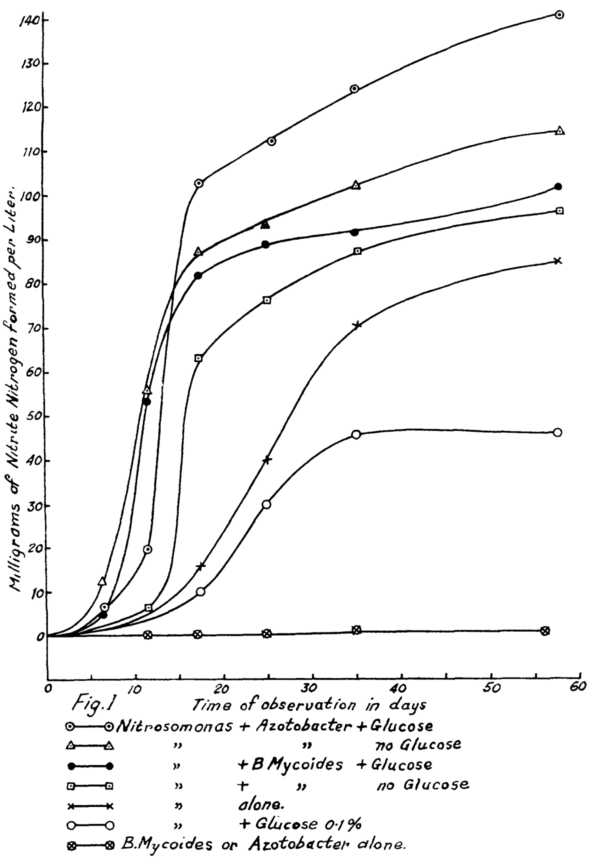
No conclusive evidence on these interesting points, however, has so far been available.

Some systematic studies were therefore carried out by the author with cultures of *Nitrosomonas* in an Omeliansky medium to which different forms of soil and other micro-flora were added, both by themselves and in presence of various forms of organic matter. As a result of these, it was found that, although the organic matter tended to depress nitrification when *Nitrosomonas* was present by itself, the adverse effect was completely removed in presence of other organisms. In most cases there was also enhanced nitrification. Fig. 1 will illustrate the type of results obtained.



Exactly similar results were obtained when these experiments were repeated in presence of soil.

These and other observations would show that by utilizing the interfering organic matter in some way, the associated saprophytes assist *Nitrosomonas* in its function. The exact mechanism by which nitrification is stimulated in some of these cases is still obscure. Nevertheless, a correlation is possible between nitrification in pure cultures and that in soil if we assume the occurrence of a regulated *Chemomixotrophic* metabolism for these organisms. Further work on this and related aspects of the problem is in progress and will be reported elsewhere.

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POSSIBILITY OF PARTHENOGENESIS IN GRASS

MANUALS agree quite unanimously that buffalo grass (*Buchloe dactyloides* (*Bulbilis,* Raf.) is dioecious, and that vegetative branches propagate only their own kind—either male or female. Sodded areas are usually and preponderantly of either staminate or pistillate plants only. This fact permits removal of large sods of each sex. Pistillate plants are generally so short that mowing is of small consequence and they have been utilized as a "self-mowing" or lazy man's lawn grass!

Thus far the genus Buchloe has been monotypic with little possibility of mistaken identity except in the vernal or juvenile stages with curly mesquite, *Hilaria belangeri,* a strictly monoecious and perfect-flowered grass which grows only in the southern end of the buffalo grass zone. The famous tree "shelter belt" passes through the heart of the recognized buffalo grass area. Hitchcock[1] says it is "probably the best known range grass—a sod-forming short grass dominant over much of the Great Plains—the foliage cures on the ground and furnishes nutritious feed during the winter. The sod houses of the early settlers were made mostly from the sod of this grass."

Only limited quantities of buffalo grass seed have been harvested because the staminate flower is located so near the soil surface and the seeds are formed below the reach of ordinary harvesting tools. Recently seed has been harvested by means of vacuum suction and by hand picking.

In the spring of 1935 some tall-growing plants were found with elevated pistillate spikelets which if reproduced would make it possible to harvest the seed crop with a mowing machine such as is ordinarily used on the farm, provided the seed would remain attached. Since buffalo grass can be propagated vegetatively the prime utility of this selection might be its hay- and pasture-producing potentiality. Quinby of the Texas station[2] has reported recently 2,423 pounds of buffalo grass hay per acre in comparison with 1,673 pounds of Sudan grass. The first mowing of our own planting produced in the summer of 1936 on four 10,000th acre plats an average rate of 3.08 tons of air dry hay per acre.

When the hay was removed a number of well-devel-

[1] A. S. Hitchcock, Misc. Pub. 200, U. S. D. A. 1935.
[2] B. C. Langley, *Capper's Farmer,* September, 1936.

oped fruits were found, some of which contained fully developed seeds (caryopses). Careful examination of this pistillate planting during the season did not disclose any staminate or perfect or hermaphrodite flowers. Hitchcock[3] reports that seedlings of *B. dactyloides* are monoecious, producing both staminate and pistillate branches which produce their own kind.

Experiments are now under way to make certain that no outside pollen will enter the place where we are attempting to produce a new crop of (unfertilized?) buffalo grass seed. If such caryopses materialize the first authentic instance of parthenogenesis in grass may become established, in so far as the writer is able to find in a search of the literature at hand.

The material providing this study came from 25 pistillate rooted branches set in a small plat of 50 square feet. From 865 spikelets 53 apparently clean and 341 diseased caryopses were obtained. The disease which resembles smut has been identified by Gertrude Tennyson as *Cercospora seminalis* Ell & Ev., an imperfect fungus. This and other fungi (*Helminthosporium*) are reputed to be the cause of considerable amount of the very low germination percentage of buffalo grass seed.

An attempt is being made to grow plants from some of the caryopses collected from this material. Recently, 30 caryopses from this plat were planted, 8 of which germinated. Of this number 6 plants survive at the time of writing, and this is admitted to be a very satisfactory percentage by local workers in this field of research. If the seeds from which these plants came were produced by fertilization with pollen it must have come from scattered staminate plants in the neighborhood or possibly from plants miles away and carried in by insects or on the balmy air of Oklahoma. Seeds of Dallis grass, *Paspalum dilitatum,* have been gathered in the air 5,000 feet above the city of New Orleans. Pollen grains of other plants have been gathered at a much greater height.

This report is being made at this time and place in the hope that it may come to the attention of others who may be interested and who will contribute additional information on the subject.

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PHOTOCHEMICAL OXIDATION OF AMMONIA IN SEA WATER[1]

PHOTOCHEMICAL transformations between ammonia, nitrite and nitrate have been frequently reported under a variety of conditions[2, 3, 4, 5]. Recently Drs. S. A. Waksman and C. L. Carey, of the Woods Hole Oceanographic Institution, and one of us (A.H.), carried out a number of qualitative tests for nitrite in sea water irradiated after the addition of nitrate and ammonia. These preliminary results, which will shortly be published, as well as the work of ZoBell[6] on the photochemical oxidation of ammonia, suggested a more quantitative study.

Accordingly, ammonium sulfate was added to sea water from various sources, and to distilled water, and determinations made for ammonia and nitrite before and after irradiation with ultra-violet light. Confirmation was so easily obtained of the change of nitrate to nitrite in sea water that further investigation of this was deemed superfluous for this preliminary investigation. Furthermore, the slow destruction of nitrite in sea water by ultra-violet light was conclusively shown, but the corresponding process in distilled water seemed much slower, even doubtful.

Finally, attention was entirely centered on the oxidation of ammonia to nitrite. Ammonia was determined by the method of Krogh,[7] which has been slightly modified to serve as a routine analytical method for sea water. Nitrite was determined colorimetrically by the well-known method of Griess.

The solution in each case was irradiated in a cell of 15 mm depth with crystalline quartz windows 70×16 mm, sealed on with picein. The light from a high pressure water-cooled quartz capillary mercury-vapor lamp,[8] operated at 150 v. and 3.5 amp., was concentrated on the exposure cell. The radiation from the lamp (1,950 to 9,000 Å) was of considerably higher intensity per unit of surface than that given by a commercial mercury-vapor lamp. Since the radiation passed through one cm of tap water, one fused quartz window and 25 cm of air, in addition to a crystalline quartz lens and window before entering the cell, it contained extremely little radiation below 2,200 Å.

The control cell was of construction identical to that of the exposure cell, but had glass windows and was painted black. The solutions in both cells were kept at 20° C. and stirred thoroughly.

Results showing the change of ammonia to nitrite are given in Table 1. All figures represent nitrogen in micrograms per liter.

In Sample 3 approximately one mg of ammonia-nitrogen was added per liter, but was not determined

[3] A. S. Hitchcock, Bul. 772, U. S. Department of Agriculture, 1920.

[1] Contribution No. 120 from the Woods Hole Oceanographic Institution.

[2] H. Thiele, *Ber. deutsch. chem. Ges.*, 40: 4914, 1907.
[3] B. Moore, *Proc. Roy. Soc.*, B., 90: 158, 1918.
[4] D. S. Villars, *Jour. Amer. Chem. Soc.*, 49: 326, 1927.
[5] N. W. Rakestraw, *Biol. Bull.*, 71: 133, 1936.
[6] C. E. ZoBell, SCIENCE, 77: 27, 1933.
[7] A. Krogh, *Biol. Bull.*, 67: 126, 1934.
[8] F. Daniels and L. J. Heidt, *Jour. Amer. Chem. Soc.*, 54: 2381, 1932.