MONMOUTH COLLEGE

1853 CENTENNIAL 1953

MONMOUTH, ILLINOIS

Monmouth College
Monmouth, Illinois
October 9, 1953

Dear Sir:

Reports of the group discussions held during the Conference of College Chemistry Teachers are enclosed herewith. These are being sent to each of the participants in the Conference. The meeting was held during Monmouth College's Centennial Year. Professors of chemistry from independent liberal arts colleges within a 300-mile radius (about) of Monmouth were invited to attend. Others invited to attend included professors of chemistry from other United Presbyterian colleges and State of Illinois colleges and universities.

These reports are being sent too, at the request of the Organizing Committee of the Midwestern Conference of Liberal Arts College Chemistry Teachers, to chemistry departments in independent liberal arts colleges in Illinois, Indiana, Iowa, Minnesota, Wisconsin, Michigan, and Missouri, who were not represented in the Monmouth Conference.

Besides serving to provide a record of the discussions at Monmouth, the enclosed reports may be helpful at this time to those planning to meet at Appleton, Wisconsin, during October 16 and 17.

Yours sincerely,

W. S. Haldeman

W. S. Haldeman, Chairman
Conference of College
Chemistry Teachers

WSH:cl

CONFERENCE OF COLLEGE CHEMISTRY TEACHERS

NOVEMBER 14 AND 15, 1952

MONMOUTH COLLEGE, MONMOUTH, ILLINOIS

Report of Discussion Group

ANALYTICAL CHEMISTRY

Participants

1.	Eastman, Irene	Aurora College	Aurora, Illinois
2.	Erickson, E. R.	Augustana College	Rock Island, Illinois
3.	Evans, G. Harlowe	Illinois State Normal University	Normal, Illinois
4.	Fawcett, Clarence	Illinois Wesleyan University	Bloomington, Illinois
5.	Ferguson, B.	Valparaiso University	Valparaiso, Indiana
6.	Fiess, Harold A.	Wheaton College	Wheaton, Illinois
7.	Jacob, F. E.	Drake University	Des Moines, Iowa
8.	Laurene, A. H.	Bradley University	Peoria, Illinois
9.	Lyon, B. I.	Central College	Fayette, Missouri
10.	Motiff, Lawrence L.	St. Norbert College	West de Pere, Wisconsin
11.	Neifert, R. E.	Knox College	Galesburg, Illinois
12.	Oyster, Leone	Ripon College	Ripon, Wisconsin
13.	Rolf, F. W.	Northern Illinois State Teacher's College	DeKalb, Illinois
14.	Skougstad, Marvin W.**	St. Olaf College	Northfield, Minnesota
15.	Tomsicek, W. J. *	St. Thomas College	St. Paul, Minnesota

* Chairman
** Secretary

SUMMARY OF ANALYTICAL CHEMISTRY DISCUSSION

The Discussion Group in Analytical Chemistry gave their consideration to a variety of problems related to the teaching and course work of both Quantitative and Qualitative Analysis. In many instances no definite conclusions could be reached. Nevertheless, the value of the opportunity to share experiences and opinions was sincerely appreciated by all who took part in the discussions. In the following summary, the principle topics discussed and certain pertinent comments relative to each topic will be listed.

1. "The place for qualitative analysis in the chemistry curriculum." The Group represented many opinions as to the proper sequence of course work, including a course in qualitative analysis for chemistry majors. However, it was the general opinion that, in order to do justice to the training that qualitative analysis can provide the chemistry major, it would be most desirable to offer this course as a separate unit of one semester to be given during the sophomore year. In this way the theoretical and mathematical aspects of qualitative analysis could be adequately treated. When qualitative analysis is given as a part of first-year general chemistry, the time allowed for class discussion and lecture periods does not allow for adequate treatment of both the descriptive chemistry of the elements and the theory of qualitative analysis. Although a separate, one-semester course in qualitative analysis would be most desirable for the chemistry major, the non-major would be adequately trained in qualitative analysis with a brief course included as a part of the general chemistry course.

2. "To what extent may microscopy or spectroscopy be introduced into the qualitative analysis course?" These techniques, while important, are generally not suited to sophomore level work. They might be introduced in advanced courses in instrumental analysis or possibly be offered as special courses -- otherwise best left to the graduate program.

3. "Qualitative methods and techniques which may be utilized to stimulate interest." Two interesting alternate testing methods were suggested. One: a fluorescence test for zinc and sodium utilizing the fluorescent characteristics of precipitated sodium zinc uranyl acetate when viewed under UV illumination. These tests were reported by White (U. of Maryland) in J. Chem. Educ. (1949?).

Second: a qualitative separation by chromatographic techniques. A brief manual of this technique has been prepared by (Miss) Fillinger, Hollins College, Hollins College, Virginia.

The utilization of spot test techniques was deemed of little value in teaching qualitative analysis, both because the tests do not, by example, teach much chemistry of the compounds or elements, and also because of the student's lack of experience in organic chemistry.

4. "The relative merits of thioacetamide reagent and hydrogen sulfide." Those who were using thioacetamide were enthusiastic in their praise of it and considered it superior to H_2S.

5. "The relative merits of macro and semi-micro methods." Those using the semi-micro method preferred that method to the macro method, claiming the technique to be more rapid (enabling more analyses to be run), less expensive of reagents, and capable of giving cleaner separations.

6. "The relative merits of the centrifuge and pressure bulb techniques." Very few had tried the pressure bulb method in class teaching, but were aware of its possibilities.

7. "The preparation, distribution and grading of qualitative unknowns." Again the Group offered several individual methods for the handling of student unknowns. In general, the student was penalized equally for all errors, either for failure to report an element or anion actually present or for reporting a substance not actually present. Most of the Group indicated that they required the confirmatory tests to be shown along with the final report on an analysis. In most cases, also, a student was allowed a second report with a chance to raise his grade if his first report was grossly in error.

8. "Should students learn the analytical schemes and be responsible for equations for the reactions?" Practically unanimously -- yes.

9. "Should commercial products be included as unknowns?" Not all were incorporating commercial products among their list of unknowns. Some were using them successfully. Among the commercial products suggested were table salt, cleansers and water softeners, and baking powders.

One member described his plan of having students, working in pairs, make up synthetic practice unknowns for each other. The student is not graded on this unknown but it serves as a practice sample before he begins work on his issued unknown.

The following topics deal with the teaching of Qualitative Analysis.

10. "Should laboratory hours be strictly regulated?" Apparently, in practice, many people did not strictly limit the amount of time a student may spend in the laboratory. Nevertheless, all agreed that if the student is aware that the prescribed work can and must be completed within the scheduled laboratory periods he will usually do so. This will obviate the necessity of providing either supervised or nonsupervised extra laboratory time. Students should not be permitted to work in the laboratory without supervision, although this is probably not as serious in quantitative laboratories as in the organic lab. because of the less-hazardous nature of the work being done. Several indicated that they provide an extra, or make-up period, scheduled at a definite time each week.

11. "What instruments should be included in a course in instrumental methods?" In general, the following, in order of decreasing necessity:

A. Potentiometric titration assembly, pH meter, glass electrode, or its equivalent.

B. Electroanalysis.

C. Colorimeter (Coleman preferred).

D. Spectrophotometer (Beckman Model DU).

E. Polarograph.

F. Spectrograph.

In no cases were radioactivity methods being taught, it being felt that this subject, at least as far as laboratory experience is concerned, should be left to the graduate program.

12. "How many unknowns should be required per semester?" The number here varied from seven to fourteen. Where fewer unknowns were required, however, there were other assigned experiments, such as calibrations, titration exercises, etc.

13. "Should the Kjeldahl determination be included in the introductory course?" The Group was divided on this question. An interesting factor here was the type of samples employed by those using the determination. The samples issued varied from dried blood, to cereals, fertilizer, and even leather.

14. "How can students be induced to keep better laboratory notebook records?" Everyone agreed that it was difficult to impress upon the student the necessity of keeping neat, complete and proper notebook records of his laboratory work. No significant suggestions were made toward the alleviation of this difficulty.

15. "To what extent should classical methods be replaced by the more modern instrumental techniques?" Practically all agreed that, for an introductory course at least, the classical methods provide the fundamental techniques and also provide basic chemical theory. For this reason these methods are a significant part of the course in quantitative analysis. A thorough grounding in these fundamentals must precede the introduction of "push-button" instruments, where the shiny black case, the knobs and dials, so often hide the chemistry involved.

16. "Relative merits of distilled and de-mineralized water for laboratory use." Either was considered satisfactory, with the de-mineralized apparently the more preferred because of its simplicity.

17. "To what extent should the student be required to calibrate his equipment?" In all cases, calibration of the volumetric glassware (buret, pipet, flask) was considered essential. A calibration of the analytical weights was considered too time-consuming to be required in the introductory course, but thought to be of value in an advanced course.

One member of the Group described the program which has been recently introduced at his school wherein qualitative and quantitative analysis are being taught simultaniously in a single year course. This is accomplished by using the same separations for the quantitative procedures as are used in qualitative analysis. In many cases the student is allowed a choice of quantitative method once the separation is made. Since the program is relatively new, a definite opinion as to its merit would be premature. However, the indications are that it will be satisfactory.

Another Group member described his method of requiring frequent library reports -- a report on a 3 x 5 filing card, abstracting an article from recent literature. He reported that such a procedure has been used to encourage students to acquaint themselves with the current literature.

This summarizes most of the topics discussed by the Group. Many other things were mentioned briefly and a great number of interesting and helpful comments were offered by everyone participating in the discussion, but because of their great number it would be impossible to include all of them in this brief summary.

Submitted by,

Marvin W. Skougstad
St. Olaf College

Report of Discussion Group

GENERAL CHEMISTRY

Participants

1.	Anderson, N. Arthur	Illinois College	Jacksonville, Illinois
2.	Baker, J. Allen	Simpson College	Indianola, Iowa
3.	Bailey, W. F.	MacMurray College	Jacksonville, Illinois
4.	Brooker, Robert M.	Indiana Central College	Indianapolis, Indiana
5.	Chase, Harold A.	Wheaton College	Wheaton, Illinois
6.	Cherry, Marianna	Milwaukee-Downer College	Milwaukee, Wisconsin
7.	Culbertson, J. B.	Cornell College	Mount Vernon, Iowa
8.	Fulmer, Jervis M.	DePauw University	Greencastle, Indiana
9.	Gooding, R. U.	Illinois State Normal University	Normal, Illinois
10.	Hall, Wade E.	Parsons College	Fairfield, Iowa
11.	Koenig, H.	Valparaiso University	Valparaiso, Indiana
12.	Long, Mrs. W. S.	Taylor University	Upland, Indiana
13.	McMullen, Warren A.	Greenville College	Greenville, Illinois
14.	Meibohm, A. W.	Valparaiso University	Valapraiso, Indiana
15.	Merkle, Paul A.	Simpson College	Indianola, Iowa
16.	Miller, Arild J.	Carleton College	Northfield, Minnesota
17.	North, E. O.	Lake Forest College	Lake Forest, Illinois
18.	Paulson, M. C.	Bradley University	Peoria, Illinois
19.	Plank, Isa Ruth**	William Penn College	Oskaloosa, Iowa
20.	Sherman, Leo P.	Grinnell College	Grinnell, Iowa
21.	VanValkenburgh, H. B.*	Iowa Wesleyan College	Mount Pleasant, Iowa

* Chairman
** Secretary

SUMMARY OF GENERAL CHEMISTRY DISCUSSION

The group on General Chemistry met in Room 210 Wallace Hall at 4:00 P.M., November 14. After introductions and a brief scientific life history of each member, discussion began.

The first discussion was on the problem of the students with and without high school chemistry. Some had found their better students had had high school chemistry while others had found their better students among those with no previous chemistry training. The explanation for this variance was given that, in Iowa at least, approximately 75 per cent of the high schools do not offer chemistry therefore there is no selection of students. In other cases, it was the better students who elected chemistry in high school. Grinnell and Wheaton reported separate classes, Milwaukee-Downer reported all in the same lecture but segregation in quiz section and laboratory. Illinois State Normal reported the same class work but different laboratory work. Some others reported two classes in general chemistry but the basis for separation was the high rank in aptitude tests rather than a credit in high school chemistry.

The question of the utilization of class period was next discussed. Professor North of Lake Forest College said he took about 15 minutes to check students preparation and to compare their outline with his, then started discussions and explanations allowing no one to ask questions who had not studied the material. There were few other comments made.

The question of mathematics difficulties then was presented. It seemed the basic difficulties in reading and mathematics could be spotted with tests. High correlation was reported between both English and mathematics test scores and chemistry success. At Grinnell, remedial mathematics is required before enrollment in chemistry or physics if the tests were low. It was suggested that remedial English should also be a prerequisite. Some decided that the trouble was not mathematics as such but the lack of ability to analyze the problem or simply the inability to think. It was suggested that a mathematics prerequisite would help the difficulty with mathematics in chemistry but that was not accepted as a satisfactory way to solve the problem.

At this juncture, Dr. Haenisch appeared and the election of officers ensued. H. B. VanValkenburg of Iowa Wesleyan College, Mount Pleasant, Iowa was chosen chairman and Isa Ruth Plank of William Penn College, Oskaloosa, Iowa was named secretary. Dr. Haenisch left and discussion resumed on the problem of mathematics.

About 50 per cent of those present encouraged the use of logarithms and slide rule in general chemistry and most all encouraged their use in the more advanced courses. For those that could not use the logarithms, time was taken to teach enough to satisfy the needs for pH. The opinion was, that we were teaching chemistry principles and not multiplication tables therefore problems on gas laws should be set up with reducible numbers or require only that the student set the problem with the indicated operations.

The next problem discussed was course content. Grinnell is trying an experiment of one semester devoted to non-metals and the other semester to Organic. Objections here were that entrance examinations to many fields of further work asked questions on metals. The time devoted to organic by the colleges represented averaged about three weeks. Time spent on the gas laws averaged about three meetings. The metals seemed to be handled rather hurriedly and in a more descriptive manner using field trips and films available through the U. S. Bureau of Mines. Some favored giving a few typical metallurgical processess rather than all the metals. Discussion of the time and place of introduction of atomic structure in the general course revealed that the majority felt it to be the logical way to start and favored its early introduction. The Periodic Table was introduced about the same time and used continuously thereafter. If chemistry was considered the study of elements, laws governing their reactions and the energy changes therein, then it was necessary to include metals, non-metals, atomic structure and chemical laws. In considering the laboratory time, several felt that one 3 hour period a more economical use of time than two 2 hour periods. Experiments on testing simple properties and simple preparations rated second to the more quantitative which involved more thought and longer sequence of operations. Workbook type manuals were not in highest favor. Some preferred a short summary written to give procedure, reasons why, and results. In larger schools, two courses were given, one for the chemistry major and another, with a somewhat different content, for the pre-professional student. On the problem of chemistry for nurses, it seemed a full year course divided into inorganic, organic and biological was most favored.

Next for discussion was the objectives for general chemistry laboratory which were summarized as follows: 1. Emphasize lecture and discussion points, 2. Give concrete experiences with otherwise abstract ideas, 3. Develop good citizenship stressing habits of cleanliness, neatness and orderliness, 4. Train the hands and develop chemical techniques.

Objectives for the recitation part of chemistry: to teach to think without confusion, clearly. Chemistry seems to create its own problem more naturally than other fields therefore it gives a better opportunity for teaching the scientific method of reasoning. Some factual material is necessary but thinking seemed to be the emphasis favored. Creating an interest in and developing an enthusiasm for chemistry were also given as goals.

Group adjourned for dinner.

The second session of the general chemistry section was called to order by Chairman VanValkenburgh in room 305 Wallace Hall at 9:00 A.M. November 15.

The first question for discussion concerned the amount of qualitative to be included in general chemistry. Of the group attending, about 50 per cent included qualitative and 50 per cent did not. If the general chemistry course was ten hours credit then almost all favored including qualitative analysis in the course but if it were an eight hour credit then there was much question and disagreement about including the qualitative in the first course. When qualitative was included, it was the laboratory work for most of second semester. The recitation work continued with regular topics and most of the qualitative theory was included in the laboratory sessions. Semi-micro procedures were in general use as was some other method of producing H_2S other than large generators. Paraffin sulfur mixture or thioacetamide were chief substitutes used. The purpose of the qualitative course was suggested as: a means of studying the metals and opportunity to organize material learned in the general course. The number of unknowns given averaged around ten which included the common anions and cations with some being systematic separations and others single unknowns in solution or solid form.

Next question was the value of lecture demonstrations. It was generally agreed that they were worth the time and effort necessary to give them but do not demonstrate the experiments which the students will do in the laboratory. An exception was made here at the first of the term when it might be desirable to show the student what was expected in the laboratory.

Should the laboratory work be ahead of or behind the lecture work was next discussed. General opinion was that if the laboratory was ahead then there was more thinking in the laboratory but with several sections and assistants it was more easy to keep all correlated to have the lecture ahead of or parallel with the laboratory work.

On the question of the place of history in the general chemistry course, the general opinion seemed to be to include it incidentally for interest and vitalization.

Another question on content discussed was concerning the amount of physical chemistry to be included. The amount was not decided but the general idea seemed to be that whatever was presented would be in descriptive terms rather than rigorous mathematical solutions.

Another question for discussion was the type of test used in general chemistry. About 1/3 of those present used the ACS tests. They were favored as a means of teacher evaluation, a means of correlation between different teachers and their classes. The essay type test, which emphasized recall, and the objective test, which stresses recognition, were discussed and the general opinion seemed to favor a diversified type of testing program.

The testing question led to the question of evaluating the students work. The final test grade was not necessarily the determining factor for passing although no uniform agreement was reached as to its value. The general trend of test grades throughout the term was considered significant. Laboratory grade based upon reports, personal technique, setting experiment, neatness and skill counted 30 to 40 per cent of the final grade in many cases. The other part of the grade was based upon recitation work, tests, problems and personal evaluation by instructor, if the class is small enough for that without prejudice, was advocated by many.

In conclusion it was decided that the teaching of chemistry is an art rather than an exact science and that the personal equation is very great in all teaching.

Submitted by,

Isa Ruth Plank
William Penn College

Report of Discussion Group

ORGANIC CHEMISTRY

Participants

1.	Richter, Henry J. *	Hamline University	St. Paul, Minnesota
2.	Parmerter, Stanley **	Wheaton College	Wheaton, Illinois
3.	Ryder, Bernard L.	Illinois Wesleyan University	Bloomington, Illinois
4.	Bluestein, Bernard R.	Coe College	Cedar Rapids, Iowa
5.	Thiessen, Garrett W.	Monmouth College	Monmouth, Illinois
6.	Coleman, Curtis B.	Knox College	Galesburg, Illinois
7.	Bornong, Bernard J.	St. Ambrose College	Davenport, Iowa
8.	Smith, L. O.	Valparaiso University	Valparaiso, Indiana
9.	Penner, Hellmut P.	Carleton College	Northfield, Minnesota
10.	Hamm, Kenneth L.	Carthage College	Carthage, Illinois

* Chairman
** Secretary

SUMMARY OF ORGANIC CHEMISTRY DISCUSSION

The discussions of the section centered around five general topics: prerequisites for organic chemistry, the presentation of subject matter, examinations, laboratory work, and qualitative organic analysis.

Prerequisites: Most of the colleges represented require that a student complete both general chemistry and analytical chemistry before studying organic chemistry. Some exceptions are made for pre-medical and pre-dental students. It was the conclusion of the group that the teaching of basic concepts as well as recent developments in theoretical organic chemistry is less difficult if the student is well grounded in the fundamentals of chemistry. Therefore, it was recommended that two years of college chemistry are desirable as a prerequisite for organic chemistry.

Presentation of Subject Matter: The question as to whether aliphatic or aromatic chemistry should be presented simultaneously or separately was a warmly debated subject. Some maintained that it is best to present the material in the order of increasing complexity beginning with saturated aliphatic compounds and proceeding through olefins before discussing aromatic compounds. Others claimed that this creates an unnecessary division of the subject matter. They believed that aliphatic and aromatic compounds should be discussed simultaneously, making mention of the similarities and differences between the two classes. It was pointed out that, since a large percentage of laboratory syntheses involve aromatic compounds, it is desirable to introduce the chemistry of these compounds early in the course. A great variety of organic textbooks are being used by the participants. The majority of the group agreed that it is the responsibility of the teacher to emphasize the important material in the course so that the student can separate the salient features from the wealth of descriptive material in the texts. A need was expressed for a new organic problem book with answers.

Examinations: It was agreed that frequent examinations are useful in the teaching of organic chemistry. On the average some kind of examination is given every two weeks. The multiple choice type of question is used by very few of the teachers.

Laboratory Work: There was a prolonged discussion of laboratory practice. Some believe that it is best to keep the subject matter of laboratory work in phase with the lecture material. Others feel that there is instructional value in the presentation of material in the laboratory before it is mentioned in lecture. There was no agreement on whether special laboratory techniques such as melting point d determinations, crystallization and distillation should be studied as preliminary experiments or introduced as needed for a specific preparation. It was agreed that close contact between student and instructor is essential to effective laboratory training. In this connection it was mentioned that oral examinations over laboratory work are good but time consuming. Provision for students to work on special preparations and group study of variations on a reaction were mentioned as means of stimulating interest in laboratory work. Semi-macro methods which make use of standard types of equipment were considered to be superior to semi-micro methods. The use of safety glasses at all times in the organic laboratory was recommended.

Qualitative Organic Analysis: The colleges represented offer qualitative organic analysis courses varying from two to four semester hours' credit. The majority felt that the equivalent of four semester hours is necessary for the best course. There is considerable variation in practice in the number of unknowns assigned and the amount of preliminary laboratory work required before the identification of unknowns is started. It was agreed that qualitative organic chemistry is the best advanced course in organic chemistry.

Submitted by,

Stanley Parmerter
Wheaton College

Report of Discussion Group

PHYSICAL CHEMISTRY

Participants

1.	Armstrong, Maurice	Millikin University	Decatur, Illinois
2.	Biester, John	Beloit College	Beloit, Wisconsin
3.	Erickson, E. R.	Augustana College	Rock Island, Illinois
4.	Grady, Harold R.	Muskingum College	New Concord, Ohio
5.	Keizer, Clifford R.**	Central College	Pella, Iowa
6.	Motiff, Lawrence L.	St. Norbert College	West de Pere, Wisconsin
7.	Nachtsheim, H. G.	College of St. Thomas	St. Paul, Minnesota
8.	Peterson, Ben H.*	Coe College	Cedar Rapids, Iowa
9.	Vellenga, S. J.	Monmouth College	Monmouth, Illinois
10.	Weaver, Eugene	Wabash College	Crawfordsville, Indiana

* Chairman
** Secretary

SUMMARY OF PHYSICAL CHEMISTRY DISCUSSION

At one time or another in the discussion periods, these topics came in for some batting around:

1. Special courses -- intended for pre-meds, non-majors;
2. Mathematics prerequisites for P. Chem. courses;
3. Textbooks and laboratory manuals;
4. Plan of laboratory work;
5. Laboratory reports, data;
6. Redistribution of topics;
7. Preparation for graduate work;
8. Advanced P. Chem. courses.

1. Approximately one-half of the college represented offer more than one elementary P. Chem. course; the one intended for pre-meds and non-majors usually does not require calculus as a prerequisite. It was agreed that where staff, space, and student personnel permit such an arrangement, it is convenient to have such a course. This permits giving chemistry majors a more intensive course.

2. The standard prerequisite of calculus makes it impossible in most colleges to offer P. Chem. to majors in their junior year.

3. It was found that the group was almost evenly divided in the use of the two most popular textbooks. There was not complete satisfaction with either one, particularly in the treatment of thermodynamics. Few use published laboratory manuals.

4. Some instructors prefer to assign a comprehensive project rather than a series of weekly experiments. There is value in such method.

5. Practice varies as to data treatment; some require a permanent record in a bound notebook; others ask for a record on loose leaf sheets, with a duplicate copy to be turned in to the instructor at the end of the experiment. Reports vary from the fill-in type to extensive surveys on comprehensive topics. Grading of reports is based on (a) quality of experimental work, (b) quality of write-up, neatness, comprehension of principles, (c) attitude in laboratory. Grading preferably on a semester or long term basis rather than on individual reports.

6. To relieve pressure on crowded P. Chem. courses, it was considered that these topics might be adequately covered in the courses in analytical chemistry:

a. Ionic equilibria, pH, etc.
b. Colloids
c. Electrochemistry, redox potentials
d. Instrumental analysis

These topics might well be taken care of in physics courses:

a. Quantum mechanics
b. Sub-atomic phenomena
c. Statistical analysis

7. In view of the varying demands of different graduate schools, it was felt that there was a great need for personal counseling of entering graduate students. If we are to continue to produce liberally trained chemistry majors, we cannot offer many hours in advanced courses.

8. Few courses in advanced PL Chem. are offered. In some cases advanced inorganic or quant. cover some important topics. Other colleges offer opportunities in senior honors and seminar work or special problems courses. The offerings depend on personnel.

In summary, it seems that although there is great variety exhibited in approach to physical chemistry and in methods of teaching, it is mutually beneficial to share ideas. Although there may be no drastic changes brought about, each of us was challenged to do the best job possible, particularly in the light of the current shortage of chemistry majors.

Submitted by,

Clifford R. Keizer
Central College

Report of Discussion Group

ADMINISTRATIVE AND OVER-ALL PROBLEMS

Participants

1.	Baker, J. A.	Simpson College	Indianola, Iowa
2.	Bennett, C. W.	Western Illinois State College	Macomb, Illinois
3.	Coppock, Homer	Drake University	Des Moines, Iowa
4.	Dalton, J. L.	St. Ambrose College	Davenport, Iowa
5.	Garrett, A. B.	Ohio State University	Columbus, Ohio
6.	Gier, D. W.	Park College	Parkville, Missouri
7.	Gier, Mrs. D. W.	Park College	Parkville, Missouri
8.	Haldeman, W. S.	Monmouth College	Monmouth, Illinois
9.	Holl, Carl W.	Manchester College	North Manchester, Indiana
10.	Larson, R. G.	Valparaiso University	Valparaiso, Indiana
11.	Mathews, Frederick	Beloit College	Beloit, Wisconsin
12.	Moore, Perry A.	Hamline University	St. Paul, Minnesota
13.	Shroyer, John H.	Bradley University	Peoria, Illinois
14.	Weatherbee, Carl	Millikin University	Decatur, Illinois
15.	Wright, Paul M.	Wheaton College	Wheaton, Illinois
16.	Oviatt, Charles D.**	Tarkio College	Tarkio, Missouri
17.	Swenson, A. W. *	Wartburg College	Waverly, Iowa

* Chairman
** Secretary

SUMMARY OF ADMINISTRATIVE AND OVER-ALL PROBLEMS DISCUSSION

The following topics were discussed during the meeting sessions:

I. Administrative pressure to eliminate classes with small enrollments.

II. Recruitment of new chemistry majors.

III. The bakeground of chemistry majors in social science and the humanities.

IV. The financing of chemistry departments.

V. Departmental libraries.

VI. Research in liberal arts colleges.

I. Few members of the group stated that they had experienced any direct pressure from college administrations that small classes be dropped from schedules. Most often, the pressure is of a more subtle nature, that of having an instructional staff so small that some advanced courses can not be offered as desired. One method for relieving pressure is to offer advanced courses in alternate years, but in the case of courses in organic and physical chemistry, this is not permissable under the American Chemical Society accrediting program. The best method for relieving this pressure is to remind the administration of the importance of guaranteeing a satisfactory major in all departments. It is also desirable to mention that most former graduates were at one time members of small classes. Whether this problem is satisfactorily solved or not has an effect upon prospective majors as well as on present majors.

II. In order to attract more high school students to the study of chemistry in college, it was agreed that the most effective approach is to make as many personal visits and contacts with high school instructors and students as possible. Here, the emphasis should be on the cultivation of proper interests and attitudes rather than on rigidly specifying the manner of preparation for college. Supplementing this program could be the benefits derived from printed matter and brochures, and from encouraging attendance at science fairs and science open houses, sponsored both by colleges and by outside organizations. The most effective results of this program can be obtained in local high schools.

Once a student has arrived at college, interest and enthusiasm in his work should continue. To have the best and most interesting teacher at work on the general chemistry course is almost a necessity. In order that a prospective major will have some idea of the nature of his work after graduation, it is advisable to publicize the accomplishments and success of former graduates. It may be necessary to make some adjustment in the handling of first year chemistry students in order to increase the confidence of students who have come to college without having had high school chemistry, especially if it is not possible to separate those who have had the high school course from those who have not.

III. Among the institutions represented, there was found to be no great difference in the science course requirements for majors in chemistry. However, there was found to be some difference in the general non-science requirements, but in no case was the variance significant, and it does not appear that there will be any changes, for all institutions seem to realize the necessity for retaining these elements of general education. In deciding which courses to require of chemistry majors, it is well to keep in mind the attributes which employers desire of an employee in addition to satisfactory technical preparation:

1. The ability to express oneself clearly both in speaking and in writing.

2. Personality characteristics which will enable him to work comfortably in close contact with others, for few companies can afford to maintain a staff of prima donna genii.

3. A variety of productive interests outside of the field of technology.

IV. Two methods for financing chemistry departments were in general usage, (a) by appropriations from general operating funds, and (b) from laboratory fees only. There seemed to be no outstanding advantage of one over the other. The group agreed on the following recommendations:

1. Departmental accounts should be on a continuing basis, so that deficits and surplus funds can be carried over from year to year, thereby facilitating the purchasing of expensive items of equipment.

2. Fees collected from students for laboratory breakage should be returned to the department so that the capital investments may be replaced.

V. Where possible, department libraries should be set up for convenience sake. Proximity of reference volumes to the laboratory encourages students to make greater use of them than if it is necessary to go to another building.

VI. In connection with research in small liberal arts colleges, it is a recommendation of this group that this conference request the American Chemical Society to address questionaires to various industries inquiring their willingness to support research in small colleges. It is suggested that information obtained from this undertaking be made available to all colleges. For research, it should be the custom to include in the contract some provision for personal service fees, and it is suggested that, to avoid ill feeling on the campus, these fees be made payable during the summer months when research would be on a full time basis.

It was the opinion of this group that industry is in some way obligated to assist small colleges, for in past years, they have not hesitated to entice, with attractive salaries, the cream of the small college instructors to industrial employment, without concern for the possible lowering of instructional quality. Unless competent instruction is available at the college level, there will be a consequent absence of adequately trained scientists available for industrial employment in the future.

Submitted by,

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Report of Discussion Group

THE SETTING OF CHEMISTRY IN THE COLLEGE CURRICULUM

Participants

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SUMMARY OF SETTING OF CHEMISTRY IN THE COLLEGE CURRICULUM DISCUSSION

At the first meeting of this committee four areas were suggested for study:

1. The ACS accreditation of chemistry in the liberal arts college, 2. Terminal courses in chemistry, 3. The philosophical and religious implications of courses in chemistry, and 4. The minimum requirements in science for non-science majors (B.A.).

Section 1. ACS Accreditation

The problem of ACS accreditation involves certain adjustments in our curricular offerings in chemistry. The importance of its consideration is due to several factors: namely, (a) some alumni request it; (b) it may aid in recruitment of chemistry students for the college; (c) industry furnishes scholarships to ACS approved colleges; (d) the ACS is sending lists of ACS approved colleges to high schools which serves to distinguish between colleges.

Various individual opinions or experiences were expressed by members of the committee regarding the desirability of ACS accreditation. Some of these are as follows: (a) Graduation from an ACS approved school does not insure high quality of future work in graduate school or industry; (b) Graduation from an ACS accredited college is not demanded by industry for employment, nor do graduate schools demand ACS accredited graduates; (c) National accrediting agencies object to one agency evaluating the work of a single department in a college; (d) Generally, administrators in colleges are not interested in ACS accreditation unless pressure is brought to bear.

In summarizing, ACS accreditation serves to stimulate the quality of chemistry taught in colleges. Some schools may seek it, whereas others feel that it imposes too severe restrictions on the curriculum. In some instances ACS accreditation aids the student in obtaining more desirable employment and entrance credits into graduate school.

Section 2. Terminal Courses in Chemistry.

Various problems are involved in offering a terminal course in chemistry. Some of these are as follows: (a) the nature and time distribution of the subject matters, (b) the poor mathematical background of many students, (c) the matter of student enthusiasm, (d) the selection of a suitable test, and (e) the problem of deciding what students are eligible for a terminal course in chemistry.

Some of the individual opinions expressed by the group were as follows: (a) the course should consist of a study of the impact of chemistry on the physical and organic world; (b) it should develop the philosophical concept of chemistry and science in relation to man; (c) a simple dynamic text should be used; (d) laboratory work should be made as dynamic, direct and vital as possible.

In summarizing, the group felt that there is a definite place for a terminal course in chemistry. It requires the best of teaching with careful selection of material and of means for effective presentation.

Section 3. Philosophical and Religious Implications.

The committee considered the relation of the study of chemistry to the area of religion. The opinions were varied. The members realized that there are philosophical and religious implications involved in the study of chemistry, but each member felt inclined to develop these with his students in his own way.

Section 4. Minimum Science Requirements for Non-Science Majors (A.B.).

The representatives of the various colleges in this group first reported on the science requirements for non-science majors in their own schools. Eight out of twelve colleges require eight hours of science with laboratory work, and four require twelve hours of science with laboratory work. One school will substitute mathematics or geology for the science requirement, and proficiency examinations in one school are used to indicate fulfillment of the science requirement.

The group considered laboratory work in science to be more effective than demonstration work alone. It was felt that the completion type of laboratory report was unsatisfactory, the use of special written forms and frequent laboratory examinations being superior. The suggestion was made that more reference work should be required to vitalize and broaden the scope of the course.

There was a general recognition that all B.A. candidates should be required to take science with the inclusion of laboratory work.

Submitted by,

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