Molecular Spectra in Celestial Objects." It will open on Wednesday, June 22, and is expected to last for four days. The following speakers have tentatively agreed to participate in the program: Professor Gerhard Herzberg, University of Saskatchewan; Professor Davis M. Dennison, University of Michigan; Dr. Hans G. Beutler, University of Chicago; Professor John T. Tate, University of Minnesota; Professor Robert S. Mulliken, University of Chicago; Dr. Rupert Wildt, Princeton University Observatory; Dr. Arthur Adel, Lowell Observatory; Professor N. T. Bobrovnikoff, Perkins Observatory, Delaware, Ohio; Dr. G. H. Shortley, the Ohio State University; Dr. Karl Wurm, Yerkes Observatory, University of Chicago, formerly of the Astrophysical Observatory, Potsdam; Dr. W. W. Morgan, Yerkes Observatory. Astronomers and physicists are invited to attend the symposium and to participate in the scientific discussions. Graduate students attending the summer school of the University of Chicago in the department of physics or the Yerkes Observatory are also invited.

THE New England Geographical Conference held its 1938 meeting in the Institute of Geographical Exploration at Harvard University on May 6 and 7, under the presidency of Robert M. Brown, of the Rhode Island College of Education. Those in attendance were guests of Dr. A. Hamilton Rice, director of the institute, at tea, and afterwards inspected an exhibit of maps prepared by Dr. Erwin Raisz. Harold S. Kemp, of the department of geography at Harvard University, gave the principal address on "The Spanish War; Is Geography Involved?" Papers dealing with scientific geography were as follows: L. O. Packard, "Recreation as a Topic in Economic Geography"; William T. Miller, "New Frontiers in New England"; Earl B. Shaw, "Geographic Influences on Aland's Windjammers"; Louise G. Ramsdell, "Old Highways of Europe and Their Importance"; Edward A. Ackerman, "The Balkan Switzerland." Other papers treated aspects of the teaching of geography.

AMHERST COLLEGE will receive $207,327 by the will of Dr. Ellwood R. Kirby, who died in December, 1935.

As residuary legatee of the late Charles Felix Burke, of New York City, Denison University at Granville, Ohio, receives the sum of $133,834.

THE London *Times* reports that G. Seligman is heading a party of scientific men to the Jungfraujoch Research Institute in Switzerland to undertake scientific research work on glaciers. This will be the first British expedition to spend its whole time in studying glaciological problems, and it will form a continuation of Mr. Seligman's previous researches on the nature of snow. The party will spend five months at the institute, at a height of over 11,000 feet, and it will consist of T. P. Hughes, of the Physical-Chemical Laboratory; M. F. Perutz, of the Crystallographic Laboratory; A. E. Benfield, of the department of geodesy and geophysics, and E. A. Ferguson, of the department of geography, all of the University of Cambridge. They will investigate the transition of firm (or partly consolidated snow) into glacier ice; the movement of glaciers; the formation of ice-bands, and the connection, if any, between those in the névé regions and those near the snout of the glacier. In addition, Mr. Hughes will carry out certain experiments on the friction of solid bodies on ice, in connection with his work at the Physical-Chemical Laboratory. Mr. Seligman has been granted a Leverhulme Research Fellowship for the purpose of this research, and the expedition is also supported by the Royal Geographical Society, the Ski Club of Great Britain and the Alpine Ski Club.

DISCUSSION

THE LOWER SONORAN IN SOUTHWESTERN UTAH

READERS of the interesting articles of W. P. Cottam[1] and F. R. Fosberg[2] may be interested in additional information concerning the effect of the prolonged subzero weather reported by Cottam on plants of the Lower Sonoran zone in southwestern Utah.

The writer visited the Long Valley region on the upper Virgin River (altitude 6,000 feet) on May 7 and 8, 1937, and noted as a common occurrence dead brown twig tips from one to six inches in length on many but not a majority of the junipers, *Juniperus utahensis,* in the region east of Zion Canyon in the Upper Sonoran zone. On repeated visits to the Long Valley region in early August, late August, mid-September and late November, the dead twig tips were less and less conspicuous until by fall they were scarcely noticeable.

On a visit to the Virgin River lower down (3,000 feet) between St. George and Hurricane on August 23 and 24, 1937, and again on September 12, it was noted that in that vicinity practically all the plants of both the creosote bush and mesquite showed frost injury, ranging from dead twig tips through dead limbs to dead trunks, but in no cases observed were any

[1] W. P. Cottam, SCIENCE, 86: 563–564, June 11, 1937.
[2] F. R. Fosberg, SCIENCE, 87: 39–40, Jan. 14, 1938.

plants completely dead. The great majority had green shoots growing from the main stems or their branch limbs. Only a few cases were observed where the green shoots were growing from twigs or from the crown only. In one case, that of a mesquite nearly ten inches in diameter, all the branch limbs were dead, and the thrifty green shoots from the main trunk were fast filling the vacant spaces between the dead limbs.

On a later visit, November 24 to 26, into the Virgin River Valley, particular attention was paid to the creosote bushes in several places, near Hurricane, Washington, Santa Clara and the Beaver Dam slope, all in Utah (altitudes 2,500 to 3,000 feet). These observations confirmed the previous conclusion that the large majority of the plants had suffered frost damage, but in no observed case was the plant entirely dead. The thrifty green shoots of the summer had, however, so grown that the dead portions were nearly inconspicuous, and the plants had so far recovered as to present an almost normal appearance.

It would seem then from these limited observations that at the places investigated along the lower portions of the Virgin River Valley the frost damage to the creosote bush was considerably less than was originally anticipated by Cottam. The plants exhibited a variable ability to resist the prolonged cold, some escaping almost uninjured, some receiving moderate injury and a few being killed down to the crown. All the plants examined showed a remarkable "comeback" from the damage.

The limits to the Lower Sonoran are abruptly reached in the foothills surrounding the Virgin River Valley, these limits being set by increasing altitude about 500 to 1,000 feet above the valley floor. Presumably the valley floor is so far down in the Lower Sonoran that the unusual cold would not be sufficient to permanently transform its vegetation, and Utah would be in no danger of losing its Lower Sonoran zone. It would be interesting to know, however, whether the cold spell was instrumental in shifting the upper limit of the Lower Sonoran downward. Would the extra cold concomitant with the 500 to 1,000 feet rise in altitude be sufficient actually to kill the more susceptible plants. This point does not seem to be settled by the observations. If some of the plants were killed, were there enough to move the limit or were there enough of the more resistant plants left to maintain the limit? If there is any shift at all in the limit of growth of the creosote bush the fluctuation would probably fall within very narrow limits, as would be expected where the limits are set by altitude instead of latitude.

A. M. WOODBURY

UNIVERSITY OF UTAH

FOREST WILDLIFE AND SILVICULTURE[1]

IN this informal talk this evening on "Forest Wildlife and Silviculture," it is my intention by way of introduction to touch briefly on the broad topic of forests and forest wildlife and then turn the attention of the group to one specific phase of this broad subject which bears closely on silvicultural problems.

We have all heard a great deal, particularly in recent years, of the role that forests play in wildlife production, particularly in the production of game birds and animals, grouse, turkey, deer, elk and the forest's importance in the production of fur-bearing animals, beaver, mink, marten and others almost too numerous to mention. Undoubtedly this phase of the forest wildlife picture is an important one and justifies the attention it has been given. It is a field which presents many interesting and difficult silvicultural problems bearing on wildlife which I wish by no means to minimize. Certainly the present wide division of opinion on whether or not timber production and wildlife and recreation can be combined on the same area or whether some areas must be devoted strictly to game production, some to recreation and still others to timber production, is a land-use problem of great moment and one on which we need a great deal of additional information on what various silvicultural practices will mean in terms of wildlife. The problems on this side of the picture might be summed up in the question: "How do forests affect wildlife?"

It is the reverse of the picture, "How does wildlife affect forests?" to which I would like to turn your attention at this time. This is a much less discussed field. The principal characters in the drama, if you will, are not the noble elk or the empire-building beaver, but such lowly creatures as the white-footed mouse, the chipmunk and the squirrel. But the story is an interesting one to the biologist, nevertheless, and one of importance from a silviculturist's standpoint.

Now if my biological audience will permit me—what is silviculture? One of the lesser known and least practiced of the arts, mainly the art of tending forests, including methods of establishment, their care during growth, their harvesting at maturity. In other words, the silviculturist occupies the same rich field in forestry that the agronomist occupies in agriculture—he is interested primarily in the art of crop production. The problems are, of course, very different in many important respects. The silviculturist must deal with a natural vegetation unit of exceedingly great biological complexity, consisting often not only of a diverse mixture of tree species but numerous shrubs, herbs, fungi, insects, animals and a complex

[1] Presented before the Biological Society of Washington at the 853d meeting, October 16, 1937.