TECHNOLOGY

Rainfall: Beyond the crystal ball

Weather forecasters would like to be able to predict not only when it will rain but how big a soaking to expect. Conventional weather radar, however, is unable to determine such essential data as how large rain droplets within a storm are or how many cohabit a given volume. And that's because the radar signals are polarized in a single direction, usually horizontal, explains Thomas A. Seliga, an electrical engineer at Ohio State University. Dual polarization is his solution.

Viewed side on, raindrops are not spherical, but elongated ellipsoids. Seliga has found that the ratio of the power returned by horizontally and vertically polarized radar provides the data necessary to calculate both raindrop size and density. What's more, it also permits determination of whether the falling droplets have formed as ice or water. Unless the ice chunks are large enough to rain down as hail, the distinction for those under the umbrella is not likely to seem important. But for those employed as atmospheric physicists, such data could help improve the basic understanding of cloud physics, improve methods for augmenting showers with weather modification and improve the ability to predict hail and severe showers.

Traditional forecasting has provided very gross rainfall estimates at best, Seliga says, with errors sometimes off by a factor of five or more. But with dual polarized radar, Seliga says he has reduced errors to "better than a factor of two" and hopes eventually to pull them into a range considered "insignificant."

EMP and electronic ignitions

Several persons attending electromagnetic-pulse (SN: 5/16/81, p. 314) simulation tests had trouble getting home afterward. Their cars wouldn't start. "And this kept happening every day," explains James Kerr of the Federal Emergency Management Agency, but only to some of the newest cars. It now appears that EMP's knocked out the solid-state controls in the vehicles' distributor systems. The recurring accidents aroused enough concern to win Kerr's office full air force funding for a study of the problem. Results are expected in by early next year, Kerr says, but "whether they will be classified [secret], I can't say."

Electromagnetic highways

Imagine driving coast to coast in an electric car without having to recharge its batteries. That's one of the things researchers at Lawrence Livermore Laboratory like to speculate about when discussing prospects for the electromagnetic roads they're developing. Just last month a 164-foot test track underwent initial field trials, supplying the inductive current to power a modified (electric) Volkswagen.

At the heart of the special road runs a magnetic core. It consists of 43 nested troughs — each about three feet long, two inches deep and constructed of steel 0.01 inches thick. Laid inside the inner trough are six one-inch-diameter insulated aluminum cables carrying an electric current. The system, covered and embedded into what appears to be a normal asphalt road sets up a one-tesla (10,000-gauss) magnetic field in the road. That is sufficient to transfer 100 kilowatts to pickup elements suspended from modified cars and riding several inches above the road. Power "couples" to the pickup in the same way an electromagnetic pulse couples to metal conductors.

While any car could ride electrified highways, only modified electric vehicles would get the free boost; they should be able to tool away at 55 miles per hour and recharge their batteries at the same time. Cost estimates developed several years ago indicated that electric highways might be constructed for $350,000 to $600,000 per laid mile.

ENVIRONMENT

Cancer duo: Microwaves, benzopyrene

Combined exposure to 3,4-benzopyrene and low-level microwave radiation accelerates the development of both spontaneous and chemically induced cancers in mice, according to the May MICROWAVE NEWS. Similar accelerated cancer development also occurred when the mice experienced prolonged stress, such as overcrowding.

In his study, Stanislaw Szmigielski of the Center for Radiobiology and Radioprotection in Warsaw, Poland, painted the skin of mice with 3,4-benzopyrene and then exposed the animals to 2,450-megahertz microwaves at power levels of five and 15 milliwatts per square centimeter two hours daily for three to six months. Quoting from a paper by Szmigielski, to be published in an upcoming issue of BIOELECTROMAGNETICS, the newsletter notes that it's still questionable "whether or not the tumor-accelerating effect observed in mice exposed to non-thermal (5 mW/cm^2) [microwave] fields is due to the specific interaction of the radiation at the cellular or subcellular level or to non-specific stress and/or adaptation." In a letter to MICROWAVE NEWS, Szmigielski adds that "our recent experiments seem to indicate that the acceleration of cancer development in microwave-exposed mice is due to... temporary suppression of cell-mediated immunity."

Pork warning to microwave-oven users

Preliminary unpublished studies indicate that under certain circumstances, following the instructions in some cookbooks for cooking pork will not ensure that microorganisms causing trichinosis would be killed. The potential problem is unique to microwave cooking, notes Donald Houston, the U. S. Department of Agriculture's Administrator for Food Safety and Quality, in a warning published by USDA this month.

Microwave ovens cook by exciting water molecules in food. But because the distribution of water in pork varies, as does the distribution of energy in a microwave oven, uneven cooking can result. And unless pork is cooked to at least 170°F throughout, trichinae may survive. The presence of bones in the pork adds to the unevenness of cooking temperatures.

Houston stresses that no illnesses from microwave-cooked pork have been reported and that his agency is repeating the studies to verify their results. However, to avoid problems, Houston suggests that users:

- Consult manufacturer's directions for cooking pork.
- Rotate pork dishes during cooking.
- Allow dishes to sit for several minutes after cooking to assure more uniform temperature distribution. (Wrapping pork in foil after cooking can increase the effectiveness of this sitting period.)
- Check the pork in several places with a meat thermometer.

Other news notes

- Cathode-ray tubes (CRT's) — also known as video-display terminals (VDT's) — received a clean bill of health this month by the Food and Drug Administration's Bureau of Radiological Health. The devices, used by an estimated seven million American workers, "emit little or no harmful radiation under normal operating conditions," a study of 125 of the devices found; detected radiation fell "well below any existing national or international standards," it added. A recent study by the National Institute of Occupational Safety and Health came out with essentially the same findings.
- Anne McGill Gorsuch, a 38-year-old Denver attorney, was sworn in May 20 as the Environmental Protection Agency's new administrator.