philosophy. Blanks for application may be obtained from the School of Mathematics of the institute, Fuld Hall, Princeton, N. J., and are returnable by February 15, 1940.

THE Rumford Committee owns a perfect diamond slab 9 × 9 × 3 millimeters. The large surface and that at one end are flat to 0.1 wave-length of sodium light and are set at 90 degrees, the edge appearing perfectly sharp under a 300-fold magnification. The other surfaces are all rough cleaned. If any person would like to borrow this slab for experimental purposes, application should be made to the chairman of the committee, Norton A. Kent, the American Academy of Arts and Sciences, 28 Newbury Street, Boston, Massachusetts.

THE Galton Laboratory, of University College, London, is carrying on its work at the Rothamsted Experimental Station, Harpenden, Hertfordshire. It is announced in *Nature* that in view of the importance of chemical engineering at the present juncture, the Ramsay Laboratory of Chemical Engineering at University College, London, has reopened, and students will be accepted for training in chemical engineering and research.

AT the State Serum Institute, Copenhagen, Dr. Th. Madsen has established an International Salmonella Center, financed by the Commonwealth Fund. This laboratory supplies to Salmonella Centers in the various countries the sera and cultures necessary for serological diagnosis, *i.e.,* 50 sera and 100 cultures. So far, thirty-seven Salmonella Centers have been established. Those in the United States are: New York City, Dr. F. Schiff, Beth Israel Hospital; Albany, N. Y., Dr. A. Wadsworth, Department of Health, and Lexington, Ky., Dr. P. R. Edwards, department of animal pathology, University of Kentucky. The centers will receive and investigate doubtful cultures without charge.

DISCUSSION

GRASSLAND AS A SITE FOR BASIC RESEARCH ON TERRESTRIAL ANIMALS

THE greater part of a century has passed since Darwin published his famous work on the origin of species, and as yet no lands nor combined *natural* outdoor and laboratory facilities have been provided to study competition and the interchange of forces, which made up the basis of his theory. With the development of modern ecology and ecological processes, methods have come into use whereby studies of biotic interaction may profitably be carried on alone or in combination with laboratory studies. Various scientists have long hoped for lands and a laboratory where the interactions of land plants and animals and their physiological relations to climate can be studied just as the marine plants and animals are investigated in seaside biological stations. Pure science studies of terrestrial animals may well have much more intimate relations to human needs than marine inquiries. The sea has attracted the efforts of scientific men and the funds of granting bodies and philanthropists perhaps to an extent disproportionate to its human value. It has been demonstrated at the State University of Iowa that grassland grasshopper eggs may be used as a material for basic physico-chemical research, rivaling the sea urchin egg. The investigators at the University of Chicago have made use of striped ground squirrels taken from their native grassland haunts, for fundamental studies in hormones and for studies of the environmental factors that influence the important function of reproduction.

A grassland laboratory possesses facilities for research not available in some other types of land, such as forest or agricultural land. The great complication of forest vegetation makes many types of shelter and many niches affording protection from the elements to animals and smaller plants, which renders observations difficult. Tundra shares the advantages of grassland for researches involving field observations. These barren lands, however, are in a climate forbidding to continued scientific research and are remote from academic centers. Grassland, however, affords unrivaled opportunities for scientific biological study for the following reasons:

(1) Grassland allows full visibility of the more important larger animals and plants.

(2) Niches and hiding places for animals, such as tree tops, fallen and hollow trees and dense thickets do not occur in Great Plains areas to retard observation.

(3) The life histories and life span of the principal plants are about one tenth that of forest trees, and this greatly facilitates long-time observation because of the more rapid turnover and hence, the quicker response to climatic fluctuations.

(4) The grassland flora and fauna have intimate relations to the general problems of agriculture and human welfare on the Great Plains.

(5) Grassland constitutes about 40 per cent. of the original vegetation of the earth's land surface and is of great importance to mankind in general.

(6) It has been much less studied than forest.

(7) Stable primeval areas or semi-primeval areas of large size are rapidly disappearing. In another generation the program proposed by biological scientists may perhaps be impracticable.

(8) The field is unencumbered by organized pure science research projects.

(9) It is a vegetation type in which ecological interest is great and much important plant ecological work has been done on the moist eastern portion of the grassland, but all animal relations and their interactions with plants have been neglected.

(10) The problems of wind and water erosion of soil and the attendant dust movement are essentially biological problems.

(11) Suitable lands are of *low* economic value.

(12) Its climate is suitable for the work of investigators.

The plans of interested scientists have called for an undisturbed check area which could be under observation for a sufficiently long period to permit an analysis of drouths and dust storms, and rodent, predator and grasshopper outbreaks that occur separated by rather long intervals such as 30 to 50 years or more.

Agricultural lands are subject to such erratic overturn that causes of cyclic phenomena can not ordinarily be followed in a scientific manner. Game preserves and other small areas are, necessarily or unnecessarily, so managed as to obscure natural phenomena and render scientific conclusions unavailable or uncertain. Students of grasshopper outbreaks and, to a lesser extent, infestations of rodents desire large areas to follow the normal population of these pest animals. The need of a large area has been voiced by many, including grasshopper specialists, whose scientific results require freedom from *marginal effects* in this migratory group. For example, a tract of a few dozen sections of land surrounded by cultivated and overgrazed areas is so completely sprinkled with windborne organisms as to render conclusion as to natural trends uncertain.

The hope is that in the not too distant future scientific men can interest government agencies and granting bodies, which have helped with such projects in the past, to cooperate in providing land and facilities for basic terrestrial biological research. For example, an endowed laboratory could be set up on land of its own for the purpose of carrying on observations continuously. Such research would include analyzing the physiology of the animals in their relation to weather and climate, studies of competition, natural selection, reproduction, hormones, etc. For example, the National Park Service is interested in setting up a Great Plains National Monument large enough to prevent domestication of plains animals and to be managed on a hands-off basis. A laboratory adjacent to such an area would have many advantages.

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OXYGEN REQUIREMENTS FOR GERMINATION OF SEEDS OF NYSSA AQUATICA—TUPELO GUM

IN the swamp forests of the southeastern United States frequently two species of trees are found to be dominants, *Nyssa aquatica* and *Taxodium distichum.* These trees have often been considered as very similar in their ecological requirements. Some time ago, 1932,[1] it was shown that *Taxodium* seeds can not be made to germinate under water, although after the seedling has attained a certain growth the roots and lower parts of the stem may be submerged indefinitely without harm. This is of interest ecologically, since it prevents the coming in of *Taxodium* in marshes that are continuously covered with water unless a dry season reduces the water to the point that the upper layers of soil become fairly dry.

So far as the writer has been able to learn, little has been known regarding the capability of seeds of *Nyssa aquatica* to germinate under water, although the trees may stand in water for indefinite periods.

The drupaceous fruits of *Nyssa aquatica* were collected in eastern North Carolina in September, 1938. They were allowed to dry and the fleshy exocarp and mesocarp tissue was removed, leaving the very hard endocarp enclosing the seed. On October 25 some of these "seeds" (endocarp plus seed) were placed in a metal cylinder containing sand, covered with water and placed out of doors at Raleigh, N. C. Similarly, a number of "seeds" were placed in a cylinder in moist sand out of doors at the same time.

On May 9, 1939, the cylinders were brought into the laboratory, and on the following day the sand containing the "seeds" was removed from the cylinders and placed in moist chambers kept in the laboratory. Those "seeds" kept moist but not flooded during the winter were kept in moist sand, and those that had been flooded were kept flooded under 3 to 4 cm of water.

When brought into the laboratory on May 9, three of the "seeds" from moist sand had already germinated. Subsequently, up to May 27 six additional "seeds" sprouted, giving a total germination in moist well-aerated sand of nine out of 21 "seeds." Up to the latter date none of the "seeds" kept flooded showed any signs of germination. Of 32 "seeds" kept flooded until May 27, sixteen were taken out on that date and placed in moist but well-aerated sand, the others kept flooded. From May 27 to June 16, eight of the "seeds" taken from the flooded container and given oxygen in moist sand germinated. None of the seeds kept flooded germinated up till the present, late July.

Since lack of aeration apparently prevents sprout-

[1] Delzie Demaree, *Ecology,* 13: 258–262, 1932.