WRITTEN SUMMARIES FROM DISCUSSION GROUPS
(Complete reports are available from the secretary - treasurer)

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

The meeting opened with seventeen interested participants to consider further plans. Five experiments were distributed, with the intention that they will be tested during the year. Forms for reporting these results were also distributed. A standard write-up procedure was adopted for all experiments. It was agreed that the immediate goal is the assembling of many more such experiments, and the discussion that followed concerned various volunteer efforts toward this end.

Group 2. ROLE OF ANALYTICAL CHEMISTRY IN THE FOUR YEAR CURRICULUM
Leader: Eugene Weaver, Wabash College

The discussion of this topic was started with an attempt to define analytical chemistry. The group concluded that analytical chemistry is the science devoted to exact and dependable measurements of constituents. Various possible approaches to the teaching of analytical chemistry as presented at the Atlantic City ACS meeting were reviewed. The almost unanimous feeling of the Bucknell conferees that elementary analytical chemistry could be redistributed among general, organic and physical was reported by the discussion leader. The Bucknell conferees' insistence on an upper level course (after Physical) devoted to analytical chemistry was also noted.

Some areas, such as stoichiometry, ionic equilibrium, free energy, redox and emf's should be introduced in the first year. In doing this, someone suggested that we should "give the students the truth but not necessarily the whole truth." We will need to build on, and add to, these concepts in later courses.

Certain topics could be handled equally well in Analytical or Physical, whichever comes first, such as: physical character of precipitate, colorimetry, errors and handling of data, and potentiometric titrations and pH measurement. Physical properties of compounds (refractive index, viscosity, etc.) and some acid-base titrations could be included in the organic laboratory.

The topics remaining for an advanced analytical course are: analytical separations, chromotography and ion exchange (might have been introduced in organic), applications of radiochemistry, spectrophotometric analysis, and various electrical methods (coulometry, etc.).

Group 3. THE LABORATORY APPROACH OF ORGANIC CHEMISTRY
Leader: Frank Pennington, Coe College

A report from the Organic Group of the Conference on Undergraduate Chemical Education at Bucknell University was read and discussed. The suggestion that the organic laboratory should include more experiments of a quantitative nature was considered. It was suggested that the merit of the suggestion could be tested by each of us initiating and evaluating a few such experiments with the object of comparing notes at the next annual MACTLAC meeting.

Group 3 (con't)

The Organic Group at Bucknell had questioned the place of the standard Qualitative Organic course and wondered if its fate was going to be the same as the fate of Qualitative Inorganic. In discussing this matter a number of people indicated that they were now including some qualitative analysis in their general organic course. It was felt that a separate Qualitative Organic course should be retained, but it should be more realistic and more quantitative.

The use of standard taper in the organic laboratory was discussed. Its greater cost represented an important drawback although there was general agreement that it was educationally desirable. The comment was made that ball and socket joints might be preferable.

Techniques for evaluating the organic laboratory were considered. It was granted that subjective evaluation was necessary. Still practical examinations that measure the ability of the student to see what is wrong with an experimental setup or that analyze his ability to interpret laboratory directions were found to be useful in making an evaluation of the organic laboratory.

Group 4. NEW APPROACHES TO HIGH SCHOOL CHEMISTRY
Leaders: Ed Haenisch, Wabash College
O. T. Benfey, Earlham College

The Chemical Education Materials Study - Ed Haenisch

An account was given of the current status of this study which began under National Science Foundation support early this year. The steering committee for the study is under the chairmanship of Glen T. Seaborg. J. Arthur Campbell is the director of the study. A rather detailed description of the study is contained in a speech made by Dr. Seaborg on the occasion of the dedication of the American Chemical Society headquarters building in Washington and is reported in CHEMICAL AND ENGINEERING NEWS for October 17, 1960, page 97.

During the summer of 1960 the contributors group of the study completed a trial version of the text and the laboratory manual combination entitled "Chemistry-An Experimental Science." These materials are currently being used in twenty-three high schools located chiefly in the Los Angeles and San Francisco areas in California.

The text assumes that students believe in atoms and molecules, but that they do not understand the reasons behind these beliefs. Introductory chapters present an overview of chemistry in terms of the atomic-molecular nature of substances and develop concepts of behavior in terms of atomic theory and energy changes. The periodic table is introduced as a means of ordering chemical information. The second section deals with some of the most basic concepts of chemistry, again from the experimental point of view. Chapters on energy, rates, equilibrium, acid-base, and oxidation-reduction are tied together in terms of the mole concept, the kinetic theory, and the atomic-molecular concept of behavior in matter. Material designed for the second semester begins with a discussion of atomic and molecular structure and of structural relationships in the various states of matter together with their influence on chemical reactivity. The chemistry of carbon and of typical elements in the periodic table is studied, particularly as to the trends in properties as one moves through the rows and columns of the table. Emphasis in these sections is on the experimental approach with the intent of utilizing the materials and ideas presented earlier to tie chemical knowledge together.

The materials will be revised on the basis of this year's trial. Summer conferences will be held this summer at Cornell University and at Harvey Mudd College, where about 100 more teachers will become familiar with the course for use in their high schools

Group 4 (con't)

In addition to the text and laboratory material, the study will make movies for high school use and sponsor the writing of monographs, some of which will be tied closely to the text material. Others will be designed to widen the contact of the superior student with chemistry.

Information as to the availability of the materials and further progress of the study may be obtained from the director, Dr J. A. Campbell, Harvey Mudd College, Claremont, California.

The CBA Project - Ted Benfey

An account was given of the Chemical Bond Approach Project, now in its second trial year and being tested in over a hundred schools. The course was developed by nine high school and nine college teachers and is supported by a series of grants from the National Science Foundation. Taking as its central theme the major bond types, the high school course attempts to present a unified picture of chemistry rather than a large number of separate topics. Structure is emphasized as well as energy concepts. The course begins with a simple charge cloud model with which a large number of physical and chemical properties of the smaller atoms and their compounds are explained.

The laboratory is designed to parallel closely the material covered in class. The student often has to develop experimental methods on his own. The better students are asked to develop "extensions" of the laboratory assignment.

Earle Scott, presently traveling among the CBA test schools, and Elton Knutsen, a CBA teacher in the Alexander Ramsey High School of St. Paul, participated in the discussion.

Further information may be obtained by writing to the Chemical Bond Approach Project, Earlham College, Richmond, Indiana

Group 5. CHEMISTRY FOR THE NON-MAJOR
Leader: John Coutts, Lake Forest College

No report

Group 6 CURRENT CONCEPTS OF OXIDATION-REDUCTION REACTIONS
Leader: Wilmer Stratton, Earlham College

This group concerned itself primarily with a discussion of the usefulness and limitations of various definitions of redox reactions. It was generally agreed that there is no sharp dividing line between redox and non-redox reactions, since all chemical reactions involve shifts in electron density to a greater or lesser extent. Many reactions accepted as redox reactions do not involve clear-cut electron transfer, but only partial shifts. It was pointed out that there is no completely satisfactory experimental criterion for defining redox reactions. Although the concept of oxidation number has obvious limitations, this appears to be only reasonable basis yet available for defining redox reactions - i.e., redox reactions are those which involve changes in oxidation number. One member of the group raised the question whether Sanderson's "stability ratio" might provide a useful criterion, and promised to do some calculations. It was agreed that the simple and admittedly arbitrary concepts usually presented to freshmen need to be supplemented later with a more complete discussion, including current information of the mechanisms of electron transter reactions The group discussed some of the recent work on mechanisms, including bridge atom transfer and electron tunneling.