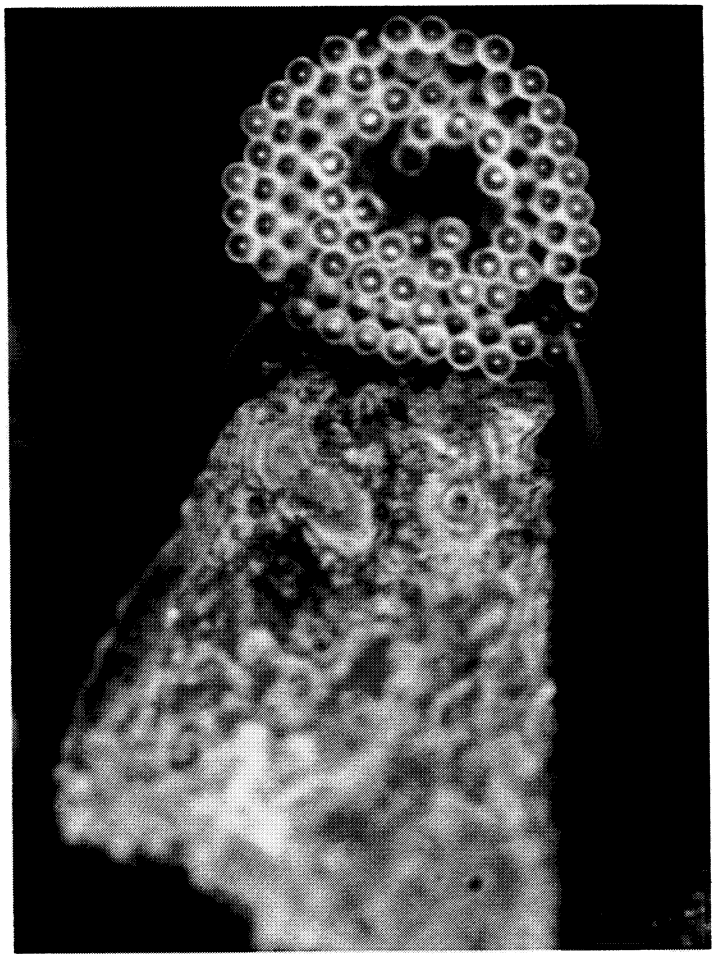
Particle Sizer

At right is a batch of microspheres, tiny plastic beads that represent the first commercial products manufactured in orbit. Part of a production run of millions of spheres made during four 1982-84 Space Shuttle flights, the beads are all perfect spheres and all of identical diameter because they were produced in the absence of gravity. Thus, they serve an important need among research and industrial laboratories as a reference standard for calibrating instruments with extreme accuracy. They are being sold for a number of applications in environmental control, medical research and manufacturing operations where there is a requirement for precise measurement of microscopic particles.

An example of how they are used is a new Aerodynamic Particle Sizer® designated APS 33B, produced by TSI Incorporated, St. Paul, Minnesota, which took the accompanying photo in a laboratory environment. TSI purchased the microspheres from the National Bureau of Standards, which certified their exact size, and the company uses them in calibration of the APS 33B instrument, latest in a line of TSI systems for generating, counting and weighing minute particles of submicron size. Such instruments are used for evaluating air pollution control devices, quantifying environments, meteorological research, testing filters, inhalation toxicology and other areas where generation or analysis of small airborne particles is required.

The APS Sensor operates on the basic principle of physics that if one can measure the speed of an accelerating particle in a known flow field, one can measure the particle's true aerodynamic size. Aerodynamic size is important in all the aforementioned applications because particles of equal aerodynamic diameter share similar characteristics; for example, they have similar probabilities of penetrating a filter, they have similar airborne lifetimes or, in medicine, they tend to deposit in similar locations of the human respiratory system. While there are other ways of sizing particles, TSI claims that the APS 33B instrument offers faster, more precise and more comprehensive measurement.

The instrument draws particles through a flow nozzle, producing a precisely-controlled, accelerating high-speed jet of air. Particle velocity is measured by a laser velocimeter. The velocity within the flow field remains constant—therefore, when particles accelerate at



varying rates, it is due to size difference: small particles accelerate more rapidly, large particles more slowly. The system measures the time it takes a particle to pass through two laser beams; computer analysis of the time interval indicates the velocity of the particle under study—hence its aerodynamic size. ▲

® Aerodynamic Particle Sizer is a registered trademark of TSI Incorporated.