Department of Chemistry Seminar

“Grand Challenges in Mass Spectrometry”

Three major challenges for molecular mass spectrometry are presented and it is argued that each of these is achievable on a five-year time scale. These objectives are:

1. **Future mass spectrometers will see routine use in surgical diagnosis and clinical point-of-care applications.** There is already considerable progress towards ambient ionization for tissue diagnostics using complex lipid profiles, especially in brain cancer. [1] Applications in clinical POC are emerging rapidly. [2] Both types of applications call for small, portable instruments. [3]

2. **Future mass spectrometers will operate at atmospheric pressure.** Ambient ionization, [4] ambient ion focusing, [5] and ambient ion detection [6] are already established. The ability to make mass/charge measurements without vacuum is still to be realized.

3. **Future mass spectrometers will find routine use in organic and nanomaterial synthesis.** Preparative mass spectrometry is already used to modify surfaces through the method of ion soft landing. [7] More recently electrolytic spray from an inert solvent has been shown to be a method of creating nanomaterials [8] while the remarkable acceleration of chemical reactions in microdroplets [9] has been used to synthesize organic compounds on the mg scale.

**References:**
[9] Li, Yafeng; Yan, Xin; Cooks, R. Graham Angew.Chem. Int. Ed. 55 3433-3437 (2016)

**Keywords:** Ambient mass spectrometry; molecular diagnostics; accelerated droplet reactions; preparative mass spectrometry

**BIO:**

**R. Graham Cooks** was educated at Port Shepstone High School and then at the University of Natal, Pietermaritzburg, where he obtained a B.Sc. in chemistry and mathematics. He earned B. Sc. (Hons), M. Sc. and Ph. D. in chemistry from Natal for research in natural products chemistry working Prof. Frank L. Warren. He was awarded an Elsie Ballot scholarship to Cambridge and obtained a Ph. D. (Cantab.) for work on reactions of sulfur compounds under the direction of Dr. Peter Sykes in 1967. After post-doctoral work with Dr Dudley Williams at Cambridge he took a position as Assistant Professor at Kansas State University. He moved to Purdue University in 1971 where he was promoted to Professor of Chemistry in 1980 and Henry Bohn Hass Distinguished Professor in 1990. He has served as major professor to 133 Ph. D. students. He has held visiting positions at the Indian Institute of Technology, Madras, Tsinghua University and the University of Warwick amongst other institutions. Cooks has been recognized with the Mass Spectrometry and the Analytical Chemistry awards of the American Chemical Society, the Robert Boyle Medal and the Centennial Prize of the Royal Society of Chemistry, and the Camille & Henry Dreyfus Prize in the Chemical Sciences. He is an elected fellow of the American Academy of Arts and Sciences, the Academy of Inventors and the US National Academy of Sciences.

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**Tuesday, November 1, 2016**

SEH B1220
2:00 - 3:00 p.m.
Refreshments will be served at 1:45 p.m.