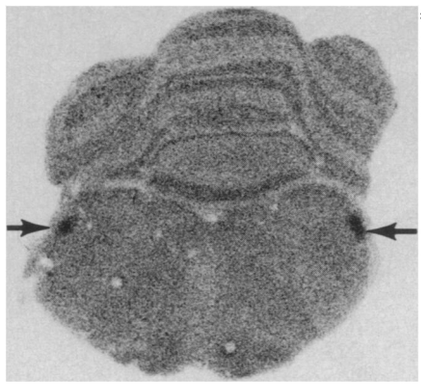
Brain part perks up during hibernation

Even in its deep winter slumber, a ground squirrel is still alert to aspects of its environment. If temperature drops too low, for instance, the animal will turn up its heat production or rouse itself. Scientists have now identified in the brain one structure likely to be a temperature monitor. Of 85 brain locations examined, only this one appears to increase its activity during hibernation.

The identification of this area, called the paratrigeminal nucleus, was unexpected and illustrates the power of the 2-deoxyglucose technique, which can scan the entire brain of an animal and compare the activity of the regions (SN: 1/31/81, p. 76). The paratrigeminal nucleus had been "virtually ignored in the neurobiological literature," says Thomas S. Kilduff, who is now at the NASA Ames Research Center in Moffett Field, Calif. "Although this brain structure was originally described in man by the eminent neuroanatomist Ramon y Cajal in 1909, there have only been three papers on this nucleus since that time," he reports.

The anatomical connections of the area, located in the brain stem just above the spinal cord, are largely unknown, but it is likely to be a way station for thermal information coming from the face, says H. Craig Heller, who is Kilduff's collaborator in the work at Stanford University. The area is also active in ground squirrels as they first go into hibernation and in cooled, but not hibernating, animals. Heller says, "This particular area is intriguing for the fact that we don't know anything about it." —*J. A. Miller*



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Only one brain area (arrows) is relatively more active in hibernating animals than in active animals, which have a 30-fold higher metabolic level. Dark areas represent greater cell activity in this autoradiograph through the medulla.

Study criticizes U.S. acid rain policies

Only the United States, among major industrial nations in western Europe and North America, has ignored new research on damage caused by acid rain and followed policies that may worsen the problem, charges a recent report from an environmental research group. While the Federal Republic of Germany has adopted strict air pollution regulations in reaction to new information on forest damage, the United States has relaxed emission control requirements, the report states.

These conclusions are contained in a new study, "Acid Rain in Europe and North America," that examines how the laws in major Western countries are or are not responding to the acid rain threat. Authors Gregory S. Wetstone and Armin Rosencranz of the Environmental Law Institute, a nonpartisan, Washington, D.C., research center, spent three years collecting and analyzing documents and interviewing more than 100 scientists, government officials and international relations experts throughout the world.

The report recognizes, for example, that last June, in Stockholm, 107 researchers and officials from 21 countries agreed that despite numerous uncertainties, "We know enough to be able to say: Unless we reduce our emissions of sulfur and nitrogen oxides, more groundwater, more soils and forests will become acidified, and we will be adding to the economic and aesthetic damage we have already done."

However, the study notes that disputes over scientific uncertainties "are likely to remain a major obstacle to the resolution of transboundary pollution problems." The report contends, "Most pollution exporters still see energy and pollution control policies as a wholly domestic matter, making policy decisions in these areas with no explicit consideration of possible foreign environmental impacts."

A spokesman for the White House Office of Science and Technology Policy, which is criticized in the report for impeding cooperation between the United States and Canada, says, "We know that there are sulfur emissions, and we know that there is acidification of some freshwater lakes, but the connection is not really all that clear at this point.... You don't undertake multibillion-dollar impacts on an economy, on industrial areas, on whole regions of the country on the assumption that the chain has been established."

George Rejhon, environmental counselor at the Canadian embassy in Washington, commends the report. "We have a choice to act responsibly when the problem is at its early stages," says Rejhon, "or we can wait until it's a horror story, and we end up ... thrashing around trying to dream up urgent responses to an urgent problem. And that's exactly what we don't want to do in Canada." —*I. Peterson*

Formaldehyde limits a cell's DNA repair

Research involving human cells grown in culture indicates that the chemical formaldehyde (HCHO) may not only inhibit the repair of DNA damaged by X-rays, but may also "significantly potentiate" DNA damage caused by X-rays. Curtis Harris, of the National Cancer Institute's Laboratory of Human Carcinogenesis, said the main impetus for this study was to explore whether high concentrations of formaldehyde in cigarette smoke may play some role in causing respiratory-tract cancers. Although the present data are insufficient to indict HCHO on that charge, they do suggest a mechanism whereby the chemical might act on cells — either alone or with other physical and chemical agents.

Harris studied HCHO's effects by using two types of human bronchial cells: epithelial cells (which normally line the bronchial surface) and fibroblasts (which originate in connective tissue).

Cells exposed to HCHO alone develop both single-strand DNA breaks and "DNA protein cross-links" (covalent bonds where HCHO acts as a bridge between DNA and one of various proteins). The NCI team reports in the April 8 SCIENCE that cross-link frequency was proportional to HCHO's concentration.

Their research also showed that HCHO impaired the repair of X-ray-induced single-strand breaks in DNA. Whether cells were incubated in a solution of HCHO for an hour before or after exposure to 800 rads of X-rays, far fewer breaks repaired than in untreated radiation-exposed cells. (A rad is the absorbed dose of radiation accompanied by liberation of 100 ergs of energy per gram of absorber.)

When cells were exposed to radiation and HCHO simultaneously, "potentiation" occurred: observed adverse effects surpassed what would have been expected by simply adding what each agent would have produced if it had acted alone.

Because HCHO binds readily to cell membranes or anything that has amine-groups, Harris says, "You would predict that only a small portion [of the HCHO available] would get into the DNA itself." Harris says his group is now investigating what that amount is. Also being investigated is whether the chemical potentiates the mutagenicity of X-rays. Finally, the NCI team is testing a hypothesis that aldehydes, produced by the body's metabolism of nitrosamines, contribute to the mutagenic and carcinogenic effects associated with nitrosamines. In the past, alkyl carbonium ions were considered the metabolites primarily responsible for a nitrosamine's carcinogenicity. But since HCHO, an aldehyde, has been shown to interact with DNA and protein, Harris now suspects these, too, may contribute to nitrosamines' hazard. —*J. Raloff*