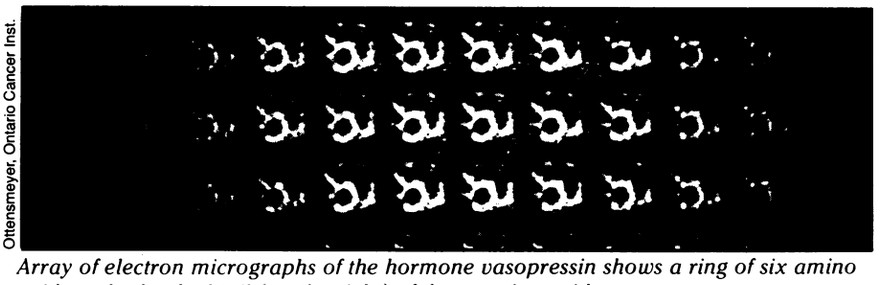

Ottensmeyer, Ontario Cancer Inst.

Array of electron micrographs of the hormone vasopressin shows a ring of six amino acids and a hooked tail (on the right) of three amino acids.

preted as different views of a DNA coil making approximately 1.75 turns within the nucleosome.

The scientists display the images in vivid colors — for example, the phosphorus of the DNA coil is rendered orange-red, the protein "bead" is yellow and the background is blue. Ottensmeyer says, "Although the technique is still in its infancy, results are very very exciting." He concludes, "The future looks bright and colorful." □

The food supply: Don't be fuelish

Powering vehicles with fuel derived from grain has become a technologically, if not economically, practical proposition. While on the surface the conversion into ethanol fuel of such clearly renewable resources as corn, sugar cane, sorghum and beets may seem a sensible answer to the energy shortage, a sobering concern has arisen. Will this approach take food out of the mouths of hungry people to put fuel into automobile tanks?

At a symposium on future food-fuel conflicts, agricultural economists compared predictions of the impact of agricultural biomass energy programs on food supplies. The speakers pointed out that fuel from food crops is a relatively minor part of the proposed energy plans. While the U.S. potential for biomass energy in the next 20 years is likely to be up to 20 percent of 1979 U.S. energy consumption, grain comprises only 4 percent of that potential, and other food or feed crops, such as sugar, represent far less potential, says Wallace E. Tyner of Purdue University.

Grain's conversion to a gasoline substitute however, makes it the most immediate biomass fuel material. "Grain alcohol should be thought of as a small component of our energy system, and as an opening wedge to prepare the ground for larger biomass sources, such as silage crops and wood," says Folke Dovring of the University of Illinois at Urbana.

Corn is currently the most practical feed and food crop in the United States for conversion to fuel. Speakers disagreed on the extent to which the corn crop could be increased by bringing into production land currently idle. Tyner says 2 billion gallons of alcohol could be produced with less corn land than was diverted from production in 1978. Milton L. David of Development Planning and Research Associates, Inc., in Manhattan, Kan., predicts, however, that bringing idle land into use would add direct production costs and produce environmental damages. Another difficult factor to predict is how much land would be switched to corn from other crops, such as soy beans and wheat. Such changes would depend in part on corn prices. According to Dovring, within three years, if current investment plans materialize, grain alcohol production could make an impression on the grain market.

David predicts a 1 billion gallon ethanol program (equivalent to 1 percent of gasoline consumption) will require 5.4 percent of current corn acreage, or, Tyner calculates, 2 million acres of new land in corn production. The cost of alcohol from corn would range from $1.21 to $1.55 per gallon, depending on the size of the production plant, Tyner estimates. Considering the increasing price of gasoline, Tyner says, "Even if alcohol from corn is not quite economic today, it will be within 18 months." Simulations of market conditions predict 1 to 2 billion gallons of ethanol could be produced in the United States without raising corn and soy bean prices. Increasing that ethanol production to 4 billion gallons would increase corn prices only 6.6 percent, says Marilyn Herman of the U.S. National Alcohol Fuels Commission. David agrees that the economy can handle a 4-billion-gallon program. "Beyond that, it's anybody's guess," he says.

Increased corn prices would affect the diet of meat-consuming populations, because most U.S. corn is used as feed rather than food. "Use of feed grains for alcohol involves trade-offs in the price and quality of meat, poultry and dairy products, but [does] not directly [involve] the issue of food for starving humans, at least at low to moderate levels of alcohol production," Tyner says.

Governmental policies that encourage or discourage crop use for fuel production can influence dramatically the market and the distribution of crops into food and fuel. Janos Hrabovszky of the United Nations Food and Agricultural Organization warns that such a policy must be flexible, adjusting to developing market conditions. □

A French ear on Jupiter

An astronomical telescope is a multipurpose device, often focused not merely on stars but on planets, moons, asteroids, gas clouds, comets and more. In France, however, about 200 kilometers south of Paris, some 8,000 square meters of the pine-dotted countryside around Nançay is now the site of a telescope dedicated almost entirely to the study of a single planet: Jupiter.

It is a radiotelescope, consisting of 144 helical antennas, each several meters high, electronically linked together to form the equivalent of a single huge instrument. The primary goal of the array is the long-term monitoring of the powerful decametric radio emissions that make Jupiter the strongest planetary beacon in the solar system. Built by the Group for Decametric Radio Astronomy of France's Meudon Observatory, the facility began operating in January of 1978, when only half of its antennas were connected. Now the entire array is on the job.

It is by no means the first Jupiter-only radiotelescope to be built. In the three decades since Jupiter was discovered to be a radio source, "probably several dozen" such devices have been constructed, according to James Warwick of Radiophysics Inc., one of the first researchers to "listen" to the giant planet. But the French group, Warwick notes, has "significantly advanced the state of the art."

Describing the instrument in the forthcoming ICARUS (43:399), André Boischot and colleagues assert that four qualities are necessary for such a device: wide bandwidth, to cover the full range of frequencies; high time and frequency resolution, to measure subtle but often critical changes in the emissions; high sensitivity, for detecting the signals' weaker components; and long tracking time — the ability to keep Jupiter in view for many hours each day. Previously built installations, according to the authors, have all been limited in one or more of these areas. An array in Tasmania, for example, offers excellent resolution, but can only pick up Jupiter for about five minutes at a time. A facility at Oulu, Finland, scores moderately well in most categories, but has a bandwidth of only 2 megahertz.

The new French instrument, by comparison, covers a band from 10 to 120 MHz, more than sufficient to cover the roughly 10-to-40-MHz Jovian emissions detectable from earth. Though the device cannot be physically rotated, the electrical phase of its individual antennas can be shifted — the equivalent of steering a single, dish-type antenna — in a way that allows the planet's signals to be recorded for as long as 10 hours a day, about the time it takes Jupiter to turn once on its axis. (It was the

earth-based monitoring of the resulting "rotational signature" in the emissions that enabled researchers to determine the true length of a Jovian day, which could only be estimated from the latitudinally varying drift rates of visible features in the cloud tops.) The instrument's sensitivity enables it to pick up emissions as weak as 10^{-24} watts per square meter per Hertz, which, says Warwick, is about 100 times better than most of the other available devices.

Building such an instrument essentially for one planet (it will also be used in solar studies, and Warwick thinks it might be able to pick up the weaker emissions from Saturn) is not nearly so extreme a notion as it would be to do the same with a large optical telescope. If the general rule of thumb holds true, Warwick says, the 8,000-square-meter antenna array would cost no more than the associated electronic equipment, or than the necessary software and data displays. □

Jet contrails appear to alter weather

Contrails — those white cloud-like swaths written across the sky by high-flying aircraft — are being implicated in weather changes, at least throughout the Midwest in regions that experience heavy jet traffic. Their suspected legacy includes a local increase in cloud cover and a diminishing average difference between daily high and low temperatures. If research proves these suspicions true, jet traffic could be crafting subtle climatological changes affecting crop production and energy use.

Stanley Changnon, Richard Semonin and Wayne Wendland at the Illinois State Water Survey in Champaign correlated trends in increasing jet traffic against weather reports dating back to the turn of the century. Readings for several bands cutting across northern Illinois were studied because flight records indentified them as paths that experience the heaviest air traffic. Weather changes over these areas were contrasted against those for regions in Wisconsin, Minnesota and southern Illinois where records reported relatively little jet traffic.

The Illinois team found that since the late 1960s—and a commercial reliance on jet transport — there has been a notable shift toward cloudier days and less extreme monthly ground-air temperatures along jet alleys. Cloud cover increased 10 percentage points since 1955 "at many or all stations with jet traffic that were studied," Wendland said. Autumn, typically having the least cloud cover, showed the greatest seasonal increase in clouds.

British Aerospace Aircraft Group

Jet exhaust leaves its mark: contrails.

This is important because clouds have two principal effects. During the day, they block the sun to hold ground-level temperatures down. At night, they tend to prevent warm air near the ground from escaping into the upper atmosphere. As such, clouds contribute to a general leveling off in diurnal temperature extremes. The apparent trend toward increasing cloud cover in jet-traffic zones could translate into warmer winter nights and cooler summer days if carried over seasons, thereby reducing costly home heating and cooling requirements in some regions. It could also translate into lengthened growing seasons for the Farm Belt.

Subtle weather changes have even been associated with contrails that formed on otherwise cloudless days. Wendland said his team monitored 12 such days last year, and in eight, "temperature and relative humidity were clearly affected." Air temperature at ground level normally rises each day between 8 a.m. and noon while relative humidity falls, the climatologist explained. But the researchers found that the presence of contrails temporarily halted the normal morning temperature incline and humidity decline. For contrails lasting half an hour, temperature and humidity leveling off persisted a full hour.

How and why contrails form is not precisely understood. It's assumed that water vapor from jet exhaust crystalizes in the upper atmosphere — above 20,000 feet — forming cirrus-like ice clouds. But whether unburned hydrocarbons and gases in the exhaust make contrails materially different from regular clouds is not known. Wendland says it's not even known why contrails appear to spread over time. The vapor trails may simply diffuse laterally, but it's also possible that they actually seed the surrounding atmosphere, spawning new clouds in adjacent regions.

Next year the Illinois team hopes to conduct contrail-formation studies from planes and even to measure the filtering effect of jet trails on solar radiation using airborne monitors above and below newly formed contrails. □

Detecting cystic fibrosis carriers

Although cystic fibrosis is the most common lethal inherited disease among whites in the United States, there has been no test to determine which four or five percent of the population are at risk of having an affected child. Now such an assay may have been found, according to a report in the Jan. 1 NEW ENGLAND JOURNAL OF MEDICINE by Jan L. Breslow, Joseph McPherson and J. Epstein of Harvard Medical School. The prospective test is based on the discovery that cultured skin cells called fibroblasts exhibit significantly less sodium transport if they are from carriers of the cystic fibrosis gene than from healthy persons.

Breslow and colleagues took fibroblast cells from 13 healthy persons, eight cystic fibrosis patients, eight parents of children with cystic fibrosis (who have to be carriers) and three healthy siblings of cystic fibrosis patients (who have a two-thirds chance of being carriers). The investigators cultured each batch of fibroblasts, exposed them to a drug called ouabain and studied each batch's ability to accumulate sodium. They found that the fibroblasts from all cystic fibrosis patients, from all parents of cystic fibrosis patients and from all three siblings had a significantly diminished ability to accumulate sodium in the presence of ouabain than did the fibroblasts from healthy persons. Thus, all three siblings appeared to be carriers of the cystic fibrosis gene.

"Our results," Breslow and co-workers conclude, "suggest that carriers of cystic fibrosis can reliably be distinguished from normal persons by means of the fibroblast assay present in this report," and while the "assay is probably too cumbersome to apply in mass screening of the population for the cystic fibrosis gene... it should be clinically useful in studies of relatives of patients with cystic fibrosis to identify carriers of the CF gene."

In an accompanying editorial, John W. Littlefield of Johns Hopkins Hospital in Baltimore contends that the National Institutes of Health or the Cystic Fibrosis Foundation, or both, should further explore the assay's ability to detect cystic fibrosis carriers. He cautions that skin fibroblasts might not always accurately identify cystic fibrosis carriers because fibroblasts from persons of different ages could act differently in tissue culture.

The discovery of Breslow and colleagues does shed further light on the nature of cystic fibrosis because a deficient sodium transport in fibroblasts undoubtedly bears some relation to the elevated level of salt in the perspiration of cystic fibrosis patients — a discovery made about 30 years ago. Salty perspiration, in fact, has been the most reliable aid in the diagnosis of cystic fibrosis. □