EDITORIAL

Analytical Chemistry: The Science of Chemical Measurements

ANALYTICAL CHEMISTRY prospers because it continues to evolve and change. Let's look at a little history. In the first half of this century (roughly), analytical chemists were concerned with forms of chemical reactivity that could produce qualitative identifications and quantitative determinations of elements, functional groups, and molecules. In the second half of the century, the use of chemical reactivity has been supplemented by chemical transducers that elicit electrical and optical signals reflecting chemical composition and by increasingly clever strategies to separate complex mixtures.

Attendant to the introduction of chemical transducers and separation columns came the science of designing instrument systems for control and measurement. The adoption in the 1950s of a course in our educational apparatus explicitly called "instrumental analysis" indelibly labeled, and nurtured, this subject.

The instrumental evolution of analytical chemistry continues today, and at high speed, and it is yielding a capacity for separation and measurement of chemical composition on scales of complexity and sensitivity that are literally breathtaking. Instrumental analysis is opening many doors to scientific progress, in support of both traditional core areas of chemistry and new ones like biotechnology, materials chemistry, environmental chemistry, chemical toxicology, and small domain chemistry. These are historical facts in which analytical chemists can take justified pride.

A third evolutionary form of analytical chemistry began some time ago, but because of its increasing incidence it deserves explicit recognition and mention in this JOURNAL since it has to do with what analytical chemistry is and consequently with the scope of the JOURNAL's intellectual turf. The intense research activity in instrumental analysis has evoked much more than a superb capacity for measurements of chemical composition. Analytical chemists have become very good at devising ways to measure all sorts of other things. The users of analytical instruments increasingly are exploiting their inventiveness as chemical measurers to learn to measure and investigate diverse phenomena that range across molecular and supramolecular structures in bulk and at surfaces, homogeneous and heterogeneous chemical reaction rates, excited-state lifetimes, transport rates in solids and membranes, molecular weight distributions, and receptor site specificity, to name just a few. Many workers in different subdisciplines actually contribute in depth to these activities, but collectively they can all be regarded as "measurements of chemical systems."

This editorial is to suggest that it is useful and appropriate to think about analytical chemistry in an expansive way. Its evolution has made it today the science of inventing and applying the concepts, principles, and instrumental strategies for measuring the characteristics of chemical systems and species. Analytical chemistry needs to appreciate the breadth of its intellectual horizon, and how fertile are its pastures of exploration, to exploit its opportunities to play a full role in the advancement of scientific knowledge.