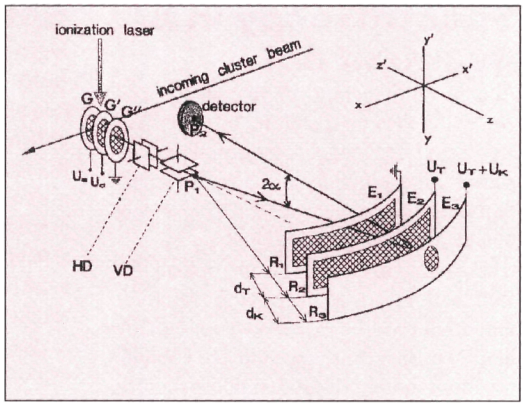
Cylindrical reflectron TOF-MS

Time-of-flight (TOF) mass spectrometry offers a convenient means for analyzing the mass distribution of clusters generated, for example, by a laser vaporization source. Two different TOF geometries are available—in line with the cluster beam or perpendicular to it. In-line arrangements analyze all the ions whatever their size, but the initial velocity is poorly determined. On the other hand, the perpendicular geometry provides the initial conditions of position and velocity, but the mass range may be limited.

In this paper, J. L. Vialle and colleagues at Université Lyon I et CNRS (France) described a new reflectron TOF-MS with a two-field cylindrical electrostatic mirror instead of the usual two-field plane reflector. The system is mounted perpendicular to the incoming molecular beam and automatically compensates for the transverse drift of the ions. As a result, ions of any mass can be collected onto the detector, regardless of their initial transverse velocity. The authors reported a mass resolution of about 4000 in the mass spectrum of laser photoionized aluminum clusters. (*Rev. Sci. Instrum.* **1997**, *68*, 2312–18)



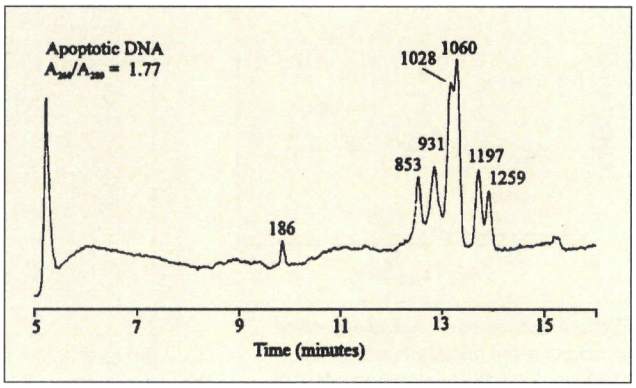
Schematic of the cylindrical reflectron mass spectrometer; VD and HD are electrostatic deflectors. (Adapted with permission. Copyright 1997 American Institute of Physics.)

Death of a cell

Understanding natural or externally induced cellular destruction and subsequent DNA fragmentation may lead to a better understanding of cellular function, survival rates of various cell lines, and embryonic development and metamorphosis. Understanding apoptosis, a natural form of programmed cell death, may have therapeutic implications in controlling degenerative diseases. Barbara A. Siles and colleagues at the National Institute of Standards and Technology and Trevigen Inc. reported on CE with a size-sieving polymer solution for monitoring DNA fragments produced from various degradation processes.

The researchers measured metabolic DNA fragmentation by analyzing the DNA extracted from ^{60}Co γ-irradiated ML-1 human leukemia cells and human lymphoblastoid nuclei that had been treated with the DNA cleavage enzyme micrococcal nuclease. Radiation-induced changes to a linear array of DNA fragments were also monitored and produced by exposing two commercially available standards, the 1 kbp ladder and the *Hae III* digest of ΦX174, to ^{60}Co γ-rays.

The polymer solution provided high run-to-run migration time and peak width reproducibilities and high separation efficiency of double-stranded DNA fragments in the 500–7000 base pair range. For the human cells, generation of the nonrandom fragmentation patterns depended on the cell type and method of apoptotic induction, which suggests the presence of multiple mononucleosomal fragment sizes in each instance. For the irradiated standards, specific and random subpopulations were observed as a function of time and radiation dosage. Peak-width-at-half-height was used to determine the presence of various DNA fragment alterations. Peak areas were used to quantify the up-to-74% loss of DNA, supposedly caused by irradiation. (*J. Chromatogr. A* **1997**, *771*, 319–29)



Electrophoretic separation of DNA fragments isolated from ML-1 tissue culture cells exposed to γ-radiation. (Adapted with permission. Copyright 1997 Elsevier Science.)

pH—Still to be defined

IUPAC is looking for a few good labs. The IUPAC Commission on Electroanalytical Chemistry (V.5) is proposing new work toward the preparation of a unified pH scale. As a result, the commission plans to launch an extensive program of experimental work on pH standard buffers and is enlisting the cooperation of "suitably equipped laboratories worldwide to make extensive emf measurements of Harned cells with buffer substance components over a wide temperature range to derive the necessary information."

The goal is a "scientifically sounder assumption for activity coefficients in mixed electrolytes . . . that will lead to the best possible definition of pH." The commission hopes that with the new data "known standard buffers, with or without background electrolyte, can be assigned calculated pH values on the unified pH scale." For more information or to volunteer to collect emf data, contact Arthur Covington, University of Newcastle upon Tyne (U.K.); fax 44-191-222-6929; a.k.covington@newcastle.ac.uk.

IUPAC has also formed a working party that will reconsider the 1985 IUPAC recommendations and provide a forum for discussion on the validity of the newer scientific assumptions for activity coefficients in mixed electrolytes. Recommendations for the working party should be sent to Sandra Rondinini-Cavallari, University of Milan (Italy); fax 39(2)706-38129; vertova@imicilea.cilea.it.