



## Dinner Meeting, MMI Course Feature Dr. Roderic P. Quirk



*Professor Roderic P. Quirk, 2002 Turner Alfrey Visiting Professor at MMI, will speak at an SPE/ACS/AIChE dinner meeting and offer a course in April on "Frontiers in Anionic Polymerization," pages 2-4*

# THE MIDLAND CHEMIST

Volume 39, Number 2

March 2002

## *In this issue...*

Midland Section Chair Ready to Go! .....	1
MMI Announces Turner Alfrey Visiting Professor/Course .....	2
Professor Quirk to Discuss Anionic Polymerization at Dinner Meeting....	4
Call for Nominations: 2002 Diversity Award .....	6
Eleventh Annual Spring Science Education Recognition Dinner .....	7
New Chemistries: Chemical Sensors .....	8
Call for Nominations: 2002 Science Teaching and Education Volunteer Awards .....	11
ChemPuzzler: Do You Measure Up? .....	13
Important Dates on the ACS Midland Section Calendar .....	14

*The Midland Chemist* is published eight times a year by the Midland Section of the American Chemical Society.

American Chemical Society  
Midland Section  
PO Box 2695

Midland, MI 48641-2695  
<http://membership.acs.org/M/Midl>

### **Volunteer Staff**

Ann F. Birch ..... Editor  
989-832-7485  
[ann.birch@editech-mi.com](mailto:ann.birch@editech-mi.com)  
Dave Baker ..... Writer  
Kerry Pacholke ..... Advertising  
James R. Birch ..... Design, layout

Please submit all articles and photographs to the editor, Ann Birch. Instructions for article submission are on the Midland Section web site, as is contact information for other staff members. Authors can also contact Ann directly with any questions.

Neither *The Midland Chemist*, nor the Midland Section, nor the American Chemical Society assumes any responsibility for the statements and opinions advanced by contributors of or to *The Midland Chemist*.

© Copyright 2002 Midland Section of the American Chemical Society

## Midland Section Chair Ready to Go!

**F**inally, I'm here! Thanks to chair-elect, Mike Owen, for last month's column. In there, you heard about me dealing with a problem. That was a stroke I suffered last November, which took me out of work for about two months. By now, I'm back for a month (well, it will be one and a half) of half-time work, and by the time everyone reads this, I'll have been back to work full-time for two weeks. I'd like to thank everybody for their help, including George Eastland for conducting January's executive meeting.



Pat Cannady, Chair  
ACS Midland Section

Well, let's see. Here we are at the early part of the year, ready to go forward. Where to? How far? Just where will we go this year? Most of us are looking forward to a steady diet of getting through the year. To take a slightly realistic point of view, some of us may not be with the rest of us by the end of the year, due to cancellations of employment by an area employer. This is a fact of life that is just one of the many things we will have to deal with. To those, I give my heart-felt sorrow for your sorrow, or joy, as it may turn out to be. Times are tough, but we have to just keep going. Others of us are dealing with an economy that just pales in comparison to that of just a year or two ago. For another group of us, we will be taking our retirement, transitioning to a different, more relaxed position. Your years of toiling away will come to one end, yet there is more fight in some.

This is another year of exciting opportunities for members of the American Chemical Society and those of you with whom we share the flame of encounter. By the time this is published in early March, February will have passed us by. Hopefully, we will have entertained Larry Dahl, in his visit to Central Michigan University. "Symmetry and its Importance in Art and Science" was his intended topic, one that will entreat many.

As I look over the activities I helped in a small way to accomplish last year, and looking forward to an ever-increasing role this year, I must stop and give thanks to a bunch of you who year in and year out play your roles for the good of our society. You know who you are! You should feel good that your work goes noticed, and is felt by many.

Finally, let me take the final few moments to say "thank you" to everyone who has taken the time to stop by, to write, to just think to themselves, that I would recover. I'm working hard on it, I'm coming back! So don't worry (too much) for me.

*Pat Cannady*

## MMI Announces Turner Alfrey Visiting Professor/Course

by Steve Keinath

**P**rofessor Roderic P. Quirk, Kumho Professor and Distinguished Professor of Polymer Science, The University of Akron, is the 2002 Turner Alfrey Visiting Professor at Michigan Molecular Institute. Professor Quirk will offer a course on "Frontiers in Anionic Polymerization." Specific topics will include:

- Fundamental and general aspects of anionic polymerization
- Living polymerization
- Kinetics and mechanism of anionic polymerization
- Chain termination and chain transfer
- Diene polymerization
- Copolymerization
- Block and graft copolymers
- Star-branched polymers
- Chain-end functionalized polymers
- Polymerization of polar monomers
- Anionic ring-opening polymerization

### Course Details

**Course 1029:** Frontiers in Anionic Polymerization

**Lecturer:** Roderic P. Quirk, Kumho Professor and Distinguished Professor of Polymer Science, The University of Akron

**Location:** Lecture Hall (Room 101), Michigan Molecular Institute, 1910 West St. Andrews Road, Midland, MI 48640

**Time:** Formal lectures: Mon.–Fri., April 15–19, 3:00–6:00 p.m.

**Fee:** There is no fee for auditors if they belong to organizations participating in the Turner Alfrey Visiting Professor Pro-



**IMPACT ANALYTICAL:**  
MORE THAN A TESTING LAB - YOUR RESEARCH PARTNER

**Our specialty:** Using the best instruments and our collective years of staff experience to solve real-life, production-halting, career-threatening, boss-paricking problems. Quickly. Affordably. Authoritatively.

**BRING ON THE TOUGH PROBLEMS.**

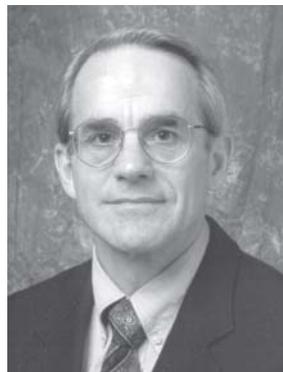
1910 W. St. Andrews Rd., Midland, MI 48640  
Phone: 989-832-5555 Fax: 989-832-5560  
info@impactanalytical.com www.impactanalytical.com

gram: Dow Chemical, Dow Corning, Saginaw Valley State University, Central Michigan University, Michigan State University, Midland Section ACS, and Mid-Michigan Section of the SPE. A course fee of \$250 will be required at registration for others. *All participants, however, must register.*

**Registration:** Preregistration is required one week in advance with the registrar by calling (989) 832-5555, ext. 555 or by e-mail at [registrar@mmi.org](mailto:registrar@mmi.org).

### ***Professor Roderic P. Quirk***

Professor Quirk, a native of Detroit, is a 1963 B.S. chemistry graduate of Rensselaer Polytechnic Institute (Troy, New York). He received his M.S. (1965) and Ph.D. (1967) degrees in organic chemistry at the University of Illinois (with Professor D.Y. Curtin), followed by two years of postdoctoral research with Professor E.M. Arnett at the University of Pittsburgh (Mellon Institute). He was a faculty member in the Chemistry Department at the University of Arkansas from 1969–1978. He joined the University of Akron as professor of polymer science in 1983 after five years as a senior research scientist at Midland Macromolecular Institute (now Michigan Molecular Institute).



His research interests are in synthetic organic polymer chemistry with an emphasis on anionic polymerization, chain-end functionalization reactions, group-transfer polymerization, transition-metal organometallic polymerization catalysts, and the synthesis of new block, cyclic, and branched polymers. He is the author of approximately 200 professional publications, including six books and eighteen patents.

He was awarded a fellowship from the Japanese Society for the Promotion of Science (1990) and was a visiting professor at the Tokyo Institute of Technology (1990), the Institut Charles Sadron, CNRS, Strasbourg, France (1991), and the Université Bordeaux, France (1998). In 1996, he was appointed Kumho Professor of Polymer Science and also Distinguished Professor of Polymer Science at The University of Akron. He served as chair of the Department of Polymer Science from 1995–1998.

Prof. Quirk is the co-recipient of the 2000 Cooperative Research Award of the ACS Division of Polymeric Materials, Science and Engineering. In 1995, he was honored by The University of Akron with the Outstanding Researcher Award. He was chairman of the Gordon Research Conference on Elastomers in 1995 and serves on the editorial advisory boards of four polymer journals.

## Professor Quirk to Discuss Anionic Polymerization at Dinner Meeting

by Steve Keinath

**D**r. Roderic P. Quirk, University of Akron, will be featured at a technical society dinner meeting sponsored by SPE, ACS, and AIChE on April 16. Dr. Quirk will be presenting "Anionic Polymerization: Development of a Science and a Technology." A social hour and dinner will precede the presentation.

**Abstract:** The use of sodium and potassium to polymerize isoprene dates back to the work of Matthews and Strange in England in 1910 and by Harries in Germany in 1911. The polymerization of butadiene by means of metallic sodium became the prime method for synthetic rubber production in Germany and the USSR during the 1920s. However, widespread academic interest and industrial development did not occur until two key discoveries were revealed almost simultaneously. In 1956, Szwarc and coworkers described the phenomenon of living polymerization. Also in 1956, Stavelly and coworkers at Firestone Tire and Rubber Company reported that lithium metal is capable of polymerizing isoprene to a very high *cis*-1,4-chain unit content, analogous to natural rubber. These were the key ingredients that led to the development of modern methods for the synthesis of well-defined polymers using alkyllithium-

# We're responsible . . .

In 1988, the American Chemistry Council (ACC) launched Responsible Care® to respond to public concerns about the manufacture and use of chemicals.

Through this initiative, Dow Corning Corporation and other ACC members and partners are committed to continually improving our responsible management of chemicals.

We're responsible because we care.

**DOW CORNING**



© 2001 Dow Corning Corporation. Dow Corning is a registered trademark of Dow Corning Corporation. Responsible Care is a registered service mark of the American Chemistry Council.

initiated anionic polymerization. Polymers with control of molecular weight, molecular weight distribution, comonomer content and distribution, molecular architecture, and supramolecular structure can now be routinely prepared. Worldwide commercial developments proceeded in parallel with the academic discoveries. Today, more than 20 major companies use anionic polymerization processes to produce a variety of useful materials. The range of products includes polybutadiene, styrene-butadiene rubber, tapered styrene-butadiene copolymers, polyisoprene, polystyrene-*block*-polydiene-*block*-polystyrene thermoplastic elastomers, polybutadiene liquid rubbers, clear impact-resistant polystyrenes and  $\alpha,\omega$ -difunctional polydienes. The development of anionic polymerization science and technology, the uniqueness of these polymerizations, and the properties of the corresponding polymers will be described.

**Presenter:** Professor Roderic P. Quirk, Kumho Professor and Distinguished Professor of Polymer Science, Maurice Morton Institute of Polymer Science, The University of Akron, and 2002 MMI Turner Alfrey Visiting Professor.

**Date:** Tuesday, April 16, 2002

**Time:** Social 6:00 p.m.  
Dinner 6:30 p.m.  
Program 7:30 p.m.

**Location:** NADA Center, Northwood University, 4000 Whiting Drive, Midland, MI 48640, 989-835-7755

**Cost:** \$23.00 for SPE, ACS, and AIChE members with reservations  
\$13.00 for SPE, ACS, and AIChE student members with reservations  
\$15.00 for other students with reservations  
\$25.00 for others or SPE, ACS, and AIChE members without reservations

**Reservations:** Reservations can be made via phone, fax, or e-mail to Randi Merrington at MMI. They must be received no later than Monday, April 8, 2002.  
Phone: 989-832-5555, ext. 555  
Fax: 989-832-5560  
E-mail: merringtonr@mmi.org

*Call for Nominations*

**2002 Diversity Award**

*By Phil Squatrito*

**T**his year, the Midland Section of the American Chemical Society will present the "Promotion of Diversity in Chemistry, Related Sciences and Engineering Award" for the first time. This award will be presented biannually to a person or group residing in Midland, Bay, Saginaw, Isabella, or Gratiot County for outstanding achievement in enhancing the participation of underrepresented groups in the study of chemistry, related sciences, and engineering. The inaugural award will be presented at the 2002 Science Education Recognition Dinner on April 24, 2002, at the Dow 47 Building Cafeteria in Midland.

Criteria for candidates for this award include teaching, mentoring, serving as a role model, and active and sustained participation in organizations that support diversity which have had a demonstrable impact on the promotion of diversity in chemistry, related sciences, and engineering. Members of the Midland Section Minority Affairs Committee are not eligible to receive this award.

Recipients of this award will be selected by the Midland Section Awards Committee. Nominators should write a letter describing the attributes of the candidate. Supporting letters from students, colleagues, supervisors, and community leaders are strongly encouraged. The deadline for nominations is March 22, 2002. Electronic and fax submissions are acceptable. All submissions must be accompanied by the name, position, address, and phone number of the nominator.

Please submit your nomination to:

Phillip J. Squatrito

Chair, ACS Awards Committee

Department of Chemistry

Central Michigan University

Mt. Pleasant, MI 48859

Phone: 989-774-4407; fax: 989-774-3883

p.squatrito@cmich.edu

# Eleventh Annual Spring Science Education Recognition Dinner

Wednesday, April 24, 2002

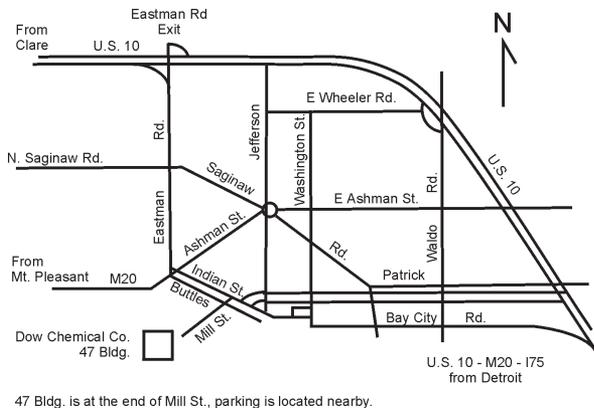
6:00 p.m. to 9:00 p.m.

47 Building Cafeteria, The Dow Chemical Company  
Midland, Michigan

Program: 6:00 p.m. Reception  
 6:30 p.m. Buffet Dinner  
 7:30 p.m. Awards Presentations—Teachers and students will be recognized for their outstanding achievements in science education.

**T**he cost of the dinner is \$15.00 per person and includes appetizers, dinner, dessert, and beverage. Please respond by mail using the form below. Your dinner reservation request must be received by April 12, 2002. You may also register by e-mail ([aneta.i.bialek@dowcorning.com](mailto:aneta.i.bialek@dowcorning.com)) and pay at the door.

This event is sponsored by the Midland Section of the American Chemical Society and underwritten by grants from The Dow Chemical Company and Dow Corning Corporation. For further information, contact Phil Squattrito at 989-774-4407.



*To reserve a place at the 2002 Spring Science Education Recognition Dinner, return this form with payment by **April 12, 2002** to Aneta Bialek, C042C1, Dow Corning Corp., 2200 W. Salzburg Rd., Auburn, MI 48611-9548.*

Name(s): \_\_\_\_\_

Affiliation: \_\_\_\_\_

Address: \_\_\_\_\_

Phone/Email: \_\_\_\_\_ ACS member? Y N

Enclose payment of \$15.00 per person. Checks should be payable to "Midland Section ACS."

## Chemical Sensors

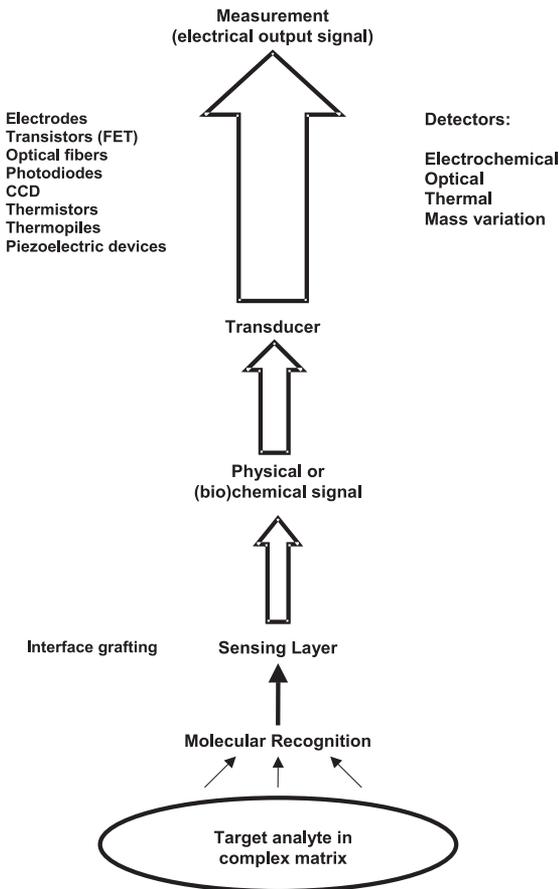
by Kristine Danowski

**B**rowse any analytical chemistry journal today and you will see at least one article on sensors. The interdisciplinary field of chemical and biochemical sensors involves microelectronics, materials science, biotechnology, laboratory automation, and analytical chemistry. Sensors are used in diverse applications from semiconductor fabrication to medicine and environmental monitoring to conventional analytical instruments. Sensors can provide direct and real-time information about their surroundings. For example, a home CO detector monitors ambient air for harmful levels of this potentially lethal gas, microelectrodes implanted in an animal's brain detect neurotransmitter levels, and a tunable diode laser monitors flue gases for HCl. Chemical sensors can provide a viable, *in situ* alternative to conventional, time-consuming analyses conducted in a laboratory.

Generally, a sensor is a self-contained analytical device that responds selectively and reversibly to the concentration or activity of a chemical species. A biosensor is a sensor physically or chemically operating in a biological sample or containing biological molecules. Any sensor has three main components: a detector that recognizes the signal of interest, a transducer that converts the signal into a more useful output, and a read-out system that filters, displays, records, or transmits the transduced signal. A sensor should respond selectively, continuously, rapidly, specifically, and usually without any added reagents.

In order for a sensor to provide accurate and precise information, a particular sequence of events must occur. First, the analyte of interest must chemically or physically interact with a sensing layer. Next, this interaction must produce a signal. Finally, the transducer converts this signal into a second signal (usually electrical). The transduction mode can be electrochemical, optical, thermal, or mass variation. The figure on the following page (adapted from Blum and Coulet) is a schematic of a generic chemical sensor.

In deciding to fabricate and/or use a sensor, the user must meet a number of technical challenges. The first is specificity of molecular recognition. Chemical interferences (including the sample medium itself) with the target analyte must be considered when selecting a recognition scheme. For example, some common recognition schemes, such as enzymes and antibodies, are highly specific. The second issue is the physical and chemical environment in which the sensor will operate. The sensor needs to be compatible with its surroundings. For example, many



enzymes have an optimum pH and temperature range and cannot operate in harsh or corrosive environments. Third, the sensing layer needs to be compatible with both the environment and analyte. The sensing layer must allow the interaction between the analyte and its recognizer while maintaining a distinct interface with the sample matrix. A common sensing layer arrangement is a polymer containing a dye and/or enzyme. For example, a fluorescence  $O_2$  sensor comprises an  $O_2$ -permeable polymer and a fluorescent dye. Oxygen diffuses through the polymer, interacts with the dye molecules, and quenches the dye's fluo-

rescence. Other sensor issues include reusability or disposability, cost, and convenience.

Oxygen in both gaseous and solution phases is a common analyte in medical, atmospheric, and industrial sensing. One method of determining  $O_2$  concentration is the Clark electrode. This sensor consists of a Pt or Au electrode in the end of a support rod that is covered by a selectively permeable membrane. A thin electrolyte film is contained between the membrane and the electrode. A tube contains the Pt electrode, membrane, electrolyte, and a reference electrode. Adjusting the applied potential gives a current that is directly proportional to  $O_2$  concentration. Another common  $O_2$  sensor is the fluorescence sensor described above. The sensing layer can be spin-coated onto the distal face of an optical fiber, and the proximal face of the fiber is connected to a CCD camera. The  $O_2$  concentration is proportional to the amount of fluorescence quenching.

**Further Reading**

Blum, LJ, and PR Coulet, Eds. *Biosensor Principles and Applications*.

Marcel Dekker, Inc.: New York, 1991.

Clark, LC, Jr. *Trans. Am. Soc. Artif. Organs* **1955**, 2, 41.

Clark, LC, Jr., and C Lyons. Electrode systems for continuous monitoring in cardiovascular surgery. *Ann. NY Acad. Sci.* **1962**, 102, 29.

Clevett, K, Archer, MD, and AJ Nozik. *Process Analyzer Technology*. John Wiley: New York, 1991.

Meijer, GCM, and AW Herwaarden, Eds. *Thermal Sensors*; BE Jones, Ed. Sensors Series; Institute of Physics Publishing: Bristol, 1994.

Woflbeis, OS, Ed. *Fiber Optic Chemical Sensors and Biosensors*. Boca Raton, FL: CRC Press, 1991.



Living.  
Improved daily.

*Call for Nominations***2002 Science Teaching and Education  
Volunteer Awards***By Phil Squattrito*

**E**ach year the Midland Section of the American Chemical Society presents awards to recognize outstanding achievement in the teaching of the chemical sciences. Nominations for the 2002 awards are invited.

Awards are presented for outstanding achievement in the following areas:

- Elementary Level Science Education
- Middle Level Science Education
- High School Chemistry Teaching
- College Chemistry Teaching

Candidates for these awards must be educators at schools in the five-county geographical area of the Midland Section: Bay, Gratiot, Isabella, Midland and Saginaw Counties.

The Science Education Volunteer of the Year Award is also presented to an individual who makes a substantial contribution to science learning in the Midland Section through voluntary efforts.

Previous recipients of the awards are as follows:

	<b>Elementary Level</b>	<b>Middle Level</b>
1992	Karen Ziemelis	Derrell Steffen
1993	Lela Wade	Laurie Hepinstall
1994	Constance A. Dullock	JoAnn Kraut
1995	Joan Klopacic	not awarded
1996	Mark Hackbarth	Barbara J. Bibbee
1997	Denise Koppberger, Cheryl Ruthig	Gary J. Johnson
1998	Barbara McGivern	not awarded
1999	John Clark	not awarded
2000	Sue Burtch, Robin Harshman-Rogers, Vicki Richard, Clare Jorgensen	not awarded
2001	Cathy Egerer, Amy Hindbaugh-Marr	not awarded
	<b>High School Teaching</b>	<b>College Teaching</b>
1989	Robert Wallace	Joan Sabourin
1990	Gary Ronk	Bob Howell
1991	not awarded	Robert Kohrman
1992	John Clark, Edna Konwinski	Scott Hill
1993	Mary Irons	Ajit Sharma
1994	Jo Ann Pelkki	Laura Vosejпка
1995	not awarded	George Eastland
1996	Sandra Schafer	Martin Spartz

1997	Mary Fredell	Philip Squatrito
1998	Dale Ressler	Thomas Delia
1999	Robert Enszer	Steven Keinath
2000	Steven Kelly	James Hutchison
2001	William Stokes	Sandra Smith

**Science Education Volunteer**

1992	Gregg Young
1993	Peter Bonk
1994	Peter Moehs
1995	Gretchen Kohl
1996	John Blizzard, Richard Van Effen
1997	Marvin Tegen
1998	Carlton Beyer
1999	William Albe
2000	Karol Childs
2001	Donald Petersen

Recipients of all awards will be selected by the Awards Committee. Nominators should write a letter indicating the award and describing the attributes of the candidate. Supporting letters from students, colleagues, supervisors, and community leaders are strongly encouraged. The deadline for nominations is March 22, 2002. Electronic and fax submissions are acceptable. All submissions must be accompanied by the name, position, address, and phone number of the nominator.

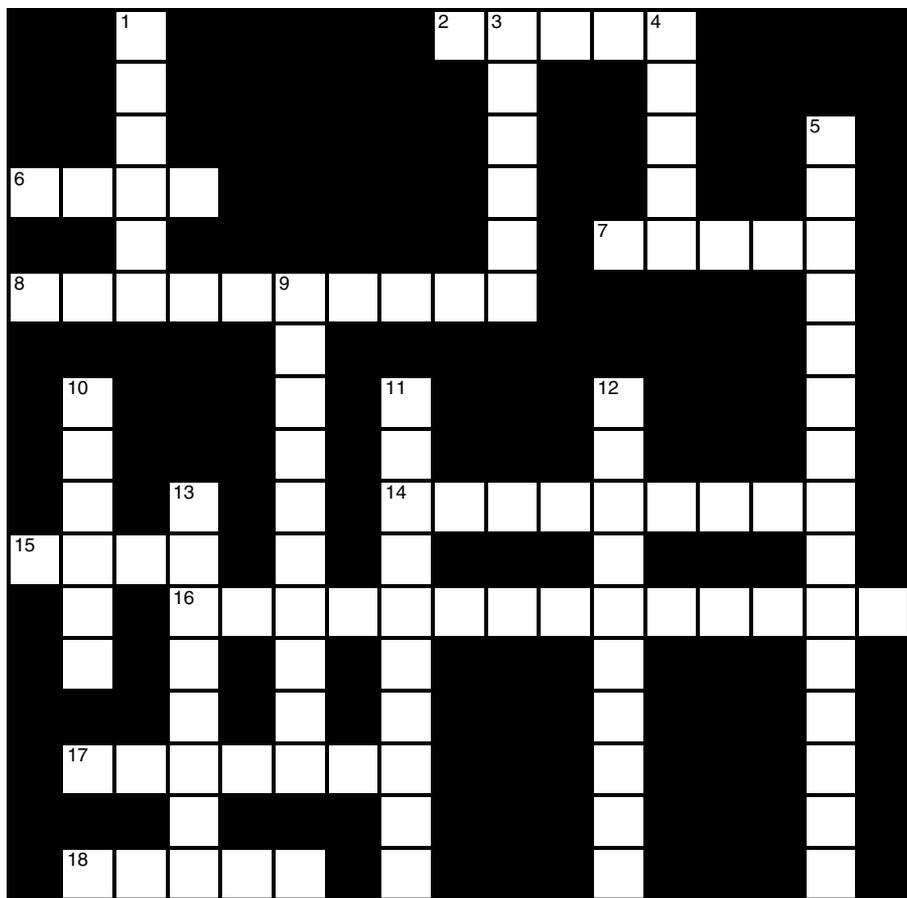
Award recipients, as well as high school and college student award recipients and Chemistry Olympiad winners, will be honored at the 2002 Science Education Recognition Dinner on April 24, 2002, at the Dow 47 Building Cafeteria in Midland.

The Awards Committee greatly appreciates the efforts involved in nominating someone and thanks you for helping to recognize deserving educators in our section. *Parents: Does your child have a great science teacher? If so, consider nominating him/her and pass this flier along to that teacher's principal or section head.* Please submit nominations to:

Philip J. Squatrito  
Chair, ACS Awards Committee  
Department of Chemistry  
Central Michigan University  
Mt. Pleasant MI 48859  
Phone: 989-774-4407; fax: 989-774-3883  
p.squatrito@cmich.edu

## ChemPuzzler

## Do You Measure Up?

**Across**

2. unit of magnetic induction  
 6. 2.54 centimeters  
 7. unit of magnetic flux  
 8. unit of radioactivity  
 14. nm  
 15. unit of pressure  
 16. amu  
 17. unit of magnetomotive force  
 18. unit of self and mutual inductance (mks)

**Down**

1. unit of pressure  
 3. unit of electric current  
 4. unit of kinematic viscosity  
 5. ppb  
 9. unit of viscosity  
 10. 1000 megohms  
 11. 0.01 meter  
 12. unit of pressure equal to air pressure at mean sea level  
 13. statcoulomb

## Important Dates on the ACS Midland Section Calendar

- March 4 Midland Section board meeting, Delta College, Midland Center, room 12, 7:00 p.m.
- March 4 Deadline for April issue of *The Midland Chemist*
- March 22 Deadline for nominations for 2002 Science Teaching and Education Volunteer Awards and 2002 Diversity Award (Phil Squatrito, 989-774-4407)
- April 1 Midland Section board meeting, Delta College, Midland Center, room 12, 7:00 p.m.
- April 8 Deadline for reservations for MMI course and dinner meeting with Prof. Quirk (Randi Merrington, 989-832-5555, ext. 555)
- April 12 Deadline for reservations for the Eleventh Annual Spring Science Education Recognition Dinner (Aneta Bialek, aneta.i.bialek@dowcorning.com)
- April 15–19 Dr. R.P. Quirk, "Frontiers in Anionic Polymerization," Michigan Molecular Institute (Randi Merrington, 989-832-5555, ext.555)
- April 16 Dr. R.P. Quirk, "Anionic Polymerization: Development of a Science and a Technology," NADA Center, Northwood University, 6:00 p.m. (Randi Merrington, 989-832-5555, ext.555)
- April 24 Eleventh Annual Spring Science Education Recognition Dinner, The Dow Chemical Company, 47 Bldg., 6:00 pm (reception) (Phil Squatrito, 989-774-4407)

All meetings are open to all ACS members and the public.

---

**AMERICAN CHEMICAL SOCIETY**

P.O. Box 2695

Midland, MI 48641-2695

<p><b>NONPROFIT</b> U.S. POSTAGE PAID Permit No. 91 Midland, Michigan</p>
---