MACTLAC

MIDWESTERN ASSOCIATION OF CHEMISTRY TEACHERS IN LIBERAL ARTS COLLEGES

To: MACTLAC Members
From: Office of the Secretary-Treasurer
University of St. Thomas
Mail #5032
St. Paul, MN 55105-1096
Re: 1990 Annual Meeting Report
Date: March 1991

THE LAKE FOREST COLLEGE MEETING: OCTOBER 19-20, 1990

On a beautiful fall weekend, 193 MACTLAC members spent two enjoyable days on the campus of Lake Forest College. This was the largest attendance at any meeting since the 1969 meeting at Elmhurst College also in a Chicago suburb. The weather was ideal: after a chilly Friday morning (low of 30°F) it was sunny and 50° by noon, reaching a high of 53° during the first afternoon of the meeting. Saturday was warmer and sunnier with a high of 65°. The members were treated to an exceptionally well organized and run meeting with much stimulating discussion, lots of good food and wonderful hospitality.

The meeting began on Friday afternoon with a welcoming statement from Eugene Hotchkiss III, President of Lake Forest College. Following this, our host, Dr. Bill Martin, chair of the Lake Forest Chemistry Department, introduced the main speaker, Dr. Thomas Steitz of Yale University. Dr. Steitz presented an illuminating talk on "Structural Principles of Protein-Nucleic Acid Interaction" (see later for notes on the subsequent discussion section hosted by Dr. Steitz on his talk). Following this talk, state caucuses from Minnesota, Missouri and Wisconsin met briefly to elect new state representatives to replace those just completing their 3-year terms. Everyone then enjoyed an elegantly catered coffee break.

The afternoon was rounded out with most members attending two consecutive one-hour discussion groups on a variety of topics (notes to follow). Simultaneously, a fully-enrolled workshop on the microscale organic lab was run by Dr. Kenneth Williamson of Mount Holyoke. The popular workshop was also offered Saturday morning in order to satisfy the great demand.

An evening of food and fellowship began on Friday with a social hour followed by an excellent banquet in the Durand Commons. Thereafter the evening's speaker, Dr. Joseph Lambert of Northwestern University, presented a fascinating lecture on "Chemistry and Archaeology". The long busy day concluded with a social lasting until 11:00 p.m. in the beautiful Glen Rowan House across the street from the campus. Many felt this was one of the more spectacular such gatherings at a MACTLAC meeting. The food, fellowship and ambience will be difficult to top. The members are grateful to the Lake Forest staff for the first class treatment received at this meeting.

Saturday morning started with a well-attended Annual Business Meeting. Minutes from this are included in this report. Next members attended a talk on Mass Spectrometry by Dr. Thomas Moran of Georgia Tech. Workshops and discussion groups, including one hosted by Dr. Moran, followed an outdoor coffee break with everything finishing by noon. The Executive Council, chaired by Dr. Anne Sherren, our new president, and including the new state representatives, convened for the second of its meetings at Lake Forest over lunch. Shortly after 1 p.m. Council members were on the road again back to their respective colleges joining all the other MACTLAC members who will have fond memories of the 1990 Lake Forest meeting.

Respectfully submitted,

Brad Glorvigen

Brad W. Glorvigen
Secretary-Treasurer of MACTLAC

MACTLAC PLACEMENT SERVICE SEEKS POSITIONS

FOURTEEN CANDIDATES ARE USING THE SERVICE PRESENTLY.

SKILLS OF CANDIDATES:

INORGANIC CHEMISTRY
PHYSICAL CHEMISTRY
ANALYTICAL CHEMISTRY
ORGANIC CHEMISTRY
BIOCHEMISTRY
POLYMER CHEMISTRY
INDUSTRIAL CHEMISTRY

THERE ARE NOW 23 POSITIONS LISTED -- MORE ARE NEEDED AS THEY BECOME AVAILABLE AT YOUR COLLEGES

SEND POSITIONS AND INQUIRIES TO

LARRY FERREN
CHEMISTRY, BOX 6047
OLIVET NAZARENE UNIVERSITY
KANKAKEE, IL 60901
PHONE (815) 939-5251

LISTING OF POSITIONS OPEN ARE TOO NUMEROUS TO INCLUDE HERE.
CONTACT PLACEMENT OFFICER FOR FULL LISTING.

MACTLAC Executive Council for 1990

Officers	
President	John W. Crump, Albion College
President-elect	Anne T. Sherren, North Central College
Past-president:	Larry L. Funck, Wheaton College
Secretary-treasurer	Bradley Glorvigen, College of St. Thomas
Placement Officer	Larry G. Ferren, Olivet Nazarene University
State Representatives	
Illinois	Dereck A. Chignell, Wheaton College
Indiana	William A. Morrison, University of Evansville
Iowa	Clinton C. Rila, Iowa Wesleyan College
Michigan	Ross Latham, Adrian College
Minnisota	Patricia A. Fish, College of St. Catherine
Missouri	Edwin H. Lane, William Jewell College
Wisconsin	Larry A. Scheich, St. Norbert College

IMPORTANT ANNOUNCEMENTS

FUTURE MEETINGS: The 1991 meeting will be held on October 11-12 on the campus of Albion College, Albion, Michigan. Jack Crump is our host in charge of the meeting. The 1992 meeting will be held at Grinnell College in Iowa. Departments interested in hosting future meetings should contact the Secretary-Treasurer. MACTLAC makes an effort to hold meetings at schools which have recently completed new facilities or have done major remodeling. Members stand to gain important perspectives from visiting such schools.

HONORARY AND EMERITUS MEMBERSHIPS: Members are reminded that persons must be nominated by letter to the Secretary-Treasurer in order to be considered for Honorary Member status. Emeritus membership is awarded upon receiving a request from the individual just prior to retirement providing that the person has been a dues-paying MACTLAC member for at least 10 years. All nominations and requests must reach the Secretary-Treasurer by September 20, 1991, in order to be considered at the annual 1991 meeting. Persons awarded such status receive a personal certificate and are exempt from future dues.

ARCHIVAL MATERIAL: Any person having archival material should contact the MACTLAC archivist, Anne Sherren (also our current President) at North Central College.

RECORDERS: I would like to take this opportunity to thank those persons who served as recorders at the discussion groups at the Lake Forest College meeting. Over the coming summer and in early fall we will be contacting members and asking them to serve in such a capacity at the 1991 meeting. I urge you all to think about becoming involved in serving your organization. The job of a recorder is to take notes during the discussion section and then to have such notes edited and typed up and sent to the Secretary-Treasurer for inclusion in this annual meeting report. The time commitment after the meeting should only amount to 1 or 2 hours. I would like to see this procedure formalized in the coming year, and I will be sending a set of guidelines to future recorders when they agree to serve their fellow MACTLAC members in this capacity. Many people work long hours to make our meeting and organization a success; please consider making a contribution yourself by being a recorder at a future meeting.

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Michigan	Ross Latham, Adrian College
Minnesota	Michael Ross, College of St. Benedict/ St. John's U.
Missouri	Edwin H. Lane, William Jewell College
Wisconsin	Dean Katahira, Ripon College

GENERAL BUSINESS MEETING

Saturday, October 20

1. President Jack Crump called the meeting to order at 8:15 a.m.

2. The Secretary-Treasurer reported on the Executive Coucil Meeting of Friday. The following items were brought to the members' attention:

   a. The Treasurer's Report was summarized. The balance transferred to the new Treasurer as of October 1 was $2525.42. The total expenses for the 1989 Luther meeting were $2818.02 including the cost of meals. MACTLAC contributed $782.77 to this and Luther added $700.00. The remainder was the balance of meals paid for by members in attendance.

   b. Future meeting sites were announced: 1991-Albion College (MI) and 1992-Grinnell College (IA). A plea for future hosts was issued and handout sheets of the duties of host institutions were supplied. The President of the institution should send a letter of invitation to MACTLAC. The Executive Council requested future potential sites from the following areas: 1993: Central—Chicago area ; 1994: Eastern—Indiana; 1995: Western—Minnesota or Wisconsin. The sites rotate in this type of 3-year cycle.

   c. Dick Ramette of Carleton College was granted Honorary Membership. The certificate was graciously accepted by Jerry Mohrig on Dick's behalf.

   d. Emeritus Membership was granted to the following: Paul Cook (Albion), Carl Osuch (Dubuque), John Ricketts (DePauw) and Sister Mary Maynard Rhodes (Mount Mary).

   e. New State Representatives elected to 3-year terms on Friday by their state caucuses were introduced:
   Minnesota—Michael Ross, St. John's University/College of St. Benedict
   Missouri—Edwin Lane, William Jewell College
   Wisconsin—Dean Katahira, Ripon College

3. Placement Officer Larry Ferren reported that last year schools listed 6 positions with us and 6 applicants seeking positions registered with MACTLAC. Larry announced plans for increased placement activity with mailings to school. $150 was authorized toward this end by the Executive Council. More information appears in the annual meeting report and a placement form will be part of the 1991 meeting registration packet mailing.

4. Archivist Anne Sherren encouraged people to send her any pertinent materials and mentioned the display she has put up at this meeting.

5. Pat Fish of the Nominating Committee presented Bill Martin (our Lake Forest College host) for President-Elect. No other nominations from the floor were received and Bill Martin was approved by acclamation.

6. New Business

   a. Outgoing President Jack Crump (next year's host) issued an invitation to the membership for next year's Albion meeting (October 11-12). Possible major themes centered on the introductory course and teacher education were mentioned. An invitation to Ohio schools to attend next year's nearby meeting was announced.

   b. Jack Crump introduced Anne Sherren as the new President and she took over the proceedings at this point.

   c. A show of hands indicated relatively high interest in a MACTLAC-sponsored safety workshop of 1-1½ days in conjunction with the Albion meeting. A poll of members indicated a strong preference that this be a post-meeting workshop, for instance, all day Saturday and half of a day Sunday.

d. It was moved that MACTLAC express its sincere thanks to Lake Forest College, host Bill Martin, other chemistry faculty George Shields, Rick Kelly, Laura Kateley and Lee Thompson, and staff members Jackie Volk and Carolyn Sasse for a superb meeting. Seconded and carried with applause. The Secretary-Treasurer was directed to write thank-you letters to the President of the college and to the Chemistry Department.

e. It was moved that MACTLAC express its gratitude to outgoing President Jack Crump and Secretary-Treasurer Forrest Frank for their service to our organization. Seconded and carried with applause.

f. Anne Sherren announced that brochures for Iota Sigma Pi, national chemistry honor society for women, were available and encouraged schools to participate. She also asked that members fill out the meeting questionnaire. These are forwarded to the host for the next meeting and provide valuable information as to members' preferences.

g. The meeting was adjourned at 8:50 a.m.

Friday, October 19, 1990

10:00–1:00 **Executive Council Meeting and Lunch** — Glen Rowan House

10:00–5:00 **Registration**
Johnson Science Center

11:30–1:00 **Buffet Lunch**
Durand Commons, Pierson Rooms

1:05–2:30 **General Meeting**
Lily Reid Holt Memorial Chapel
Welcome
Eugene Hotchkiss III, President
Lake Forest College

William B. Martin, Chair
Department of Chemistry

Structural Principles of Protein-Nucleic Acid Interaction: on the central dogma of molecular biology
Thomas A. Steitz
Department of Molecular Biophysics and Biochemistry
Yale University

2:30–3:10 **Refreshments** — Reid Hall

3:15–4:10 **Discussion Groups I**

4:15–5:10 **Discussion Groups II**

3:00–4:00 **Microscale Organic Laboratory Discussion and Demonstration**
Johnson Science Center
Kenneth L. Williamson
Department of Chemistry
Mount Holyoke College

4:00–6:00 **Microscale Workshop**
Johnson Science Center
pre-registration required

5:15–6:15 **Open House**
Johnson Science Center

6:15–7:00 **Hors d'Oeuvres**
Durand Commons, Commonplace

Friday, October 19, 1990

7:00–8:10 **Dinner**
Durand Commons, Dining Room

8:15–9:30 **Chemistry and Archaeology**
Lily Reid Holt Memorial Chapel
Joseph P. Lambert
Department of Chemistry
Northwestern University

9:30–11:00 **Social** — Glen Rowan House

Saturday, October 20, 1990

7:00–8:00 **Breakfast**
Durand Commons, Dining Room

8:15–9:00 **Annual Business Meeting**
Johnson Science Center, McCormick Auditorium

9:00–10:15 **Mass Spectrometry– Nurtured in Industry But Slighted in the College Curriculum**
McCormick Auditorium
Thomas F. Moran
School of Chemistry and Biochemistry
Georgia Institute of Technology

10:15–10:45 **Refreshments**
McCormick Lobby & Courtyard

10:50–11:40 **Discussion Groups III**

10:30–11:15 **Microscale Organic Laboratory Discussion and Demonstration**
Johnson Science Center
Kenneth L. Williamson

11:15–12:00 **Microscale Workshop**
Johnson Science Center
pre-registration required

11:45–1:00 **Executive Council Meeting and Lunch** — Durand Commons, Pierson Rooms

11:45–1:00 **Lunch**
Durand Commons, Dining Room

Discussion Groups I, Friday 3:15–4:10

A. **Discussion of the Protein-Nucleic Acid Presentation**
Thomas A. Steitz, Yale University
George Shields, Lake Forest College
North Gym, room 101

B. **Chemical Education in Russia: a recent eyewitness view**
Edward Carberry, Southwest State University
Johnson Science Center, room 272

C. **Macintosh Computers in Chemistry, Session I**
Robert Kooser, Knox College
Johnson Science Center, room 188

D. **Inorganic Chemistry: are the current texts relevant?**
Cynthia S. St. Clair, Cornell College
Johnson Science Center, room 200

E. **Analytical Chemistry**
Michael D. Seymour, Hope College
Johnson Science Center, room 100

F. **Grants, Session I**
Brian Andreen, Research Corporation
Joseph Rogers, Jr., The Petroleum Research Fund
Johnson Science Center, room 267

Discussion Groups II, Friday, 4:15-5:10

G. **Small Chemistry Departments: their special concerns**
Clinton C. Rila, Iowa Wesleyan College
Johnson Science Center, room 272

H. **Safety and Waste Control: solving the problem for MACTLAC schools, Session I**
Eugene N. Losey, Elmhurst College
Johnson Science Center, room 200

I. **Physical Chemistry in the 1990s**
Joseph M. Brom, College of St. Thomas
Johnson Science Center, room 188

J. **Biochemistry: its role and place in the chemistry curriculum**
Nancy Devino, Beloit College
Johnson Science Center, room 267

K. **General Chemistry: how much inorganic and physical chemistry?**
Larry L. Funck, Wheaton College
Johnson Science Center, room 300

L. **Undergraduate Research: integral to the chemistry curriculum; how should it be done?**
Addison Ault, Cornell College
Johnson Science Center, room 100

Discussion Groups III, Saturday. 10:50-11:40

M. **Discussion of the Mass Spectrometry Presentation**
Thomas F. Moran, Georgia Institute of Technology
Richard S. Kelly, Lake Forest College
Johnson Science Center, room 272

N. **Safety and Waste Control: solving the problem for MACTLAC schools, Session II**
David C. Sonnenberger, Illinois Benedictine College
Johnson Science Center, room 100

O. **Macintosh Computers in Chemistry, Session II**
Robert Kooser, Knox College
Johnson Science Center, room 188

P. **Chemistry for Non-Majors: methods and goals**
Jerry Mohrig, Carelton College
Johnson Science Center, room 300

Q. **Organic Chemistry: an evaluation of the content**
Richard G. Scamehorn, Ripon College
Johnson Science Center, room 200

R. **Grants, Session II**
Brian Andreen, Research Corporation
Joseph Rogers, Jr., The Petroleum Research Fund
Johnson Science Center, room 267

Discussion Group A : Discussion of Protein-Nucleic Acid Presentation
Facilitator and Recorder: George Shields, Lake Forest College
14 attendees

The group split the time discussing the science applicable to the talk and discussing education and graduate school with Tom Steitz. In the first part, the group discussed the error rate in DNA/RNA processes, the similarity of certain domains performing specific functions in different proteins, and reviewing some of the specific actions of tRNA synthetase with RNA and Klenow with DNA. The group discussed the advances in X-ray Crystallography Technology, including the use of Area Detectors instead of diffractometers, and Imaging plates instead of film as detectors for Synchroton X-ray sources. The power and speed of modern computers has enabled the application of X-ray diffraction methods to bigger and bigger problems. Tom Steitz stated that the main problem scientists have with Crystallography is obtaining purified protein. His belief is that growing crystals is not a major problem provided the protein is pure. NMR is great for small, single-domain proteins but is not the appropriate method for large co-crystal systems.

The second part of the discussion turned towards education and graduate school. Tom stated that a modern biochemist must learn how to utilize all of the available methods. His advice to the undergraduate faculty is to send their students to graduate labs where they won't specialize in just one method (such as cloning), but where they will get broad training. In discussing the undergraduate curriculum, Tom strongly stressed the importance of Physical Chemistry, including quantum mechanics (how else will students understand spectroscopy and bonding?). He felt that molecular modeling was a good way to capture the interests of undergraduates. Several participants noted the Biology/Chemistry strain at their schools. Tom noted that his department (Molecular Biophysics and Biochemistry) rarely accepts a student who has not taken physical chemistry, and if they do then that student takes PChem once they arrive at Yale. At Yale they like to see the quantitative GRE scores, undergraduate research experience, and letters of recommendation from people they know or from schools that have developed a good track record. Lastly, Tom passed around two brochures written to encourage undergraduates to pursue a career in biochemistry.

They are:

"Careers in Biophysics" available from the Biophysical Society, $2 each.

Address: Emily M. Gray, Administrative Director
9650 Rockville Pike
Bethesda, MD 20814
(301) 530-7114/5
FAX (301) 530-7133

"Critical Shapes" available from the Howard Hughes Medical Institute, free.

Address: Robert A. Potter, Director
Office of Communications
HHMI
6701 Rockledge Drive
Bethesda, MD 20817
(301) 571-0330

Discussion Group B: Chemical Education in Russia: A Recent Eyewitness View
Presenter: Edward Carberry, Southwest State University, Marshall, MN
Recorder: Shirley Dieterman, St. Mary's College, Winona, MN
13 attendees

The facilitator spent 10 days in Russia with a group of U. S. chemistry educators becoming acquainted with their system of teaching chemistry in the Soviet Union.

He gave a general background of the setup of their school system and how it compared to ours. They generally start teaching chemistry in their secondary school level (in high school) and by the time they graduate at 17 they will have been exposed to primarily descriptive inorganic and some descriptive organic chemistry. They are not given very much theoretical chemistry even in the upper levels of the school system. Mostly memorization is stressed and probably not many lab classes are taught due to a lack of equipment.

However, as a whole they are well prepared, in fact they are a little ahead of our students by the time they are out of their secondary level (high school).

The next level is their high school (institute) like a combination of our B.A. and Masters degrees and takes 5 - 5-1/2 years.

Once special exams are passed the student becomes a Candidate of Science (our Ph.D.). After 3 - 5 years they graduate with a degree from the National Academy of Science.

The highest level of achievement is to become a Doctor of Science (like our full professorship level). This takes anywhere from 3 - 10 years or even longer and is only given after many years of research and publications and is conferred by the Government. This is a very prestigious achievement and these professors are the highest paid in the Soviet Union.

The group visited three institutes:

1) Moscow - Chemical Technical Institute - the facilities here were very poor, at least 25 years behind in equipment.

2) Kiev Polytechnical Institute - they had somewhat more instrumentation, but fairly old type.

3) Leningrad Technical Institute - considered the "Harvard" of the Soviet Union and had many very up-to-date classrooms and general facilities but the labs were being renovated and so could not be seen.

Slides were shown and some interesting points were added: They use Morrison and Boyd in Org. but only have 3 - 4 copies per class. The group ended each visit with a gift of an Indian peace pipe and Kinnikinic (tobacco) for each of the Institute Rectors (Presidents).

During the discussion, someone asked why the people have a hatred of chemistry (the facilitator had mentioned this earlier). The activities of Greenpeace, the Chernobyl incident, and very bad air pollution in the cities were some of the reasons given. The air pollution can be so bad that many students are so sensitized that they can not work in an organic lab.

Another person asked, "Where do the students go after graduation?" We were told that the institutes have around 700 arrangements with industry and so the students can pick the general area they'd like to live in and then are told which industry needs whom.. No job shortage.

The facilitator ended the discussion with the observation that these were his impressions during his July, 1990 visit - but that things were rapidly changing and by the time he next visits Russia it will probably be quite different.

Discussion Group D: Inorganic Chemistry: are the current texts relevant?
Facilitator and Recorder: Cynthia S. St. Clair, Cornell College
25 attendees

The following questions were posed.
Are we equipping our students with the tools necessary to understand the field?
Are the topics new, relevant and exciting?
Do we teach the basics or teach newer topics? What are the newer topics?
What standard topics can be eliminated, if any?
What do we do with a mixed interest class (e.g. grad. school vs. med. school bound)?
Does anyone teach intermediate inorganic? What texts are being used?

Other issues to address were the microscale lab, integration of organic and inorganic synthesis and integration of coverage of organic and inorganic reaction mechanisms and coverage of kinetics.

Points of discussion:
Basics are crucial; new topics are used as examples.
Topics that we teach:

Structure and Bonding	Coordination Chemistry	New Topics
atomic structure	bonding and spectra	organometallic
valence bond theory	structure, stereochem	bio-inorganic
shapes of molecules	reactions	catalysis
symmetry & group theory	Acids and Bases	solids
MO theory	Redox Reactions	inorg. environmental
inorganic solids	Metal Chemistry	
	Non-Metal Chemistry	

The comment was made that the entire 2nd column could be used for a sophomore inorganic course. Only 2 persons said they taught a soph. course (One used Wulfsberg, the other Cotton and Wilkinson as a text). This soph. course is shorter (lower # of credit hours). Topics that some are phasing out are: group theory, acids/bases, redox, non-metal chemistry.

Textbook Survey and Comments:
Shriver: 8 are using; bare bones approach, but many new examples; since future jobs will be in biotechnology and materials science, and Shriver is in the field of materials science and inorganic solids, some people have chosen this text; problems and solutions manual were also recommended by a few people.

Butler & Harrod: used by a few; "won't be used again"; too sketchy for students.

Huheey: 1 using

Cotton, Wilkinson & Gauss: 2 using.

In all books one has to jump around a bit. A fair number of people were disappointed with the coverage of basics and often have students return to the freshman text.

Advanced Inorganic comments:
A few have students use the literature.
12 out of 26 have a lab associated with the course, but all seem to use home-generated experiments and not a lab manual. Many work on a small scale, but not officially micro.
Roughly half are covering organometallics and catalysis.
One-third are covering bio-inorganic.
A few are covering solids (topics: metals, semiconductors, superconductors).
The Wulfsberg text does a good job of handling environmental inorganic chemistry.

Discussion Group F: Grants, Session 1
Presenters: Joe Rogers (PRF), Brian Andreen (Research Corporation)
Recorder: Colleen Byron, Macalester College
22 attendees

The session was divided into 2 halves, in which the first half of the session was spent delineating the history, purpose, and current status of the Petroleum Research Fund. The types of PRF grants available to undergraduate institutions were described (Type B, ~$20,000/2 years intended for small colleges; Type G, starter grants, ~$18,000/3 years), the criteria for judging PRF grants were given (a sheet was passed around to be put on the "mailing list" for an information packet from PRF, otherwise one can obtain this information through direct inquiry to PRF).

Recent data regarding proposal pressures and success were stated as follows. In 1990, 126 proposals were submitted to the Type B granting program and 61 proposals were funded, a 48% success rate. For Type G grants in 1990, 371 proposals were submitted, with 162 grants awarded for a 44% success rate.

Currently, the PRF program is in the middle of a ten year review and it was interestingly noted that over the last fifteen years, the proposal pressure on Type B have remained level (1989/1990 was a particularly low year for proposal submission for the Type B program), while the proposal pressure on the Type G program has gone up. One possible reason for this, as believed by J. Rogers, was that NSF-RUI and NIH-AREA programs were siphoning off some of the proposals formerly submitted to PRF.

When the level of funding of the various PRF grant programs were compared to the Consumer Price Index (CPI), PRF found that the level of funding of Type B grants has actually gone down while Type G grants have "sawtoothed" to level (the level of funding for Type AC grants, which predominantly go to Ph.D. granting institutions, have gone way down when compared to the CPI).

The overall impression given was that PRF is seeking larger numbers of proposals from liberal arts colleges to be submitted to their Type B and Type G granting programs.

Brian Andreen took over the second half of the session which was spent discussing grant opportunities with the Research Corporation (RC). Again, some history behind RC's Cottrell Grants was given and the criteria for funding were discussed (details of which are available from RC upon inquiry). The success rate for Cottrell Grants in 1989 was given as RC receiving 262 proposals with funding granted to 143 of them (54%). Brian Andreen was in agreement with the PRF people in that both agencies would like to keep the success rates for proposals around 40%. He further indicated that RC is willing to go higher if a particularly strong group of proposals is received. However, proposal pressure for Cottrell Grants has gone down, and if RC is not funding at a certain acceptable success rate due to lack of solid proposals, it was indicated that the Board of Directors may try to find something else to do with the money.

Research Corporation is also in the early stages of another program in which RC identifies good astronomy, chemistry or physics departments and, through the use of consultants and money, seeks to help those departments make great strides toward improvements relatively quickly.

Several questions were addressed to Brian Andreen regarding the proposal review process (one must request copies of reviewer's comments) and the "pipeline" issue (RC funded a study entitled, "They're Not Dumb, They're Different" which explored the responses of gifted "humanities" scholars who took physical science classes for credit).

Discussion Group E: Analytical Chemistry
Facilitator: Michael D. Seymour, Hope College
Recorder: Ed Acheson, Millikin University
34 attendees

Mike opened the session by asking the group to suggest topics they would like to discuss. Dick Bayer responded by sharing some information provided by Gene Wubbels, who is serving as a program director for the ILI program at NSF. FT-NMR and FT-IR are the most popular pieces of instrumentation requested under the ILI program. You should not ask for a "regular" NMR under ILI.

A variety of questions were tossed out for discussion by several members of the group. The questions and responses were:

1. Is anyone using ICP in lab? No--apparently nobody present has an ICP.
2. How much instrumentation should we have in the freshman and sophomore levels? Several people responded that they were successful in obtaining instrumentation grant money by tying the use of the instruments to the freshman and sophomore labs. Other "hooks" for obtaining grant money: a) innovative use (innovative was not defined); b) demonstrate maximum impact per dollar spent.
3. Should ILI grants be "focussed" i.e., present 1-2 experiments in detail describing how the instrument will be used, or is a "scatter-shot" approach describing several experiments in slight detail better? It was generally agreed that the focussed approach was better.
4. Has anyone had any experience writing a collaborative grant involving several schools? No one reported any recent experience with such a grant. Some states have supported collaborative programs within the state, but no one knew of any federal programs along these lines.
5. At what point should instrumentation be introduced in lab? Several schools use sophisticated instruments in the freshman course. Such use is approached as a "black box," with explanations coming in later labs.
6. Where should the analytical course fit in the curriculum? 2nd semester of freshman year? Junior year after organic? Mike expanded this question to: What do we want our students to be after they have taken analytical? How should they be different when they leave the course compared to when they begin the course? Some responses: students should have an appreciation for: quantitative measurements; accuracy and precision; statistics and propagation of error; analytical chemistry as a way of life, a way of looking at things unlike any other way that they may be used to; the fact that analytical touches every aspect of their life.

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7. How many titrations in lab is enough? No one suggested a number, but several responded that they still do a lot of titrations. Other comments: "Wet chemistry is not dead"; "Use real-world samples in your titrations"; "Disguise your titrations by using automatic titrators"; "A buret still costs a lot less than an AA."
8. What do we do with the waste metals from lab? Precipitate them (e.g. as sulfides) and pay a waste hauler to remove them.
9. Computers:
a. The ACS "Programmed Learning" computer programs were highly recommended. Cost: $300 each.
b. Interfacing: IBM is selling an interfacing starter pack for $400. Big Blue is selling it for the PS/2 line, but it will also work in older PCs. Montana State has a new interfacing package available--it was described in a summer issue of J. Chem. Ed.
c. No one was using the Macintosh in the lab, but in its defense, the Mac aficionados may have been in the Macintosh discussion group.
10. Is anyone using normality and equivalent weights? No.
11. Textbooks used: First course: 1) Skoog--both editions; advanced edition makes a good future reference. 2) Harris. Instrumental Analysis: 1) Skoog (new edition due this year). 2) Strobel and Heineman. Distant 3) Braun. Willard, Merritt, Dean, and Settle not liked.
12. Announcements: The Pittsburgh Conference will be held in Chicago in March of 1991. MUACC is a worth-while conference--see Mike Seymour for more information.
Mike adjourned the session at 4:15.

Discussion Groups C and O: Macintosh Computers in Chemistry
Presenter and Recorder: Robert G. Kooser, Knox College (Galesburg, IL)

1. Presentation:
Several programs for the Mac that are of importance to chemistry were presented along with an annotation as to their worth by the presenter. The programs discussed were WingZ, Excell, Cricketgraph, Kaliedagraph, Passagell, Datascan, LabView, MacFunction, Mathematica, Stella, Alchemyll, Chem3DPlus, Filemakerll, ChemDraw,MacSpin, several Hypercard programs by Project SERAPHIM, the presenter, and the ACS, and desk accessories and fonts as well as some programming languages. The attached handout was given to all participants who wanted it. Material from Project SERAPHIM was also distributed. QCPE was mentioned
2. Discussion
A discussion period followed where participants contributed their own ideas as to the important ideas and programs that could be used in chemical education. The availability of several very important programs surfaced during the discussion (mainly due to the fact that the PChem leader was ignorant of organic chem programs), they are:\
Beaker (Brookes-Cole,publishers) inexpensive and powerful general aid to organic
Nanovision maybe released and sold through the ACS
SynTree a synthesis pathway scenario program by Trinity Software
SpectraDeck a Hypercard stack for NMR, MS,and IR analysis of organic compounds. Good words on this (availability:Paul Schatz, Univ. of WI-Madison)
Theorist This is an inexpensive (and very possibly easier to use) alternative to Mathematica, especially for undergraduate instruction.
3. Participation
After the discussion, participants had a chance to have a hands-on experience with several of the programs discussed above in an environment that allowed them to experience the program but respected the copywrite of the software companies.

Discussion Group I: Physical Chemistry in the 1990's
Facilitator: Joe Brom, University of St. Thomas
Recorder: Richard White, St. John's/St. Benedict's
26 attendees

The discussion focussed on the experiences of participants at several different workshops held during the summer of 1990. Duane Carr talked about a program which does ab initio calculations. This workshop was held at the University of Northern Colorado. There are problems with time as the system becomes more complex. In conjunction with Micromol and Draw programs can get the shapes of orbitals. Program has been applied to HCl, atmospheric chemistry, superconductivity. Mark Masthay discussed the program H2ION. This workshop was held at Calvin College. This program is user friendly but requires a separate graphing program. Useful in performing electronics calculations and geometry optimization. Mark Muyskens spoke on the uses of Theorist in physical chemistry. This is a MAC program that is a Mathematica competitor. He provided a detailed handout on its uses. It has an animation feature which lends itself well to classroom demos. George Shields compared Chem3D+ and Alchemy II. The Chem3D+ program was found to have more advantages than Alchemy II. The Chem3D+ program was in general more flexible. Joe Brom discussed Labview. It is a data acquisition program for the MAC. It requires about 6 weeks for a student to develop an interface. It requires a 2Mbyte RAM.

The customary survey of texts currently used for the physical chemistry course gave the following results:

Atkins	12
Noggle	5
Barrow	3
Alberty	3
Adamson	2
Levine	1

Discussion Group J: Biochemistry: its role and place in the curriculum
Facilitator: Nancy Devino, Beloit College
Recorder: none—topics for discussion furnished by Nancy Devino

Who should take biochemistry?

Two semesters or one semester?

What about biology majors with weak chemistry background?

What do you do about lab?
1) emphasis on techniques to be learned?
2) emphasis on obtaining results?

How much time devoted to new developments in biotechnology?
1) lecture time?
2) lab time?

What do you leave out, to make room for new material?

How do you deal with the use of radioisotopes at small colleges?
1) NRC licensing?
2) disposal?

Use of new technologies for teaching biochemistry:
1) computer simulations
2) videodisc technology
3) computer-interfaced instrumentation, and how to pay for it

Additionally, textbooks were discussed and those new for 90/91 were compared. The types of exams given were discussed in light of the limitations of a 50-minute class period.

Discussion Group K: General Chemistry: how much inorganic and physical chemistry?
Facilitator: Larry L. Punck, Wheaton College
Recorder: Cindy St. Clair, Cornell College
37 attendees

What is the purpose of General Chem? This question preceeds the one above.
Some comments from the group:
—"filter" for physical therapy program
—primary purpose to teach stoichiometry and chemical equations
—many schools have more than one "track", since audiences vary and we must teach to the audience to some extent
—get all students to the same level in preparation for organic
—teach problem solving
—evangelize? motivate them to be interested
—focus not on exact content but on attracting students
—historical and philosophical content

The question was posed if we should eliminate general and start with organic:
—general chem is a survey of all the areas, and students don't get to see anything in enough depth
—students need a survey; they need to see topics at a basic level and then revisit them later at a more sophisticated level
—other departments require a chemistry survey course

What could be left out?
MO theory, free energy entropy (considerable disagreement), kinetics, atomic structure, photoelectric effect, uncertainty principle, screening effects??
Our students will not be interested unless we teach what is interesting to us.
We should teach those topics that a)they will need or ought to have b)what is exciting to us c)what will be exciting to them

Descriptive Inorganic: many students don't find it very interesting; di we think it is important to teach? Comments:
do it in a way in lab that will grab their attention; don't worry about being comprehensive; use demonstrations; point out the relevance to the chemical industry (e.g., the top ten industrial chemicals).

Lab:
about ½ of group does a qual. scheme
too structured, no time for creativity
current areas of interest in chemistry need exposure
consideration of use of modern instrumental methods in genchem lab
few teachers have incorporated microscale
what about open-ended experiments (Jay Young book cited—project-oriented labs)
provide opportunities to work in groups

Discussion Group M: Discussion of Mass Spectrometry Talk
Facilitator: Thomas Moran, Georgia Tech
Recorder: Gary Mabbott, University of St. Thomas

Question: Is the VG-Trio comparable to the HP instrument?

Moran: Yes. We used one of their instruments for a workshop on MS and it worked well there. VG has been very good about service in the Southeast. There are not as many VG instruments out there as HP. The commercial market has gone in cycles with one or two companies dominating for a few years followed by a collapse of business only to have a different manufacturer step in and dominate. For a while Hitachi-Perkin Elmer--then collapse,then Finnegan MAT-- collapse--then Hewlett Packard. VG is doing well now although HP still is the major seller.

Question: What about interfacing a GC to the VG instrument?

Moran: Just about any GC will do. We had no problems. We probably used a HP GC, in fact.

Question: Do you really have to spend over $100 K to get a GC/MS instrument that also has a direct insertion probe?

Moran: I'm afraid so. I don't know of anything out there between the HP MSD and the $100 K instruments with a direct insertion probe. I don't know that that won't change.

Question: How do you work MS into the undergraduate curriculum?

Moran: In general chem. We bring parts of older instruments into class and talk about the concept of isotopes using the spectrum for neon. You can show other spectra, too. We invite students to come for a tour of the MS lab. That's purely optional. Not many come, but a few do. They tell friends and a few more show up the next week.

In the organic course there is some coverage in the lecture course. In the second semester lab, when the students do qual. unknowns, they can submit a certain number of samples (typically solids that are done by direct insertion) and then they return to the lab and get help interpreting their spectra.

In analytical they do GC/MS experiments. In PChem. you can do charge-transfer experiments or measure ionization potentials of a few compounds. This can be as qualitative or quantitative as you want. We use a magnetic sector instrument to obtain ionization potential of N_2. The students calculate the probability that a molecule will be in the first vibrational state. They can calculate $<\psi_{v=0}$ for $N_2/\psi_{v=0}$ for $N_2^+> - 1$. Then they go into the lab and vary the ionization energy of the electron beam and plot the intensity of the N_2^+ ion. They evaluate the ionization energy from the foot of the curve where the ion intensity begins to grow with increasing electron beam energy. They can also watch for the appearance of N^+. The difference in energy for the N_2^+ and N^+ curves gives the bond dissociation energy for the N_2^+ ion. It works very well in this case.

Question: We do something similar with diethyl ether in a mixture with Ar [at St. John's U], but our HP instrument re-scales the output signal each time we tune to a new electron beam energy so that it's hard to compare the ion intensities at different energies. Do you know how to get around that?

Moran: No. I'm sorry that I don't.

Question: Could we talk about some practical things; I'd like to know more about cleaning parts with this ammo tumbler.

Moran: We learned about this from a technician at the Center for Disease Control in Atlanta. They are really very good at MS. They are the principle government lab that does dioxin analysis. They charge about $900-1000 per sample and they are running all of the time. They have an excellent solvent extraction protocol and use high resolution mass spec on a GC/MS instrument. We went over there to see if we could get a spare part. There was this gun aficionado there who had brought in a $40 ammo tumbler to clean their mass spec parts. If you go to a gun shop you can get a tumbler, some fine grade corn cob pieces, some very fine rouge and an oil that are all mixed together in the tumbler. You can drop even the delicate parts from your ion source in there and let them gently tumble overnight. Clean up by rinsing the rouge and oil away with a chlorinated solvent then sonicate them in acetone dry and reassemble the parts. Be sure to wear gloves. [Others noted that the first few spectra after a cleaning can show ion peaks characteristic of the person who did the cleaning.]

Question: Can FAB be done on a HP particle beam mass spec?

Moran: It can be done. We have essentially modified the inlet to allow us to do that, but I don't know whether or not they are marketing it that way.

Question: Would you explain why the parent ion is M+1 for FAB?

Moran: The molecules pick up a proton. The sample is in a glycerol matrix (usually). Right above the spot where the fast atom beam strikes the glycerol surface there are a lot of molecules fragment ions and clusters of glycerol. It is very likely that an ion/molecule collision will occur. What frequently happens is: $F^+ + M \rightarrow MH^+ + (F\text{-}H)$ [where F^+ = a fragment ion, perhaps of glycerol]. You can do this without the glycerol matrix, but the signal does not last very long. With glycerol the sample, apparently, diffuses to the surface replenishing the material that was bombarded. Other matrices work, too. Some give higher backgrounds than others. Glycerol gives lots of low molecular weight ions that correspond to protonated clusters, $GlyH^+$, Gly_2H^+, Gly_3H^+ up to 3-400 amu. Hopefully, the molecule that you are interested in has an M+1 higher than that.

Question: Is the background reproducible enough to store it and subtract it out of your sample spectrum?

Moran: It is pretty reproducible, but it's so easy to change the matrix that that is preferable. In about five minutes you can remove the probe, dab another matrix with a few ng of sample on another plate and stick it back into the source. You don't have to use a lot of care in preparing the sample. It's such a forgiving technique. Mind you, this is easy for polar compounds. For large non-polar compounds something like field desorption is needed. There are lots of hassles with that.

Question: Why is the wire so small with field desorption?

Moran: You want lots of sharp points from this micro-growth of pyrolyzed carbon. You need a "Christmas tree-like" growth of material with a bigger diameter than the wire itself. The process is like field ionization that we use to do with the sample on the edge of a sharp razor blade. It is something like the fine point in a scanning tunnelling microscope where charges are passed through the fine point.

Question: In your talk you mentioned using ammonia for chemical ionization. Is that more common now than methane?

Moran: No. I didn't want to get into talking about CH_5^+ as a species for transferring protons. Typically the first thing that we will try first is $C_4H_9^+$ because it is so easily handled. What you want to do is to produce mainly [protonated] molecular ion. If it gets lots of energy in the process then it is likely to fragment. Let's consider A as the ionization gas:

$$AH^+ + M \longrightarrow MH^+ + A$$

and $\Delta H_{rxn} = \Delta H_f(MH^+) + \Delta H_f(A) - \Delta H_f(M) - \Delta H_f(AH^+)$

Different ionization gases give different ΔH_{rxn}'s. You want to keep ΔH_{rxn} small to control the amount of energy delivered to MH^+. The utility is in generating parent ions.

Question: Why can't you achieve the same result by lowering the energy of the electron beam in the electron impact ionization source?

Moran: The textbooks always suggest that but when you lower the electron energy you often lower the signal intensity, too, so you don't always see the molecular ion. With the VG instrument it is easy to switch back and forth between CI and EI quickly. We routinely get both when doing an organic sample.

Another advantage that FAB has is that one can easily switch between positive and negative ion spectra. When you get a peak in the positive ion spectrum that you think might be the $(M+1)^+$ peak, you can run the negative ion spectrum and look for $(M-1)^-$. It is very unlikely that a fragmentation would lead to two peaks of this sort [that vary by 2 mass units] in going from the positive to negative spectra. However, it is very commonly to form both $(M+1)^+$ and $(M-1)^-$ with FAB.

Discussion Group N: Safety and Waste Control: solving the problem for MACTLAC schools Session II (Session I on this topic was Group H, both covered the same material).
Presenter: David Sonnenberger, Illinois Benedictine College
Recorder: Dean Katahira, Ripon College

In this session Dave Sonnenberger reported on the unannounced OSHA visit to the IBC (Illinois Benedictine College) campus and the response of the college to alleged violations of various federal regulations in 29 CRF 1910.1200 (enacted May 1988).

The OSHA visit was precipitated by an IBC employee complaint regarding air-borne asbestos, and some radioactive material. As a result of the visit, IBC was cited for 7 to 8 violations (3 to 4 involving the chemistry stockroom). Chemistry violations ranged from improper grounding of electrical plugs to improper labelling of gloves. A violation that illustrated the difference in view of the college chemistry department and OSHA was one involving the availability eyewash equipment. Eyewash equipment was located in the teaching labs since the department was concerned with student safety, however OSHA was concerned with the employee safety and felt that eyewash equipment should be available to areas accessible to the employees (say in rest rooms).

Fines for the violations were in the $10,000 range. In an informal hearing about 2 months after the citations IBC pleaded its case and the fines were reduced to $1,500, essentially the cost to cover the paperwork. The major problem at IBC was the absence of a Hazard Communication Standard as required by 29 CRF 1910.1200. To rectify this situation the college developed a program based on the form developed by OSHA. The IBC plan included the following features:

Training
Labels
MSDS
Written Plans
Grouped Employees
Video Presentations

Training Employees and students who work frequently with hazardous materials were trained twice a year. Short seminars on interpreting MSDS were given, and students were tested on their ability to interpret them. Safety videos were also presented. All employees were required to attend some training. Paychecks were withheld from those who were absent.

Labels Labels on chemicals were modified to provide the identity of the material and any hazards associated with the material. In regard to the hazard information, it was felt by some that the more information, the better.

MSDS MSDS information of all hazardous materials was obtained. CD ROM discs from Sigma and Aldrich were the main sources for the MSDS. The MSDS were located at a central location (business office) as well as locations were the hazardous materials were most frequently used. In the latter case, the chemistry stockroom served as a MSDS location for all chemicals used in the chemistry department. The paint room was another example of a location where MSDS were placed.

Written Plan The written plan contained information such as where MSDS are located, who is the executive safety person was on campus (at IBC, the vice president of administration), information on how things are labelled, and how to read MSDS.

Grouped Employees All employees were grouped into one of three categories. Category I included all persons who regularly worked with hazardous materials (for example, faculty in chemistry, art, students taking lab courses, physical plant staff, workers handling swimming pool chemicals, print shop employees, etc.). Category II included all other personnel who might come in contact with hazardous materials (for example, history department faculty, the college president, etc.) Category III included exempt employees (for example, faculty who taught evening courses.)

Video Presentations Two video tapes were made by IBC to train students and college employees on safety matters.

From this session it seems that a hazard communication standard is something that should be in place or in the works for all of our chemistry departments.

Discussion Group Q:Organic Chemistry: an evaluation of the content
Facilitator: Dick Scamehorn, Ripon College
Recorder: Brady Williams, College of St. Catherine (edited by Brad Glorvigen)
40 attendees

The facilitator pointed out that 40% of the freshman interested in science are lost during the freshman year of college. Furthermore, 40% of those remaining are lost before graduation. The questions were posed: are we teaching too many reactions? what other content is taught? what is our methodology?

Typical of MACTLAC organic sessions, a very lively discussion ensued about these and other points.

One person commented on covering more about biomolecules; another posed the possibility of leaving this material for a second course in biochemistry and replacing it with study of polymers. Yet another saw a distinction between the way bio-organic is covered in an organic course compared to a biochemistry course. Several people said that they get to neither biochemical topics or polymers; others leave them out intentionally in favor of topics like natural products, organometallics and use of the literature, including library assignments. The texts have become too long; what do we leave out?

In this regard, a comment about using only the most modern systematic names lead to a lengthy discussion about the pros and cons of using or teaching common names. Many expressed a desire to keep teaching them in light of the still widespread usage of such names in industry, medicine and biochemistry. Many of our students who go into health professions may have contact with common names longer than many of our chemistry majors.

The inclusion of new reactions and teaching students how to do synthesis was debated. The value of getting students to think backwards (retro-synthesis) was mentioned. The study of reversible reactions which can be controlled by chemists to go either direction are useful tools for teaching. Different routes to the same product and study of various side- or competing reactions are also important. It appears that the depth of detail and reasoning possible is always in some sort of conflict with just how much material to cover.

How do we make this material exciting to students; cerebral exercise is important to us, but what do we include to build interest among students? One person described his use of daily sniffing compounds, including many common pleasant chemicals. This is used in conjunction with naming and functional groups, relevance to every day life and interesting word origins tied to the source of the compound. Some sort of modest demonstrations were used by about ½ of the attendees. Things like organic qual. tests (Tollen's, CrO_3, iodoform, Lucas, Br_2/CCl_4, $KMnO_4$, etc.) can make nice lecture supplements if such reactions are not being done in lab. Examples of chemistry in the news can be discussed in class (e.g., Alar, saccharin). One person has an extensive collection of drug leaflets and has "Drug of the Day" in biochem class--could also be used in organic lecture for names and functional groups; many pharmaceutical books are available with information that can be presented to interest pre-med students and teach them organic at the same time.

The session ended with a discussion of classroom techniques: lecture vs. discussion. Most felt straight lecture was not good enough to engage the students. Some hand out lecture notes; most ask questions, with some classes voting on answers. Models can be used in class by students; writing workshops can be of value in helping teachers to get students to write things down in a way most conducive to learning. One person even used the Pig Mania game to teach stereochemistry. Considerable interest was expressed about having an organic exam exchange at next year's meeting.

Discussion Group R: Research Grants, Session II (see Group F for Session I)
Presenters: Brian Andreen (Research Corporation), Joe Rogers, Jr. (PRF)
Recorder: Joanne Stewart, Hope College
12 attendees

Rogers began the session by encouraging everyone to join the Council on Undergraduate Research (CUR). Andreen passed out several handouts including "Encouraging Research with Undergraduates", a Spring 1990 Research Corporation Bulletin, a Partners is Science newsletter, and a CUR pamphlet. He gave a brief history of Research Corporation and the Cottrell College Science Grants. The grants are 1) for summer research with undergraduates, 2) for faculty in astronomy, chemistry, and physics departments which do not offer doctoral work, 3) for equipment, supplies, faculty and student stipends, and 4) for "initiatory" projects of beginning investigators, and new projects of more senior faculty. The aim is to foster and encourage research with undergraduates, and develop and increase the number of physical science graduates. In 1989, 2.58 million dollars were awarded in Cottrell Grants. The average grant was $22,400. There has been a significant decline in the number of proposals from chemistry departments at private colleges and an increase in physics proposals. Approximately 40-50% of proposals are funded. Research Corporation does not strictly define what a "beginning investigator" is, and concerns can be raised with Andreen.

Rogers handed out a PRF program description and presented a brief history of PRF, which awards 14 million dollars annually in grants. The board holds three meetings a year (Nov., Feb., and May) and proposals should be submitted about 4 months before the meeting. The value of PRF grants will probably not change in the next 12 months. He recommended that new researchers apply for a Type G. They have observed an increase in proposal pressure for type AC grants (success rate ~30%) and a slight increase for Type G (success rate ~40%). Although proposal pressure for type B has been very constant (about 120 proposals a year, with ~50% success rate), they have observed a decline in the number of proposals from chemistry departments at private colleges. For Type B grants, PRF likes to fund proposals that are of a fundamental nature and include teaching and training of students.

Two questions were addressed to the facilitators:
Q: Can one have a Research Corporation and PRF grant at the same time?
A: Yes, but not for exactly the same proposal.
Q: Why do you think there are less proposals being submitted from chemistry departments at private colleges?
A: One of the reasons might be because of Howard Hughes and Pew money, as well as good support from NSF and NIH.

Andreen added that Research Corporation does entertain a "limited number" of renewals for a maximum of 3-4 years. A renewal depends on the initial ranking of the proposal, progress of the research, whether attempts at other funding has been made, and if other major funding has been obtained.