worldwatch Institute, Lester Brown's Washington-based research organization, Erik P. Eckholm draws new attention to this little-recognized problem. Denuding the earth's great forests, both for fuel and for timber, Eckholm says, "lies at the heart of what will likely be the most profound ecological challenge of the late 20th century." Not only is another vital resource endangered, but cropland is lost through erosion, deserts expand, flooding increases and soil fertility drops because of increased leaching.

The problem is most severe on the Indian subcontinent and central Africa, but areas as close to home as the Caribbean are beginning to feel the pinch. In the Sahel, one-quarter of a family's meager income may now go to buying wood for fuel. The once heavily forested Himalayan foothills of Nepal are now so barren around remote villages that journeying to gather firewood and fodder may take a whole day.

But the most subtle danger results from the substitute fuel to which many desperate families finally turn when all the wood is gone: dried cow dung. Using these wastes as fuel rather than returning them to the land to provide nutrients for crops has become so severe in India that the loss is equivalent to one-third the country's chemical fertilizer use. In addition, soil structure is damaged by loss of the organic bulk that keeps it porous.

Eventually a vicious cycle results. Falling soil productivity causes clearing of even larger tracts of forests, often on steeper terrain where productivity and erosion will be even more of a problem. In much of Asia, the rising silt load is beginning to threaten reservoirs and irrigation projects. The rising frequency and severity of flooding in Pakistan, India and possibly Bangladesh is also being blamed in part on denuded watersheds.

London was suffering from coal-pollution as early as the 13th century because of a firewood scarcity (see note p. 203). In a chapter for an upcoming book, Eckholm traces the history of deforestation back to the Phoenicians of the Middle East and the Plains Indians of America, who burned great forests to extend the range of the buffalo. By now, he concludes, people have reduced the world's original forested area by at least one-third and perhaps one-half.

John H. Douglas

*Eckholm: "Ecological challenge."*

Some governments are beginning to take action, but the task is particularly difficult because of local politics and age-old traditions. Eckholm told a Washington press conference that mainland China probably has the most extensive reforestation program, but even with strict government control and intense local involvement, he says, the program is only about 10 percent effective. Most of the trees get rooted up for fuel or otherwise destroyed before they reach maturity.

Another partial solution involves new technologies that depend on essentially infinitely renewable resources, such as solar energy or bio-gas plants. (Unlike petroleum, firewood can be reproduced, but the length of time required to grow a forest makes wood an only partially renewable resource in the short-term.) The problem with most alternate technologies is that the capital investment lies beyond the reach of most poor families, or involves radical changes in lifestyle. A solar cooker, for example, might cost one-third the annual income of a family and not provide heat for the evening meal.

Still, the problem must be attacked soon, or in Eckholm's words, "India will find itself with a billion people to support and a countryside that is little more than a moonscape." □

# A marker for lung cancer

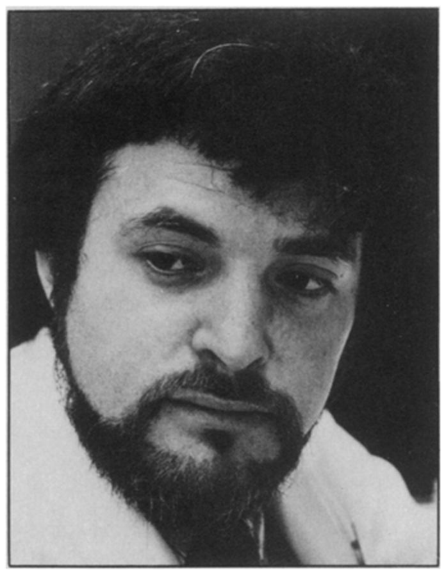
During the past few years, investigators have been identifying biological markers that would help them diagnose cancers and monitor progress in treating them. An example of a very specific marker they have found is the hormone calcitonin. An unusual thyroid tumor, medullary thyroid carcinoma, secretes this hormone in abnormally high levels; elevated levels of calcitonin in the blood invariably indicate the presence of this thyroid malignancy.

Two more ubiquitous yet less specific markers have also been identified—the CEA and AFP proteins. If the CEA protein is found in a person's blood in high levels, it suggests that he may well have cancer, particularly cancer of the colon. If the AFP protein is found in his blood in high levels, it suggests that he has cancer of the liver (SN: 6/9/73, p. 367).

Still another cancer marker—for lung cancer—has now been identified by Stephen B. Baylin, a physician at the Johns Hopkins University School of Medicine, and his colleagues. The marker, Baylin hopes, will eventually assist in the diagnosis and treatment of this common and nearly always fatal form of cancer. His findings are in press with the NEW ENGLAND JOURNAL OF MEDICINE.

Several years ago, Baylin and his coworkers found that the enzyme histaminase is elevated in the blood of patients with medullary carcinoma of the thyroid. Since data suggested that this unusual thyroid tumor might be embryologically related to the second most common form of lung cancer—small-cell carcinoma of the lung—Baylin and his colleagues set out to study the levels of the enzyme in the blood and tissues of patients with small-cell lung cancer.

Using two different, sensitive tests, they examined the levels of the enzyme in the blood of 25 patients with small-cell lung cancer, in the blood of 63 healthy persons and in the blood of 20 patients with large-cell lung cancer (the most common form of lung cancer, not believed to be of the same origin as small-cell lung cancer and medullary carcinoma). In one test, 33 percent of the patients with small-cell lung cancer had levels significantly elevated over those for healthy persons. In the other test, 26 percent did.



Johns Hopkins

*Baylin: The enzyme has therapy potential.*



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In contrast, levels in the patients with large-cell lung tumors were similar to those of healthy persons.

Baylin and his team then examined levels of the enzyme in small-cell tumor tissue taken from five patients who had high levels of the enzyme in their blood. They found that the levels in the cancer tissue of four out of five of the patients were also high and sometimes in the range previously reported for medullary carcinoma tissue. Healthy lung tissue and other kinds of tissue taken from the patients did not have the high enzyme levels.

So, they conclude, "histaminase levels are elevated in the blood of a number of patients with small-cell lung cancer, and the elevated levels appear to come from cancerous lung tissue."

Baylin told SCIENCE NEWS that he hopes the enzyme can be eventually used to improve the diagnosis of small-cell lung cancer and to monitor the effectiveness of treatment of this kind of cancer. He is quick to point out, however, that a number of questions must be answered before the enzyme can be used routinely in this manner.

For instance, why do only some patients with the disease have elevated levels of histamine? What does an elevated level in the blood actually mean? Do therapies alter the enzyme, or does the enzyme change with the progression of the disease? And what is the role of the enzyme in lung cancer tissue? Says Baylin: "We're tryng to isolate the enzyme from certain normal tissue where it occurs, such as the placenta, and to compare it with the tumor enzyme."

Might a somewhat elevated level of the enzyme in the blood be used to pinpoint people who are especially at risk from lung cancer? Baylin believes not. "I don't think that the level of the enzyme in the blood of patients with early lung cancer would be high enough to be of predictive value, especially since only one-third of patients with definite disease appear to have abnormal blood levels."

He concedes, however that if the enzyme turns out to be a definitive enough marker for small-cell lung cancer, purified enzyme preparations might be of future use in cancer therapy. Enzyme preparations might be injected into lung cancer patients to stimulate their immune systems to wipe out cancer cells. There is reason to believe that such immunotherapy might be effective. At the recent annual meeting of the American Association for Thoracic Surgery, for instance, Jack A. Roth, a surgeon at the University of California at Los Angeles School of Medicine, reported that lymphocytes taken from lung cancer patients made immune responses in the test tube to a crude extract of lung tumor antigens.

Alternatively, antibodies made to purified preparations of the enzyme might be directed against tumor tissue in persons with small-cell lung tumors. □

# Knocking a galaxy into a cocked hat

Galaxies are generally considered to be among the flattest things in nature. They are large thin disks that can be characteristically 100,000 light years in diameter but only about 10,000 or 15,000 light years thick. However, at least two of them now have a distinctly 3-D image thanks to recent work of David H. Rogstad of the Jet Propulsion Laboratory, M.C.H. Wright of the University of California at Berkeley and Ian A. Lockhart of the California Institute of Technology.

Radio observations they did at Caltech's Owens Valley Radio Observatory give a distinct reverse twist to the galaxies M33 and M83. Results are to be published in the ASTROPHYSICAL JOURNAL.

The three radio astronomers were mapping the hydrogen in M33. Normally the hydrogen in a galaxy should lie in the same disk as the stars, but M33 showed, in addition to the expected disk, a strange new configuration, a cloud that was either intermingled with the disk or between it and the earth. The cloud was rotating with M33 but at only half the rotation speed of the disk (typically about 300,000 kilometers per hour).

Two other mysteries about the gas in M33 were already on the books. The disk gas itself did not have the usual flat shape but had wings that gave it an S-shaped appearance, and the edges of the disk cloud near those wings ended abruptly.

The key to the mysteries came from observations of M83. This proved to have a similar cloud, and the sight angle to M83 allowed the astronomers to deduce that its gas cloud was warped into an S shape, flat in the middle of the disk but bent up and down at the edges like the brim of a cocked hat. The same model fits M33 if they assume that the line of sight is such that the strange cloud they first observed is the bent edge of the brim through which they are looking toward the center of the disk.

Slight warping from gravitational attraction by a nearby galaxy is known for several galaxies, but what could cause bends like these (up to 40 degrees) is less obvious. The observers speculate the warps may be gas from intergalactic space falling into the galaxy and therefore a transient phenomenon. □

# Last rocket flight for X-24B

On December 9, 1946, the Bell XS-1 (later called the X-1) became the first U.S. aircraft to fly under pure rocket power. On Oct. 14, 1947, it made the world's first supersonic flight. Six years later, the rocket-powered Douglas D-558 II was the first plane to exceed Mach 2 (twice the speed of sound), followed by the Bell X-2, which broke both the Mach 3 and the 100,000-foot altitude marks. The superstar of rocketplanes was the North American X-15, which set records that still stand in both speed (Mach 6.7—4,520 miles per hour) and altitude (354,200 feet, more than 67 miles) before it was grounded in 1968.

The only rocket-powered aircraft now known to be flying is the X-24B, built by Martin Marietta Corp. and used for research by both the U.S. Air Force and the National Aeronautics and Space Administration. Like its three most recent ancestors, the M-2, HL-10 and X-24A, the ungainly looking craft has no wings, depending instead on its body shape for aerodynamic lift in studies of controlled-reentry spacecraft and never exceeding Mach 1.9. On Sept. 23, using the same kind of engine that powered the old XS-1, the X-24B made its last powered flight.

Are more rocketplanes to come? The Air Force and NASA are considering an X-24C, with a hydrogen-fueled engine promising speeds above Mach 6, and it may come to pass. But at the NASA Flight Research Center in Calfornia on Tuesday, says one official, they had an "End-of-an-Era Party." □

## U.S. Rocketplane History

| Aircraft | Dates Flown | Flights | Max Speed (mph) | (Mach) | Max Altitude (in feet) | Manufacturer |
|---|---|---|---|---|---|---|
| X-1 (3 planes) | 1946-51 | 156 | 957 | 1.45 | 71,902 | Bell |
| X-1A | 1953-58 | 21 | 1612 | 2.435 | 90,440 | Bell |
| X-1B | 1953-58 | 27 | 1282 | 1.9 | | Bell |
| X-1D | 1953-58 | 1 | subsonic | | | Bell |
| X-1E | 1955-58 | 26 | 1471 | 2.2 | 73,458 | Bell/NASA |
| X-2 (two) | 1955-56 | 20 | 2094 | 3.20 | 126,200 | Bell |
| D-558 II (two) | 1948-56 | 161 | 1291 | 2.005 | 83,235 | Douglas |
| X-15 (three) | 1959-68 | 199 | 4520 | 6.70 | 354,200 | Rockwell Int'l. |
| M-2 (two) | 1966-72 | 43 | 1064 | 1.673 | 71,501 | Northrop |
| HL-10 | 1966-70 | 37 | 1228 | 1.861 | 90,303 | Northrop |
| X-24A | 1969-71 | 28 | 1036 | 1.60 | 71,400 | Martin Marietta |
| X-24B | 1973-75 | 29 | 1158 | 1.752 | 74,132 | Martin Marietta |