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Jelly and Silly -- The Air Sniffers

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Jelly and Silly -- the air sniffers

--- U.D. students majoring in physics are doing research of social significance: checking Dayton's atmosphere for radioactivity and for the presence of microscopic pieces of metal floating in the city's air from industrial effluent.

It was inevitable that the two new pieces of sophisticated equipment in Dr. "Rick" Cothern's physics lab would be dubbed "jelly and silly." One is an instrument that uses germanium and lithium, whose chemical symbols are Ge and Li Ge(li). So to the students it naturally became "jelly".

The other uses silicon and lithium Si(Li) so of course it was dubbed Silly.

The two instruments and their associated equipment were acquired by Dr. Cothern primarily for nuclear research with the help of a $20,000 grant from the National Science Foundation and a $4,300 grant from the Research Corporation. Both instruments are similar in function.

Silly--the silicon device--is used in a new approach developed by Dr. Cothern to detect metallic contamination of the air from industrial waste products.

To collect atmospheric samples for analysis, student Tom Dittrich rigged up a vacuum sweeper-like device to suck in air against a piece of filter paper. Placed on the roof of UD's Sherman Hall, the air sampler changes the bright white filter paper to nearly jet black in 24 hours.

Then the blackened filter paper is analyzed by Silly--actually a nuclear spectroscope--to see what metals have been trapped on its surface.

No one was surprised to find microscopic particles of airborne lead showing up on the spectrum. Lead is used as an anti-knock component in gasoline and is spewed into the air from car exhausts.

But other metals were also present--copper, tin and cadmium. Although not conclusively identified, there is also a suspicion of iron. Most puzzling of all, however, was the appearance of the spectrum of indium, classified in chemistry texts as a rare earth. Why such a rarity should be present in the atmosphere of Dayton, Ohio, is a mystery.

Are these metallic particles dangerous to health?

Dr. Cothern is at present unable to answer that one. His student-assisted studies have not yet reached the point where the amount of the metallic contaminents has been determined.

When this data is eventually established the results will be submitted to the National Institute of Health. Only then will it be known whether the level of metallic contaminents is high enough to be injurious.

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Both Jelly and Silly have also been used to measure the level of local atmospheric radioactivity. Again, students participate by operating the instruments and maintaining records. The Atomic Energy Commission has given its blessing to this kind of atmospheric monitoring and hopes to establish a network of similar stations throughout the country.

P.S. For the Technically Minded

Dr. Cothern's method of detecting microscopic metallic particles in the air is a pioneering effort which he and his students are still refining. The sketch shows the basic method: a radioactive source--in this case promethium--emits gamma rays to the filter paper containing the trapped metals. Gamma rays knock off electrons of the metallic molecules on the filter paper, producing a spectroscopic X-ray pattern that is analyzed by the X-ray spectrometer (Silly).

The radio active material, promethium, used in this procedure is heavily shielded by lead to safeguard the operators against radiation hazards.

Liquid nitrogen is used to cool the detecting element in the spectrometer to 350 degrees below zero F. This is necessary because the silicon is "drifted" with just a trace of lithium, and the combination is so delicate that extreme cold is necessary to maintain its stability. The temp is only 110 degrees from absolute zero, (-459.7 F) the coldest temperature that can be registered on a thermometer and the temperature at which all atomic motion literally freezes.

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