

MACTLAC

MIDWESTERN ASSOCIATION OF CHEMISTRY TEACHERS IN LIBERAL ARTS COLLEGES



TO: MACTLAC MEMBERS

APRIL 1985

FROM: OFFICE OF THE SECRETARY-TREASURER
NORTH CENTRAL COLLEGE
NAPERVILLE, IL 60566

SUBJECT: 1984-85 ANNUAL REPORT

THE COLLEGE OF ST. CATHERINE MEETING - OCTOBER 12-13, 1984

On a beautiful October weekend, approximately 130 members and guests traveled to the Campus of The College of St. Catherine in St. Paul, Minnesota for the thirty-second annual meeting of MACTLAC. The meeting was skillfully organized by Sister Mary Thompson of The College of St. Catherine.

The meeting began on Friday afternoon with a brief welcoming statement from the Acting President of The College of St. Catherine, Dr. Anita Pampusch. Sister Mary Thompson introduced the speaker for the session Dr. Truman Schwartz of Maclester College and MACTLAC member of long standing. Dr. Schwartz presented a summary of TOMMORROW, The Report for the Study of Chemical Education in the United States, produced by the American Chemical Society.

Following a break, the conferees divided up among several discussion groups. Opportunity was given to attend one session for one and one half hours. The afternoon ended with informal tours of the Science Center and a mixer with musical entertainment. In the evening everyone enjoyed a delicious banquet in St. Joseph Hall followed by a speech by Dr. Margaret Etter of the University of Minnesota on "X-Ray Crystallography, Crystals, and You".

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

INTERFACING COMPUTERS WITH INSTRUMENTATION

Three alternatives for computerized instrumentation were mentioned: (a) Interfacing existing instruments to microcomputer (this was the most common approach and most of the later discussion referred to this approach); (b) Purchase of new instruments that are already computerized--expensive and although cost effective for repetitive analyses they have the disadvantage that students do not so all the steps required and might not be aware of the existence of these steps; (c) hooking all lab instruments to a larger computer. Alternative c has the disadvantages that the system becomes very complicated and unwieldy, although an IBM series 9000 computer is being used successfully for 4 simultaneous experiments at one college. For alternative a the most popular "device" for introducing students to the concept of interfacing was the "Adalab" system which consists of a printed circuit card and some software which is used with an AppleII+ or Apple IIe microcomputer. It was mentioned that the computer can eliminate much of the drudgery of intergration of experimental curves, choosing the best straight line through least squares, etc. Experiments that have been done by those present included: IR, UV, HPLC, polarography, titrations, digital balance for gravimetric titrations and cooling curves. The use of the game port for input was mentioned. It was the general feeling that the role of the computer ought to be to help the students think rather than teach specific computer skills. Just as one teaches the relative merits of one design vs. another in any instrument and just as one teaches the effect of instrument parameters on output one ought to present the effects of the computer interface. About 30 persons participated and about 2/3 are now doing interfacing.

Leader: Rod Olsen

Recorders: Mike Collins, Don Haydon

ADVANCED INORGANIC CHEMISTRY

The meeting was comprised of a series of questions asked by participants for general discussion.

WHAT YEAR ARE THE STUDENTS?

All schools had senior or junior/senior level courses except DePauw. DePauw offers a sophomore level descriptive inorganic course plus a senior level group theory course. Good enrollments were experienced in the sophomore level course.

DOES THE INORGANIC COURSE INCLUDE A LAB?

Most schools do offer lab with lecture. It was felt that lab should be integrated with lecture to be effective. Macalester offers a non-traditional lab, with students picking a compound to synthesize based on a J.Chem.Ed. article by Jolly. Most schools used texts by Jolly or Angelici, supplemented by their own experiments.

WHAT TEXTBOOKS ARE USED FOR INORGANIC CHEMISTRY?

Huheey was widely used but not particularly liked. Two people had used the new edition of Douglas, Daniels, & Alexander and liked it. The lower level Purcell & Kotz was universally disliked, primarily for its early introduction of MO's and symmetry. Sharpe's book was recommended for its structural and descriptive aspects. Greenwood and Earnshaw was considered a good reference book but not a teaching text. Porterfield had good concepts but tries to cover too much material. It is one of the few books that does not have quantum mechanics early in the text, which was seen as a favorable point by some. Gould's book has good problems. DePauw uses Jolly and Rochow for its sophomore level course.

WHAT GENERAL CHEMISTRY TEXTS COVER INORGANIC CHEMISTRY WELL?

Brady was mentioned favorably, Bailar, et. a. a good, less expensive text, but covers too much material. The consensus was that there are many texts with adequate coverage but the inorganic chapters are often skipped by general chemistry professors.

WHAT ABOUT PHYSICAL CHEMISTRY AS IT RELATES TO INORGANIC CHEMISTRY?

Several persons thought it would be helpful if quantum mechanics was taught in the fall and thermodynamics in the spring. This would make it much easier to meet the CPT requirements of having physical chemistry-based inorganic chemistry. Some participants feel that Group Theory should be taught in physical rather than inorganic chemistry. Many people felt that inorganic chemistry has become too theoretical. If more descriptive courses were offered there would be less of a need for physical chemistry.

WHAT ABOUT THE NEW CPT GUIDELINES AND INORGANIC CHEMISTRY?

One year of inorganic chemistry is required by the guidelines. Up to one semester can come out of general chemistry. Nothing is available to help in determining how one justifies how much of the general course can be counted towards the inorganic requirements. It seems that a case by case examination of the curriculum may occur.

IS BIO-INORGANIC INCLUDED IN THE INORGANIC COURSE?

Most schools do include bio-inorganic chemistry. This appeals to pre-med students particularly. It can be used to illustrate coordination chemistry principles.

WHAT INORGANIC CHEMISTRY EXPERIMENTS ARE USED IN GENERAL CHEMISTRY LABS?

Cu(I) compounds (discuss vs. Cu(II)), Synthesis and analysis of $\text{Co}(\text{NH}_3)_5\text{Cl}$, Ferrocene synthesis (Angelici book), experiments using ACAC (based on Harry Gray work), and ferrioxylate photochemistry were mentioned. It was noted that the use of colored coordination compounds is impressive to the students.

ARE ORAL EXAMS GIVEN?

The consensus was that oral exams were useful and good experience for the students, but that the time involved was prohibitive except for small classes. Some students find oral exams traumatic, so care must be taken to keep exams low pressure.

MISCELLANEOUS:

Library projects on the history and properties of elements are used at some schools. Descriptive chemistry can be taught using product maps of industrial processes, based on some J. Chem. Ed. articles in the last couple of years.

Nine persons attended.

LEADER: Anne Sherren

RECORDER: Tom Herrinton

EXPERIMENTS FOR A BIOCHEMISTRY LABORATORY

John Dwyer opened the session with an outline of the lab format and a description of some specific experiments he uses. Many participants had adapted experiments from the lab manual by Clark & Switzer. A number of other formats were described:

1. Project Assignments - 4/term, Groups of four students approach a project. The experiments don't have to work - but an effort must be made to understand the theory. the first four weeks are chaotic then Group 1 teaches Group 2 as tasks are successively covered. Students are assigned to groups by the instructor. Group lab reports are prepared. Four typical projects include: (1) sepharose-trypsin affinity column chromatography, (2) LDH enzymology, (3) protein isolation, (4) polyacrylamide gel electrophoresis. Rod Ordman (Beloit) had the protocols for the experiments on an Apple Computer program and offered to send out the program if sent a disc.

2. Project assignments - 8/term, work in pairs. Advantages: (1) Students make their own reagents--buffers, mM solutions, etc. This teaches them the practicalities involved in preparing for a biochemical experiment as well as saving the instructor's time for more important efforts. (2) Students submit written reports on each experiment but, in addition, choose one experiment to study in greater depth for an oral exam covering the theory and extending applications to new situations.

3. Individual experiments. The pace of the lab curricula must be adapted to the student audience. When the class is composed of sophomores, the group approach may be too complex. An effort should be made to keep it simple and emphasize an understanding of the instrumentation used and its limitations. The first experiment covers an introduction to the spectrophotometer.

4. Identification of unknowns. The first three weeks are devoted to identifying an unknown Amino acid. Procedures are provided for performing titrations, paper and thin-layer chromatography, UV spectrophotometry, etc. The second assignment is the characterization of an unknown protein by means of gel

electrophoresis, sephadex chromatography, N-terminal identification, and other classic techniques. Goals include: developing independence, learning lab skills, and understanding classic techniques.

The question of how to develop appropriate ways of incorporating recombinant DNA experiments into the curriculum was raised. Many of the enzymes and other reagents are prohibitively expensive for limited budgets, but there are ways to circumvent this problem. Simple restriction maps can be done. A student project to isolate a restriction endonuclease (EcoR 1, for example) could be done to provide materials for use in a mapping exercise.

No one had ideas for good carbohydrate experiments. Use of radioisotopes had been curtailed at one college due to NRC guidelines which mandate that a student have had a course in radiochemistry before using them.

J. Chem. Ed. is a good source for experiments. The idea of putting the lab after the class (lecture 1st sem., lab 2nd sem.) was discussed. This concept depends on whether the course is geared to learning techniques or reinforcing lecture material. Some of the problems of the Nursing Biochemistry were presented.

LEADER: John Dwyer RECORDERS: Kathy Parson and Larhee Henderson

ORGANIC CHEMISTRY: TEXTBOOKS AND LABORATORY ASSIGNMENTS

The principle topic of the discussion was the new organic texts which are now on the market. The choice of texts seems to have broadened widely among the represented schools. Solomons, Morrison & Boyd, Ege, McMurray and Streitweiser are all in use at various places. Most of the discussion was about the relative weight given to non-reaction topics as early in the books and to topic placement. Several Ege users expressed concern about topic order and mixing seemingly unrelated material. M&B still is very slow in getting to functional groups, with oxygen not encountered until the second semester.

There was a brief discussion of single semester courses & texts for them. Some excerpt from full year texts. There were no specific single term texts mentioned.

The topic then turned to laboratory with an expression of concern about the early Laboratory sessions and the lack of reactions in lecture to correlate with lab. Most participants reported that they use separations and techniques for the first several sessions. Many are using their own laboratory materials; however several commercial manuals are also popular; including Landgrebe, Pavia, and Laymon. Several supported the idea of less specific laboratories in which separation techniques and results are not spelled out so clearly.

The next topic was texts for advanced courses. The basic feeling seemed to be that none of the available texts is ideal for an advanced topics course although a number are being used. The basic complaint was that the texts are at the wrong level, either too complex or not enough.

The question was raised as to the advisability of changing the order of and emphasis on topics in the basic organic lecture. The current sequence is largely that dictated by Morrison and Boyd 25 years ago. There does not appear to be a book in the offing which will catalyze such a change.

The final major discussion was on computer applications. The primary use is micro (mostly Apple & Commodore) for Stan Smith's and Phil Bay's tutorials, for molecular animation and for games. A number of participants noted that the games spark real interest and that they require good chemical knowledge. Some mentioned were Chem Rain, Chem Maze and ID (qual organic). Project Serephin and Conduit were mentioned as good sources.

Friday = 20 participants

Saturday = 7 participants

LEADER: Brady Williams

RECORDER: Brady Williams

MINNESOTA ANALYTICAL CHEMISTS FORUM: WHAT WE DO TOGETHER.

Pat Fish described the organization ("MAP", Minnesota Analytical Professors). Members gather annually in May or April to discuss problems, experiments, texts, etc. in Analytical Chemistry. Members are from Minnesota, Iowa and Wisconsin. occasional speakers when host colleges can afford the speaker. There are no dues. The meeting in 1985 will be at Carleton College.

The members present exchanged stories, described experiments in data acquisition, in quant lab. St. John's is using gravimetric titrations connected to the Apple. Gustavus is doing GC monitored by computer with emphasis on data acquisition. St. Catherine's uses the computer with a Cary spectrophotometer. The members discussed Grav. Titrations with weighed solutions dispensed from plastic bottle. The members discussed the CPT in "alarmed terms", compared stories about CPT experiences.

5 members were present on Friday and 3 on Saturday.

LEADER: Pat Fish

RECORDER:

NOVEL EXPERIMENTS FOR A NON-MAJORS BEGINNING COURSE

The idea of a MACTLAC lab manual for non-majors was discussed. The questions were is there interest? Are there resources? The participants described the types of students involved. These ranged from Art Majors required to fulfill requirements to older students returning to college to nursing students meeting certification. In one case a student's young children often got involved with their mother's budding science career. Our interest

is communicated to the students. They become involved in the things we make look interesting. Involvement is a key for awareness and understanding in this course. Science education should teach students to think and not just recall. Students generally get over their apprehension about computers fairly easily.

Experiments were described. One successful lab experiment described was the familiar "blue bottle" experiment in which students were asked to determine what was going on in the solution. Often, students with no experience in chemistry were more willing to try novel tests than those who "knew" the answers.

In one case, the laboratory was assigned around the chemicals in the student's homes. Each person was asked to investigate substances in their kitchens, medicine chests, etc.

Field trips offer the students the opportunities to see professional chemists in action. These can include water plants, plastic manufacturers, etc. Oral as well as written reports are valuable in that they ask the students to condense the experiments to the essentials.

It is important to use substances with which the students are familiar (vinegar, rather than KHP, and so forth). At Grinnell, the students became involved in the design of the experiments. One instance was the rate of reaction of magnesium with various acids. The rusting of steel wool is the subject of another possible experiment. This particular experiment was the subject of a recent J. Chem. Ed. article. Paper chromatography of ink offers a simple way to introduce separation. The students are not given the idea of Rf values. Rather, they are asked to investigate any characteristics of the movement of the fractions. Natural acid-base indicators (red-cabbage, phenolphthalein laxatives, etc) offers a novel way to talk about acids and bases. This might be a way to relate chemistry to the human body. Three-component emulsions might relate well to the students' experiences in the kitchen and elsewhere.

Pottery making and glazing is a nice opportunity to talk about chemical principles such as oxidation and reduction.

The use of demonstrations was discussed and the consensus was that these were good.

The transformation of copper pennies ("tokens") offers the chance to observe chemical transformations in a simple, direct way.

It was mentioned that persons having copies of their experiments should send them to Sr. Mary Thompson at the College of St. Catherine.

LEADER: Mary Thompson

RECORDERS: Fred Hadley, Jean Beckman

PHYSICAL CHEMISTRY: TEXTBOOKS, LABORATORY EXPERIMENTS

Subjects discussed included the P. Chem texts used by various people, and which material was included or excluded. The order of presentation of topics was discussed, and the use of computer programs in the teaching of physical chemistry was also discussed. Labs were discussed--integrated labs, "conventional labs, lab texts and experiments, and the write-up required for labs.

About 12 people were in attendance.

LEADER: Clifford Creswell

RECORDER: Lynn Hartshorn

BEGINNING CHEMISTRY FOR MAJORS AND NONMAJORS: TEXTS, LABS, COMPUTER PROGRAMS

Textbooks in use vary more widely than in past years with some trends emerging of less detailed bonding theory and formal thermodynamics, and more descriptive or periodic chemistry, reaction types, and chemical applications. Supporting materials are generally made available, but not required.

The group spent considerable time discussing computer materials and computer use in general chemistry courses. Although many had CAI material available, they are generally used extensively by only a few members of the class. Several people described use of computer for pre-lab exercises and simulations, for data checking in lab, and for classroom demonstrations. Interest in the development of programs stressing experimental design was strong.

About 30 were in attendance.

LEADER: James Fionhold

RECORDER: Brock Spencer

The following groups met but submitted no reports.

DISCUSSION OF TASK FORCE REPORT LED BY TRUMAN SCHWARTZ,

CHEMICAL ENTREPRENEURS LED BY MARGARET ETTER,

GRANTS: WHO GETS THEM, HOW TO WRITE A GOOD ONE.

GENERAL BUSINESS MEETING
Saturday, October 13, 1984
9:15 AM

1. President Lembke called the meeting to order.
2. The Group paused for a moment of silence in memory of Joe Danforth.
3. 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 \$1,327.41.
 - b. Meeting sites through 1987.
 - c. Granting of Emeritus Status to Martin Allen, Herman H. Broene, Allen Hanson, and Wallis G. Hines.
 - d. Greetings from the Mid-Atlantic States Association.
 - e. Carthage has an EM-300 NMR contact them if interested. Next year the Executive Council will investigate having an equipment exchange among MACTLAC Members.
 - f. The Saturday Lunch for the Executive Council will be paid for by MACTLAC.
 - g. Status of Archival Material.
 - h. Donald Koeltzow will continue to serve as Placement Service Chairman.
4. New State Representatives were announced and introduced:
Minnesota: John Dwyer, St. Catherine
Missouri: Ryler Hastings, Westminister
Wisconsin: Mike Collins, Ripon
5. Nominating Committee:
Rhoda Craig nominated Eugene Wubbel of Grinnell College as President-Elect. After opportunity was given for nominations from the floor, it was moved, seconded, and passed that Dr. Wubbel be elected by acclamation.
6. Constitutional Amendment:
Brady Williams presented the following Constitutional Amendment which had been passed by the Executive Council:
That Article VI, Section 4 read: By-Laws may be amended by a majority vote of the Executive Council or of the Association, or by a majority vote at any annual meeting at which a quorum is present. It was moved, seconded, and passed unanimously to accept the amendment.
7. Pat Fish presented Dr. Martin Allen with Honorary Membership in MACTLAC.
8. New Business:
 - a. Rhoda Craig, on behalf of Kalamazoo College Chemistry Faculty, issued an invitation to the membership for the 1985 meeting to be held in Kalamazoo, MI on October 11-12, 1985. The theme will be interfacing Industry and Academic Chemistry.
 - b. Harry Neumiller moved that the members of MACTLAC express

our sincere thanks and appreciation to Roger Lembke of Central Methodist College for his service to MACTLAC in the Capacity of President. Seconded and carried by applause.

c. David Speckhard moved that MACTLAC direct the Secretary-Treasurer to write letters of appreciation to the President and the Chemistry Department of the College of St. Catherine for hosting the 1984 Meeting. Seconded and carried by applause.

d. Eugene Lousey announced the Chiago Section of the ACS Career Conference on November 17, 1984.

e. Evaluations of this meeting were distributed and were to be returned to Anne Sherren, Secretary-Treasurer.

f. President-Elect Arthur Bosch was introduced and applause followed.

9. It was moved, seconded and passed to adjourn the meeting at 9:53 AM.

PLACEMENT OFFICER

Any correspondence regarding positions available or positions desired should be directed to Dr. Donald Keltzow, Chemistry Department, Luther College, Decorah, IA 52101

REMINDER ABOUT HONORARY AND EMERITUS MEMBERSHIPS

ALL MEMBERS are reminded that one must nominate persons for Honorary and Emeritus Membership. All nominations should reach me prior to October 1, 1985 for consideration at the 1985 meeting. If you have questions or nominations please write to Dr. Anne T. Sherren, North Central College, Naperville, IL 60566.

Current Status of Future Meeting Plans

The Executive Council reaffirmed the following meeting schedule through 1987:

- 1985 - Kalamazoo College
- 1986 - Wheaton College
- 1987 - Westminster College

At the present time there are several active invitations. Invitations to host a meeting 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,



Anne T. Sherren, Secretary-Treasurer of MACTLAC