PROCEEDINGS OF SECTION F. — BIOLOGY.

ADDRESS OF W. J. BEAL OF LANSING, MICH., VICE-PRESIDENT OF THE SECTION, AUG. 15, 1883.

AGRICULTURE: ITS NEEDS AND OPPORTUNITIES.

INSTEAD of presenting a summary of the progress made in biology during the past year, I have chosen, rather, to speak of the 'Needs and opportunities of agriculture,' — a subject which has heretofore scarcely been mentioned at the meetings of this association. Within the past few years the progress of agriculture, which I use in its broadest sense, has been greater than ever before. This may be attributed to a variety of causes; such as the general thrift and intelligence of our people, and the advancement of science.

Many agricultural schools have been established, experiment-stations organized, the rural press has been much improved in quality and quantity, clubs and societies are flourishing, and thousands of granges have helped to stimulate thought and investigation. Though there is much chance for improvement, the U. S. department of agriculture in several of its sections has done excellent work. It is true, and it is strange that it should be true, that, until within a comparatively recent period, but very little of the best thought, even of civilized nations, has been devoted to subjects intended to advance agriculture.

Columella, eighteen hundred years ago, keenly felt the want of more thought in agriculture when he said, " Husbandry alone, which, without doubt, is next to, and, as it were, near akin to, wisdom, is in want of both masters and scholars. Of agriculture, I have never known any that professed themselves either teachers or students." Many of our states have freely appropriated money to conduct surveys in geology, mining, with a little attention given to zoölogy and botany, not neglecting to provide liberally for coast-surveys.

The nation, considering its age, has also been very generous with money in support of surveys of various kinds, including, also, anthropology, construction of lighthouses, improving rivers and harbors, investigating the supplies of fish, and even astronomy has been generously supported. It is true that some of this work performed by the government has been very poorly done, and has been enormously expensive; but the methods of work are improving.

This munificence of the United States in support of science is encouraging, and, as far as it goes, speaks well for the country and our law-makers. Doubtless, in many cases, the close connection with politics is one great hindrance to successfully conducting investigations in science for the government. The chances of losing positions are often too great to make them desirable, especially to persons who dislike political contests. Frequent changes are fatal to good, long-continued work.

Notwithstanding the large sums of money expended by our national and state governments in support of science, but a small sum, considering its importance, has been appropriated in the interest of agriculture. Even private gifts have gone to endow literary colleges, schools of physical or natural science, astronomical observatories, public libraries, and not to endow something which is directly intended to encourage agriculture. The men like Lawrence, Sheffield, Smithson, Peabody, Washburn, Swift, Stevens, are numerous, but not numerous enough. All honor to the noble names of those who have so generously contributed to the advancement of science.

To illustrate the hesitancy of men to bequeath money for the promotion of agriculture, I take the following from an address given by President T. C. Abbot: —

"I met a very pleasant and intelligent gentleman, who, from his large wealth, was about to give some sixty or seventy thousand dollars for the advancement of higher education. He had been for some years, and was still, the president of a state agricultural society. He was a farmer. Did he then endow some chair of agriculture, or agricultural chemistry, of veterinary science, of horticulture? Did he fit out an experiment-station to analyze fertilizers, to study the value of cattle-foods? Did he establish an agricultural library? None of these. He found the science that was the most advanced of any, the one that government supports at a great expense from the public treasury. This farmer gave his thousands to endow another workshop of astronomy."

Yet, even in respect to private endowment, there are approaching signs of better days for agriculture. A few far-seeing men have observed the needs of this interest, and have set a noble example by giving of their wealth bounteously. Cornell, Bussey, Purdue, Valentine, Storrs, in this country, are names which will long be honored for liberal gifts in the interest of agriculture. They showed great sagacity, and not a little originality, by placing endowments in a new field, where gifts are few, and the opportunities for good are boundless. It is hoped that these illustrious examples will stimulate others to make similar bequests.

Where agriculture thrives, there we always find a prosperous people. She needs more trained minds to work in her interest. With better thought would come great and needed improvements in the agricultural department of the nation. It lacks means, strength, and stability.

The matter of plans, and the naming of a competent director of the geological survey, was referred to the National academy of sciences, whose suggestions the government authorities sought and adopted.

The same body, or the standing committee of this association, or the members of the Society for the promotion of agricultural science, would be amply competent to name a good man for commissioner of agriculture. Such a plan would throw the position more out of politics, and it would be more likely to

run smoothly on, like the work of the Smithsonian institution.

Greater permanency would tend to make the department more efficient, and help it to co-operate with the agricultural departments of the several states and the agricultural colleges and experiment-stations.

The leading object of these remarks is to call the attention of those who are working for the advancement of pure science to the great needs of agriculture, the grand opportunities for making discoveries, and the lasting gratitude which such workers are likely to receive from the people. Of course, we grant that all science is valuable, that much of pure science has a practical bearing, that no one can foretell what practical results may be reached by investigations in pure science; still there is a tendency among scientific men to ignore economic science.

I will illustrate my meaning. The U. S. signal-service is generally supposed to have been established in the interest of science, with the avowed intention, also, of benefiting navigation. The benefits in these respects are certainly worth all they cost, but these are not all the benefits which the service should recognize.

I note the following as given by Dr. R. C. Kedzie some months ago, to illustrate the tardiness of science and the government to promptly grant assistance to the interests of agriculture.

"No industry, except navigation, is so completely at the mercy of the weather as agriculture, in its widest sense. In the magnitude of the interests thus threatened, agriculture outweighs all others in importance. Indeed, without the sustaining influence of agriculture, commerce itself would vanish like the dew of morning. Timely warnings of impending meteorological dangers might be given by the signal-service, which would be of incalculable worth to agriculture."

He illustrates the subject by referring to the protracted rainy weather during the wheat-harvest of 1882, in Michigan, where the loss was very great. "The approach of a protracted storm was known for days before the damage was done. If specific warning had been given our farmers at that time, most of the wheat might have been safely housed, and the farmers of Michigan saved from a loss of more than $1,000,000. The damage inflicted in this way is not isolated and exceptional."

At length the growers of cotton and tobacco in the south, and of cranberries in New Jersey, have been recognized by the government, and warnings of approaching frosts have been promptly given. "The general government, through the signal-service, should hold the shield of its protection over land as over sea, over corn-field as over tobacco-plant, over hay-field as over cranberry-marsh, over wheat-field as over cotton-plantation, over orchards and vineyards, and the cattle upon a thousand hills and prairie leas. Why not extend this work into wider fields by doing for the *producer* what it has so well done for the *carrier?*"

The opinion seems to be too prevalent that few experiments in agriculture are worth attempting, unless it be those conducted by a chemist. This is by no means the case, though it is true that none but a chemist is capable of making those of a certain nature. A physicist will still find in the soil much to interest him, and there is, no doubt, a chance to make discoveries valuable to agriculture.

With regard to the great importance of investigations and united action concerning the control of various plagues of our domestic animals, we should suppose no one would give a dissenting voice. Some valuable investigations have been made concerning the cause and nature of these diseases, among the most interesting of which, it seems to me, are the experiments made by Dr. Salmon in using an attenuated virus for inoculating animals, and inoculating again and again with a stronger virus those not affected by the attenuated virus. If the subject of animal plagues and the means of controlling them were fully discussed at meetings of this association, it would tend to allay prejudice, enlighten the minds of our citizens, and stimulate our law-makers to action. That there is need of a more general knowledge of this subject, I quote from a recent article by Professor Law in the proceedings of the Society for the promotion of agricultural science. "The present agitation on behalf of legislation for the extinction of this lung plague in America began actively in 1878, and, notwithstanding that the subject has been continually before federal and state legislators for four years, but little real progress has been made. Among the drawbacks that may be specially named is the ignorance of legislators, of executives, and even of electors, on this subject."

In learning how to economically feed domestic animals, there is a great opportunity for investigation. There is much of interest and value to be learned in reference to the causes of fluctuation in weight of animals which are carefully fed and watered in a uniform manner.

Concerning the great need of continued and increasing efforts to investigate our injurious and beneficial insects, I need say but little; for the subject has been kept before the people, and the people are always interested to know something about an insect as soon as it injures their crops, or causes them trouble in any way. There is especially much need of more experiments to find better remedies for injurious insects. Attention to this portion of the subject cannot fail to meet with some degree of success. Success here is sure to win the gratitude of every one engaged in agriculture. Success in finding good, cheap, and safe remedies for injurious insects will tend to make science popular, and make endowments for research much easier and more frequent than ever before.

I need hardly add, that he who finds or breeds a race of honey-bees which is hardier, more industrious, longer-lived, quieter, possessed of longer tongues, and, last but not least, possessed of blunter stings, with less inclination to use them, — he who can succeed in any or all of these objects is entitled to rank

with the man who shall cause two blades of grass to grow where only one grew before.

The U. S. commission on fish and fisheries is an example of good scientific work, with prospects of early returns in the form of an increase in knowledge and a large increase in the supply of fish. A somewhat similar work, conducted by Prof. S. A. Forbes of Illinois, is in progress, where the object of the survey is to inquire into the food of birds and the food of fishes.

Some valuable scientific work of an economic nature has been done in connection with the tenth census, conspicuous among which is that performed by Prof. C. S. Sargent, in the study of forestry.

Botanical explorers in every land have repeatedly and liberally contributed plants of economic importance to the horticulturist, — a few new fruits, but more especially flowers and foliage-plants. An occasional contribution has been made to agriculture in the form of plants which promised to be of value for seeds or forage, or for some other purpose.

I have often been surprised that more attempts had not been made to secure the introduction of some new foreign grasses, and test them to ascertain their value for meadows and pastures. To be sure, grasses from western Europe have been tried; but we need others.

More than twelve years ago this idea appeared in my address on grasses, as given before the Northwestern dairymen's association, where the advice was given to get other grasses from Japan, China, central Asia, and the dryer portions of South America. The cereals and pasture-grasses, the world over, are of more value to man and his domestic animals than all other plants taken together; yet the list of pasture-grasses now generally sown in any state can be counted on the fingers of one hand. In Great Britain, where much attention has been given to the subject, twenty-five or thirty species are much cultivated. It is hard to give all the reasons why so few grasses are employed in this country; but the fact remains, that few are cultivated. The grass family is a large one, containing from thirty-one hundred to four thousand or more species. They are widely distributed in nearly all parts of the habitable globe, in every soil, in society with others, and alone. This does not convey an adequate idea of their value in unwooded regions, because the number of individuals of several of them is exceedingly large.

I have recently found the following in the *American agriculturist* for 1858, a statement probably made by Dr. Thurber. "A dozen sorts, probably, cover nineteen-twentieths of all the cultivated meadow-land from Maine to Texas. It can hardly be supposed that so limited a number meets, in the best manner possible, all the wants of so great a variety of soil and climate. This is one of the pressing wants of our agriculture. Experimental farms are needed where the value of new grasses and kindred questions can be determined. A single new grass, that would add but an extra yield of a hundred pounds to the acre, would add millions of dollars annually to the productive wealth of the nation."

Still farther back, in 1853, the late I. A. Lapham of Wisconsin expressed similar views; and still longer ago, in 1843, forty years ago, in a prize-essay, J. J. Thomas said, "The great deficiency in the number and variety of our cultivated grasses has been long felt by intelligent cultivators." In this subject, but very slow progress has been made in forty years.

In the extensive unwooded regions west of the Mississippi, the native grasses afford much pasture; but many of them start very late in spring, and stop growing early in autumn. They do not completely occupy the ground: they are easily stamped out by the hoofs of cattle and sheep. Some of the tame grasses will thrive better, and afford much more pasture.

In Science, vol. i. p. 186, of this year, Prof. N. S. Shaler refers to this subject. He says, "It seems possible to improve this pasture by the introduction of other forage-plants indigenous to regions having something like the same climate. The regions likely to furnish plants calculated to flourish in a region of low rainfall include a large part of the earth's surface. Those that would succeed in Dakota are not likely to do well in Texas or Arizona. For the northern region, the uplands of northern Asia or Patagonia are the most promising fields of search; while for the middle and southern fields, the valley of the La Plata, southern Africa, Australia, and the Algerian district, may be looked to for suitable species." He recommends three experiment-stations, — one in Nebraska, one in Texas, and one in Arizona.

In this connection, when we remember that exotic plants often thrive better than natives, we see what a vast field lies ready for experimenting with the grasses.

Grasses look much alike to all who have not closely studied them; so that farmers — in fact, none except botanists are likely to attempt experiments. This is a strong reason why the state and national governments should assist agriculture in an undertaking which seems so fruitful of good results within a short time, at so trifling an expense. Expeditions are sent at great expense to explore polar seas, with a view to slightly extending our knowledge of a barren portion of the earth's surface. Large sums are employed to fit up in magnificent style, and send to the remotest parts of the earth, expeditions to spend a few minutes in observing an eclipse or a transit of Venus. Would the sending of competent persons around the earth in search of better grasses be an undertaking less praiseworthy?

The men who control the Northern Pacific railway were enterprising enough to see that a complete economic survey of the adjacent territory would help the sale of their lands. Among other things, the grasses will be carefully examined.

For the past ten years the writer has been testing, in a small way, some hundred and fifty species of grasses. These, with few exceptions, are natives of the eastern United States and western Europe. I am fully convinced that further experiments, carefully made on a larger scale in several portions of our country, will be quite sure to result in great gain to agriculture.

Grasses suitable for the western prairies, to take the place of those which will be rapidly stamped out by close feeding, are sure to be found even without the aid of the government; but greater time will be required.

Prof. E. M. Shelton of Kansas agricultural college has probably done more than any one else in the west to test grasses and clovers, and diffuse information in regard to the results, which are most gratifying. At nearly all gatherings of farmers in the west, this question of new grasses is a prominent topic of discussion.

Wherever irrigation has been well tried, especially on land which is light and well drained, the results have been quite surprising, converting a dry, hungry meadow into a little oasis. Such a meadow is the triumph of agricultural art.

One of the most remarkable results of irrigation, as viewed by a scientific man, is this: the list of grasses will not remain the same, or maintain the same proportion. The bad grasses will nearly all die out, or improve in quality; while the best ones will rapidly increase. And again: experiments in England have shown that irrigation causes many herbaceous plants, distinct from grasses, such as plantain and buttercups, to give place to good grasses. Docks are not diminished by irrigation. The best grasses are a sign of good land in fine condition. Such grasses are hearty feeders, and are most sensitive to good treatment. In a well-managed meadow, irrigation in four years increased the value threefold.

Solon Robinson long ago expressed the view, that, if the streams of Connecticut were properly utilized in irrigating the soil, they would be more productive in value than by turning all the water-wheels of the state. More experiments in irrigation are much needed in this country.

Baron J. B. Lawes, a most renowned experimenter in agriculture, possessed an old pasture having been in permanent grass over a century. No fresh seed of any kind was sown during this period. For some seven years or more, he experimented by applying to this old pasture, on different plats, twelve different kinds of manures. The results were very interesting and gratifying. "The manures, which much increased the produce of hay, at the same time very much increased its proportion of graminaceous herbage. The total miscellaneous herbage (chiefly weeds) was the most numerous in kind, and nearly in the greatest proportion, on the *unmanured* land, — viz., sixteen per cent, — while on the manured plat it decreased to two per cent. Every description of manure diminished the number of species and the frequency of occurrence of the miscellaneous or weedy herbage. A few weeds were increased by the manures, such as Rumex and Achillaea."

"The plants of a meadow," in the words of the *Agricultural gazette*, "live in harmony on the unmanured open park, having nothing to fight for in a state of nature; but toss them a bone, ground fine, or any other choice bit, and their harmonious companionship terminates at once. Every act of improved cultivation occasions instant war. A grass likes the best that can be got. It will swallow soda, but not when it can get potash. As a general principle, all manures tend to drive out the weeds by increasing the better herbage." A repetition of like experiments in this country could not fail to give valuable results.

In Europe some success has been reached in selecting and cultivating different varieties of Lolium perenne, Dactylis glomerata, and Trifolium pratense.

The field is a promising one for any careful and enthusiastic student. For three years past, I have been studying hundreds of plants of red clover at all seasons and stages of growth. I have plants growing, the seeds of which came from marked plants which varied much from each other. Plants in the fields of red clover vary amazingly in many respects, which influences their value for forage-crops. I believe our fields of red clover to-day contain nearly or quite as great a variety of plants as would a field of Indian corn, if we were to mix in a little seed of all the varieties cultivated in any one state.

Some of our grasses in cultivation are quite variable, notably the fescues, orchard-grass, and perennial rye-grass. It was some time ago observed that alfalfa of California, and lucerne of Europe, were quite different in their capacity to endure dry weather, though they belong to the same species. Different treatment in widely separated countries for many years has wrought a great change.

The subject of changing seed, planting old seed, mixing seed, raising it one year or more in a remote country, and then returning to the starting-point, deserves the attention of careful experimenters.

The late Charles Darwin experimented on the effects of cross and self fertilization of plants, and found that in most cases plants from crossed stock were earlier, hardier, germinated better, and yielded more seeds, than those from seed of self-fertilized plants, while crossing with foreign stock of the same variety is a far greater improvement. The idea is to cross the flowers of a plant with pollen from other plants of the same variety, the seeds of which were raised pure for five or more years in a remote locality, fifty miles or more away.

Mr. Darwin said, "It is a common practice with horticulturists to obtain seeds from another place, having a very different soil, so as to avoid raising plants for a long succession of generations under the same conditions; but, with all the species which freely intercross by the aid of insects or the wind, it would be an incomparably better plan to obtain seeds of the required variety, which had been raised for some generations under as different conditions as possible, and sow them in alternate rows with seeds matured in the old garden. The two stocks would then intercross, with a thorough blending of their whole organizations, and with no loss of purity to the variety; and this would yield far more favorable results than a mere exchange of seeds."

In a word, with plants which may be easily crossed, get some foreign seed of the same sort to mix with your own seeds to raise seeds for ensuing crops.

In 1877 I began some experiments of this kind with Indian corn and with beans, and have since

made others. The advantage shown by crossing of corn over that not crossed was as 151 exceeds 100, and in the case of black wax-beans it was as 236 exceeds 100. Since then similar experiments have several times resulted in showing a large increase in favor of crossing with foreign stock.

In a review of Darwin's book, the *Gardener's chronicle* of England said in 1877, "It is certain that these practical results will be a long time filtering into the minds of those who will eventually profit most by them." The results of my experiments have been widely printed in the agricultural papers of the day, and have been given at numerous farmers' institutes and granges, beginning in the winter of 1877, nearly six years ago; and yet I cannot learn that any other person in this country has attempted similar experiments. I will make one exception, in case of Prof. W. A. Henry of Wisconsin university, who tried the experiment in connection with myself. The results, so far, fully accord with the prophetic statement above quoted from the *Gardener's chronicle.*

In originating new varieties and races, see what has already been done, largely in our own country, in a haphazard way, with strawberries, raspberries, blackberries, gooseberries, and grapes, to say nothing of improvements in ornamental plants.

I need hardly add, that some of the best results, considering the time and means employed, have been obtained by persons who have crossed and hybridized according to some well-devised plan.

Our varieties of fruits in cultivation have become so numerous, that to describe them by the fruit and foliage alone often baffles the skill of the most expert pomologist. In the proceedings of the American pomological society for 1877, 1879, and 1881, I have shown that much help can be obtained by noticing the peculiarities of the flowers of apples and pears. The same is no doubt true, to some extent, with grapes, peaches, gooseberries, and other fruits.

Here is a promising field, full of interest to the botanist, — a field where he may accomplish much to aid the horticulturist, and something to advance science. A new variety of any cultivated fruit can no longer be considered as well described, unless some account be made of the flowers.

It has often been shown that many kinds of insects are beneficial to plants by aiding the fertilization of the flowers. The subject has still about it much that is new. Even Mr. Darwin said he did not suppose that he fully understood all the contrivances for fertilization in any one flower.

If it be true, as my experiments during the past six years help to indicate, that bumble-bees aid in fertilizing red clover, then farmers should try to encourage these interesting insects, even though they be disagreeable companions. Bumble-bees prefer to raise their colonies in old nests of meadow-mice. I mentioned in my last report, that it had been suggested that we should not keep many cats, nor allow hawks, foxes, or dogs to catch these mice; for they make nests which are quite necessary for the bumble-bees, which help fertilize our red clover, and thereby largely increase the yield of seed.

Perhaps it may not be altogether visionary to predict that men will yet engage in raising bumble-bee queens, and sell them to farmers at a fair profit, for starting colonies to improve the yield of clover-seed. We may yet have conventions and societies where the leading object shall be to discuss the merits of different sorts of bumble-bees.

A few years ago experiment-stations in Europe began testing seeds which were offered for sale in the markets. Adulterations were discovered most ingenious in character, harmful in effect, and remarkable in amount.

The more the subject was investigated, the worse it seemed to be. Something of the same sort has been undertaken in this country, showing that even in Michigan some worthless seeds are put on the market. In 1877 and later I tested large numbers of vegetable-seeds purchased of fifteen of our large dealers and growers. Not one of these is free from selling seeds that are worthless. The remedy is not easy. On account of its effect on their advertising, publishers are unwilling to print for their readers the results of these experiments. Only a few people can acquire the information after experiments are made.

In making tests of seeds, we still lack information in regard to the surest and best mode of testing each sort. Here is a good work for some accurate and ingenious scientist to invent new apparatus, learn the proper amount of heat, air, and moisture, for producing the best results, find out whether seeds will thrive best with a constant temperature, or a variable temperature; and learn the best modes of preserving seeds alive from one year to another.

I need hardly mention to intelligent students, that there is an extensive field, a very attractive one, in the study of fungi. The agriculturist who deals with plants, not only wants to know the kinds, but the requirements which are favorable or unfavorable to their development. In the study of effectual remedies against fungi, something has been done; but there is still much demand for more knowledge. Successful experiments in regard to fungi are not likely to be made except by botanists.

I have only glanced at a few points where the biologist can find interesting work which will give threefold returns by advancing science, helping to elevate agriculture, and benefiting our country. There are many experiment-stations in Europe, and some in this country. We hope their number may soon increase, and that liberal and permanent endowments will not be lacking. This association, and all other societies working in the interest of science, can render a great service by doing what they can to encourage experiments in all departments of agriculture. Men can be encouraged to prepare papers, and committees can make reports pertaining to the subject. There is a need of thorough state surveys, solely with a view to the interests of agriculture and kindred subjects. More knowledge of our soils, water, building-materials, plants, timber, injurious fungi, insects, and birds, would return to a state, fivefold the cost of acquiring such information. In brief, then, as one of the humble workers in the interests of agriculture,

I most cordially invite you to turn your attention to some of the problems which vex the husbandman.

PAPERS READ BEFORE SECTION F.

On the use of vaseline to prevent the loss of alcohol from specimen jars.

BY B. G. WILDER AND S. H. GAGE OF ITHACA, N.Y.

IN the absence of the authors of the paper, an abstract of it was read by the secretary of the section, Professor Forbes. Vaseline, when used for the purpose indicated, proves to be an agent unaffected by temperature, and by most chemical substances. It is sparingly soluble in cold alcohol, but wholly soluble in hot alcohol, solidifying on cooling. It can be fitly applied in sealing specimen-jars, and meets many requirements when so used.

A new plan of museum-case.

BY E. S. MORSE OF SALEM, MASS.

THE author described, and exhibited by means of drawings, a new plan of museum-case. He said his observations in the museums of Paris proved the great inferiority of the cases there to those in the United States. He gave, in addition to a detailed plan of a case, some suggestions as to the best method of arranging articles within. Mr. Morse has had the subject of arrangements for museum exhibitions under consideration for several years, and the present plan includes contrivances which he has previously suggested as separate devices.

(BOTANICAL PAPERS.)

A supposed poisonous seaweed in the lakes of Minnesota.

BY J. C. ARTHUR OF CHARLES CITY, IO.

IN the summer of last year many cattle and hogs died in the vicinity of Waterville, Minn. Residents in the locality believed that the animals were poisoned by drinking the water of adjoining lakes. There are two lakes of considerable size in the neighborhood: they are free from marsh, and have wooded borders; through them runs a somewhat sluggish river.

At the time of the occurrence, the lakes showed a quantity of dark-green scum on the surface, as well as disseminated through the water. The surface-layers of the scum were in places several inches thick. The scum proved to be a water-weed, having some characteristics like those of the nostoc, but is known to botanists as Rivularia fluitans, and has been described by Cohn, a European naturalist. The plant is spoken of by the author of this paper as a seaweed: he supposed it did not occur in this country elsewhere than in Minnesota, and it is not frequent in Europe.

Last year Mr. Arthur visited the locality of the occurrence, and he repeated his visit this summer; but in each instance too late in the season to examine the scum *in situ*. It appears to be composed of innumerable small round bulbs of a transparent gelatinous substance, which are filled with a dark-green material. After they first begin to be seen on the water, the bulbs increase in number with marvellous rapidity. In about two weeks they begin to decay, and their entire disappearance quickly ensues. These phenomena take place usually in June. As no actual experiments have been made upon animals, the deadly qualities ascribed to the so-called seaweed are as yet a matter of conjecture, though the reported facts tend strongly to strengthen the belief that the plant is poisonous.

Relations of certain forms of algae to disagreeable tastes and odors.

BY W. G. FARLOW OF CAMBRIDGE, MASS.

ALTHOUGH large masses of any decaying vegetation may render water unfit for drinking, the only group of plants to be feared, as far as their effect on the taste and odor is concerned, is the members of the nostoc family, which form floating scums of a bluish-green color. When exposed to a bright sun, especially in shallow water, they are transformed into fetid, repulsive-looking masses of slime, which give to the water the so-called pig-pen odor. The water-supplies of several eastern cities have been thus contaminated, and principally by species of Coelosphaerium, Clathrocystis, and Anabaena. In Minnesota is the representative of a fourth genus, Rivularia, which was first found last year at Waterville by Professor Arthur, and which has been found to be very abundant this year in Lake Minnetonka; and in all probability it occurs in most of the other lakes of this region. The singular fact is, that while unknown elsewhere in this country, the species was found several years ago by Cohn in Silesia, who named it Rivularia fluitans; and it was detected also by Gobi near the Gulf of Riga. It appears also to be very closely related to, if not identical with, an alga abundant in certain parts of England, referred by Harvey and more recently by Philips to Echinella articulata, Ag. This is another illustration of the very wide distribution of the species of the nostoc family, of which we have other recent illustrations in the Nostochopsis lobatus of Wood, first described from the northern states, but which has since been found to be identical with Mazea Rivulariaides subsequently discovered in Brazil, and with Hormactis Quoyi found only at Falmouth, Mass., and the Marianne islands in the Pacific.

There is a strong probability, that in the future Minneapolis may be troubled by the decay of the different nostocs floating in the lakes near the city, where they are very abundant. As far as avoiding trouble from these plants is concerned, undoubtedly river-water is to be preferred to lake-water; but before many years the Mississippi near Minneapolis will be contaminated by sewage, and the water will probably then be obtained from the lakes. If the shallower lakes near the city are used, there can be little doubt that in summer Minneapolis will have the same trouble as that experienced in Boston. Even at greater expense, the water should be brought from large and deep lakes, especially those across which the