reexamination of the material collected by the writer in 1921 at Highgate Falls has revealed a specimen (plesiotype) conforming to *D. schucherti,* but with the outlines of the thecae in general somewhat better preserved than in the holotype.

Although somewhat delayed, the recognition of this new species among the graptolite specimens found in 1921 at Highgate Falls will be of interest in correlating the slates in which it was found with other rocks of the immediate region, as well as of service in interpreting the age and structural relations among the rocks in the river gorge at the Falls.

C. E. GORDON

MASSACHUSETTS STATE COLLEGE

SOCIETIES AND MEETINGS

JOINT SYMPOSIUM OF THE AMERICAN CHEMICAL SOCIETY, THE UNIVERSITY OF WISCONSIN AND THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

A SYMPOSIUM on the Kinetics of Homogeneous Gas Reactions will be held at Madison, Wis., from June 20 to 22, under the sponsorship of the Division of Physical and Inorganic Chemistry of the American Chemical Society and the University of Wisconsin, with the cooperation of Section C of the American Association for the Advancement of Science.

PROGRAM

TUESDAY, JUNE 20

9:00 A.M. to 12:00 M.

GEORGE SCATCHARD, *Presiding*

Everett Gorin, Walter Kauzmann, John Walter and Henry Eyring. "Reactions Involving Hydrogen and the Hydrocarbons."

Eugene P. Wigner. "Some Remarks on the Theory of Reaction Rates."

J. A. Christiansen. "On an Elementary Theory of Intramolecular Reactions."

General Discussion. "Calculation of Activation Energies and Absolute Rates."

2:00 to 5:00 P.M.

FARRINGTON DANIELS, *Presiding*

George Scatchard. "The Nature of the Critical Complex and the Effect of Changing Medium on the Rate of Reaction."

K. F. Bonhoeffer, K. H. Geib and O. Reitz. "On the Rate of Ionization in Aqueous Solution of the Carbon-Hydrogen Bond in Aliphatic Compounds."

F. O. Rice and K. F. Herzfeld. "Heats of Activation and the Theory of Free Radicals."

H. A. Taylor and M. Burton. "The Reactions between Methyl Radicals."

General Discussion. "Free Radicals." "Bond Energies."

WEDNESDAY, JUNE 21

9:00 A.M. to 12:00 M.

HAROLD C. UREY, *Presiding*

O. K. Rice and Hallock C. Campbell. "The Explosion of Ethyl Azide in the Presence of Diethyl Ether."

Guenther von Elbe and Bernard Lewis. "Mechanisms of Complex Reactions and the Association of H and O_2."

R. H. Crist and J. E. Wertz. "Kinetics of the Oxidation of Hydrogen Sensitized by Nitrogen Dioxide."

General Discussion. "Explosions."

2:00 to 5:00 P.M.

S. C. LIND, *Presiding*

G. B. Kistiakowsky and W. W. Ransom. "The Polymerization of Gaseous Butadiene."

Richard A. Ogg, Jr., and W. J. Priest. "Kinetics of the Vapor Phase Reaction of Cyclopropane with Iodine."

Robert N. Pease. "The Experimental Basis for the Theory of Quasi-Unimolecular Reactions."

Farrington Daniels and Preston L. Veltman. "The Decomposition of Ethyl Bromide and the Collision Theory of First Order Reactions."

General Discussion. "Collision Theory of Unimolecular Reactions."

THURSDAY, JUNE 22

9:00 A.M. to 12:00 M.

PHILIP A. LEIGHTON, *Presiding*

W. Albert Noyes, Jr., and F. C. Henriques, Jr. "Fluorescence and Photochemical Kinetics of Polyatomic Molecules in the Gas Phase."

G. K. Rollefson and D. C. Grahame. "The Effect of Temperature on the Predissociation of Photoactivated Acetaldehyde Molecules."

E. W. R. Steacie and Roger Potvin. "The Cadmium Photosensitized Reactions of Ethane."

S. C. Lind. "Chemical Activation by Gaseous Ionization."

General Discussion. "Photochemical and Ionic Reactions in Gases."

2:00 to 5:00 P.M.

GEORGE SCATCHARD, *Presiding*

On Thursday afternoon the University of Wisconsin will hold a general session devoted to 10-minute papers. Although technical reasons prevent the Division of Physical and Inorganic Chemistry from sharing in sponsoring this session, all those attending the symposium are invited.

This session is planned to accommodate brief reports on work completed too late for inclusion in the preprints. Any one desiring to present a short paper in this field

should submit the title and abstract of about 200 words to Farrington Daniels before June 21. The program of papers approved by the committee will be announced on June 21 at the symposium.

The symposium papers will be distributed as preprints before June 1. Together with the discussions they will be published in the *Journal of Chemical Physics*. An attempt will be made to record most of the discussions, but any one may withdraw his discussion from publication.

Chadbourne Hall, one of the university dormitories near the Chemistry Building, will be available for the symposium at rates of $1.50 per day. One floor will be reserved for families. In order to ensure accommodations, those intending to come should make reservations in advance.

Meals will be served in the cafeteria at the Memorial Union on the lake shore. Informal discussions will be continued at noon and in the evenings at the Memorial Union.

The Symposium Committee for the Division of Physical and Inorganic Chemistry is composed of E. J. Cohn, Farrington Daniels, H. Eyring, J. H. Hildebrand, L. S. Kassel, C. A. Kraus, V. K. LaMer, P. A. Leighton, S. C. Lind and G. Scatchard. The committee for the University of Wisconsin is composed of Farrington Daniels, J. O. Hirschfelder, W. E. Roseveare and J. E. Willard.

An informal dinner and launch ride are planned for the early evening on Tuesday and Wednesday.

HAROLD C. UREY,
Secretary

SPECIAL ARTICLES

THE SYNTHESIS OF A POLYSACCHARIDE FROM GLUCOSE-1-PHOSPHATE IN MUSCLE EXTRACT[1]

IT has been shown in previous papers[2, 3] that dialyzed extracts of muscle, heart, liver, brain and yeast contain a phosphorylating enzyme which catalyzes the reaction

glycogen + H_3PO_4 → glucose-1-phosphate ..... (1).

Glycogen is esterified with inorganic phosphate on carbon atom one of each glucose unit. The entire molecule is thereby disrupted into uniform fragments which consist of glucose-1-phosphate. Reaction (1) does not occur unless a small amount of adenylic acid (1 mM) is added to the dialyzed extracts.[4]

Another enzyme which is present in the extracts catalyzes the reaction

glucose-1- → glucose-6-phosphate ..... (2).

The migration of the phosphate group is greatly accelerated by Mg^{++} or Mn^{++} ions but takes place also without their addition, so that with time all the 1-ester formed is changed to 6-ester.[5] Attempts to reverse reaction (2) have not been successful, and it became obvious that for a further study of reaction (1) the phosphorylating enzyme had to be separated from the conversion enzyme.

Adsorption with aluminium hydroxide, followed by elution with disodium phosphate, yields an enzyme solution which is rich in phosphorylase and contains relatively little of the conversion enzyme. A second adsorption and elution results in an almost complete separation of the two enzymes. These elutions, after removal of the inorganic phosphate by dialysis, are suitable for a study of reaction (1).

When natural or synthetic 1-ester and 1 mM of adenylic acid are added to these dialyzed elutions, inorganic phosphate is liberated and a polysaccharide is formed. This substance has been isolated by a method similar to that used for the preparation of glycogen from liver or muscle. Without addition of adenylic acid the enzyme remains inactive, showing that adenylic acid is necessary for reaction (1) in both directions. Inosinic or adenosinetriphosphoric acid can not be substituted for adenylic acid. Galactose-1- and mannose-1-phosphate[6] are not transformed into a polysaccharide, and their phosphate group is not split off.

The polysaccharide formed by the muscle enzyme from added 1-ester is not destroyed by heating for one hour in 20 per cent. NaOH at 100°, is insoluble in 50 per cent. alcohol in the presence of electrolytes and does not show measurable reducing power with the alkaline copper reagent of Shaffer and Somogyi. The rate of hydrolysis in 0.2 N HCl at 100° is similar to that of glycogen, and the sugar formed is glucose. When the polysaccharide is added to muscle extract with inorganic phosphate and adenylic acid, it is converted back to the 1-ester. The polysaccharide differs from glycogen by the color it gives with iodine, which is blue. Under certain conditions, particularly after prolonged incubation, the formation of a polysaccharide which gives a purplish-brown color with iodine, can be demonstrated. It is not yet possible to give an explanation for these different color re-

[1] This work was aided by a research grant from the Rockefeller Foundation.

[2] Cori and Cori, *Proc. Soc. Exp. Biol. and Med.*, 36: 119, 1937; Cori, Colowick and Cori, *Jour. Biol. Chem.*, 121: 465, 1937.

[3] Cori, Colowick and Cori, *Jour. Biol. Chem.*, 123: 375, 1938.

[4] Cori, Colowick and Cori, *Jour. Biol. Chem.*, 123: 381, 1938.

[5] Cori, Colowick and Cori, *Jour. Biol. Chem.*, 124: 543, 1938.

[6] Colowick, *Jour. Biol. Chem.*, 124: 557, 1938.