of Bolyai Farkas, interesting as proving that in 1804 Gauss was still under the spell of Euclid.

Then is to follow the Latin text of the immortal Appendix with a German translation. Next comes in German translation selections from the 'Tentamen.' The book concludes with the geometric part of 'Kurzer Grundriss,' the only one of the Bolyai's works printed originally in German. This volume is nearly published and may be expected in a few weeks. The volume undertaken by Engel has just appeared (1899). It is a German translation of Lobachévski's first published paper (1829), 'On the Principles of Geometry,' and also of his greatest work, 'New Elements of Geometry, with Complete Theory of Parallels.' Only from the 'New Elements' can any adequate idea be obtained of the height, the breadth, the depth of Lobachévski's achievement in the new universe of his own creation.

Of equal importance is the fact that Engel's book gives to the world at last a complete, available text-book of non-Euclidean geometry. There is no other to compare with it.

For the history of non-Euclidean geometry we have the admirable Chapter X., of Loria's pregnant work, 'Il passato ed il presente delle principali teorie geometriche.' This chapter cites about 80 authors, mostly of writings devoted to non-Euclidean geometry.

In my own 'Bibliography of hyper-space and non-Euclidean geometry,' in the *American Journal of Mathematics* (1878), I gave 81 authors and 174 titles. This, when reprinted in the Collected Works of Lobachévski (Kazan, 1886), gives 124 authors and 272 titles.

Roberto Bonola has just given in the *Bollettino di Bibliografia e Storia della Scienze Matematiche* (1899), an exceedingly rich and valuable 'Bibliografia sui Fondamenti della Geometria in relazione alla Geometria Non-Euclidea,' in which he gives 353 titles.

This extraordinary output of human thought has henceforth to be reckoned with. Hereafter no one may neglect it who attempts to treat of fundamentals in geometry or philosophy.

GEORGE BRUCE HALSTED.

AUSTIN, TEXAS, Aug. 14, 1899.

BOTANY AT THE COLUMBUS MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

SECTION 'G' was attended by a large number of Botanists and the meeting was in every way pleasurable and profitable.

On Monday afternoon Charles R. Barnes gave the vice-presidential address in Botanical Hall of the Ohio State University, to a large and appreciative audience. His theme was the 'Progress and Problems in Vegetable Physiology,' and the address has been published in full in SCIENCE.

During each of the succeeding four days, two sessions were held and thirty-three papers were read and discussed. Wednesday was made a Memorial Day to Sullivant and Lesquereux; the exercises are described below by Mrs. Britton.

Among the items of business transacted by Section 'G' may be mentioned that which related to the publication of the card index of American Botany, and an expression of high appreciation of the appointment of an eminent physiological chemist in the Division of Vegetable Pathology and Physiology, United States Department of Agriculture.

The authors of papers and an outline of the more important points are herewith presented:

'The Fertilization of Albugo bliti,' by F. L. Stevens, Chicago, Ill.

The paper presented the results of two year's research on the development of the

sex organs and the act of fertilization which, in this species, differs from the current conception of a fertilization in that the oösphere is a compound one, having about one hundred functional nuclei: each one of these fuses with one male pronucleus derived from the antheridium. The development of these nuclei and the organs that bear them is followed and the mitoses described, as is also the opening of the antheridial tube and the fusion of the nuclei. A new cell organ, present during the oögenesis, the *cœnocentrum*, is described, and the ripening of the oöspore followed.

'The Embyro Sac of Leucocrinum montanum,' by Francis Ramaley, Boulder, Colorado.

The embryo sac of Leucocrinum is of the usual Liliaceous type. The sac is never greatly elongated but generally rather spherical. The polar nuclei fuse before the fecundation of the egg. The definitive nucleus moves from the center of the sac toward the posterior end before any division takes place. The synergids are large: they persist for a short time after the fecundation of the egg. The antipodal cells do not increase in number but a fragmentation of the nuclei sometimes occurs. The antipodals do not become completely disorganized for a long time, and may still be recognized after a considerable mass of endosperm has been built up and the sac completely filled. The author found nothing to suggest a fusion between the definitive nucleus and a male cell.

'Notes on Subterranean Organs,' by A. S. Hitchcock, Manhattan, Kansas.

A classification of the underground parts of perennial plants, especially the herbs, is made as below: accompanied also by notes and examples:

Roots which form adventitious buds;
Fleshy roots with a crown at apex:
Crown with top-root—with fibrous roots;
Rhizomes; simple, crown-bearing.

Various subdivisions of each of the above, with examples were given. The notes referred to plants in the vicinity of Manhattan, Kansas, confined chiefly to dicotyledons.

'Some Monstrosities in Spikelets of *Eragrostis* and *Setaria* with their Meaning,' by W. J. Beal, Agricultural College, Michigan.

A few plants of *Eragrostis major* made a second growth of some of the spikelets—more than twice the usual length, in a damp late autumn. A few spikes of *Setaria viridis* in same autumn had bristles bearing spikelets at the top, and one with a spikelet on the side of a bristle.

'Studies of the Vegetation of the High Nebraska Plains,' by Charles Edwin Bessey, Lincoln, Nebraska.

The physical conditions on the high plains of Western Nebraska include a general elevation of 1000 to 1200 meters above sea level, a rainfall of but 40 centimeters per year, a very high insulation, a sandy soil, with a generally undulating surface, with now and then a shallow moist valley. Until recently these plains were swept annually with prairie fires. The ecological conditions are taken up for the Box Butte plains where the grassy covering is an Agropyron-Stipa-Bouteloua formation; for the Snake Creek valley, with a Sporobolus formation, surrounded by a zone of Distichlis; for the undulating surface with its exclusive Carex formation; for rocky hills with a broad zone of Artemisia in one line capped with a zone of Mentzelia; for the river bottom (Platte) with its Distichlis-Atriplex-Chenopodium.

'The Tamarack Swamp in Ohio,' by A. D. Selby, Wooster, Ohio.

A preliminary study of the Larix plant company as occurring in Ohio. The location of these bogs in the northeast counties extending as far south as Canton, and in the extreme northwest of Ohio, was pointed out; and a preliminary list of 36 species collected

in these swamps by the author and E. W. Vickers, of Ellsworth, Ohio, was presented in summary form. The rarest of these are of the genera *Sarracenia*, *Drosera*, *Trientalis*, *Salix*, *Arethusa*, *Coptis*, *Chiogenes*, *Ilicioides*, *Cornus* (*C. Canadensis*) and species of *Viburnum*.

'The Breeding of Fruits for the Northwest Plains,' by Wm. Saunders, Ottawa, Canada.

The author refers to the many failures which have followed the testing of a large number of the hardiest forms of useful apples on the northwest plains. These failures have led to the belief that the most hopeful line of work in future is the improvement of two species of Wild Crabs from Northern Siberia, viz.: *Pyrus baccata* and *P. prunifolia*, both of which have been tested and found quite hardy, but are quite small. These have been crossed with hardy forms of the larger apples and some of the particulars of the results obtained from these crosses were presented.

'Field Experiments with 'Nitragin' and other Germ Fertilizers,' by Byron D. Halsted, New Brunswick.

The study of leguminous root tubercles is uppermost in the minds of botanists and there is a practical side that deeply interests the crop growers. It has been shown that the microscopic symbionts greatly assist in the acquiring of nitrogen by the plants with which they live.

Professors Knobbe and Hiltner, of Tharand, Saxony, foremost in the study of the symbiotic germs, have produced pure cultures and these are placed upon the market as bottled lymph under the trade name of 'Nitragin.' Experiments are now in progress at the New Jersey Experiment Station, and some of the results are as follows:

The germs from five species, namely, *Vicia sativa*, *V. villosa*, *Trifolium pratense*, *T. repens* and *T. incarnatum* were used, each in separate rows and upon the seeds of all five of the above named legumes. Plants were lifted August 3d and the tubercles counted upon five plants and the average taken. It was found that the tubercles were more numerous upon the check plants than where the 'Nitragin' had been used, and it seems evident, judging from the number of galls, that the germ fertilizer has had no appreciable effect.

A duplicate of the above trial was made upon soil where peas had been grown for four successive crops. Here the only difference to be noted was the large increase in the number of tubercles, those of the old pea land being nearly double those upon the new land.

A still more extended experiment was made with thirteen leguminous crops from land that had been variously treated in previous years with soil remedies for club root in turnips. It was found that sulphur and lime both materially diminished the number of tubercles.

An equal area was given to a test of the germ fertilizer offered through the trade under the name of 'Alinit' and recommended for crops generally. The actual weight of five leguminous crops and four cereals (one failed) showed a grand total in favor of the check, although the difference was only slight.

Experiments with several other substances that might be supposed to stimulate the development of germs in the soil indicate that they have no wholesome influence.

'The Duration of Bacterial Existence under Trial Environments,' by Henry L. Bolley, Agricultural College, N. D.

The paper is based upon studies made from ordinary cultures which had been preserved for a number of years. Many had been allowed to become air dried, suffering the varying conditions of the laboratory atmosphere. Other cultures had been hermetically sealed and thus kept in fresh form.

The results are of interest because of the longevity shown for many of the germs; and because of the indicated possibility of keeping typical cultures in normal form as to gross characters and as to the morphology of the individual germs for long periods of time.

'Suggestion for a more Satisfactory Classification of the Pleurocarpous Mosses,' by A. J. Grout, Brooklyn, N. Y.

It is axiomatic that the classification of plants having an alternation of generations should be based on both gametophyte and sporophyte character. Schimper and nearly all modern authors except Lindberg and Braithwaite give undue weight to sporophyte characters, as in the *Isotheciæ*, where a heterogeneous collection of plants is put in the same subfamily because of their sporophyte character alone. Lindberg while classifying more scientifically often overestimates single characters, *e. g.*, when he puts *Porotrichum* (*Thamnium*) with the Neckeraceæ because of its leaf character, all its other characters indicating a close relationship to the Hypneæ.

There are two characters of the pleurocarpous mosses whose importance in classification is generally underestimated: the presence or absence of a central strand in the stem and, the presence and degree of development of fine transverse lines on the lower dorsal plates of the teeth of the peristome. The latter are present and well developed in the subfamilies Hypneæ and Brachytheciæ. Also in the genera *Isothecium*, *Porotrichum*, *Pterogonium* and *Leseura*, which are closely related and constitute a separate subfamily differing from the above mentioned subfamilies in leaf structure.

These lines are as well developed in Thuidium and allied genera of the Leskeaceæ (as usually constituted) as in the Hypneæ and taken in connection with the perfect Hypnaceous peristome indicates that these forms are at least as closely related to the Hypneæ as to the Leskeaceæ. In the latter family these lines are vestigial and the whole peristome degenerate so that Thuidium must either be an intermediate form or a separate derivative from the Hypnaceous type. The presence of a perfect peristome with these lines well developed in the Pterygophyllaceæ indicates that this family is closely related to the Hypneæ.

The entire absence of these lines in the Fontinalaceæ, Neckeraceæ, and Climacium taken in connection with other characters indicates that these forms constitute a group by themselves, coördinate with the forms previously mentioned and possibly derived independently from the acrocarpous mosses. The anomalies of the Fabroniaceæ may possibly indicate a third similar group.

The central strand is the physiological homologue of the vascular bundle and for many reasons would seem to be of a far more important character than the length and shape of the capsule, yet in our present system it is given far less weight. The presence of a central strand is usually correlated with the presence of a costa in the leaves except in aquatic or subaquatic species. This indicates that *Amblystegium* and *Plagiothecium* are not naturally grouped and must also modify the present systems in many cases.

The author wishes it distinctly understood that the above statements are thrown out as suggestions, because his knowledge of forms is far too incomplete to warrant any final statements.

'Notes Concerning the Study of Lichen Distribution in the Upper Mississippi Valley,' by Bruce Fink, Fayette, Iowa.

A brief report of area covered, data as to habitat, etc., and a list of species examined. The author pointed out the incompleteness of recorded observations and suggested the noting of fuller data in connection with the collection of specimens.

'Botanical Teaching in Secondary Schools.'

Under this head three papers were read, the authors being W. C. Stevens, Lawrence, Kansas; Ida Clendenin, Brooklyn High School, and Conway MacMillan, Minneapolis, Minn.

The paper of Mr. Stevens forcibly pointed out serious defects in much of the so-called botanical teaching, and argued for a study of plants rather than text-books merely.

Miss Clendenin maintained that biological studies were important factors in mental development of children, and that they should not be postponed till late in the school curricula. It was immaterial whether zoology or botany was taken up first, but that at least an entire school year—four or five lessons weekly—should be given to them. In addition to this the last year in the course should offer one or both of these branches as optional studies. As to whether the work should be largely microscopical, dealing fully with the cell and tissues, commencing with the lowest plants and closing with the representatives of the highest groups; or rather making morphology and physiology prominent in the course, dealing mostly with specimens and material obtainable by the pupils and using the microscope only for demonstration; is determined mainly by the environments in which the teacher finds himself (large classes, excessive work in the school room, etc.): there is no alternative for the great majority, and the second scheme must be followed.

Miss Clendenin rightly insisted that it offered as good disciplinary and practical work as the first, and that the finer methods of the modern laboratory of histology should be left to the Universities, where alone their practice was possible.

Professor MacMillan's paper can not be condensed and therefore, it is here presented as it was read to the Section:

I.

Introduction:

(*a*) Education is essentially a social function, hence the school is a social organ. The work of the school must therefore be criticised not by the individual aptitude or abilities of the graduates, but by the intellectual and moral condition of the community in which the school has been active.

Sociology, not psychology, is the scientific foundation of a true system of pedagogics.

(*b*) Society is an organism with moving equilibrium, always progressive or decadent. Progress of individuals is not incompatible with social retrogression.

It is stated that homicides are on the increase in the United States. In the light of the figures it may well be asked, does education educate?

(*c*) What are the fundamental difficulties with the schools? clearly the same as with any complex organ derived by a process of evolution: *There are too many vestigial characters.*

Educational methods arise to meet the exigencies of particular epochs, nations or localities. After these epochs are past, nations extinct or localities abandoned, the methods do not likewise disappear but remain petrified in the traditions of the schools, to be worn away by the slow attrition of the ages.

Nevertheless, while I am in favor of educational museums, I regret that our public schools should ever be such institutions.

(*d*) The modern tendency in school cirricula is to introduce everything new as a concession to the radicals, and to keep everything old as a concession to the conservatives. But education is not pursued by the race either for the exploitation of pedagogical theories, or for the perpetuation of traditions belonging to a by-gone civilization.

The real practical problem is not what to put into the cirriculum, but what to take out. This deserves the most thoughtful consideration. We are sometimes told that

there are so many demands upon the high school pupil that little space is left for biological science.

II.

(*a*) The object of the high school education is not culture but *capability*, not individuality but *organizability*, not consciousness but *conscientiousness*, not well-rounded men and women but *well-adjusted* men and women.

Therefore, education must always have a double content (1) information, developing the structure of the social individual, (2) training exercise in social functioning.

(*b*) A general classification may be made of subjects in the cirriculum, under these views.

1. Technique of life: Reading, writing, spelling, mathematical calculation, etiquette, hygiene, manual training and drawing, local geography, modern languages, logic.

2. Conditions of life: Chemistry, physics, physiography, geology, civil government. (Physiology.)

3. Principles of life: Psychology, economics, ethics, sociology.

4. Epitomes of life: History, biology, literature, art, music.

5. Vestigial subjects: Ancient languages, metaphysics.

(*c*) Such a classification is necessarily very elastic. Certain phases of biology are seen to be properly included under each of the classifications.

(*d*) In general the value of biological instruction lies not in the information, but in the training. This training is without a rival in the curriculum for the following reasons:

1. The organisms studied, whether plants or animals, are microcosms revealing to the student, under conditions free from prejudice, the laws and factors of man and of society.

2. As compared with history or literature which are likewise epitomes of life, biology has the advantage of thorough organization under the modern scientific method. The subject itself may be considered as a record: it differs, however, from history in being a record not so much impregnated with human error, and from literature in being free from the personal element. Furthermore, the method of reading the record is fresh, and devoid of those older unscientific blemishes which prevent us from interpreting either history or literature apart from prejudice.

3. The quality of insight is developed under conditions that are more impartial than in the study of history or literature. For example, there is a secular and even a profane history—but there is neither secular or profane biology. There is national, religious, political, personal literature, but there is no national, no religious, no political, no personal biology.

4. The quality of judgment, under such conditions, must be more perfectly and completely developed than under any other.

Observation, classification, recollection, orderly notation, etc., can be inculcated as well by other disciplines. Note A. T. Harris' comparison of botany with grammar.

III.

What should be the nature of High School courses in Biology.

(*a*) In the first place courses in elementary general biology are impracticable because (1) either an inherently superficial view of both plants and animals, or (2) a one-sided view of the living world must be presented. Further, there is no possible way of instituting just comparisons between plants and animals in the time given to elementary study. Consequently, the idea of 'general biology courses' is founded on pedagogical error.

(*b*) Courses must be in 'botany and zoology,' or 'botany or zoology.'

(*c*) A year of either biological science should include more anatomy and physiology than taxonomy, although the latter must not be neglected.

(*d*) I favor a year of botany followed by a year of zoology, in the High School course.

IV.

Methods: (Not presented).

'On the Occurrence of the Black Rot of Cabbage in Europe,' by H. A. Harding, Geneva, N. Y.

During the season of 1898 this disease was observed by the author, on cabbage and related plants in fields near Haarlem in Holland, Bonn, Karlsrule, Fulda, Berlin, Halle on Saale and Kiel in Germany, Slagelse in Denmark, Zurich in Switzerland and Versailles in France.

Wherever an opportunity to visit fields presented itself the disease was always found, although with the exception of Switzerland and possibly Denmark, it did not appear to be of economic importance.

Field observations were supplemented whenever possible by microscopic and cultural examinations.

Sections of infested plant parts presented the same characters as is shown by the disease common in America.

Cultures uniformly produced a predominant growth of yellow colonies, agreeing in general appearance and in morphology with *B. campestris* Pam.

Subcultures were brought to New York and inoculated into cabbage and cauliflower. In the case of germs obtained from Zurich, Switzerland, the inoculation invariably produced a disease exactly like that found common in our fields, and behaved in all respects like cultures obtained from diseased plants in Wisconsin and New York.

With germs brought from other plants in Europe the results were not so conclusive.

'A Thousand Miles for a Fern,' by Charles Edwin Bessey.

The Southern Maiden-hair Fern (*Adiantum capillus-veneris*) was found August 24, 1898, in the Black Hills of South Dakota. It grows in the warm streams (25° C.), which issue from numerous large springs. The species is indigenous.

'A Summary of our Knowledge of the Fig with Recent Observations,' by Walter T. Swingle, Washington, D. C.

A summary of the existing knowledge concerning the fig, caprifig and caprification, including the results of recent observations by the author in North Africa, Greece and Asia Minor.

This paper is published in full below.

'The Classification of Botanical Publications,' by William Trelease, St. Louis, Mo.

This article will appear in full in a later number.

'The Geotropism of the Hypocotyl of *Cucurbita*,' by Edwin Bingham Copeland.

Experiments show that the plant executes the geotropic response without direct regard to the consequences, and without the power of adaption to unusual conditions. In nature the rapid growth of the under side of a prostrate hypocotyl bears the cotyledons upward: but if a young plant be placed horizontal with the cotyledons fast and the roots free, the same response bears the roots upward, and is therefore likely to be immediately fatal. While the object of geotropism is to secure a certain arrangement of the longitudinal elements for the plant—root, hypocotyl, cotyledons—the stimulus is a disturbance of the normal disposition of the transverse pressure of the tissues. It is not necessary for the perception of a geotropic stimulus that the plant compare the difference in position or pressure of its two halves; for if the plant is laid prostrate, the lower half will of itself grow more rapidly than the upper, as may be demonstrated by cutting the halves entirely apart.

'The Destruction of Chlorophyll by Oxidizing Enzymes,' by A. F. Woods, Washington, D. C.

This paper details the results of experiments going to show that the Mosaic disease of tobacco is due to oxidizing enzymes rather than to a 'living fluid contagium' as suggested by Beijerinck. It also shows that these enzymes are unusually abundant in many other cases of variegation, and in the disease known as peach yellows and peach rosette; and in these cases also ascribes the destruction of the chlorophyll to the abnormal abundance of these ferments.

'The Effect of Hydrocyanic Acid Gas upon the Germination of Seeds,' by C. O. Townsend, College Park, Md.

In the experiments that form the basis of this paper, seeds in both the dry and damp state have been tested with different strength of gas and for different periods of time. In the case of dry grains and seeds it was found that they might remain for several weeks in an atmosphere of hydrocyanic acid gas, many times as strong as is required for the almost instantaneous destruction of insect life, without appreciably injuring their germinating power. Indeed the gas under these conditions slightly accelerates germination, and the subsequent rate of growth of the seedlings is slightly above the normal.

Seeds that have been soaked in water become very sensitive to the presence of hydrocyanic acid gas. If the seeds have been soaked for twenty-four hours they cannot germinate if more than 0.030 of a grain of potassium-cyanide per cubic foot is used in generating the gas. Even 0.003 of a grain of potassium-cyanide per cubic foot has a very marked effect on the time of germination of seeds that have been soaked in water for twenty-four hours. If the grains and seeds have been soaked but six hours, they are more resistant than when soaked for a longer period; but even under these circumstances germination is distinctly retarded by the pressure of hydrocynic acid gas.

'Some Physiological Effects of Hydrocyanic Acid Gas Upon Plants,' by W. G. Johnson, College Park, Md.

A brief report of the first precise experiments with hydrocyanic acid gas upon young fruit trees, both dormant and in full foliage.

'Etiolative Reactions of Sarracenia and Oxalis,' by Wm. B. Stewart, Minneapolis, Minn.

An anatomical examination of etiolated leaves of Sarracenia and Oxalis, shows the increase of length of supporting tissues by increase in size and multiplication of cells, and the new development of portions which functionate in light only.

Etiolative reactions are almost purely adaptive in their nature.

'The Mycorhiza of Tipularia,' by Julia B. Clifford, Minneapolis, Minn.

The roots tipularia show some marked specializations of structure for adjustment, for the presence of an endotropic fungus with which a symbiosis is formed. The fungus is differentiated into a vegetative mycelium, with external absorbent branches and internal branches serving as organs of interchange.

'Cultures of Uredineæ in 1899,' J. C. Arthur, Lafayette, Ind.

Successful cultures of eleven species of Uredineæ were made upon their host plants, showing the connection of æcidial and teleutosporic stages. The following is a list of the associated forms, the host plants, and nature of the cultures:

1. *Puccinia Convolvulus* Cast. on *Convolvulus sepium*, and *Æcidium Calystegiae* Desm. on same host, with sowings of teleutospores.

2. *Puccinia Phragmitis* (Schum.) Koern. on *Phragmites communis* Trin. and *Æcidium rubellum* Pers. on *Rumex crispus* L. and *R. obtusifolius* L. with sowings of teleutospores.

3. *Puccinia Americana* Lagh. on *Andropogon sco-*

parius Mx. and *Æcidium Pentstemonis* Schw. on *Pentstemon pubescens* Sol. with sowings of æcidiospores and teleutospores.

4. *Puccinia Windsoriæ* Schw. on *Triodia cuprea* Jacq. and *Æcidium Pteleæ* B. & C. on *Ptelea trifoliata* L. with sowings of æcidiospores.

5. *Puccininia Vilfæ* A. & H. on *Sporobolus asper* (Mx.) Kunth. and *Æcidium verbenicola* K. & S., with sowings of æcidiospores.

6. *Puccinia peridermiospora* (E. & T.) Arth. on *Spartina cynosuroides* (L.) Willd, and *Æcidium Fraxini* Schw. on *Fraxinus viridis* Mx. with sowings of teleutospores.

7. *Puccinia Caricis* (Schum.) Reb. on *Carex stricta* Lam. and *Æcidium Urticæ* Schum. on *Urtica gracilis* Ait., with sowings of æcidiospores.

8. *Puccinia angustata* Ph. on *Scirpus atrovirens* Muhl. and *Æcidium Lycopi* Ger. on *Lycopus sinuatus* Ell., with sowings of æcidiospores.

9. *Uromyces Euphorbiæ* C. & P. on *Euphorbia nutans* Lag. and *Æcidium Euphorbiæ* Am. Auct. on same host, with sowings of æcidiospores.

10. *Phragmidium speciosum* Fr. on *Rosa humilis* Marsh. and *Cæoma miniata* Am. Auct. on *Rosa sp.* with sowings of teleutospores.

11. *Triphragmium Ulmariæ*—on *Ulmaria rubra* Hill and *Cæoma Ulmariæ*—on same host, with sowings of æcidiospores and uredospores.

'The Embryology of Vaillantia Hispida,' by Francis E. Lloyd, New York.

The archesporium consists of about twelve cells. But one of the megaspores produced therefrom normally becomes the embryo-sac, the development of which follows in much the usual fashion, in a position, however, removed from the archesporium; this position is attained by a migration of the megaspore involved out of the nucellus into the micropylar canal. Fusion of the polar nuclei takes place at some distance from the egg; toward which, however, the endosperm moves and to which it ultimately becomes closely applied. The antipodals are three, one of which is very long, one end being plunged into the disintegrating archesporium, which is believed to serve as food. The embryo has a suspensor which forms outgrowths into the endosperm, these acting as food absorbing organs. The endosperm enlarges at the expense of the integument which has the appearance of a tissue undergoing digestion. A part of the integument remains as a seed envelope. The reserve food consists of cellulose and starch.

'The Division of the Megaspore of Erythronium,' by John H. Schaffner, Columbus, Ohio.

Our knowledge of the process of reduction is still very fragmentary and the observations and interpretations presented by the several investigators differ widely. *Erythronium albidum* and *E. americanum* present favorable objects for the study of the important phenomena which take place during the transition from the sporophyte to the gametophyte. As in the case of the lilies generally, the megaspore of *Erythronium* arises from the archesporial cell, directly, by differentiation and not by division. The archesporial cell can usually be distinguished before the first of October and it continues to develop until after the first of December, when it passes into a partial resting stage and does not complete its division until early the next Spring. The cell, therefore, in which the reduction takes place, has a period of development extending over six months.

In the Fall while the nucleus is expanding, the chromatin net-work begins to thicken until a continuous band is formed. In the Spring the band twists itself up into twelve loops, which break apart and form twelve very large, coiled chromosomes. The chromatin granules never appear very distinct and they do not begin to divide until the chromatin band begins to form the loops. After the pseudo-reduction the chromosomes are arranged on the spindle threads with their closed ends turned outward and are then gradually untwisted and pulled apart at the middle. This results in the transverse division of each chromosome, one transverse half going to each daughter nucleus.

The division of the megaspore of *Ery-*

thronium is, therefore, essentially the same as in *Lilium philadelphicum*, and it seems to the writer that a transverse, qualitative division is the only interpretation possible.

'The Flora of Franklin County, Ohio,' by A. D. Selby, Wooster, Ohio.

A comparison of the known flora of Columbus, Ohio, with that listed in the catalogue of Wm. S. Sullivant in 1840, in tabular form. It shows a gain of the known list amounting to 353 species; of which 117 are introduced; in other words, 184 species of the present known flora, or 167 per cent. of the present, are of introduced species.

'The Fungus Infestation of Agricultural Soils in the United States,' by Erwin F. Smith, Washington, D. C.

A continuation of studies begun by the writer in 1894 on the parasitic soil *Fusaria* of the United States. Results are detailed of completed experiments on soil infections with the watermelon fungus, over 500 of which have been obtained. It shows that related species are likely to prove equally destructive to plants of other families, *e. g.*, cabbage, tomato, sweetpotato. The fact to be specially emphasized is that these fungi live in the soil over winter and attack the plant from the earth. Further, the soil once infected with one of these resistant fungi becomes worthless for growing the agricultural plants subject to it for a long series of years, and consequently the greatest care should be taken to avoid the spread of these parasites to land which is now free from them.

'Are the Trees Advancing or Retreating Upon the Nebraska Plains'? by Charles Ewing Bessey.

To appear in full later.

'Useful Trees and Shrubs for the Northwest Plains of Canada,' by Wm. Saunders, Ottawa, Canada.

In this paper is given the results of a large number of experiments conducted during the past eleven years in testing the hardiness and usefulness of many species and varieties of trees and shrubs, both native and foreign, on the Canadian experimental farms in Manitoba and the northwest territories. Some particulars are given as to the success which has attended this work and attention called to some of the groups to which the hardiest forms belong. References are also made to many individual species and varieties which have been found most useful.

'The Occurrence of Calcium Oxalate and Lignin during the Differentiation of the Buds of *Prunus Americana*,' by H. L. Bolley and L. R. Waldron, Agricultural College, N. D.

The paper consists of a short *résumé* of the occurrences of crystals of calcium oxalate and of the presence of lignified tissues, as observed by Mr. Lawrence Waldron in a study conducted upon the development of life history of the buds of *Prunus Americana*. It was found that the crystals of calcium oxalate occur in quite surprising abundance in the meristematic tissues of the bud and in the very youngest stages of the scales of the bud; and that the oxalate becomes lessened in proportionate quantity as the tissues develop. Lignification of the hairs and scales of the bud commences at a very early period of their development. While it is usually assumed that calcium oxalate is a waste product of metabolism, its occurrence in such large quantities in the meristematic cells of the bud and scales would seem to indicate a question as to whether it has a definite value at this point, at this particular time, in the life history of the plant.

'Two Diseases of *Juniperus*,' by Herman Von Schrenk, St. Louis, Mo.

The species of *Juniperus* are trees which have few fungous and insect enemies. The author describes two destructive diseases of *Juniperus Virginiana*, one of which is also found in *Juniperus Bermudiana* and *Thuya*

occidentalis. The first one is due to an undescribed species of *Polyporus*. Large holes are formed in the heartwood of the trunk, one above the other. Each is full of mycelium and has a thick white lining, consisting of wood fibers from which the lignin has been removed, leaving the pure cellulose. The fruiting part forms on the outside of the trunk, forming around a dead branch. It has been reported so far from Kentucky and Tennessee. The second form of destruction is more widely spread. It is due to a *Polyporus*, probably *P. carneus*. Long pockets are formed in the heartwood of a tree, filled with a brown bitter wood, which has characteristic properties. The sporophore forms in the branch holes on the trunk; they have a flesh-colored hymenium and are quite common.

Attention is called to the fact that a very large per cent. of the individuals of *Juniperus Virginiana* are defective because of one or other of these fungi.

'The Crystals in *Datura Stramonium* L.', by Henry Kraemer, Philadelphia.

An exhaustive paper which will be published in full in the *Journal of Pharmacy*.

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SULLIVANT DAY.

WEDNESDAY, August 23d, was taken by the Botanical Section for a bryological memorial to do honor to Sullivant and Lesquereux. The meeting was held in the Botanical Lecture Room which had been appropriately decorated with mosses and ferns and hung with portraits of Sullivant and Lesquereux loaned by the members of both families present. The tables surrounding the room were filled with books and pamphlets on bryological subjects, and the spaces under the windows with microscopes showing rare or type specimens of mosses and hepatics. The walls were hung with photographs of botanists whose names are associated with American bryophytes, as well as plates and illustrations from original publications.

The meeting was called to order with Dr. Chas. R. Barnes in the chair and Professor Kellerman as Secretary, who welcomed the large number of members and guests present and opened the session with some preliminary remarks on the work done on the flora of Ohio by Joseph Sullivant, William S. Sullivant, Riddell and others, and exhibited pressed specimens, framed of *Sullivantia Ohionis*, *Lonicera Sullivantii*, *Solidago Ohionis*, *S. Riddellii*, and other rare plants. Duplicates of these were distributed in sets after the adjournment of the session. Professor Kellerman then read Dr. Gray's tribute to Sullivant from the Supplement to the Icones. Twelve North American mosses have been named for Sullivant; specimens of these with original drawings were loaned from the Sullivant collection in the Gray Herbarium at Harvard University; duplicates of these species were presented by the Herbarium of Columbia University to the Ohio State University and microscopic slides were made by Mrs. Britton who gave a short account of them.

Dr. Barnes then read a brief biographical sketch of Leo Lesquereux, exhibiting the picture of his father's home at Fluellen where he fell down a mountain in search of plants, one of the causes of his subsequent deafness, a misfortune which in the end proved a blessing, as it enabled him to devote himself with undisturbed serenity to the study of fossil plants and mosses. Several of his paleontological works were not published until after his death and many of the illustrations were made by his granddaughter, Miss Ahrhart, who acted as his interpreter and assistant. A brief account of these posthumous publications was pre-