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

winds sweep so as to keep the surface-water roughened.

The spread of epidemic diseases in plants.

BY W. G. FARLOW OF CAMBRIDGE, MASS.

In the case of animals it can be said, that, excepting the diseases attributed to bacteria, they are subject to but few diseases caused by fungi. In the case of plants, however, the greater part of the diseases to which they are subject are caused by parasitic fungi; excepting, of course, the injuries caused by insects, which need hardly be considered in speaking of epidemic diseases. Most of the violent epidemic diseases of plants are caused by fungi of the orders Uredineae, rusts, and Peronosporeae, rots. Fortunately the species of these orders attack only a single species of host, or at most several species closely related botanically; so that, for instance, a rot which would attack the potato would not probably attack the grape, although it might be expected to attack the tomato, which is botanically closely allied to the potato. As might be expected, the most violent epidemics occur during, or just after, unusually wet periods. An epidemic disease spreads either by the dispersion of its spores through the air, or by the transportation of the host-plant on which it is growing; the latter being probably the means by which diseases are carried across large bodies of water, as the Atlantic.

With the introduction of food-plants from Europe to this country come, of course, many of their parasitic diseases. It should be noted, however, that the most violent plant-epidemics of recent times have advanced not from east to west, but from west to east. The best-known case is that of the potato-rot in 1845, and since then the very accurately recorded case of the grape-mildew, Peronospora viticola, has arisen. In the first case, the disease is supposed to have reached Europe from the west coast of South America, by way of the United States. In the latter case, the grape-mould, which is a native of North America, can, as I showed by experiments in 1876, be transferred to the European vine; and it was prophesied that the disease would extend to Europe, and do more harm than with us. The prophesy was very soon fulfilled, as you all know. In the two diseases just mentioned, it is a characteristic of the spores, that in germinating, instead of giving off a filament, they discharge a number of motile zoöspores, each of which is capable of propagating the disease. We have several other species of Peronospora, which produce zoöspores, some of which have apparently crossed from America to Europe; and there are others which, although common in this country, have not yet appeared in Europe, although, following the grape-mould, they may be expected to appear there hereafter. Among these may be mentioned Peronospora Halstedii, which grows on composites, and may later be found in Europe on the Jerusalem artichoke. Professor Trelease has recently found a Peronospora on Sicyos in Wisconsin, which resembles the grape-mould in general appearance. The germination of the spores has not yet been observed, but judging by analogy one would expect them to produce zoöspores. It would not be surprising if the Peronospora on Sicyos should also be found hereafter causing a disease of squashes or melons; and its progress eastward might be expected as in the cases previously cited.

The speaker then referred to a modification of the spores sometimes observed in Peronospora. Mr. Earle of Cobden, Ill., collected species on Geranium and Viola, where, instead of the usual branching spore-stalks, the spores were borne on the mycelium close to the breathing-pores; the spores themselves being very much larger than in the common form. A similar monstrosity has been noted by Cornu in the grape-mould. The specimens were collected by Mr. Earle in April, and the speaker suggested that this form of spores might perhaps be an adaptation to the cold and wet weather of spring. The conditions which produce the monstrous forms are worth considering by collectors.

Of the diseases caused by Uredineae which have advanced from west to east, the hollyhock-disease, Puccinia malvacearum, is the best-known instance. Its original home was probably Chili; but it spread through Europe about ten years ago, not, however, by way of this country, as was probably the case with the potato-rot. The diseases produced by fungi of other orders, as Ascomycetes, do not spread with the same rapidity as the rusts and rots. This is shown by the black knot, which is so destructive in this country to plums and some kinds of cherries. It is a native of this country, and is found on most of our wild species of Prunus, especially the choke-cherry, a shrub which has been introduced into many places in Europe. As yet, however, the black knot has not made its appearance in Europe.

The speaker then said that he had just found the grape-mildew growing on the Virginia creeper (Ampelopsis quinquefolia) near Minneapolis. As this plant is closely related to the vine, the occurrence of the mildew might have been expected. In attempting to prevent the spread of the disease to countries where it is now unknown, the discovery is of importance. It is evident, that, to prevent the spread of the disease, the importation of Ampelopsis as well as of grape-vines must be prohibited.

Parallelism of structure of maize and sorghum kernels.

BY E. L. STURTEVANT OF GENEVA, N.Y.

If kernels of flint, pop, sweet, and Tuscarora maize be split parallel to the germ, each race will be seen to present a definite arrangement of structure. Thus, the flint corn presents a germ surrounded by starchy matter, and this in turn by a corneous envelope; in the pop-corn proper, the germ is enclosed in the corneous matter, the starchy matter being absent except as the pop variety intrenches upon the flints; the sweet corn has a similar structure to the pop, but the corneous matter is translucent and wrinkled.

By means of blackboard diagrams, the relative arrangements were exhibited of the 'chit' or germ, the corneous matter, and the starch, in the kernels of the above-named varieties of maize and in sorghum.

These different arrangements are constant, and do not pass into each other. The proportion of these elements is also, in general, constant throughout the development of the kernels. The parallelism which is apparent may be accounted for on the familiar axiom that similar forces acting under like circumstances produce similar results.

Agricultural botany.

BY E. L. STURTEVANT OF GENEVA, N.Y.

IF kitchen-garden plants be closely studied, in many varieties it will be found that selection has differentiated the various natural species in accordance with desired uses. It will be noticed, that, while there is a striking uniformity within varieties in those portions of the plant which have not been selected for improvement, there is a great variation between those portions which have secured attention on account of their uses. Thus, in forty-five varieties of onions growing side by side, the foliage is all similar; yet the bulbs vary in size, color, shape, and habit of formation. The effect of selection concentrated upon visible forms has been to produce and fix changes from the natural plant to such an extent as in cases to mask the original plant, so that historical data must supplement morphological data in order to connect the genetic record. It is clearly evident, that conscious selection is a powerful agency for the changing of form, and by long exercise can overcome the type affixed by nature to a species. In the domesticated plant, the power of intelligence to eliminate, modify, and direct the action of natural laws under a given purpose introduced a new factor to influence plant-growth; and forms designed for uses mask genetic resemblances in those portions of the plant where change means value to man. If these views are correctly stated, then it is seen that an agricultural botany, as an annex to natural botany, is imperatively required for the purpose of furthering classification of domesticated plants; and such an annex must vary in its methods as widely from the methods of the natural botany as cultivated plants vary from feral plants, the key to the motive being in one case the use, while in the other it is the floral organs.

The present condition of the box huckleberry, Vaccinium brachycerum, in Perry county, Pennsylvania.

BY E. W. CLAYPOLE OF NEW BLOOMFIELD, PENN.

THIS was an interesting account of a plant that may become extinct. The discovery of this plant took place over hundred years ago, in Virginia, and it subsequently disappeared until 1846, when it was again discovered by Prof. Spencer F. Baird in Pennsylvania. This peculiar plant exists in Perry county, Penn., and in New Castle county, Md., and in no other known locality in the world. It exists in limited quantities there. Its geographical limits are sharply defined, and never extend, but rather recede, indicating a probability of its extinction.

Relation of root and leaf areas; corn.

BY D. P. PENHALLOW OF MONTREAL, CAN.

IN the absence of the author of the paper, the secretary of the section briefly stated the contents. The paper sets forth the importance of the relations between the aërial and subterranean surfaces of plants, especially in respect to area. The experiments of the author were mainly upon the growth and development of maize, of which he has tabulated careful measurements showing the proportions of areas above and beneath the soil.

Influence of position on seed.

BY E. L. STURTEVANT OF GENEVA, N.Y.

THE 'position' referred to in the title of this paper is that of the individual seeds grown on a spike. The object of experiment was to ascertain the differences of germinating force between seeds from the middle and from the ends of the spike. In trials carried forward at the New-York agricultural experiment-station last winter, it was found, that, for an average of 91 per cent of butt kernels, 88 per cent of central kernels, and 98 per cent of tip kernels, of flint corn, germinated. Other experiments gave the following results: In the butts planted, 79 per cent germinated; of the centres, 84 per cent germinated; and of the tips, 86 per cent germinated. For flint-corn, the tip-kernels have the stronger vegetative power.

Periodicity of Sabbacia angularis.

BY MARY E. MURTFELDT OF ST. LOUIS, MO.

THE attention of the authoress was first drawn to this plant in Missouri. It is a matter of popular belief there, that the plant flowers only once in seven years. Mindful of the story in the Greek Reader, of the *scholasticus* who bought a turtle to ascertain whether it would live a hundred years, Miss Murtfeldt obtained some seed of the Sabbacia, and planted it at once. Seven years have expired since the planting, and now the plant is for the first time in flower. In a brief discussion on this paper, Professor Mason showed reasons for doubting in general the popular notions about periodicity in the flowering of certain plants.

An abnormal orchid, Habenaria hyperborea.

BY W. R. DUDLEY OF ITHACA, N.Y.

THE peculiarities of this orchid, as observed by the author of this paper, consist of the spur characteristic of its generic relations, the smaller size of the plant, the narrowness of the side petals, and the broad spatula-form of the lips of the flower. These changes are apparently in a direction from an irregular to a regular form of flower. The peculiar cases observed, of which mounted specimens were exhibited to the section, may be due to arrested development; but, the author suggested, they possibly indicate a tendency to revert to older and simpler forms. The habitat of this orchid is not invariably in swamps, but also in dry beech-woods, where they are found to bloom much later than in damp regions.

In the discussion of the paper, Prof. E. D. Cope inquired as to the likelihood of a reversion to a variety of non-spurred orchids, an idea which met with a favorable response from the author.

Origin of the flora of the central New-York lake region.

BY W. R. DUDLEY OF ITHACA, N.Y.

THE region referred to contains a series of lakes, and is bounded on the west by the Genesee river and on the east by Oneida lake. It is of a low, sandy character, the shores of the lakes having but a slight elevation; but towards the north the country gradually rises to a level of 2,000 feet above the sea. The whole region may be regarded as a series of old eroded valleys, filled with drift deposits, and having occasional lake-basins; its entire characteristics being such as would naturally give rise to a peculiar flora.

Professor Dudley described seven species among a large and varied flora peculiarly localized in this lake-country, the natural or ordinary habitat of which is variously situated to the south-west, west, and north-west. The conclusion he sought to establish was that the waters of the great lakes had formerly flowed through these valleys, and carried with them these several varieties of a widely scattered flora.

The remarks which followed the reading of the essay favored this theory, and pointed especially to the abrupt eastern limit of the species in question.

Development of a dandelion flower.

BY J. M. COULTER OF CRAWFORDSVILLE, IND.

BY means of crayon illustrations, the author of this paper displayed the changes which the different parts of a dandelion-flower undergo in the process of growth to full maturity. The main object was to demonstrate the place, and method of origin, of the ovule.

(ZOÖLOGICAL PAPERS.)

Mya arenaria: its changes in pliocene and prehistoric times.

BY E. S. MORSE OF SALEM, MASS.

AT a previous meeting of the association, the author showed that the species of shells found in the Indian shell-heaps along the coast of New England differed in their proportionate diameters from the same species living to-day. He pointed out, moreover, that species belonging to similar genera, in the shell-heaps of Japan, had changed in precisely similar ways. It was important to find out, if possible, the cause of these changes. A comparison between the shells of two common species, found north and south of Cape Cod, gave indications that temperature was the inducing cause. The two species selected were Mya arenaria and Venus mercenaria; the former extremely variable, the latter very constant, in its characters. Specimens of these species had been collected in great numbers, both recent and ancient. The following are the indices, of Mya arenaria:—

RECENT.		ANCIENT.	
South of Cape Cod, 61.42.	North of Cape Cod, 61.67.	South of Cape Cod, 62.	North of Cape Cod, 62.78.

of Venus mercenaria:—

RECENT.		ANCIENT.	
South of Cape Cod, 81.01.	North of Cape Cod, 81.10.	South of Cape Cod, 81.51.	North of Cape Cod, 81.81.

Since the waters south of Cape Cod are much warmer than those north of Cape Cod, it was reasonable to suppose that these changes were due to temperature, and that the higher index of the ancient specimens found in the Indian deposits might indicate a colder climate. This supposition receives some support in the fact that a measurement of specimens found in the glacial clays about Portland, Me., and on the Kennebec river in the same state, gave the high index of 66, and a number of Norwich and Red Crag fossils of Mya, which he had the opportunity of measuring at the British museum, had an index of 64; recent Mya from South End, Eng., having the low index of 58.30.

It was interesting to observe, that measurements of Mya in Japan gave, for the southern form, an index of 61.10, and, of a more northern form, 62.50.

In the discussion which followed, Mr. Morse stated that he had made similar observations with regard to other shell-fish.

Some recent discoveries in reference to Phylloxera.

BY C. V. RILEY OF WASHINGTON, D.C.

EVERY new fact in the life-history of the insects of this genus has an exceptional interest, because of its bearing on the destructive grape-vine Phylloxera. The genus is most largely represented in this country by a number of gall-making species on our different hickories, and the full annual life-cycle of none of them has hitherto been traced. The galls are produced, for the most part, in early spring; the winged females issue therefrom in early summer; and thenceforth, for the remainder of the year, the whereabouts of the insect has been a mystery. The author has for several years endeavored to solve this mystery and at last the stem-mother (the founder of the gall), the winged agamic females (issue of the stem-mother), the eggs (of two sizes) from these winged females, the sexed individuals from these eggs, and the single impregnated egg from the true female, have been traced in several species. There is some evidence, though not yet absolutely conclusive, that this impregnated egg hatches exceptionally the same season; also, of a summer root-inhabiting life. In Phylloxera spinosa, which forms a large roseate somewhat spinose gall on Carya alba, and which has been most closely studied, the impregnated egg is laid in all sorts of crevices upon the twigs and bark and in the old galls, in which last case they fall to the ground.

Up to this time they have remained unhatched, and will in all probability not hatch till next spring, thus corresponding to the 'winter egg' of the grape Phylloxera.

Psephenus Lecontei; the external anatomy of the larva.

BY D. S. KELLICOTT OF BUFFALO, N.Y.

THE species referred to is found in large numbers at the rapids above the falls of Niagara, and is scattered throughout the north-eastern part of North America. The author proposed to supplement the accounts given of it by earlier observers with a record of his own observations, which differed in some respects from those of Dr. LeConte. Several details of anatomical structure were brought to the attention of the members, and illustrated with wood-cuts prepared for the purpose and with specimens mounted in balsam for observation under the microscope.

The Psyllidae of the United States.

BY C. V. RILEY OF WASHINGTON, D.C.

THE Psyllidae, or flea-lice, are rather small homopterous insects, that have remarkable jumping powers. Some of them injure cultivated plants. This is notably true of the Psylla pyri, which blights the buds of pear-trees; and Phylloplecta tripunctata, which crumples the tips of the blackberry. The family has received little attention in the United States, and scarcely any thing has been known of the life-history and development of the species. The paper enumerates 17 described species, four of these being synonymes, and one of them (Psylla pyri) introduced from Europe. They fall into four subfamilies, and represent four genera already characterized, and three new genera, — Brachylivia, Pachypsylla, and Phylloplecta. The new species characterized are Calophya vitreipennis, from Arizona; C. nigripennis, on Rhus copallina; C. flavida, on Rhus glabra; Pachypsylla celtidis-cucurbita, forming galls on Celtis texana; P. c.-pubescens, P. c.-asteriscus, P. c.-umbilicus, and P. c.-vesiculum — all forming galls on leaves of Celtis occidentalis; Blastophysa (nov. gen.) c.-gemma, forming galls on the twigs of the same tree; Ceropsylla (nov. gen.) xyderoxyli, a remarkable form developing in pits on the leaves of Xyderoxylon masticodendron; Trioza sanguinosa, on Pinus australis; T. sonchi, on Sonchus arvensis; and Rhinopsylla Schwarzii, from the cypress-swamps of Florida. The paper records discoveries as to the entomography of the species, and especially those affecting Rhus and Celtis; the latter forming a group peculiar to North America, and the most perfect gall-makers in the family.

The most interesting portion of Professor Riley's paper, to those who are not entomologists, was that where he dwelt on the life-histories and habits of the insects he described. The eggs are attached to leaves by a pedicel, and are somewhat pointed at one end, and often terminate in a filament. The young are broad and flattened, with a fringed margin. They are generally pale, and more or less covered with a flocculent secretion. Those on sumach are dark, and without such flocculence. Those making galls on hackberry have stout spines at the end of the body, by the aid of which they are able to work out of their galls.

Note on Phytoptidae.

BY HERBERT OSBORN OF AMES, IO.

THE Phytoptidae comprise a group of very minute mites, species of which produce galls of various forms on the leaves or twigs of various trees. Recent investigation in Europe has placed the group in a different light from that in which it previously was considered. Their study is rendered difficult by their extreme minuteness, and the care necessary to discover the different stages. One of the most common species produces the little wart-like swellings which occur so abundantly on soft maple leaves. A species on ash leaves produces a swelling which is nearly uniform on the upper and under surfaces of the leaf; while another species on the same tree produces a leafy growth at the end of the twigs, the growth sometimes being inhabited also by cecidomyian larvae. On the elm occurs a large deformed leafy growth, which also contains Phytopti; while still another form of gall occurs on box elder, consisting of a depression on the under surface of the leaf, this depression being filled with a woolly growth, and containing Phytopti.

Notes on the potato-beetle and the Hessian fly for 1883.

BY E. W. CLAYPOLE OF NEW BLOOMFIELD, PENN.

THE author found that only one brood of the potato-beetle appeared last year. This seemed an unusual fact, but no second brood had appeared on the potatoes under his observation. In the present year, no beetles appeared during the early stage of the growth of the plant. This fact had been also noticed in New York and New Jersey. He attributed the cessation in the early part of this year to the same unknown cause which had checked the late brood of last year, and asked the opinions of members in determining the cause. Professor Riley thought the disappearance of the beetle could be attributed to the drought. But Professor Claypole said that in 1881, which was an unusually hot and dry season, the beetles were more numerous than he had ever seen them, and gave him more trouble than ever before or since.

In regard to the Hessian fly, Professor Claypole was of opinion that the insect injured the later wheat much more than the early crop, because the crops that gain full strength are best able to resist the attack. Wheat sown before Sept. 10 escaped the ravages of the fly. The winter wheat being chiefly attacked, the observations on the insect had been directed especially to that crop. Contrary to the opinion of many farmers, Professor Claypole believes there are two broods, one in the autumn, and one in the spring. The insect, it is thought, often killed the stalk in the fall, and then probably died with it.

Professor Riley thought that this class of observations could apply only to certain localities, and that in the southern states the conditions might be entirely changed. Professor Forbes thought there were three distinct broods per year in Illinois. As late as July he had found eggs of a brood already abroad.

The structure of the skull in Diclonius mirabilis, a Laramie dinosaurian.

BY E. D. COPE OF PHILADELPHIA, PENN.

A BLACKBOARD sketch of this dinosaur, as reconstructed by Professor Cope, attracted much attention. The animal existed in the mesozoic age, and is estimated to have been 38 feet long. The skull, which is about four feet in length, is in profile a good deal like that of a goose, but, seen from above, is somewhat like that of a spoonbill. Skulls of this type of reptiles are rarely found, and this one throws much light on the question of the classification of the order. The arrangement of the teeth is very peculiar; and the number is very great, amounting to nearly 2,000. The general form of the animal is that of a gigantic kangaroo. The food evidently consisted of very soft aquatic vegetation.

The trituberculate type of superior molar, and the origin of the quadrituberculate.

BY E. D. COPE OF PHILADELPHIA, PENN.

IN the lower eocene, Professor Cope finds all the mammalian molar-teeth to be tritubercular. He has now a complete series of molar-teeth from different mammals in successive horizons, showing all the steps of transition from tritubercular molars of somewhat triangular form and very simple structure, up to the regular quadritubercular tooth, which is defined as of nearly square section and having four tubercles. Man has quadritubercular molars : all the monkeys are similarly equipped. Some of the lemurs have tritubercular teeth. Among lower types, such as marsupials and hedgehogs, about half have the tri- and half the quadri-tubercular development. The insectivora are similarly divided, about half having the old eocene molars and half the modern form. The various steps of development were illustrated by blackboard-drawings.

Two primitive types of Ungulata.

BY E. D. COPE OF PHILADELPHIA, PENN.

THE author announced the discovery of a new mammalian fauna of the eocene, having the following characteristics: 1°. All the fingers and toes are retained; they are plantigrade, each limb having five digital extremities. 2°. The limbs are shorter than usual. 3°. They invariably have a flat astragalus. To the second specification there is one exception, a swimming animal whose hind-limbs were long. One of the discoveries is of a hoof-type animal with carnivorous jaws. It existed in the eocene, and appears to have been of short duration.

In the discussion on this paper, Dr. Dawson stated that some of the plants he had traced in the eocene were well adapted, by the circumstances under which they grew, for supplying food to the creatures described. Professor Cope received this announcement with expressions of pleasure. Thus the new mammal of the old eocene not only bridged the interval between ungulates and carnivores, but also the wider gulf between Dr. Dawson and Professor Cope.

Pharyngeal respiration in the soft-shelled turtle, Aspidonectes spinifer.

BY S. H. GAGE OF ITHACA, N.Y.

DURING the last twenty-five years, respiration in the Chelonia has been investigated with considerable thoroughness, both in this country and in Europe; and at present the chelonian form of respiration is considered to be comparable with that of the mammal, rather than with that of the frog as formerly supposed. While, however, the mechanism of respiration has been very fully investigated, there has been, so far as the author is aware, but one investigator who has considered the organs of respiration in the different groups of turtles. The author showed reasons for believing that a true aquatic respiration, and a true aërial respiration, co-existed in the soft-shelled turtle. It is hoped, that, during the coming year, investigations may be completed which shall determine the exact proportion of the pharyngeal respiration, and the structure of this unusual respiratory organ.

The application of nitrous oxide and air to produce anaesthesia; with clinics on animals in an experimental air-chamber.

BY E. P. HOWLAND OF WASHINGTON, D.C.

THE paper opened with the conclusion of the author that a mixture of nitrous oxide and oxygen, administered in a closed air-chamber, would eventually take the place of ether and chloroform as an anaesthetic for all surgical operations. As ordinarily administered, nitrous oxide cannot be used for prolonged operations, because the blood does not separate oxygen from the gas. Nitrous oxide is expelled from the lungs without change: if it is supplied to them without air or oxygen, death ensues from asphyxia. The author claimed to have administered nitrous oxide for dental and surgical operations in over 30,000 cases. He has found that where unmixed nitrous oxide is used, in the average of cases insensibility is produced in fifty seconds, and recovery from unconsciousness takes place in two minutes. With animals experimented upon, in the average of cases, death ensued within two and a half minutes, where air or oxygen was excluded.

If, at the ordinary pressure of the atmosphere, enough air is mixed with nitrous oxide to support respiration, the mixture fails in producing anaesthesia. But the increase of pressure which can be effected by administration in an air-tight chamber changes the result materially. In such a chamber, with suitable air-pressure, equal parts of air and nitrous oxide breathed from a gas-bag, or a mixture

of 85 parts oxide and 15 parts oxygen, can be breathed for an indefinite time without danger or injury, producing perfect anaesthesia while thoroughly oxygenating the blood. The effect of the pressure of air in the chamber is simply to concentrate the mixture in the gas-bag into smaller space; and, when thus concentrated, the oxide does the work of producing insensibility, while the air or oxygen of the mixture keeps up the vital processes.

The author gave an historical account of the discovery of this method of administration by Paul Bert in 1878, and its subsequent applications. Having used it for many capital operations, Dr. Howland recommends the system unhesitatingly. Some points of its excellence, in addition to those already mentioned, were stated as follows: By augmenting or diminishing the pressure, the degree of anaesthesia may be regulated at will, and with mathematical precision. Therefore there is no danger of any of the accidents incurred through the use of ether or chloroform. When inhalation of nitrous oxide and oxygen is stopped, the patient recovers consciousness in a few seconds, and feels no subsequent discomfort. The action of compressed air on the surgeon and his assistants is not injurious.

After the reading of the paper, the operation of the system was exhibited. The air-chamber in this case was a tight box with glass sides; and the patient was a chicken. Perfect anaesthesia was produced and proved; and then, after the chicken was restored to consciousness, it was again placed in the chamber, and killed by the administration of unmixed nitrous oxide.

Conscious automatism.

BY C. P. HART OF WYOMING, O.

THE author confined his inquiry to the manifestation of conscious automatism in man. The question was whether the centres in the cortex of the brain were essential to the production of automatic functions of this character. Claiming that the destruction of these cortical centres induces complete and permanent motor paralysis, the author drew the conclusion that conscious automatism depends upon the integrity of that portion of the brain in which arise consciousness and volition.

Prof. E. D. Cope, discussing the paper, hinted that the author had raised the question upon mistaken grounds; that conscious automatism, of necessity, originated in the cortical portion of the brain, but by the influences of use and heredity became so far habitual that it is independent of volitional impulses. The question is evidently not one of automatical origination, but of functional independence.

List of other papers.

The following additional papers were read in this section, some of them by title only: A fact bearing upon the evolution of the genus Cypripedium, by *E. S. Bastin;* Leaves of the Gramineae with closed sheaths, by *W. J. Beal;* Observations on Cephalopoda, by *Alpheus Hyatt;* Position of the Compositae in the natural system, by *Joseph F. James.*

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

National museum.

Priestley's apparatus. — Priestley's chemical and physical apparatus, now in the possession of his descendants in Northumberland, Penn., has been presented by the latter to the National museum, and will be placed in the collection illustrating the history of science.

STATE INSTITUTIONS.

Iowa weather service, Iowa city.

Weather bulletin for July. — The weather of July, 1883, was very favorable to the crops, being fair, nearly normal in temperature, with an excess of rainfall, and southerly winds prevailing.

The mean temperature of the air was but a little over one degree below normal: last year July was nearly five degrees below normal. The number of hot days has been high, especially during the first and last decade, while the middle decade was cool.

Insolation has been high, because, even during the stormy period, cloudy days were rare, and during the month clear days were numerous. The sun thermometer exceeded 140° on twenty-one days; its highest reading was 161°, on the 23d.

The total rainfall was below normal in southern-central Iowa, from Union to Jasper counties: in the balance of the state it was considerably above normal, averaging about six inches in the north-west and in the south-east, and nine inches in the north-east. The highest rainfall, of fourteen inches, for the month, was measured at Decorah. The number of rainy days averaged ten for the east and north-west, and about six for the balance of the state.

As usual during July, very heavy rains have occurred, but only in the north. The highest rainfall measured on one day was nearly six inches, at Homedale, south of Sibley, in Osceola county, on the 23d; next to this stands Algona, Kossuth county, with over five inches on the same date. But the most notable rain period of the month occurred in north-eastern Iowa, from the 20th to the 23d inclusive, giving very nearly ten inches of rain in Howard and Winnesheik counties.

No tornadoes have occurred, but several squalls have visited parts of Iowa; yet the most destructive of these storms have but touched Iowa. The squall of the 4th started about 5 P.M. in central Iowa, and reached south-eastern Iowa about 9 P.M.: it was not very severe. The squall of the 12th started about 6 P.M. in Black Hawk county, reached the Mississippi in Scott and Clinton counties about 9 P.M., doing much damage by wind and hail : it