on "The Tridymite Problem." The talk was followed by a lively discussion bearing on the geological implications of the unusual thermal behavior reported, and on the mechanism of formation of super-structures based on silica frameworks. The speaker's abstract of his talk follows:

THE TRIDYMITE PROBLEM

Crystals of tridymite from Plumas County, California, have been investigated by the Weissenberg method. The diffraction symmetry of the low temperature form is *mmm*. It is based upon a face-centered orthorhombic lattice, the cell having the following dimensions:

$a_o = 9.91$Å $b_o = 17.18$Å $c_o = 81.57$Å

Possible space groups include *Fmm*, *Fmmm* and *F222*. The abnormal length of the *c* axis prompted investigation of tridymite from other localities. A sample from San Cristobal, Mexico, was found to have the same *a* and *b* axes, but the *c* axis was one half as long. The *c* axis rotation patterns of the two materials were substantially identical as regards distribution and relative intensities of all reflections except that the intermediate layer lines found on the pattern of the Plumas County material were missing on the pattern of the San Cristobal material.

Spectroscopic and chemical analyses of the Plumas County tridymite indicate a high impurity content, with an empirical formula approximating $NaCaAl_3Si_{15}O_{36}$. The presence of the impurity atoms is believed to be the cause of the doubled *c* axis.

Attempts were made using a controlled-temperature Weissenberg camera to locate the two inversions of tridymite at 117° C. and 163° C. as determined by Fenner from thermal observations on artificial material. The Plumas County material inverted directly from the low form to the high form at 127° C. with no evidence of a middle form. The tridymite from San Cristobal showed two inversions, low to middle at 121° C. and middle to high at 135° C. The absence of a middle form in the case of the Plumas County material and the smaller temperature range than expected in the case of the San Cristobal material are attributed to the presence of impurities.

Weissenberg patterns of the Plumas County tridymite were taken just above the inversion. In addition to the pattern to be expected from the hexagonal silica framework, there was found superimposed an orthorhombic pattern of satellite reflections which varied in their distribution in a definite manner with temperature, but not with time. The sequence was not reversible, and once it had been carried through to completion, it could not be obtained again on the same crystal. A similar, but less complicated, sequence was found using the material from San Cristobal. The presence and the behavior of the satellite reflections can be explained by the migration of the impurity atoms from positions taken at the time of formation of the crystals, when electrostatic forces only were satisfied, to positions taken during heating that are more compatible with packing requirements. It appears that both the Plumas County and the San Cristobal tridymite must have formed below 121° C. and 127° C., respectively, inasmuch as the temperature inversions are irreversible.

CLIFFORD FRONDEL,
Secretary

THE NEW HAMPSHIRE ACADEMY OF SCIENCE

THE twenty-third annual meeting of the New Hampshire Academy of Science was held at the University of New Hampshire, Durham, on Friday and Saturday, November 14–15, 1941. At the Friday evening session, Professor Herbert E. Warfel of the university and the State Fish and Game Department presented the principal address, "Biological Basis for Fish Management in New Hampshire." Several reels of motion pictures of scientific interest were shown.

Saturday morning was given over to the reading of nine different papers by members, in the fields of geology, botany, ecology and anatomy. On Saturday afternoon, two papers were read in the field of meteorology.

At the annual business meeting, it was voted to award the grant-in-aid for the current year from the American Association for the Advancement of Science to Mr. Paul R. Doe, of Spaulding High School, Rochester, N. H., for a continuation of his work with time-lapse photography.

The following officers were elected for 1941–42: *President,* Dr. Charles D. Howard, State Board of Health, Concord; *Vice-president,* Professor Guy Williams, Colby Junior College; *Secretary-Treasurer,* Dr. Robert H. Denison, Wilson Museum, Dartmouth College; *Councilors,* Professor J. H. Gerould, Dartmouth College, for three years, and Professor Donald Chapman, University of New Hampshire, for four years; *representative* to the Academy Conference, W. W. Ballard, Dartmouth College.

The Executive Council voted to hold the next annual meeting at Keene, N. H., in the fall of 1942.

The address of the retiring president, Professor Bancroft H. Brown, of Dartmouth College, was on "Teaching and Research in a Democracy."

W. W. BALLARD,
Retiring Secretary

REPORTS

THE NEW ENGLAND FIELD GEOLOGISTS

THE thirty-seventh annual field meeting of the New England Field Geologists was held on October 10, 11 and 12, at Northampton, Mass. The headquarters for the meeting was in Seelye Hall, Smith College. Dr. Robert Balk, of Mount Holyoke College, was in charge