The NPPD affair: The spy who dusted me

It sounds like a *pas de deux* between Agent 007 and his SMERSH archenemy Rosa Kleb, but it wasn't happening in an Ian Fleming novel. The United States accused the Soviet Union last week of using "potentially harmful" chemical substances to track U.S. embassy personnel in Leningrad and Moscow. The United States demanded that the practice be stopped, while the Soviet Union called the charges "absurd allegations." "I am not wishing to make comment," a spokesperson at the Soviet embassy in Washington, D.C., told SCIENCE NEWS.

According to the State Department, the tracking substance most commonly used by the USSR — nitrophenylpentadienal (NPPD)—is an odorless, colorless powder that leaves no visible residue when it's properly applied by the Soviet secret police to, for example, the steering wheel of a diplomat's car or the doorknob of his house. If the diplomat were to meet with a Soviet dissident, the State Department says, he might unknowingly leave tiny amounts of the chemical on the dissident's clothing, hands or doorknob. Then, according to this scenario, the chemical evidence of this meeting could then be picked up by a KGB agent, who would wipe the dissident's doorknob, then bring the cloth to a laboratory for analytical tests using chromatography or a mass spectrometer.

State Department officials say that through biological screening, NPPD has been determined to be a mutagen—a substance capable of altering the genetic material in cells—and that "mutagens can be, but are not always, carcinogens in human beings." The State Department also says that "extensive testing will be necessary to determine whether NPPD and other compounds used by the Soviets pose a threat to health, as well as to determine the extent of the embassy community's exposure to these chemicals." In addition, a special team of four federal scientists, led by Ernest McConnell of the National Institutes of Health, departed for Moscow this week to conduct a thorough investigation.

But statements by U.S. officials seemed to raise many unanswered questions, such as how — and precisely when — U.S. intelligence detected the substance, the amounts they think the Soviets used and the minimum level at which it is thought to be a mutagen. The State Department refused to give out the names of the other chemicals it suspects the Soviets of using. Furthermore, only government scientists are thought to know about the properties of NPPD, and, under orders from the State Department, they're evidently keeping their information a secret.

Though U.S. intelligence had known of Russian tracking agents in the 1970s, State Department spokesperson Peter Martinez told SCIENCE NEWS, "we did not feel it was necessary to report our information to the embassy staff because the amounts were 'minute and sporadic.'" But recently, he says, "the greater amounts and more frequent usage" detected by intelligence experts had prompted an investigation. Martinez declines to elaborate on how these varying levels had been detected, but, he says, "I am sure that over the years scientists and health experts have been involved in analyzing the stuff."

U.S. government scientists synthesized the chemical themselves in order to test its health effects, according to State Department spokesperson Charles Redman. The chemical's mutagenicity was determined with the Ames bioassay test, he says.

"If this is correct," Bruce Ames, the test's inventor, told SCIENCE NEWS, "I would interpret it as being a potential carcinogen, though not every mutagen in our test is a carcinogen in rodents....Even if NPPD is a carcinogen, the risk is likely to be very small given the exposure." Ames, at the University of California at Berkeley, says he doesn't know what government laboratory had administered his test.

Only eight references to NPPD exist in the scientific literature, according to American Chemical Society spokesperson Peter Andrews, and of these, six are Soviet and two are Australian. None of them, he says, are papers about forensic uses.

—J. Mathewson

Computer memories recall radiation dose

Several years ago, it was noticed that certain high-density computer-memory chips were generating inexplicable errors. Research eventually showed the cause to be alpha particles, ionizing radiation emitted by trace levels of uranium and thorium in the chips' packaging material. Now a Navy physicist reports on efforts to harness the alpha-sensitivity of these chips in designing digital monitors to measure human exposures to neutrons — an especially potent form of radiation.

As an uncharged form of radiation, neutrons interact weakly with most materials, including those meant to detect them. Yet accurate monitoring of human exposure to them is important since they can exert up to 10 or more times the biological damage of X-rays or gamma rays.

John L. Davis, now at the Naval Research Laboratory in Washington, D.C., worked on the new computer-memory-based neutron dosimeter while at the Naval Surface Weapons Center in Silver Spring, Md. In the August HEALTH PHYSICS he describes how it works.

Because fast neutrons, the type emitted by nuclear reactions, are particularly difficult to trap and measure, dosimeters first use a "moderator" — something containing hydrogen — to interact with them and "slow" them down. For most dosimeters, the hydrogen source is the body of the human wearing the dosimeter. Interactions cause neutrons to shed some energy; when they have slowed enough to become thermal, or low-energy, neutrons they can be captured by a converter element such as boron or lithium. Capture by the converter promptly causes the neutron to emit an alpha particle — which is where the computer chip comes into play.

In a dynamic random-access memory (D-RAM) computer chip, "an individual memory cell consists of, among other things, small capacitors which are either charged or uncharged," Davis explains. This is how the memory stores information — as zeros and ones, represented in the chip by the presence or absence of charge.

But an alpha particle passing through silicon can discharge a capacitor. Davis says the trick is to see that each memory cell starts out filled with just enough charge so that an alpha-generated discharge event will essentially empty it. Then, when the chip's circuitry monitors its capacitors, any cell reading empty represents an alpha interaction. How many occur will correspond to the neutron dose received by the wearer.

In the Navy experiments, some chips proved to be more immune to alpha discharge, suggesting that oxide coatings made these chips more radiation resistant. Any commercial dosimeter would therefore require chips specially designed without these coatings.

Under Navy contract, Radiation Monitoring Devices of Watertown, Mass., is investigating the commercial potential for these devices. Frank Sinclair, a physicist with the firm, says that unlike existing neutron dosimeters, this one would allow instant and digital readout of dose.

— J. Raloff

Quake shakes China

A magnitude 7.5 earthquake struck western China near the Sino-Soviet border on Aug. 23, reportedly killing 60 people and leaving 16,000 homeless. According to the U.S. Geological Survey (USGS), the quake was centered about 80 miles north of Kashi in the Tien Shan Mountains and was the second-largest quake this year. The year's strongest earthquake, registering 7.8 on the Richter scale, occurred off the coast of central Chile on March 3. The USGS reports that there were at least 25 earthquakes with magnitudes 6.5 or greater in the first eight months of 1985 — a pace comparable to that in 1984. □