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# Department of Chemistry Kolthoff Lectureship in Chemistry

## February 18-21, 2013 Professor Mary Wirth Purdue University

Website:  
<http://www.chem.purdue.edu/people/faculty/faculty.asp?itemID=87>

Faculty Host: Philippe Buhlmann

Mary J. Wirth is the W. Brooks Fortune Distinguished Professor in the Department of Chemistry at Purdue University. She is a native of Joliet, IL. She received her bachelor's degree in 1974 from Northern Illinois University, where she did undergraduate research under the direction of Alfred A. Schilt. She earned her doctorate in 1978 from Purdue University, working under the direction of Fred E. Lytle.



She was on the chemistry faculties at the Universities of Wisconsin-Madison, Delaware, and Arizona, and she also spent two years working at Lawrence Livermore National Laboratory.

Wirth's interests span the fields of bioanalytical chemistry and materials science. Her research has been recognized by national awards that include the ACS Analytical Division Award in Spectrochemical Analysis, the EAS Gold Medal Award in spectroscopy, the ANACHEM Award, and the EAS Award for Outstanding Achievements in the Fields of Analytical Chemistry. She is a Fellow of the Society of Applied Spectroscopy and a Fellow of AAAS. She is a founding member of the Advisory Board for COACH, which provides workshops for women all around the world who aspire to academic careers in science and engineering.

### Lecture 3:

### *Protein Separations Using Colloidal Silica: Miniaturized Electrophoresis and Isoelectric Focusing*

**9:45 a.m. Thursday, February 21  
331 Smith Hall**

The workhorse of protein electrophoresis and isoelectric focusing has been the polyacrylamide gel for over forty years, but by today's standards the separations are too slow and low in resolution. The main problems are gel uniformity and thermally induced broadening. Silica colloidal crystals behave as if they are a uniform polyacrylamide gel when the surfaces of the silica particles are coated with a brush layer of polyacrylamide. Electrophoresis sieving of proteins occurs over shorter distances by virtue of the uniformity and thermal conductivity of the separation medium. Isoelectric focusing can be extremely miniaturized, down to distances compatible with 96-well plate technology, without loss of resolution. The glycoforms of prostate specific antigen, which comprise a new biomarker candidate for prostate cancer, are more resolved in only a 5-mm length of this material than they are in a 100-mm long commercial gel strip. The prospects for using this technology to replace polyacrylamide gels are discussed.

**Izaak Maurits Kolthoff** was born on February 11, 1894, in Almelo, Holland. He died on March 4, 1993, in St. Paul, Minnesota. In 1911, he entered the University of Utrecht, Holland. He published his first paper on acid titrations in 1915. On the basis of his world-renowned reputation, he was invited to join the faculty of the University of Minnesota's Department of Chemistry in 1927. By the time of his retirement from the University in 1962, he had published approximately 800 papers. He continued to publish approximately 150 more papers until his health failed. His research, covering approximately a dozen areas of chemistry, was recognized by many medals and memberships in learned societies throughout the world, including the National Academy of Sciences and the Nichols Medal of the American Chemical Society. Best known to the general public is his work on synthetic rubber. During World War II, the government established a comprehensive research program at major industrial companies and several universities, including Minnesota. Kolthoff quickly assembled a large research group and made major contributions to the program. Many of Kolthoff's graduate students went on to successful careers in industry and academic life and, in turn, trained many more. In 1982, it was estimated that approximately 1,100 Ph.D. holders could trace their scientific roots to Kolthoff. In 1983, he received the American Chemical Society Division of Analytical Chemistry inaugural Award for Excellence in Teaching.

