

MACTLAC

MIDWESTERN ASSOCIATION OF CHEMISTRY TEACHERS IN LIBERAL ARTS COLLEGES



TO: MACTLAC Members

March, 1984

FROM: Office of the Secretary-Treasurer
Wheaton College
Wheaton, IL 60187

RE: 1983-84 Annual Report

THE VALPARAISO MEETING - November 4-5, 1983

On a crisp, clear November weekend, approximately 160 members and guests traveled to the Campus of Valparaiso University in the Indiana city of the same name for the thirty-first annual meeting of MACTLAC. The meeting was skillfully organized by Valparaiso chemist, Dr. Oliver Smith.

The meeting began on Friday afternoon with a brief welcoming statement from the President of Valparaiso University, Dr. Robert V. Schnabel. Oliver Smith then introduced the speaker for the session, Dr. Lon J. Mathias of the Department of Polymer Science, University of Southern Mississippi, Hattiesburg, MS.

Dr. Mathias introduced his talk with a discussion of the growing importance of polymers, ranging from pharmaceutical applications to industrial chemistry. He included references to uses of polymers in energy related fields such as enhanced oil recovery and weight reduction in automobiles. He then discussed ways of incorporating polymer science into the teaching of chemistry. He included in his discussion reference to various demonstrations and experiments which he has used with success in his own teaching.

Following a break, the conferees divided up among several discussion groups. Opportunity was given to attend two sessions of one hour each. The afternoon ended with informal tours of the Neils Science Center, browsing at the book and software exhibits and a mixer at Deaconess Hall. In the evening everyone enjoyed a sumptuous banquet in the Union Great Hall followed by excellent entertainment by a trio of Valparaiso music faculty.

On Saturday morning the members gathered for the Annual Business Meeting, the minutes of which are included later in this report. There followed two more opportunities for engaging in discussion on topics we missed on Friday. Several of the discussion groups on both days assigned recorders who passed on their reports to me. A summary of these follows.

Polymer Chemistry in the Laboratory

Dr. Lon Mathias began by recommending a number of textbooks, audiovisual aids, lab manuals, and video courses that effectively present polymer chemistry to the student. He also mentioned the Polymer Education Newsletter (free) which can be obtained by writing to: June Bogl, Chemistry Department, Brooklyn Polytechnic Institute. Also, he noted that the November '81 issue of J. Chem. Ed. serves as a very nice textbook for polymer chemistry. Finally, there are available, he said, visitation programs which serve to bring scientists to college classrooms.

Next, the group reviewed the collection of lab experiments mentioned during Dr. Mathias' opening remarks to MACTLAC members. These included IR spectra of polymers, preparation of Nylon-6, micro-emulsion, etc. Dr. Mathias also has an upcoming article, now in press, that lays out a possible lab course (1-semester) in polymer science.

The group discussed polymer chemistry as it is normally presented in texts. It was Dr. Mathias' feeling that the best way to test polymer chemistry is to introduce it throughout an organic course, rather than demarcate it. Every type of organic reaction, he claimed, has examples in polymer reactions.

Finally, he demonstrated a viscosity experiment on the Apple computer which allows the student to "dry lab" the experiment before going into the lab.

Leader: Lon Mathias

Recorder: Fred Hadley

Polymer Chemistry in the Lecture

Three reasons were given to use demonstrations:

1. to illustrate
2. to create interest
3. to "set" or "ingrain" chemical ideas in memory

It was suggested that one should start with the familiar.

There followed examples of polymer demonstrations:

1. Nylon rope (J. Chem. Ed., April, 1949) with modifications (See Shahashiri's demo manual.)
2. Polyurethane foam (instant insulation),
From pressurized can (takes longer to cure), or
from 2-can formulations (easy to get in hobby shops).
Use gloves and bench top covering.
3. Preparation of latex emulsion - simple to do and fast.
Fisher Scientific is source (sold as 62% sol'n, dilute to 5%
before demo).
4. Phenol-formaldehyde - should have good ventilation, therefore
not so good for lecture.

5. PMMA - 2 samples shown:

- (1) with low level initiator, takes overnight, nice clear polymer.
- (2) with high level initiator, faster but heat of reaction vaporizes volatile components and produces opaque polymer.

MMA available from Aldrich. Comes with inhibitor which, if desired, can be removed on alumina column or by distillation at reduced pressure.

6. Polybutadiene - Kit from Organometallics, Inc., Route 111, East Hampstead, N.H. 03826.
7. Thiokol rubber - Uses Aliquat 336 (request from Henkel Corp., Minerals Industry Dept., 4620 W. 77th Street, Minneapolis, MN 55435.
8. Discussion of polyesters, polyamides, polyethers: elasticity and rubber band warming demo. See M. Bader, J. Chem. Ed., 58, 285 (1981).
9. Needle through balloon demonstration. An inflated high quality latex balloon has a relatively relaxed section at the end. An Aldrich needle with Vaseline was reported to work.
10. Demonstration of stretching a strip of polymer between two sheets of polaroid on an overhead projector; series of colors shows with stretching and relaxation. Colors are related to thickness of polymer. Will only work with crystalline polymers, e.g., polyethylene bags. Polaroid film from Bausch & Lomb or Edmund Scientific.

Leader: Steve Heideman
Iowa State University

Recorders: Cliff Meints
Rolf Myhrman

Innovative Courses: Soup to Nuts

Dr. Kosman began by describing a short course (7 wks., 2 hrs./wk.) offered at Valparaiso during the last part of freshman chemistry. The course focuses on symmetry in chemistry and serves as a nice preface to organic chemistry the next year. The text for the course is Symmetry in Chemistry by Jaffe. Topics covered are:

1. What is a symmetry element?
2. Classification of point groups
3. Review of bonding
4. Applications of Symmetry

One member of the group asked what came out of the curriculum to make room for Symmetry, to which Dr. Kosman replied, "nothing, really." Other members suggested books which were good, such as Symmetry by Weyl, a book by Bryce Crawford, etc.

The group then moved to other topics. One asked how we can introduce innovative courses and still satisfy ACS requirements? One responded that he has taken some kinetics and thermo out of freshman chem and replaced it with inorganic.

Next the group decried the lack of industrial chemistry in the curriculum. Some mentioned a course based on notes by Harold Witkoff that has worked well. Another by Clausen and Matheson was mentioned as being particularly good. Ordman mentioned a trip abroad to Israel and Egypt with chemistry students. In this course they study chemistry and policy issues in Israel, Egypt and the U.S. Lab work was made up after returning to the U.S.

Other ways to introduce industrial chemistry into the curriculum is to invite speakers from Industry, use C & E News sources, and take advantage of "professors-in-residency" programs which some companies offer.

Leader: Warren Kasman

Recorder: Fred Hadley

Writing A Successful Grant Proposal

Gary Greinke and Gene Wubbels began the meeting with a discussion of new proposals that NSF would accept from small colleges regarding both personal research and instrumentation.

RUI Program at NSF: In the past, cost limit was \$35,000, but now that limit has been removed--there is no limit. Thirteen C-NMR facilities were suggested as an important instrumentation step forward within the next five years, that most small colleges will want to consider. Target total sum this year for the RUI program will be around \$5,000,000.

Proposals now go through Program Directors at NSF--there is no special RUI Program Director. Review will probably be done by mail. Proposals for RUI should be clearly so marked on the outside.

At this point, a break was made in discussion, to discuss tips and problems in proposals to NSF.

- They want to know there is a good chance that whatever is proposed is going to work--it's useful to be able to demonstrate this with your previous work--however, they often also want it to be innovative and/or imaginative.
- If institutions can be encouraged to make funds available internally to new faculty, this can be very helpful.

Don Kettke, Chairman of Physics (Valparaiso), carried on cooperative research program at Concordia College which was funded by Argonne National Labs. Often it is easier to tag on to a larger program at a nearby university or institution which helps to establish credibility for the faculty member with research funding agencies..

He also stressed it is useful to visit (in Washington) with directors of the programs involved when your proposal is submitted, and, in that way, they learn more clearly what your proposal is all about.

The Chicago office of DOE is at argonne and if proposals are intended for that agency, it would be useful to visit there. It is really helpful to sit down with these representatives to discuss contract terms, too, if contracts are applied for, and to ensure these are reasonable.

Research Corp., Brian Andreen: Research Corp. programs continue as in past - Cottrell college grants are available--provide for direct costs only--frequently are 2-year grants. He commented on several problems: Often significance of research and the purposes of research are confused. Also, proposal-writing is different from journal writing. One must be persuasive--it must be sold to the evaluators. Third, proof-reading and making sure grammar is correct is important--how a proposal looks affect how readers look at it. There is a danger--if one is too truthful--of being too tentative so one might wonder if the work will ever be successful or has a chance of being useful.

Faculty add-on proposals to NSF are really quite easy to obtain if one is willing to interview and talk to faculty at a university and then write a 1 or 2-page proposal to accompany the main proposal.

It was suggested that MACTLAC might be able to help members know of available NSF grants at larger universities in a particular summer or period.

The question of overhead expenses charged by the college was raised. Some funding organizations (Research Corporation and ACS-PRF, for example) do not allow overhead. Of those that allow overhead, such as federal agencies, this needs to be worked out between the College and the funding agency. This is an ad-on, as a rule, which goes into your proposal. Overhead expenses probably have no effect on success of proposals.

Comments on success or failure of proposals are available, and are helpful in writing better proposals. Service on peer review panels is helpful both in seeing what is being submitted, and in what is effective.

On additional sources: Luther Ericson, Grinnell, reported that their department had written a larger departmental proposal to the Dreyfus Foundation which is funding research for the next two or three years.

There are two additional categories in the new NSF regulations. 1) You can now initiate your own research collaboration as a principal investigator with another larger institution, yet 2) work on your own campus with your own students.

If possible, adopt the language, "We're already doing this, but we want to do it better."

Leaders: Gary Greinke and Gene Wubbels

Physical Chemistry Experiment Exchange

Fifteen people participated in a lively discussion of the P. Chem. Lab. Luther Erickson opened the session with an outline of the lab format and a description of some specific experiments he uses. He offered to send his first term manual to anyone interested. His experiments selected mainly to illustrate principles, emphasize computer analysis of data to reduce tedium of calculations and reports and sharing of student data to obtain class results. This led to a wide ranging discussion that touched on the following specific topics:

1. Gas. Equil. Exp. The N_2O_4 dissociation experiment is used by several people. Don Stephenson (Albion) uses a similar aniline/ SO_2 system. He will send write-up to attendees.

2. Format, etc. Though a physical chemistry lab as part of the lecture-lab course is the most common pattern, some incorporate such experiments in advanced project labs. 5-10 experiments term is typical, but scheduling is often varied, ranging from a single afternoon a week with students using common equipment in rotation to an open schedule. The write-ups required also ranged from formal separate write-ups to calculations completed in lab notebooks and even some oral reports.

3. Valpo Lab. Semester begins with error analysis based on a doctored meter stick and computer programming and ends with extensive look at keto-enol equilibrium.

4. Calorimetry. Though most include a calorimetry experiment, suggestions for adding interest to the experiment are welcome. Stephenson uses it to focus attention on error analysis and the identification of the temperature measurement as most critical.

5. Spectroscopy. IR spectra of HCl/DCl was noted by Erickson as a good experiment. He and others also noted the rich detail that are available in the vibrational structure of the UV-vis spectrum of I_2 gas. Nagel (Valpo) has Apple Computer program to analyze the data and give some neat displays of results. Send disc to get program.

6. Texts and Manuals. Most use experiments from either MIT (Shoemaker/Garland/Steinfeld) or Wisconsin lab manuals though Oelke/MACTLAC manual is still a good source. The Texas manual (White) was also noted.

Texts used in the lecture course varied greatly with Atkins the most popular (5/15). Bromberg, Levine, Adamson, Barrow, and Castellan were also represented.

Vincent's Symmetry and Group Theory (Prentice Hall) was noted as a superb programmed text.

Leader: Luther Erickson

Chemistry Laboratory: the Nonchemist

Around 90% have a course for non-science majors; about half also have a course for (e.g.) health profession majors.

Questions asked about how enthusiasm is generated in such a course. Childs indicated that he does it by doing lab experiments involving drugs, polymers, etc. Synthesis of aspirin is a good one but not necessarily clear what that really shows the students. Many do syntheses from salicylic acid - to aspirin or oil of wintergreen.

Lots of organic--how do you get something else in the lab. Armstrong from Albion has a chromatography experiment involving Cu, Ni, and ?. He will supply copies if one writes to him.

Quantative analytical experiments were mentioned by some: Fe in breakfast cereal; Vitamin C in fruits and juices; titration of vinegar, etc.

Kelso at Luther mentioned that he has his students do an experiment on diffusion of KMnO_4 in water at different temperatures as a starter. It emphasizes observation and interpretation.

Wickham at Coe pointed to the importance of having clear objectives. Others said one needs to indicate what chemists really do, e.g., synthesize aspirin, analyze vinegar, etc.

The question of excitement was raised again. How does one do it? Specific recipes? Poel from North Central College emphasized the value of personal excitement. Problem was then how do you really whip up your excitement; aren't there some substantive bases for it? Personal attention to students is important; taking a break from teaching the same course and taking a sabbatical leave were noted. Wickman mentioned that making aspirin is a rather tired experiment; he hunted up a bunch of aspirin analogs and had success asking nursing students to synthesize these.

Question arose of which lab manuals were valuable. Netterville, Jones, et.al. lab text (1976) is supposedly no longer in print. The book has a great variety of experiments. Hill, et.al. (Chemistry for Changing Times) has been a good text for lab experiments. Willard-Grant separates for lab have been used with mixed success. A 'fill-in-the-blanks' lab exercise was condemned as not useful. Holum's lab manual is not recommended; lecture text is very good.

Sr. Mary Thompson, St. Catherines, will be pleased to act as receiver of lab experiments for non-science majors before MACTLAC meeting next year. Please send good experiments to her so that a collection is available for next year.

Several use Netterville, Jones, et.al.; lesser of several evils. Brown's text (Beloit) is a MACTLAC text. A few mentioned using Stine's text.

Leader: Allan Childs

Recorder: Anonymous

Laboratory Safety: Disposal of Chemicals

It is difficult to give answers to specific questions regarding the disposal of chemicals because the location and surrounding circumstances determine the options available. It is important for scientists to accept the responsibility to describe the options and risks associated with the disposal of chemicals.

A useful place to begin the decision-making process is to understand the laws associated with disposal. Hazardous waste regulations are described in the Resource Conservation and Recovery Act (RCRA). The new book Prudence Practices for Disposal of Chemicals from Laboratories (National Academy Press) has parts of the law in Appendix A and an ACS publication, RCRA and Laboratories (Dept. of Public Affairs, cost \$1.00) has a useful interpretation of the law.

The Clean Water Act helps define what can be poured down the sink. Some additional guidelines and ideas are available from R. Bayer, Carroll College, Waukesha, WI 53186.

After there is an understanding of the law and some feeling for how the local sewage plant operates, it is possible to define options available for specific disposal problems. Three options available are landfill, POTW (Public Owned Treatment Works), and incineration. At this time, finding incineration possibilities in some areas may be difficult.

Leader: Richard Bayer

Novel Experiments for Instrumentation

Bob Hade (Carroll College) asked how schools comply with the ACS requirement that PChem be a prerequisite for Instrumental Analytical when non-chemistry majors (e.g., Medical Techs) also take Instrumental. PChem is prerequisite for 10 schools and is not for 10. Most schools have Analytical prerequisite.

To ease instrument maintenance burden of Instrumental instructor, colleagues can maintain designated instruments. A nearby major university's instrument technician may charge less than the manufacturer for repairing instruments. A nearby Technical School might repair instruments at little or no charge.

When an instructor has many different instruments being used during a lab period, videotape instructions for each instrument are helpful. Having each group spend two periods on the first instrument they use in a rotation and holding them responsible for explaining procedures to all other students who follow on that instrument is aided by requiring peer evaluations of the instructions given.

RS232 outputs make instruments easy to interface. Beloit has successfully used Add-a-Lab with an Apple. Game paddle gain ports can be used when measuring resistance. TERC (Technical Education Research Corp., 8 Elliot St., Cambridge, Ma) is developing inexpensive interfacing packages. TERC provides sabbatical leave opportunities for faculty.

Examples of experiments illustrating matrix effects are needed. Blood, urine, and fish (Hg) are "real" samples. (Pooled blood from hospitals may contain hepatitis virus.)

Examples were requested of long term major projects to be used in place of a different experiment for each instrument in Instrumental Analysis courses. Students can use literature to design project using several instruments. Students can separate and characterize a binary mixture. A cost analysis component can be added to a Senior Projects lab. Oral defense of an instrument purchase is a Senior Project.

Leader: Anne Sherren
North Central College

GENERAL BUSINESS MEETING

Saturday, Nov. 5, 1983
8:30 a.m.

1. President Fish called the meeting to order.
2. The Secretary-Treasurer reported on the Executive Council Meeting of the previous day. Items mentioned included:
 - (a) A Summary of the treasurer's report. Balance of \$1,141.15.
 - (b) Meeting sites through 1986.
 - (c) Granting of emeritus status to Landborg, Fiess, and Potter.
 - (d) By-laws amendment to raise support level to \$800.
 - (e) Disbanding of Health & Safety Committee.
 - (f) Naming of Donald Koeltzow as new Placement Office.
3. New state representatives were announced and introduced:

Iowa : David Speckhard, Loras
Indiana: James George, De Pauw
4. Nominating Committee

Brady Williams nominated Arthur Bosch of Central College as President-elect. After opportunity was given for nominations from the floor, it was moved and seconded that nominations be closed and, Dr. Bosch was elected by acclamation. Motion Carried.

Brady Williams then nominated Anne Sherren of North Central College to be Secretary-Treasurer. Following a call for nominations from the floor, it was moved and seconded to close nominations and elect Dr. Sherren by acclamation. Motion Carried.
5. New Business
 - (a) President Fish, on behalf of the College of St. Catherine Chemistry Faculty, issued an invitation to the membership for the 1984 meeting to be held in St. Paul, MN on October 12 and 13, 1984.
 - (b) Harry Neumiller moved a resolution to recognize and commend President Fish for her service. Seconded and carried by applause.
 - (c) Glen Frerichs made a motion to direct the Secretary-Treasurer to write letters of appreciation to the President of Valparaiso University and to the Chemistry Faculty for their hosting of this meeting. Seconded and carried by applause.
 - (d) Harry Neumiller moved a resolution to extend recognition and thanks to the retiring Secretary-Treasurer. Seconded and carried by applause.
6. A motion was made to adjourn. Seconded and carried.

Placement Officer Named

As indicated in the preceding minutes, the Executive Council in its meeting at Valparaiso named Dr. Donald Koeltzow as the Placement Office of the organization. Any correspondence regarding positions available or positions desired should be directed to him at this address:

Dr. Donald Koeltzow
Chemistry Department
Luther College
Decorah, IA 52101

Reminder about Honorary and Emeritus Membership

The Executive Council suggested at the Valparaiso meeting that a copy of the Constitution and By-Laws be included with this annual report. You will note in Article II, Sections 2 and 3 a description of Honorary and Emeritus membership status. Any correspondence regarding these matters should be addressed to the new Secretary-Treasurer in advance of the Annual meeting. Her address is:

Dr. Anne Sherren
Chemistry Department
North Central College
Naperville, IL 60540

Current Status of Future Meeting Plans and Invitations

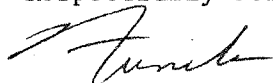
At its 1982 meeting the Executive Council established the following schedule of meetings through 1986:

1984 - College of St. Catherine
1985 - Kalamazoo College
1986 - Wheaton College

There are at the present time, four active invitations: one in Missouri, one in Illinois, and two in Indiana. Invitations to host a meeting ordinarily involve a letter from the President of the College and/or a letter from the Department Chair. These letters should be addressed to the Secretary-Treasurer.

The host institution is responsible for all meeting arrangements. The current support allowance is \$800 plus postage.

Respectfully submitted,



Larry L. Funck
Secretary-Treasurer of MACTLAC