On the radioactive road

Oak Ridge National Laboratory

Interior of van looking toward the rear. The quadrupole mass spectrometer is on the right; a work bench with microscope, vortex mixer and centrifuge is on the left.

In order to measure trace quantities of uranium and plutonium in the environment, scientists at the Oak Ridge National Laboratory have taken their instruments on the road. They converted a van into a mobile analytical lab and in the process pioneered a new use for recreational vehicles. The Office of Safeguards and Security at the Department of Energy funded the project.

David H. Smith of the Analytical Chemistry Division at Oak Ridge says the laboratory is the first of its kind to make onsite measurements of ratios and concentrations of radioactive isotopes. Smith, along with Joe Walton and Henry McKown, demonstrated the mobile lab at a recent conference on Analytical Chemistry in Nuclear Technology in Gatlinburg, Tenn.

Besides environmental monitoring at nuclear installations, the lab will also aid in keeping track of radioactive materials at plants to ensure all material is accounted for. In the past, reported discrepancies in plutonium stores, for example, may have resulted from inadequate and faulty measuring techniques.

The chief instrument in the van, occupying one of the sleeping areas, is a quadrupole mass spectrometer weighing 150 kilograms. The spectrometer can measure concentrations as low as 1 part per billion uranium and 0.01 part per billion plutonium in water. As little as 0.01 nanogram of the elements gives a detectable signal. The mobile lab can process 15 samples in an 8-hour day.

To make the van more like a chemical lab, the carpet was removed, and a stainless steel hood was installed over the gas stove. Although the spectrometer can handle untreated samples, sometimes chemical separations are necessary. The stove becomes the handy Bunsen burner while chemicals, such as acids, are stored well-protected in the bathtub.

Some of the comforts of home are not missing. Air conditioning is necessary because of the heat generated by the spectrometer's vacuum pump and filament heater. If necessary, the two technicians required to operate the lab can sleep over the cab of the van. □

Why women PhDs advance more slowly

Discrimination "against women as a class or as individuals" appears the most likely explanation for the wide differentials segregating men from women, in the scientific professions, with regard to salary and academic rank. At least that's the finding of a statistical analysis that Nancy Ahern and Elizabeth Scott conducted for the National Research Council of the National Academy of Sciences. It examined how well-matched samples of men and women PhDs fared, relative to each other, in climbing the pay scale and academic ladder.

Explanations other than discrimination have been posed for the well-documented differences in pay and academic rank between men and women scientists in academia. Among them: relative to men, as a class women tended to face a greater constraint on career mobility if they married; they entered the better-paying scientific disciplines in smaller proportions; they were more likely to interrupt their careers for child bearing and rearing (thereby losing years of experience); and they had acquired their degrees in large numbers only recently (so that young—and hence lower paid—professionals dominated this subgroup of scientists).

But, report Ahern and Scott, "We found that such explanations do not agree with our findings."

Their data showed women are at least as mobile as men, regardless of whether they marry or have children. Fewer than half of all women with PhDs have children, and of those, only 10 percent with small children drop out of the labor force. Finally, even when women were matched to men by scientific sub-field, by years of experience, by years since graduation and by prestige of the department in which they were employed, their average salaries lagged behind those of the men. For example, among those who earned their PhDs after 1975—the group where differentials proved smallest — women's salaries trailed men's from $400 (2 percent) in math to $3,300 (15 percent) in chemistry and $2,100 (10 percent) in the biological sciences. □

Cheer up, without side effects

A new set of drugs to treat depression is about to burst onto the pharmaceutical scene. While being enthusiastic about the drugs' effectiveness, scientists are puzzling over their mechanisms of action. Most antidepressants currently in clinical use are from a family of chemicals that was found effective in the 1950s. They are called "tricyclics" because a row of three rings provides the basic chemical structure. Tricyclics can have many disturbing side effects, including dry mouth, blurred vision, constipation, weight gain and abnormal heart rhythms. The new drugs, which are not tricyclics, appear to be free of these effects.

The new drugs seem to share some actions with the tricyclics, which facilitate action of the neurotransmitters serotonin and noradrenaline by inhibiting their reuptake by nerve cells. At the meeting in Los Angeles of the Society for Neuroscience, scientists from several drug companies reported investigations of the action of novel antidepressants. Barrett R. Cooper of Wellcome Research Laboratories in Research Triangle Park, N.C., says that one antidepressant, currently in clinical trials, inhibits the uptake of the neurotransmitter dopamine in rats. He also finds evidence that the drug, called bupropion (Wellbutrin™), elevates serotonin and noradrenergic neural activity. Cooper says that since all three chemicals are theoretically implicated in human depression, he would like to see clinical evaluation of the activation of the three neural system compounds by bupropion in depressed patients.

Another antidepressant in clinical trials