Comments and Communications

Sulfur in Ether Extracts of Lake Sediments

DURING a study of the carotenoids of mud from Linsley Pond, Conn., a relatively large amount of a crystalline substance was encountered in an ether extract. In order to get a sufficient amount of the material for analysis, 245 g of mud was dried at 75° C for 24 hr and then exhaustively extracted with diethyl ether. The crystals separated when the ether was cooled and concentrated over a stream of nitrogen. The yield of once-recrystallized material was 2.70 g, mp 119°–120° C. The sample was twice recrystallized from ether, with a final yield of 1.54 g of monoclinic crystals, melting point unchanged. A fraction was sent to Carl Tiedcke for analysis. The results were as follows: C: 0.00%, 0.00%; H: 0.00%, 0.00%; mol wt: 35, 28; 33, 32. Subsequent separation of the rhombic form, together with the above data, was sufficient to characterize the material as sulfur. Sulfur formed 1.1% of the dry weight of the mud. Total ether-extractable substances formed 2.1% of the dry weight of the mud, hence more than half the ether extract consisted of elementary sulfur.

The occurrence of sulfur in lake sediments is of interest, since some limnologists have interpreted ether and benzene extracts in terms of lipids only. The behavior of sulfur resembles lipids in that it leaves no ash on ignition, is insoluble in water, and is soluble in such solvents as ether, chloroform, and benzene. Unless supplemented by analysis for sulfur or organic carbon, such extracts will have at least a dual meaning and must be cautiously interpreted. This work forms part of a program supported by National Science Foundation Grant G-14 given to G. Evelyn Hutchinson.

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Use of Propositions in Examinations for the Doctor's Degree

DURING the past seventeen years the final examination for the doctor's degree for students majoring in chemistry at the California Institute of Technology has consisted in part of the oral defense, by the candidate, of a set of propositions prepared by him and submitted to the examiners two weeks before the day of the examination. It is the opinion of members of the staff of the Division of Chemistry and Chemical Engineering, after these years of experience, that the use of propositions contributes significantly to the effectiveness of the examination, as well as to the interest of the examiners.

In 1935 the members of our staff, after participation in several scores of doctor's examinations during the preceding fifteen years, had become bored by them. The thought occurred to me that the system of propositions (*stellingen*) that has been used in examinations for the doctor's degree in the universities of Holland for hundreds of years might be introduced. One of my students, David Harker, agreed to prepare a set of propositions in order that a trial of the proposal might be made. His oral examination for the degree of Doctor of Philosophy in chemistry, with a minor in mathematics, which was carried out with the use of propositions on May 31, 1935, was much more interesting to the examiners, and apparently to the men being examined, than most of the earlier examinations had been. The members of the committee were also of the opinion that it provided a better test of the candidate than was provided by examinations of the sort previously given, in which the candidate was asked questions arbitrarily formulated by members of the examining committee. The decision was accordingly made that all candidates for the doctor's degree in chemistry should thereafter prepare propositions.

Dr. Harker introduced the system at the Johns Hopkins University when he was appointed a member of the staff there, and it is now in use in several other universities, including Princeton, the University of California, the University of Southern California, and Columbia. In some institutions (University of California and Division of the Geological Sciences at the California Institute of Technology) propositions are used in connection with the examination for admission to candidacy for the doctor's degree, rather than in the final examination.

The nature of the system may be indicated by the regulation in the Division of Chemistry and Chemical Engineering of the California Institute of Technology, which reads as follows:

> 5. The final examination will consist in part of the candidate's oral presentation of a brief résumé of his research and its defense against attack, and in part of the defense of a set of propositions prepared by the candidate. The candidate may also expect questions related to his minor subject.
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> The propositions should be about ten in number, of which about four should relate to the minor subject and to general branches of chemistry, and about six to the branch of chemistry of major interest to the candidate, including his research.
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> For students in chemical engineering about three propositions should relate to the minor subject, two to chemistry if this is not the minor subject or to mechanical engineering if chemistry is the minor subject, and about five to chemical engineering. The candidate may also include propositions not relating to his major and minor fields.
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> The propositions, prepared by the candidate himself, should display his originality, breadth of interest, and soundness of training; the candidate will be judged on his selection and formulation of the propositions as well as on his defense of them. It is recommended that the candidate begin the formulation of his set of propositions early in his course of graduate study.
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> Two copies of the set of propositions in final form must be submitted to the Division of Chemistry and Chemical