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

of the meeting, which was attended by 170 persons, representing 35 colleges.

Various sites of Triassic fossils were visited on Friday afternoon in the vicinity of South Hadley. Dinosaur footprints were viewed at two localities. Specimens of conifer remains were obtained in the Longmeadow sandstone. Miss Christine Lochman was the leader of this trip.

Dr. Balk led a party on Saturday which visited the fossil locality of Bernardston, Mass., from which the only identifiable fossil, according to G. A. Cooper, is *Spirifer divaricatus* of Onondaga age. The relations of the Bernardston formation to the older phyllites and slates were discussed, and the succession of rocks within the Bernardston formation was demonstrated. The rocks crop out mainly on the west side of the Connecticut River, but at a few places, typical phyllite and amphibolite appear east of the river. Outcrops of phyllite, one half mile from outcropping Pelham granitic gneiss (Carboniferous age) shows no effects of injection. A series of metamorphosed sediments east of the Pelham gneiss and outcrops of gneiss along the valley of Millers River were also visited.

R. H. Jahns and M. E. Willard, of the U. S. Geological Survey, conducted an all-day excursion on Saturday to examine sections of Quaternary deposits in the Connecticut Valley between Northampton and Turners Falls. The chief points of interest included outwash forms deposited in, and adjacent to, the great pre-glacial Connecticut valley lake, varved-clay bottom deposits and glacial spillways. The structure and morphology of the deltas and their relations to nearby ice-contact forms were demonstrated and their significance discussed. The relations, areal and vertical, of the glacial spillways to the adjacent outwash deposits were pointed out.

Three excursions were conducted on Sunday, October 12. M. E. Willard led one group in a study of the variations in rock types of the Triassic in the Connecticut Valley north of the Holyoke Range. The significance of these variations as they bear on the nature of the topography of the Triassic floor of deposition was discussed. Data obtained at exposures of a basal Triassic talus breccia together with information obtained from drill records indicate that the Triassic area of deposition is divided into two parts: namely, west of the present Connecticut River there was a deep north-south basin of deposition; and to the east there was a similar, but much shallower basin. It was suggested that the break between these two basins represented a now-buried fault scarp.

Miss Lochman led a group that studied two varved-clay localities. Special attention was directed to the problems of the Pleistocene *vs.* Recent slumping phenomena: the character and mode of formation of the zone of disturbed varves found at the top of each section: the extent and significance of crumpled zones and the significance of different colorations of the clay layers.

A study of the geology of Winsor (Quabbin) dam was conducted by a group led by Dr. Balk on Sunday morning. The contact exposures of a series of chloritic schists and an offshoot of the Belchertown tonalite were studied in the spillway. The general geology of the huge reservoir was described from the observation tower on top of Quabbin Hill. Exposures of metamorphosed volcanics on the northeast slope of the hill and injection gneisses in the eastern portion of the reservoir were also studied.

The 1942 field meeting of the group will be held in eastern Massachusetts under the leadership of Robert Nichols, of Tufts College, and Dr. L. W. Currier, of the U. S. Geological Survey.

LLOYD W. FISHER,
Permanent Secretary

LEWISTON, MAINE

SYMPOSIUM ON FOLSOM-YUMA PROBLEMS

AN informal symposium on the Folsom-Yuma and other problems related to Early Man in North America, especially in the Southwest, was held on September 3 and 4, 1941, at the Laboratory of Anthropology, Santa Fe, New Mexico. To this meeting, sponsored jointly by the University Museum (University of Pennsylvania) and the Laboratory of Anthropology, Santa Fe, were invited those interested in the various phases of this complex of problems. Happily, many amateurs, or local archeologists, as well as the strictly professional men attended.

During the morning (E. B. Howard, *chairman*) and afternoon (F. H. H. Roberts, Jr., *chairman*) sessions on September 3, discussion was primarily directed to the problem of nomenclature of the Folsom, Yuma and similar points. It was proposed, after the discussion, that a committee be chosen to prepare a resolution embodying the conclusions of the informal discussion. This committee, composed of Dr. E. B. Howard, Dr. F. H. H. Roberts, Jr., and Marie Wormington, drew up resolutions, which were passed by unanimous vote at the morning session (Marie Wormington, *chairman*), on September 4.

These resolutions have been circulated among those present at the meeting for further consideration and final approval and to those interested workers who were unable to attend.

During the morning session, September 4, numerous problems were thrown open to general discussion. Such matters as the possible spurious Folsom points, reported especially from southeastern Colorado, and