

February Meeting of ANACHEM/ SAS and Detroit Section, ACS

- Topic:** Electrochemical and Optical Anion/Gas Sensors Using Metalloporphyrins in Thin Polymeric Films
- Speaker:** Mark E. Meyerhoff, Department of Chemistry, The University of Michigan
- Location:** Ford Research Innovative Center (Previously the SRL Lab, see page 6, top for map)
- Date:** February 22, 2006
- Time:** 6:00PM

While a wide range of cation selective electrochemical (potentiometric ion-selective electrodes) and optical sensors have been developed successfully over the past 35 years using appropriate cation binding ionophores within thin polymeric membranes/films, the design of analogous anion selective sensors has been far more difficult. Recent efforts in this laboratory have shown that polymeric films doped with given metalloporphyrin species can exhibit enhanced electrochemical response toward certain anions, depending on the nature of the metal ion center of the porphyrin complex, and the surrounding peripheral structure of the porphyrin ligand. Selectivity for one anion over others is dependent on the relative equilibrium constants for anion axial ligation to the central metal ion of the metalloporphyrin structure. Interestingly, the potentiometric anion response of polymer membranes doped with In(III), Sn(IV), Ga(III), Zr(IV), and Al(III) porphyrins often exhibit unusual super-Nernstian behavior toward target anions that bind favorably with the metal ion center (e.g., chloride (In(III)), salicylate (Sn(IV)), fluoride (Ga(III), Zr(IV) and Al(III))). This behavior has been traced to a spontaneous metalloporphyrin dimer-monomer equilibrium reaction that occurs within the organic polymer phases of such electrochemical sensors. The dimer-monomer chemistry also yields a significant absorbance change of the polymer films when metalloporphyrin dimers are reversibly converted into corresponding monomers (or dimers) upon exposure of the films to anions or and even certain neutral gases species that bind as axial ligands to the given metalloporphyrin structure. For example, analytically useful optical sensors for

(Continued from page 1)

chloride (1) and gas phase amine (2) species (at < ppm levels) can be developed using In(III) porphyrins within thin polymer films. Al(III) and Zr(IV) porphyrins can be employed to develop both electrochemical and optical fluoride ion sensors, with the Al(III) system yielding especially high selectivity and sensitivity for monitoring fluoride levels in municipal drinking water (3). The response times of optical sensors can be enhanced significantly by employing ultra-thin films containing the metalloporphyrin species on optical waveguides. Further, it will be shown that the response properties of the electrochemical anion sensors based on metalloporphyrin species can be improved to yield Nernstian response by preventing any dimer-monomer chemistry in the polymer films. This can be achieved by covalent immobilization of the metalloporphyrin to the polymer, or use of picket-fence type structures that sterically prevent formation of dimeric metalloporphyrin species.

[1] Zhang, W. et al. *Anal. Chem.* **2002**, *74*, 4548-4557.

[2] Qin, W. et al. *Anal. Chem.* **2003**, *75*, 332-340.

[3] Badr, I. et al. *Anal. Chem.* **2005**, *77*, 6719-6728.

Biographical Sketch: Mark E. Meyerhoff is currently Philip J. Elving Professor of Chemistry in the Department of Chemistry at the University of Michigan, Ann Arbor. He received his Ph.D. from the State University of New York at Buffalo in 1979, working with Professor Garry A. Rechnitz. Following a short post-doctoral stint at the University of Delaware, he joined the faculty at Michigan as an Assistant Professor in the Fall of 1979. He was promoted to associate professor in 1985, and to full professor in 1990.

Professor Meyerhoff's primary **research** interests are in the field of analytical chemistry, particularly the development of new ion-, gas-, and bio-selective electrochemical sensors suitable for direct measurements of clinically important analytes in physiological samples. Currently, he also has active research programs in the areas of novel non-separation electrochemical immunoassay methods, immobilized metalloporphyrin stationary phases for liquid chromatography, and the development and characterization of novel nitric oxide (NO) releasing polymeric materials for biomedical applications. He and his collaborators have authored more than 270 original research papers on these various topics over the past 26 years.

Professor **Meyerhoff** received the University of Michigan's Faculty Recognition Award in 1990, was elected as a Fellow by the National Academy of Clinical Biochemistry in 2002, received the ACS-Division of Analytical Chemistry Award in Electrochemistry in 2003, and the Society for Electroanalytical Chemistry's Reilley Award in 2006. He currently serves on the editorial/advisory boards of *Analytical Chemistry*, *Clinical Chemistry*, *Biosensors & Bioelectronics*, *Electroanalysis*, *Analytica Chimica Acta*, and *Applied Biochemistry and Biotechnology*. He is also active as a consultant and/or is on the Scientific Advisory Boards of several biomedical companies.

Members of the Detroit Section,

Thank you to everyone who voted in our last section election, and thank you very much for placing your trust in me, to be your chairman for 2006. It is truly an honor.

Be Proud of Your Section

You can be very proud of the Detroit Section of the ACS, and of the people who volunteer their time to make each of the events happen. We have an award winning Kids and Chemistry group, an excellent Careers committee, a busy Education committee, a dedicated group of folks who run our National Chemistry Olympiad, a tremendous National Chemistry Week program, and several programs that involve members of our WCC, YCC, and Programming Committees. The people who work on all these committees as well as those I haven't mentioned should be very proud of what they do, and would all probably say they will happily take the help and suggestions of other members who want to get involved in the section.

Speaking of getting involved, is one of your New Year's Resolutions to get involved in some activity in your community? If so – or even if the thought just occurred to you – think about your ACS section. Those of us who are running various aspects of it are all believers that the more people we have who volunteer, the less each person has to do. We are all busy, whether it is home, kids at school, or your job. But if you'd like to make a difference in a positive way, meet some new friends, network, and in general have a good time, see what your section has to offer. Our meetings are generally the second Tuesday of each month (excluding the summer), at the PEC building, room 1310, of the University of Michigan – Dearborn. We'd love to see you there.

What do you want?

One of the eternal questions of any organization made up of volunteers, such as our Detroit Section, is, what do the members want? We're good, but we're not mind readers. We are putting together a program this year that will most likely involve bringing in speakers, a presence at the Detroit Taste Fest, activities at the Cranbrook Science Center and Detroit Science Center for National Chemistry Week, interaction with our state and federal elected officials, and others. But we need to know what you want. Send me an e-mail with any ideas, at: benvenma@udmercy.edu. I'm happy to hear from any and all members.

Help us to help you. Your membership in the ACS should be more than just 51 issues of C&EN. The people of our local section represent a lot of talent, brain power, and ability. Let's work together to make 2006 a year to remember.

Mark Benvenuto

Call for Nominees: Salutes to Excellence

Each year the Detroit Section of the ACS presents Salutes to Excellence Awards to its members. Currently the Executive Committee is soliciting nominations for this award. In case you are not aware of the program, Salutes to Excellence is an award program that gives ACS members an opportunity to recognize the positive impact on everyday life made by a product of chemistry, a practitioner of chemistry, or a place of importance in chemistry. Therefore, if you know of someone who deserves to be recognized for his or her hard work, please send in the nomination. The nominee can also be an institution as well. For example, ABC Chemical Company was very involved in your local school district. As a result of their commitment, your students' interest in science increased.

Since the program was first unveiled in 2000 by the ACS Office of Community Activities (OCA) more than 251 honorees nationwide have received *Salutes to Excellence* recognition.

A central part of the event is the presentation of a commemorative plaque, furnished by OCA, for the honoree(s) for the chemistry achievement being honored. Each year the award is presented at the CIC meeting in May. The honoree(s) and their guest(s) will be invited to the awards banquet compliments of the Detroit Section.

If you have any questions on the criteria of the award, please contact Mary Kay Heidtke, Recognition Chair for the Detroit Section. Her e-mail address is:

mkheidtke@aol.com

Please submit your nominee(s) name along with a short paragraph describing why they should receive the award. This information can be submitted to Mary Kay at the address above. Please be sure to include your name and contact information in the e-mail. **Please submit your nominations by March 1, 2006.**

2006 DETROIT METRO SCIENCE FAIR

The 2006 Metro Science Fair will be held March 7-11 in Detroit's Cobo Hall in downtown Detroit. Exhibit Judging will begin at 8:30 am on Wednesday, March 8th. The Section Safety and Environmental Committee will again be judging in the Professional Senior Division of the Fair. As in prior years, only projects dealing with the combination of the environment and chemistry will be judged by the Committee. Judging will be completed by noon or shortly thereafter. If you would like to help with the judging contact Peter Warner 313-821-6021 or Ed Havlena at 313-393-3685. More about this program can be found at www.detroitsection-acis.org under Section awards/science fair awards

March Meeting of the Detroit Section, ACS

Topic: Job Fit and Career Planning

Speaker: Carole DePetro

Location: Livonia Civic Center Library, Jenkin Room, 32777 Five Mile Rd, Livonia, MI 48154 (North of I-96, between Farmington and Merriman, see map on page 6, bottom)

Date: Wednesday, March 22, 2006

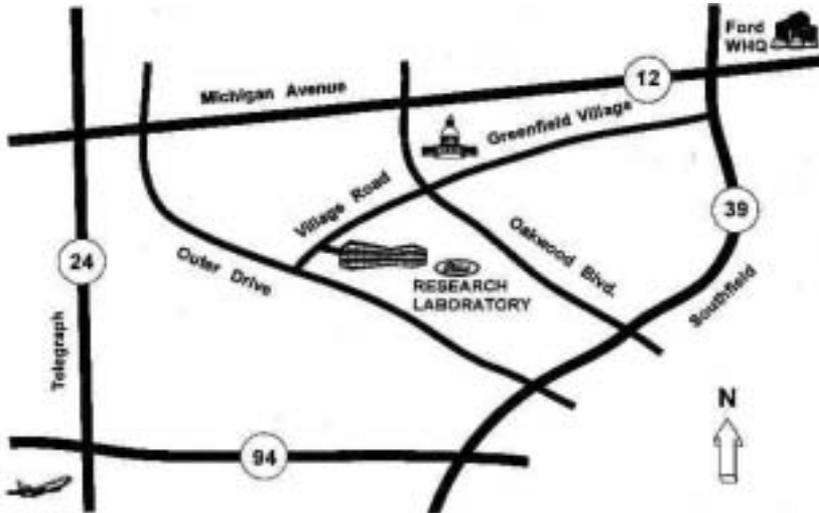
Time: 7:00PM

Do you need help figuring out the best direction for you or what to do in your retirement? If so, join this highly experimental, interactive presentation hosted by ACS Career Services. Presented by Carole DePetro, Career Counselor and Life Coach, this lecture will explore clues found in your personality, talents, and skills to help you gain tools to develop a clearer sense of where to utilize your skill set. Appropriate for people in all life phases.

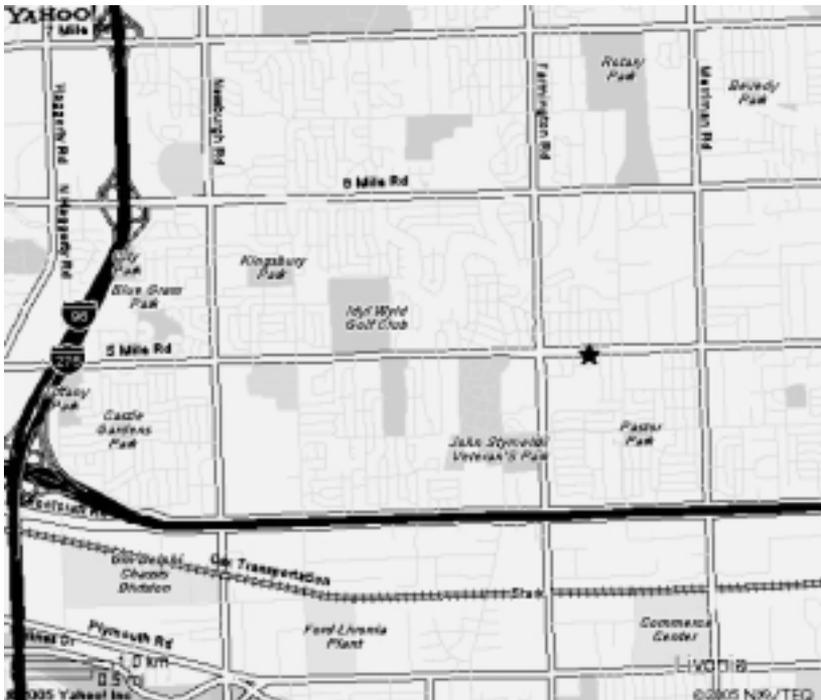
Ms. Petro has utilized her background in teaching to build on her business and psychology degrees. She often lectures on finding your mission in life, changing careers, identifying personality and temperament types, and creating the life you want.

If possible, please e-mail Megan Klein if you would like to attend at KleinMegan@comcast.net.

Map to February Meeting at Ford



Map to March Meeting at Livonia Library



Calendar of Upcoming Events

February 3, 2006 — RSVP Deadline for items 2 and 3 (*see below*)

February 11, 2006 — 15th Annual High School Chemistry Teachers In-Service Day *See January Chemist for details. RSVP to Matt Mio, Education Committee Chair by email miomj@udmercy.edu before Friday, 02/03/06*

February 11, 2006 — Tri-Sectional Meeting *See January Chemist for details. RSVP contact: Joseph A. Grappin at (419) 868-8812, email to: ja.grappin@sbcglobal.net before Friday, 02/03/06*

February 22, 2006 — ANACHEM Meeting: "Electrochemical and Optical AnIon/Gas Sensors Using Metalloporphyrins in Thin Polymeric Films". *See pages 1, 2 and 6 for details.*

March 1, 2006 — Deadline for Nominations for "Salutes to Excellence" Awards. *See page 4 for details.*

March 16, 2006—Local Section Exam for the US National Chemistry Olympiad, at the University of Michigan-Dearborn. Contact Mark DeCamp at (313) 593-5379 or mdecamp@umd.umich.edu.

March 7-11, 2006 — Detroit Science Fair. *See page 4 for details*

March 22, 2006 — Section Meeting: "Job Fit and Career Planning". *See pages 5 and 6 for details.*

March 26-30, 2006 — ACS Spring National Meeting, Atlanta, Ga

April Section Meeting: — "The Chemistry of a Bowling Ball". *See April Chemist for details.*

May 16-20, 2006 — Central Regional Meeting *See January Chemist for details.*

Detroit ACS Section and ANACHEM on the Web

A Website for the Detroit ACS Section and ANACHEM, maintained by Ed Havlena can be found at: <http://www.detroitsection-acs.org>

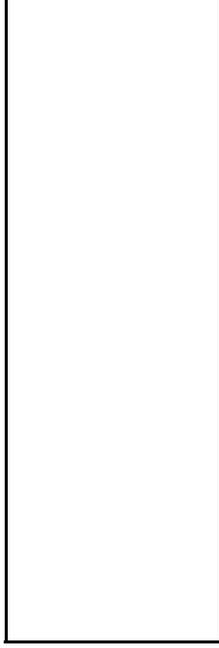
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Attn: Dated Material

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