U.S. Geological Survey Fact Sheet

Robots in the geochemical laboratory

Geochemical studies often generate large quantities of samples to be analyzed in the laboratory. Although technological advances have produced vast improvements in analytical measurements and data reduction, the manual preparation of samples has remained a time-consuming problem. As a result, one of the most rapidly growing areas in laboratory automation is the use of robotics for sample preparation.
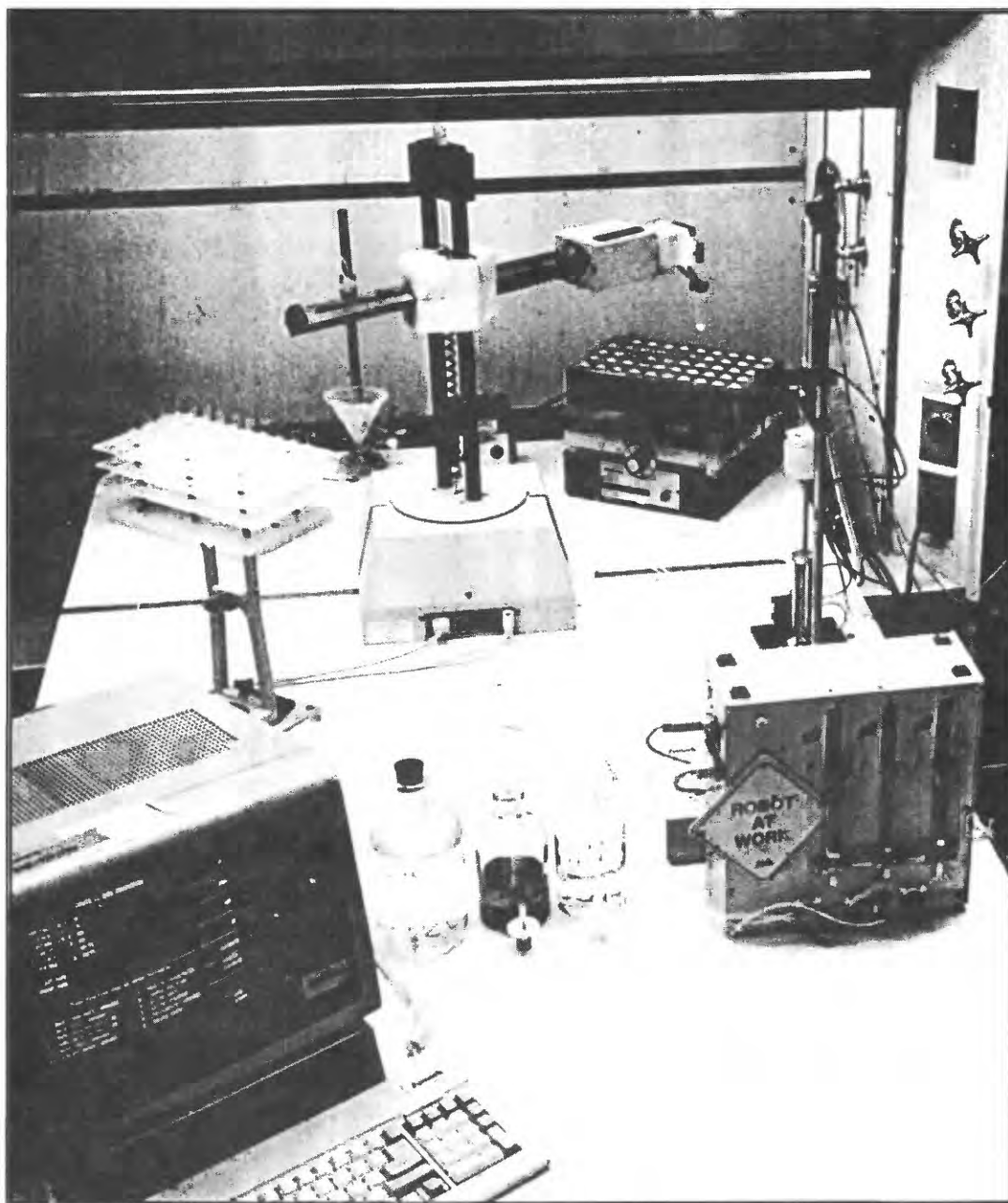
Laboratory robot prepares samples for geochemical analyses.
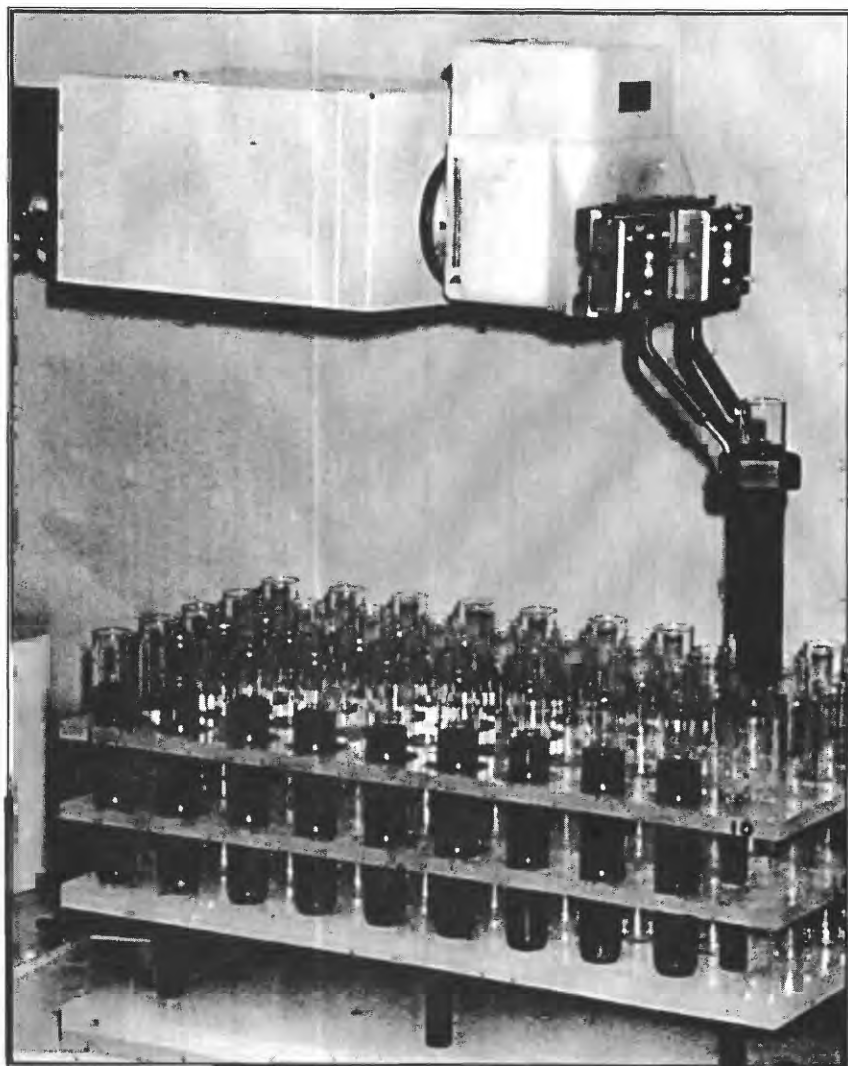
Similar to a laboratory technician, a robot has an arm, hand, and fingers. The arm moves in and out and up and down and rotates 360°.

There are several advantages to the use of robotics. Robots generally increase productivity two to three times. Because sample preparation usually requires the use of hazardous chemicals, the robot minimizes human exposure to these chemicals. By delegating the repetitive applications to the robot, the technician is available to assume greater responsibilities. Finally, robots provide consistency in sample preparation and improve the precision of the data.

In U.S. Geological Survey laboratories, robotics has been applied to a range of techniques including the grinding of soil and sediment samples to a fine powder, the digesting of powdered samples with mineral acids prior to instrumental analysis such as atomic absorption spectroscopy and atomic emission spectroscopy, and the weighing of fusion fluxes used in X-ray fluorescence.

The USGS has realized the following benefits from laboratory robotics. Robotics has provided a means to increase the productivity of laboratory people; it has increased the capacity, or output, of our facility; and most importantly, the use of robots has increased the quality of our sample preparation. ❑

A laboratory robot generally consists of an arm, a hand, and a pair of fingers. These components are programmed to duplicate the sample preparation usually performed by a laboratory technician. The centrally positioned robot moves samples in and out of laboratory work stations. Each work station performs a specific function, such as dispensing acids, mixing, heating, centrifuging, filtering, and weighing.

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