MIDWESTERN ASSOCIATION OF CHEMISTRY TEACHERS IN LIBERAL ARTS COLLEGES

OFFICE OF THE SECRETARY-TREASURER
Cornell College
Mount Vernon, Iowa

February 15, 1962

TO: MACTLAC members in good standing
SUBJECT: Report of the Tenth Annual Meeting, held at Cornell College in Mount Vernon, Iowa on October 27-28, 1961

Cloudy and cool weather greeted some 140 members and guests as Cornell College hosted the Tenth Annual Meeting. Public transportation into Mount Vernon was not too good but most everyone arrived on time.

Arild Miller, the president, opened the first general meeting. Harry Lewis presented a most interesting report for Bill Manuel, who could not be present, on their report of the baccalaureate origins of M.D.'s from our MACTLAC schools.

The discussion groups (see attached summaries) were well attended. From the over-heard comments at coffee breaks and other times your secretary missed another informative meeting. (Note to any future secretary - don't play host while you are secretary.)

Jim Culbertson, the program chairman, and your secretary would like to take credit for those steaks and fish that were enjoyed at the banquet on Friday evening. Unfortunately, we must give all the credit to our food service. The meal was followed by a most stimulating and thought-provoking lecture by Cal Vanderwerf.

Your officers for the current year are as follows:

President: Joe Danforth, Grinnell College
President-Elect: Enno Wolthuis, Calvin College
Secretary-Treasurer: Bill Deskin, Cornell College

The newly elected state representatives, chosen in caucus by members present from their states, are:

Iowa - F. Emmitt Jacob, Drake University
Michigan - Jacob DeYoung, Alma College
Minnesota-Jim Finholt, Carleton College
Missouri - Bill Pivonka, Park College
Wisconsin-Dick Bayer, Carroll College

The state representatives who still have a year to serve are:

Illinois - Robert Berntsen, Augustana College
Indiana - Wilmer Stratton, Earlham College

The Eleventh Annual Meeting (1962) will be held at Alma College, Alma, Michigan, with Howard Potter as program chairman. The dates for this meeting are October 12th and 13th, so mark your calendar.

In 1963 we shall meet at Wabash College, Crawfordsville, Indiana with Ed Haenisch as program chairman.

At the general meeting on Saturday morning the following items were approved by the members present.

1. Arild Miller was appointed as the Director of Teacher Placement for the MACTLAC schools in the seven states comprising the active membership. This file of available candidates seeking positions would be maintained on an informal basis for a period of two years. The file would include name, address and major field. These names would be available only to active MACTLAC schools. If you have names or are trying to fill a position you may write to Dr. Arild Miller, The Paper Institute, Appleton, Wisconsin.

2. The Physical Chemistry Laboratory Manual Group requested and received permission to ask each department of MACTLAC schools to make a $10.00 contribution to support the work of groups in assembling and writing the manual. The secretary-treasurer was directed to establish a separate record for these contributions and he is happy to report that as of this date 61 schools have complied. Please send your contribution if you have not done so.

3. The members present unanimously passed a recommendation that the secretary be directed to write a letter of appreciation to Mr. William S. Haldeman. In 1952 Mr. Haldeman assembled a group of college chemistry teachers at Monmouth College for a two day meeting and from this group, MACTLAC was formed.

Sincerely,

William A. Deskin

William A. Deskin

FINANCIAL STATEMENT

General Account			
Balance as of 1 May, 1961			$258.59
Income since 1 May, 1961	$558.85		
Expenses since 1 May, 1961		$387.87	
Balance as of 15 February, 1962			$429.57
P. Chemistry Lab Manual Account			
Income to 15 February, 1962			$610.00
Expenses to 15 February, 1962			67.77
Balance to 15 February, 1962			$542.23

Membership	
Active members as of 15 February, 1962	219
Associate members as of 15 February, 1962	48
Total number of schools represented by active and associate members	106

WRITTEN SUMMARIES FROM DISCUSSION GROUPS

Group 1. PHYSICAL CHEMISTRY LABORATORY MANUAL GROUP
Leader: Dr. William C. Oelke, Grinnell College

The physical chemistry laboratory group met to consider further developments on the manual. A motion was passed to the effect that the position of editor be established, that he be the Chairman of the Committee and have power to carry out the usual function as editor and to appoint members of a group known as the Board of Associate Editors. Dr. W. C. Oelke was unanimously elected to this position and reappointed Dr. J. P. Huselton as secretary. Dr. Oelke, who will be on sabbatical, was authorized to write the theoretical portion of the manual with the understanding that he and any others, as authors, will have publishing rights.

The other part of the manual will be flexible. Only workable experiments should be submitted, but three categories are being considered, namely (1) untested ideas, (2) tested experiments, (3) rechecked work. Research-type and open-end experiments are desirable, though some routine-type are needed as are those affording practice in universally-used techniques. Periodical references should be included as well as information about apparatus (home-made and otherwise) as this is often difficult to obtain. Anyone else wishing to be included in the program is invited to send experiments to J. P. Huselton, William Jewell College, Liberty, Missouri. Adequate credit for these is being given in the manual.

In a discussion of methods of financing the manual, it was brought out that conditions for many grants require that the project be well beyond the initial stages. A motion was passed to the effect that the chemistry departments of all MACTLAC schools be asked to contribute $10.00 toward the MACTLAC Physical Chemistry Laboratory Manual in order to getthe project rolling. This request is to be brought before the general meeting. Before adjournment, the group expressed a desire to meet next year at a time that will permit attendance at other MACTLAC discussions.

Submitted by: J. P. Huselton

Group 2. LABORATORY APPROACH TO INTRODUCTORY CHEMISTRY
Leader: Dr. Jay A. Young, King's College

This group participated in a discussion of the functions of the introductory laboratory and the means by which they might be attained. The introductory laboratory has four major functions as outlined by this group. (1) To generate a lively educated interest in chemistry, dependent upon the notion that though much is known, much more remains unknown. (2) To teach the student how to think systematically for himself. (3) To understand that theory and fact are <u>both</u> important, but that theory depends upon fact; hence, in this sense, laboratory is synonymous with chemistry. (4) To acquire, retain, and use information concerning the chemical properties of selected elements and compounds, manipulative skills, the habit and practices of safety and a respect for reagents (as distinquished from the aspects related to safety).

Five approaches were noted by the group which can be used to fulfill one or more of the functions. In practice, an assigned experiment would often incorporate more than one of these approaches simultaneously or consecutively.

A. The student is given specific directions and notes his observed results and makes his calculations on a printed page in appropriated blank spaces.

B. The student is given an unknown, which is known to the instructor, and is asked to determine constituents or composition, or both.

C. The student is directed to perform certain manipulations and observe the phenomena which ensue. This may require information and or methods from a text, reference work or

Group 2 (cont'd)

the literature and suitable modification to meet the unique requirements.

D. Identical with C (above) except that the student is required to rely upon what he has previously learned (and remembered) from the classroom and from related prior experimental exercises; he cannot refer to the literature.

E. The student is asked to synthesize a compound, organic or inorganic.

It was suggested (and this is considered to be one of the most important practical results of the discussion) that many of the defects of the cook-book approach could be remedied by using a seminar-like discussion period. This would be in conjunction with but separate from the laboratory work. At this time the reasons why certain manipulative steps were performed are examined, detailed observations are considered, results are interpreted, and other matters are similarly treated by a critical evaluation which is conducted by the students and led by the instructor.

Synthetic exercises can fulfill all four functions, unless the procedure is lifted directly from the printed page with no attempt by the student to adapt, modify, or question. This is probably the weakest in fulfilling function 4 (information) in that the information learned is usually restricted in scope.

Probably, the best practical solution to instruction in the introductory laboratory is to use two or more of the approaches. One can then proportion the emphasis in accordance with the instructor's opinion of the relative importance of the four functions in terms of the probable future curricular plans of his students.

The group expressed a desire to record its recommendations of a minimum of three to four hours of introductory laboratory, per week, for an academic year. Many felt that more time should be available.

Group 3. SEMINAR, WHY? HOW? WITH WHOM? AND ON WHAT?
Leader: Richard Ramette, Carleton College

The discussion began with reports from 10 to 12 schools on the types of seminars which they now have or have had in the past. Quite a variety of approaches were presented, although they appeared to fall into two main categories: (a) research seminars and (b) special topics seminars. In some schools the seminar is required for all seniors while in others it is required only for honors students (especially where it is a research seminar). In a number of schools, juniors are encouraged to attend. In some schools the seminar has the status of a credit course, while in others it is an "extra", non-credit offering. In a few schools, an interdisciplinary seminar is offered in place of, or in addition to, a departmental seminar. Many schools reported some dissatisfaction with their present type of seminar, but have hopes of better things to come. In particular, there is frequent unhappiness with the quality of student preparation for seminar talks -- a frequent criticism was that students seem to be talking to the faculty rather than to their fellow students.

The group tried to outline the purposes for a chemistry seminar as follows:

1. Opportunity for student oral presentations.
2. Opportunity to cover topics not covered in regular chemistry courses, e.g., history of chemistry, philosophy of science, interdisciplinary topics, current research, special topics, use of scientific literature, aspects of teaching, and "socio-scientific" topics.
3. Review and integration of course work (e.g. in preparation for comprehensives).
4. Informal, co-operative atmosphere between students and faculty.

It was agreed that there is need for students to acquire more historical and biographical perspective on chemistry and that it is probably more meaningful to introduce

this at the advanced level (where students have greater maturity and more chemical knowledge) rather than the older practice of including it in general chemistry. A number of useful historical and biographical references were recommended, including the following: (1) the Harvard Case Studies, (2) Alembic Club Reprints, (3) Hildebrand, Science in the Making, (4) Hoffman, Strange Story of the Quantum, (Dover paperback), and (5) Jaffe, Crucibles; The Story of Chemistry (Premier paperback).

Special topics which have been used successfully in seminars include: Use of C-12 for atomic weights; chromatography; least squares fit of data; less well-known elements; the electron microscope and other instruments; "sandwich" compounds; structure proofs; radiochemistry; antimatter; and hydrogen bonding.

By "socio-scientific" topics is meant such things as fluoridation of water, nuclear fall-out, etc. Manchester College has used very successfully a series of films put out by the Washington University sociology department on socio-scientific issues.

As a technique to improve the quality of student participation, some schools ask each student to submit a bibliography on his talk, which is mimeographed and distributed to the other students in advance. Another useful technique is to have a series of student talks on a single major topic, thus creating more student questioning and discussion.

Submitted by: Wilmer Stratton,
Recorder

Group 4 TRENDS IN ENROLLMENTS AND DEGREES IN SCIENCE
Leader: Dr. Arild J. Miller, The Institute of Paper Chemistry

Bachelor's degrees now mainly granted by public institutions (about 60% in 1960), while in 1950 about 50% were granted by private colleges.

The number of Bachelor's degrees in Physics and Mathematics is increasing rapidly; in 1958-59 the number of baccalaureates in Mathematics was greater than the number in Chemistry for the first time. There is some evidence to indicate that the number of Bachelor's degrees in Chemistry is again increasing after being nearly constant for several years.

In terms of percentages; the per cent of baccalaureate degrees with a major in Chemistry has been declining since 1947. At the same time the per cent with a major in Mathematics has been increasing, as has the per cent of those in Physics.

The number of doctorates in Chemistry is greater than the number in Mathematics, Physics, or Biology, and has been stable at approximately 1000 per year since 1949. Physics and Mathematics doctorates are lower, and are also stable for the period 1949-1960.

The proportion of Bachelor graduates who attend graduate school in Chemistry has been increasing; in 1957 only 15% of the ACS certified men went to graduate school, while in 1961, 34% attended graduate school.

Possible reasons for the high rates of increase in baccalaureates in Mathematics and Physics were discussed.

It was agreed that data such as that presented by Dr. Miller should be widely disseminated to chemists, teachers, and high school counselors.

Submitted by: W. D. Larson,
Secretary

Leader: Dr. Enno Wolthuis, Calvin College

I. Which Students Should Participate in Research?

A variety of opinions were expressed as to which students should be allowed to do research. Some thought that freshmen and sophomores are capable of a limited amount of research, and that they should be introduced to it as a means of stimulating their interest in chemistry at an early point in their education. Others felt that the first and second year students needed the more conventional introductory laboratory experience in order to acquire the basic experimental skills which are necessary prerequisites to research. It seemed to be generally agreed that research directed at gathering truly new knowledge should be reserved primarily for the upper-class students. It was suggested that selected lower classmen might be allowed to choose a professor and begin to participate in the professors area of research. This relationship would then be allowed to develop into a research assignment for the student in his junior or senior years. This type of program could well include summer research employment of the same student under the supervision of the professor.

II. Type of Research Problems

It was pointed out that developmental research (e.g. developing new or better methods for solving old problems) was as valid a basis for a research problem as so called "basic research" which sets out to find new information. Developmental research is especially important in preparation for industrial research. A problem should be carefully selected such that it will not be too complicated or long. There should be every opportunity for a successful conclusion to the problem within the allotted time. This will give the student a sense of accomplishment and satisfaction. The problem should be sufficiently difficult to challenge the student and condition him to the difficulties and frustrations inherent in research. This will lend a sense of reality to the students experience in chemistry. It is not necessary to pick a problem on the basis of its research value; i.e., its value to providing completely new knowledge. It is better to pick a problem with instructional and experimental value to the student.

III. The Literature Search in Research

The importance of introducing the student to the chemical literature at an early date was stressed. It was especially important to teach them how to use the literature (e.g. Chemical Abstracts, etc.). It was pointed out that it is usually possible to share or borrow books and journals from other institutions. Also, it is possible to obtain photo copies of required literature references to supplement a limited scientific library. It is helpful to first introduce the students to the literature via an assigned literature research paper of some kind.

IV. How to Conduct Undergraduate Research.

The key to successful research is an enthusiastic professor who is active in research. Faculty research is time consuming, and it is important to sell the administration the need for time, money, and man power for research. Research is expensive in both time and money. It is estimated that directing three research students is the equivalent of teaching one course in time and energy consumed. Research may be run as an honors program or as a special course (e.g. "Chemical Research" or "Independent Studies" etc.). However it is done, it was felt that two afternoons per week were a minimum amount of time if anything is to be accomplished. It may prove very helpful to break a problem into several parts and let 2-4 students attack each part as a team effort. Teamwork is good training for industrial research. Usually a senior thesis and oral examination is included in the research program.

Saturday morning was largely devoted to a discussion of sources of support for research. Questions were answered about such support as is provided by NSF, Research Corporation, Petroleum Research Fund, etc. The flexibility of NSF support was stressed and members left the meeting encouraged to apply for funds.