particularly the sulfur dioxide, emitted from the stacks of industrial plants. One promising solution to this problem is a radioisotope substitution method. In the mercury substitution—nucleonic detection method, sulfur dioxide reacts stoichiometrically with insoluble mercurous chloride to produce soluble bisulfito-mercurate ions. The concentration of mercury can be determined by X-ray absorption spectroscopy, perhaps using low-energy X rays emitted by cadmium-109 or molybdenum X rays excited by americium-241. This process will indicate the concentration of sulfur dioxide.

Systems studies and working-design concepts have indicated that an instrument for stack-gas monitoring would be capable of stable, reliable measurement of sulfur dioxide to about 10% accuracy in the 100 to 4000 parts per million range with a response time of about 10 minutes. Field testing of a working model is being conducted this year, and, if the results are favorable, prototype units will be developed for extended testing.

Sulfur compounds emitted from industrial facilities are among the most damaging of atmospheric pollutants. In many metropolitan areas there are so many sources of sulfur pollutants that there is no way to determine which among them are the chief contributors. The AEC is now working with the National Air Pollution Control Administration to adapt radioisotope techniques to trace atmospheric sulfur compounds from their origin to their ultimate fate in the environment. The "isotope ratio tracer" uses nonradioactive isotopes to chart the origin of specific pollutants in an industrialized area. It should make possible new experiments on some of the major meteorological problems of sulfur oxides released into the air over large metropolitan areas.

This method is based on the marked variation from one fossil fuel to another in the ratio of sulfur-32 to sulfur-34. Measured ratios are expressed in "per mil" units, or parts per thousand, as either higher or lower in sulfur-34 than the standard of meteoritic sulfur. An isotope-ratio mass spectrometer now in use can achieve a precision of measurement such that about 1 part of fuel sulfur in the atmosphere can be detected in 50 parts of background sulfur.

This process is undergoing extensive testing in New Haven, Conn., with the cooperation of the local power company. The tests are being conducted over 24-hour periods at different times of the year to establish seasonal and diurnal variations in the background. For a similar program in New York City, a "tall-stack" power plant on