by V. F. Marsters, and 'Evolution of some Devonic Spirifers,' by A. W. Grabau.

The sessions of the succeeding days of the general convention were given over to the Geological Society of America. The vice-president and chairman for section E for the next annual meeting of the association is Professor William North Rice, of Wesleyan University, Middletown, Conn. The secretary of the Philadelphia meeting holds over, by constitution.

Edmund Otis Hovey,
Secretary.

SECTION G—BOTANY.

During the recent meeting of this section at Philadelphia, the following items of business of public interest were transacted.

Professor C. R. Barnes, University of Chicago, Professor F. C. Newcombe, University of Michigan, Dr. D. T. MacDougal, New York Botanical Garden, Professor H. M. Richards, Barnard College, and Dr. Burton E. Livingston, University of Chicago, were appointed a committee to confer with a like committee from the Society of Official Agricultural Chemists on the meaning of the expression 'Plant Food.'

The council of the association appointed as delegates to the International Botanical Congress, to be held at Vienna during the coming summer, Professor C. R. Barnes, University of Chicago, Mr. C. L. Shear, U. S. Department of Agriculture, and Dr. H. C. Cowles, University of Chicago.

Dr. Erwin F. Smith, U. S. Department of Agriculture, was elected vice-president and chairman of this section for 1905.

A joint session was held with the Mycological Society on Friday afternoon.

The following are the abstracts of papers offered:

Stages in the Development of Sium cicutæfolium: George Harrison Shull.

There is great range of variation in the leaves of *Sium cicutæfolium,* the first nepionic leaf being the most variable and the bracts in the region of the umbel least variable. The juvenile leaves and the senescent leaves, which have been interpreted as atavistic, are shown to disagree with each other in almost every particular. The only cases in which the ancestry of a species is definitely known indicate that whatever change of structure gives rise to new adult characters also results in changed juvenile and senescent characters. The relative simplicity of the juvenile and senescent leaves is due to physiological causes having no essential bearing on the phylogeny of the species. *Sium* is mesophytic, hydrophytic and xerophytic at different periods of its development and these structural differences are associated with, but appear to be independent of, their appropriate environmental conditions. They are not a direct effect of the environment, but are due to the peculiar mechanism of the protoplasm. Rejuvenescence is the process by which protoplasm is changed from the senescent to the juvenile condition. This may result through sexual reproduction or may be brought about in other ways. In *Sium* it occurs regularly in the lateral buds at the base of the stems and may, under special conditions, occur in any other vegetative bud or even in the flower buds. In passing from less complex to more complex leaves the new characters consist in incisions or indentations above the base of the leaf, so that, in pinnate leaves, the proximal pairs of leaflets are homologous, and other pairs which are of like order counted from the proximal pair are likewise homologous.

Alternation of Generations in Animals, from the View-point of a Botanist: Charles J. Chamberlin.

This is an attempt to show that the egg with its three polar bodies, and also the primary spermatocyte with the four spores

which it produces, constitute sexual generations comparable with the gametophytic generation in plants. The argument is based upon: (1) The gradual reduction of the gametophytic generation in plants with the gradually lessening interval between the reduction of chromosomes and the process of fertilization, and (2) upon the phenomena of chromatin reduction in both animals and plants.

The theory has no bearing whatever upon relationships and it does not contemplate any homologies between any organs of animals and plants.

Anatomy of Foliaceous Cotyledons: FRANCIS RAMALEY.

Foliaceous cotyledons occur in many species of dicotyledons, yet in form and structure they are never exactly like the true leaves of the same plant. Any cotyledon, however, which is of herbaceous texture and has a leaf-like form may be described as 'foliaceous.' The term is especially well applied to those cotyledons which increase greatly in size after leaving the seed and act as photosynthetic organs for a long time. In the many species of both temperate and tropical plants thus far studied certain rather constant differences between leaves and cotyledons have been noted. The lamina of the cotyledon has usually a looser palisade than the leaf; it has stomata on both surfaces even in those cases where the leaf has them only on the under side. Stomata are, however, not so closely placed as in the leaf. Vascular tissue is less well developed in the cotyledon, as may be easily seen by examination of cross-sections of cotyledon stalk and leaf petiole. In the former the bundles are smaller than in the latter, also fewer and differently arranged. Stereom is usually not developed in the cotyledon stalk.

The Botanical Institute at Buitenzorg: FRANCIS RAMALEY.

The Botanical Institute at Buitenzorg has the best facilities to be found anywhere for the study of tropical botany. Practically all the trees in the large garden are arranged according to plant families, so that it is possible to get, in a short time, a good idea of the members of any particular group. The similarity of the flora of Java to that of the American East Indies makes Buitenzorg especially attractive to our countrymen who expect to do botanical work in the Philippines. The excellent library, the well-equipped laboratory, and the large staff of investigators all go to make the place worth visiting. And more than this—the director, Dr. Treub, is anxious to have visitors to the gardens and does everything to make their work profitable to them. The botanist, no matter what his specialty, will find here always ready and at hand an abundance of material for observation and study. Probably nowhere else can he learn so much in so short a time.

Polyembryony in the Genus Pinus: J. W. T. DUVEL.

The occurrence is reported of two or more fully developed embryos in each of the following species of pines: *Pinus coulteri* Lamb., Coulter's pine; *flexilis* James, limber pine; *jeffreyi* 'Oreg. Com.,' Jeffrey pine; *lambertiana* Dangl., sugar pine; *murrayana* 'Oreg. Com.,' lodgepole pine; *ponderosa* Laws., bull pine; *radiata* Don., Monterey pine; *rigida* Mill., pitch pine.

Observations on the Teratology of the Pine-apple: MEL T. COOK.

The term 'teratology' is used with a very indefinite meaning. It is very probable that a careful study of teratology will be of some service in taxonomy and morphology. Thirteen types of variation on the smooth 'cayenne' variety described. Many have been caused by the character of the

stock, the method of cultivation or the character of the fertilizer.

The Development of the Microspores of Vallisneria spiralis: Robert Bradford Wylie.

The staminate flowers of *Vallisneria spiralis* are borne in clusters, each containing often as many as two thousand flowers surrounded by a spathe. This group of flowers crowded upon the short conical axis is homologous with the single pistillate flower found within its spathe. The individual flowers are very small, simple, and contain usually less than one hundred pollen grains. The staminate flower may therefore be considered as a pollen carrier since the microspores are not shed, but are lost to the stigmas by the pollen producing flowers. In their development the upper flowers on the axis develop earlier than do the lower ones; the terminal one is conspicuously more advanced than those adjacent to it. The mature flower always shows four pollen sacs, but a study of their devlopment shows that each of these may arise from a single sporangium or by the fusion of two sporangia. It follows that the single (?) stamen may have from four to eight sporangia; the number seems to vary indifferently even in flowers of the same cluster. The microspores have a single coat which is thin and slightly spinous. The male cells are developed while the spores are still in the sporangium. The male structures clearly show their morphology as cells rather than as nuclei only, and remain joined end to end while in the pollen grain.

Note on the Morphology of the Cyperaceæ: Amon B. Plowman.

Queva, in his study of the anatomy of certain monocotyledons (Lille, Travaux & Memoires, No. 22, 1899), has described the occurrence of concentric or amphivasal fibro-vascular bundles in the nodes of *Gloriosa,* and has concluded that these bundles are the result of the anastomotic conditions attending the transition of the bundles from the main axis to the axillary branch. Among the Cyperaceæ it has been found that amphivasal bundles occur in practically all nodes of plants bearing well-developed leaves, whether branches are produced or not; while, on the other hand, in those forms of which the leaves are rudimentary, no amphivasal bundles are present, even in nodes where branches of considerable size are given off. Hence it appears that the occurrence of amphivasal bundles in this group is related to foliar rather than to ramular differentiation of the stelar structures.

Dictamuus Albus L. (D. Fraxinella Pers.), Gas Plant: W. J. Beal.

This is an herbaceous perennial of the rue family (Rutaceæ).

The pistil is compound, deeply lobed, consisting of five carpels, each containing two to three seeds, 'each carpel, when ripe, splitting into two valves,' which divide into an outer and an inner layer. In other words, when mature, a considerable portion of the endocarp separates from the exocarp and at once each half begins to make the attempt to twist in opposite directions, much in the manner of the ripe half carpels of a vetch or pea. In this operation the half endocarps press the apical portion of the carpel wide open. A slight ridge on the inner edge of each margin of the carpel prevents for a time the escape of the twisting endocarp. The placenta separates into another thin trough-like piece, the margins of which are inside of the endocarp. The two seeds separate from the placenta, which sets loosely over the seeds, preventing them from falling out in case the branch bends down toward the ground. Seeds are torn off the placenta as this dries, shrinking away in the central portion and

lastly at the ends, which approach each other slightly. Each half endocarp resembles in a general way the capital letter J. The apical portion of the endocarp presses outward, while the basal portion tends to twist inward. When dry enough, and the carpel spreads open well, if the stems are jarred against each other by wind or animal, or the carpel pressed laterally or from each extremity, a sharp explosion follows as the half endocarps complete their twisting, thus liberating the thin placenta and throwing out the seeds. When left to themselves in a quiet place where there is no artificial pressure, the tension of the endocarp at length forces its way out, sometimes sending one or both seeds seventeen feet, possibly in some cases aided somewhat by the wind. Next to an examination of the parts as they develop, is to see models shaped like ripe pistils. The black, smooth seeds are nearly spherical, with a short neck. The seed is nearly 4.5 mm. long, by 3 mm. or more in transverse diameter. In size they are much like those of *Vicia sativa.*

The Value of the Diatoms in Determining the Direction of Ocean Currents and the Origin of Sea-bottoms: ALBERT MANN.

The investigation of the Diatomaceæ contained in the United States sea-dredgings and hydrographic soundings has brought out the fact that these organisms are a sure and the only sure index of the origin of sea-bottoms and incidentally of the extent and direction of sea-currents. This comes from four facts: (1) The indestructibility of diatom frustules, (2) their extreme minuteness, lightness and hence transportability, (3) their enormous numbers in genera and species, (4) the great differences between recent and fossil diatoms; between fresh-water and marine diatoms; between tropical, temperate and arctic diatoms. Illustrations of the foregoing facts from the dredgings and soundings examined; need of this work, especially in classifying and tabulating the characteristic diatoms of the different sea-bottoms.

Economic Methods in Restocking White Pine Forests: F. WM. RANE.

At present white pine lumber is getting scarce and hence its value is increasing. There is no lumber that can be depended upon to take its place and the economic problem of growing this tree for future lumber is deserving of much study and experimentation. This paper gives the data obtained from experiments in utilizing natural seedlings, showing that by their use much economy can be practised in restocking waste lands and in reconverting pine forests into new forest growth. By utilizing these seedlings, which at present have little or no value, the whole expense of restocking lands to forests can be accomplished at less expenditure than the original cost of the plants themselves when purchased from a nursery. Experiments outlined show that one thousand three-year-old seedlings can be dug and transplanted at a cost of one dollar and twenty-five cents a thousand. The nursery price varies with various sections and the quantity purchased, but it is safe to say that the first cost of seedlings from this source is much larger than the total expenditure of digging and setting in the former.

The Principles of Phytogeographical Nomenclature: PEHR OLSSON-SEFFER.

(1) Clearness and conciseness are the main requisites for a system of terminology. (2) Each technical term should have only one meaning. (3) In case of doubtful terms consult the proposer of the name. If the conception it represents is not absolutely clear, the name has no status in nomenclature. (4) If a term has been commonly used and understood in another sense than the original author proposed, it

should be retained, but only in case there can be no doubt as to its interpretation. (5) If a conception has already received a name and there is no obvious reason to discard that name, an author has no right to propose a new term. (6) A law of priority is practicable, we think, only so far as the principles laid down in the previous pages of this article will admit. (7) A name, the conception of which has materially changed in the course of time, naturally has no standing. (8) A technical term should be associated in our mind with the idea it represents. (9) A technical term should be clearly defined so as to leave no doubt as to its significance. Authors should, therefore, desist from proposing new terms in mere catalogues. (10) A new term should be published in some work accessible to scientific workers. (11) Vernacular names should not be excluded from phytogeographic nomenclature, but they must in every case be definite and give rise to no ambiguity. (12) An international committee of phytogeographers should be appointed by the Vienna congress, to continue the work on a proposed code of rules. (13) This committee should consider what kinds of technical terms are needed; how they should be classified, *f. i.*, with regard to distribution, abundance, elevation, phenological phenomena, etc. (14) The result of the work of the committee already existing, and of the succeeding one, should be published at an early date, so as to give the public ample time to discuss the various phases of the question before the following congress assembles.

The Cycadofilices: David White.

The 'cycadofilices' (Pteridospermeæ) comprise a group of Paleozoic fossil plant genera which, as the name implies, are intermediate between ferns and gymnosperms. The structure of the stems, roots and petioles shows a mingling of filical with cycadean characters; the fronds are typically filicoid, as also would seem to be the little-known microsporangia; but the seeds, definitely recognized in but three genera, appear to agree in their main features with the primitive (fossil) gymnosperms. The paper describes the more important or striking characters as yet discovered in these remarkable types, which, in general, antedated the cycads.

Suggestions from the Study of Dairy Fungi: Charles Thom.

The demands of certain economic problems emphasize the necessity of finding more certain and more uniform means of describing and determining common saprophytic fungi. The intimate connection between most of these problems and bacteriological questions suggests the desirability of seeking such methods of description in their physiological and morphological relations to well-known culture-methods and media. A dairy problem would indicate the methods of the dairy bacteriologist as to some extent necessary to make the work of practical value. Following these suggestions a series of dairy fungi have been cultivated upon such media through many generations. Certain species of *Penicillium* have been grown in hundreds of cultures to ascertain the comparative value of the observations made upon several substrata. In spite of wide variations on different substrata a remarkably constant series of characters have been secured which recur regularly upon the media used. These results suggested the utility of a diagrammatic summary upon the general plan used by the bacteriologists which should be useful for contrasting the characters of different species. The characters found of value in the genus *Penicillium* are reaction to litmus-media, liquefaction of gelatine, variations in color of colony, structures appearing at the margin of the rapidly growing colony, general surface effect of the colony, the relations of

the conidiphore and conidial fructification, the description of the conidia themselves, with occasional unique characters which identify special forms—such as the formation of sclerotia. Cultures, diagrams and card descriptions of species of *Penicillium* were presented to illustrate the characters mentioned.

The Asciferous Stage of Glœosporium Psidii: JOHN L. SHELDON.

By means of artificial cultures and inoculations, Dr. Sheldon was able to study the life-history of *Glœosporium Psidii* G. Del., a fungus which causes the 'mummy disease' of the guava. The *Glœosporium* stage of the fungus closely resembled the *Glœosporium* stage of the 'bitter-rot' fungus (Glomerella) of the apple as determined by himself and other investigators. In old cultures on apple-agar, masses of perithecia were produced which resembled those of *Glomerella* both in shape and in structure, and also in the size and shape of the ascospores. The results indicate that the two fungi may be identical, although there were certain characteristics of the two that were not quite the same. The investigation will be continued.

Cytological Studies of Sapromyces and Rhipidium: CYRUS A. KING.

Sapromyces and *Rhipidium* both belong to the Septomelaceæ, which family is placed by Schroeter in the Saprolegniineæ.

In zoospore formation the individuals are separated by the severing of connecting cytoplasmic meshes. This process begins on the interior if there is a vacuole present. In some cases, at least, there is an indirect nuclear division in the zoosporangium of *Sapromyces*. In the oogonia of *Sapromyces* there is one mitosis and there is probably one in *Rhipidium* also. In both forms during oogenesis the supernumerary nuclei migrate to the periphery where they are cut off in a periplasm. This periplasm in *Sapromyces* is very rudimentary. The fertilization tube in *Rhipidium* is of oogonial origin, although it is possibly of antheridial origin in *Sapromyces*. A conspicuous differentiated region corresponding to the oocentrum of Trow is seen in *Rhipidium*. The reticulations on the oospore wall of *Rhipidium* are probably homologous with the radiating walls between the peripheral cells of *Acosospora*. The structure of the oogonium and the processes in oogenesis show this group to be related to the Peronosporineæ and it is suggested that they be placed in this cohort as follows: Peronosporineæ—Albuginaceæ, Peronosporaceæ, Septomelaceæ, Saprolegniineæ—Saprolegniaceæ.

A Study of the North American Coleosporiaceæ: J. C. ARTHUR.

A list of twenty-four species is presented, some of them now described for the first time. The presentation chiefly deals with the method employed in discriminating between the species, their degree of relationship, and their distribution.

Nomenclatorial Type Specimens of Plant Species: A. S. HITCHCOCK.

In systematic botany there is an increasing tendency to base species upon definite specimens. Older authors did not do this. It becomes necessary to decide upon rules for selecting the specimen upon which species should be based when these are not definitely indicated. The present paper is a discussion of such rules.

Cultures of Wood-Inhabiting Fungi: PERLEY SPAULDING.

It has been found easier to make cultures of wood-rotting fungi from actively growing mycelium than from the spores. Agar made from infusions of the species of wood which the fungus is found upon, usually serve to start growth of the mycelium at first. They can then be transferred to tubes of sterilized green wood of the suit-

able species. Cultures of *Lenzites sepiaria* and *Schizophyllum commune* have yielded fruiting bodies, the latter in about five weeks' time. The spores of the former were germinated in a very weak cane sugar solution, but failed totally to germinate in water or in weak salt solutions. Inoculations with mycelium of *Lenzites* have given no parasitic action, but in cut timber they have produced fruiting bodies in less than five months.

The Effect of Climatic Conditions on the Vitality of Seeds: J. W. T. Duvel.

This paper is a preliminary report on experiments undertaken to determine the effect of climatic conditions on the vitality of seeds when stored in the ordinary seed packages and in air-tight containers.

In December, 1902, seeds were distributed to sixty stations throughout the United States, including Alaska, Hawaii, Porto Rico and the Philippines. In addition seeds were also stored in Newfoundland, Canada, Isle of Pines, Cuba, Jamaica, St. Kitts, Dominica, Barbados and Trinidad. At the expiration of six months and one year respectively two complete sets from each of the sixty stations were returned and tested for vitality. The results of the germination tests show a great deterioration in the seeds contained in paper packages which were stored in places having a warm, humid atmosphere, while the seeds put up in air-tight containers preserved their vitality much better under these conditions. Seeds from places having comparatively dry climates showed no appreciable loss in vitality from either the paper packages or the air-tight containers.

The Germination of Seeds as affected by Soil Temperatures: Edgar Brown.

A brief description of observations on the temperature of the upper layers of soil and the effects of soil temperatures on the germination of seeds. From March 26 to June 30 planting of twenty different kinds of seeds were made at intervals of from two to three days, and records were kept of the total germination and appearance of first sprouts.

Readings of soil thermometers at depths varying from one fourth inch to two feet and of air and solar radiation thermometers, were made from 5 A.M. to 10 P.M. at intervals of fifteen minutes. Great variations in germination resulted. Lettuce germinated well in the early part of the season when the temperature was comparatively low, but poorly later as soil became warmer. The reverse was true of corn and many other seeds.

The time between planting and the appearance of first sprouts was generally inversely proportional to the per cent. of germination. Seeds of low vitality germinate much more slowly than seeds of high vitality. Seeds of *low* vitality are much more affected by unfavorable conditions than seeds of high vitality.

The Relation of Transpiration to other Functions: Burton E. Livingston.

The subjects for study were wheat plants grown in soils and nutrient solutions. The respective amounts of water lost by transpiration during a period of two or three weeks in a synchronous series of cultures in different soils or in different solutions appeared to be a good criterion for judging the relative values of these different media. To test this more rigidly, total transpiration was compared in a large number of series with the weight of the leaves and with their area. It was found that through a wide range of treatments transpiration is proportional to leaf area. The relation of transpiration to leaf weight seems not to be quite so simple, although by this criterion the different treatments in a series would fall in the same order as by that of transpiration. In other words, transpiration per unit area is quite generally uniform

throughout a series, while that per unit weight varies slightly. The amount of variation in the last case is far too small, however, to interfere with the use of transpiration as a criterion for estimating relative leaf weight. The conclusion from these tests is simply that *soils or solutions may be compared, in respect to their power to support growth, by means of total transpiration of the plants growing therein.*

A number of studies were presented of the relation of transpiration to absorption of salts in water cultures. In a series of cultures with identical treatment excepting for the use of different solutions, transpiration (since it is proportional to area and weight of the leaves, and therefore to growth of the plant) is found to be proportional to the amounts of salts absorbed. But when one culture is grown in a moist air and another in a relatively dry one this relation fails. A moist air (such as that in a bell-jar), as is well known, checks transpiration to a marked degree. It checks absorption of salts to a very slight degree, often not at all.

Further Notes on the Physiology of Stigeoctonium: BURTON E. LIVINGSTON.

The alga is the same as that on which the author has studied the effects of external osmotic pressure, drying and the presence of cations. The three above-named conditions cause filaments to assume the palmella form. It is now found that the effect of low temperature (2° to 10° C.) is nearly identical with that of the mineral poisons. Thus the palmella form is produced from filaments but zoospores are not inhibited, although there was no stimulation of zoospores observed.

In sea-water the alga lives and grows slowly as the palmella form. In sea-water diluted with distilled water to one hundred times its volume the same response occurs, showing that, although natural sea-water has an osmotic pressure high enough to produce the change, yet there is present a poison which will produce the same effect without the physical stimulus. It is apparent from the studies on metals that this poison must be either anionic or organic in its nature.

Further, water from peat bogs, although it has no appreciable osmotic pressure, causes the alga to change from the filamentous to the palmella form. It is probable that here we are dealing with an organic substance in small quantities. The observation is of special interest in connection with the xerophytic structures of bog plants, seeming to suggest very strongly that the explanation of such structures lies in the presence in the bog water of some organic poison. The toxic property of this water is not proportional to its acidity.

The Salt Water Limits of Wild Rice: CARL S. SCOFIELD.

Wild rice (*Zizania aquatica* L.) is naturally a fresh-water plant, and abounds in streams flowing into salt water along the Atlantic coast. An investigation was made to determine the salt-water limits of the plant. Three delta regions were surveyed, and the water both inside and outside the wild rice field was tested by an electrical conductivity method. It was found that where the water surrounding the plants is more saline than the equivalent of 0.031 normal solution of sodium chloride, the growth of wild rice is nearly or quite inhibited.

Notes on the Vegetation of Onondaga Lake: J. E. KIRKWOOD.

Onondaga Lake is situated in central New York and is known chiefly through the existence of certain salt springs on its shore. These springs impart a salinity to a considerable area of the marshy lowlands about the lake and a conspicuous holophytic

vegetation has sprung up. The plants thus far observed which are characteristic of salt marshes and maritime situations are: *Ruppia maritima, Triglochin maritima, Scirpus robustus, Juncus Gerardi, Salicornia herbacea, Tissa maritima, Aster subulatus, Senecio viscosus.* Analyses of the salt soils show saturated soils to contain solutions varying in concentration from .957 per cent to 7.32 per cent. A strongly saline sample of soil bearing *Tissa, Salicornia,* etc., yielded the following figures: 20 grams of fresh soil contained 6.56 grs. water (by evaporation to constant weight in laboratory at room temperature), .479 grs. water soluble salt, 2.489 grs. acid soluble material, 1.896 grs. volatile material and residual water, and 8.576 grs. solid residue after ignition.

Spermatogenesis and Behavior of Pollen Tube in Some of the Cucurbitaceæ. J. E. KIRKWOOD.

The forms studied were *Fevillia cordifolia, Melothria pendula, Cucurbita Pepo, Micrampelis lobata, Cyclanthera explodens.*

In the organogeny of the flower, the sepals, where present, arise first, followed by the petals on an inner circle and alternating with the outer members. Stamens appear about the same time as the petals, with which they alternate in *Fevillea.* The archesporial series of cells is hypodermal in the outer angles of the anthers and divides to furnish primary tapetal and primary sporogenous cells. In *Fevillea* the latter multiply by repeated divisions to form a mass of pollen-mother-cells. Cytoplasmic phenomena in the mitosis of the pollen-mother-cells of *Micrampelis* are interesting as revealing the evolution of certain darkly staining masses, which are regarded as the extranuclear nucleoli of other writers. These appear to arise, before the dissolution of the nuclear membrane, from kinoplasmic strands of the cytoplasm.

The pollen tube, in some of the forms examined, requires about forty-six hours to reach the embryo-sac. Its course is mostly intercellular. Where starch is present in the tube it was not found in the conducting tissue and where found in the conducting tissue none appeared in the tube. Evidence points to the secretion of peptones in the one case and of sugars in the others as the directive stimulant, and to the endosperm nucleus as the center for the elaboration of such stimulant in the embryo-sac.

Fasciation of Field Peas: F. H. BLODGETT.

Carelessness in selecting seed often results in direct loss in the quality or quantity of a crop, but this loss is not always as distinctly evident as was recently the case in fields of peas grown for cannery purposes, near Baltimore. The peas in question were grown from seed secured through a feed dealer, who knew nothing apparently of their pedigree, and who could not guarantee the quality of the seed as the regular seedsmen do. The observations were made especially upon two fields of approximately fifteen acres from which no crop was harvested and probably not more than five per cent. of a crop formed. The lack of pedigree establishing good qualities on the part of seed parents was made evident in the growth of the peas early in the season.

The soil conditions were a light sandy loam abundantly enriched with city manure, upon which the large amount of moisture and high temperatures worked together to produce a very vigorous growth of vine, but which from its very vigor, was abnormal. The vine instead of setting pods became fasciated, forming tubular or flattened stems bearing large numbers of flowers at the upper end, which set practically no seed. The stems had the appearance of two tubes, the inner one tapering

downward to a point and united to the upper cylindrical portion by the common rim, along which the flower clusters were developed. The two tubes were practically free from any connection with each other, except at the end and each bore upon its exposed surface leaves and branches, the inner one, of course, in a lesser degree. Many of these branches were hollow and often somewhat flattened or fasciated.

The cultural conditions in the locality are such that the pea vines are almost a complete loss in the absence of stock to which it could be fed, the only use possible being to turn them under as green manure. The loss to the grower was total and was measured by the cash outlay, not only for the seed in the first instance but for all labor upon the field, and the maintenance of the force of pickers, for a number of days in anticipation of a possible crop. Seed of known parentage will hereafter be used in the locality where the above observations were made. F. E. LLOYD,

Secretary.

SCIENTIFIC BOOKS.

International Catalogue of Scientific Literature. First Annual Issue. N—Zoology. Part I., Author Catalogue. Part II., Subject Catalogue. London, Harrison & Sons. 1904. Pp. xvi + 1528.

This work is planned to include the zoological literature for the year 1901, although one is compelled to analyze the preface in order to determine the period covered, since no record of its extent appears on cover or title page of either part. According to information printed on the cover the manuscript of this volume was completed in August, 1903, and the printed copy is dated February, 1904, although the work seems not to have been generally distributed until some months later.

Part I. contains the general explanations with the scheme of classification and an index thereto in English; and this matter is repeated in French, German and Italian. Following these the author catalogue fills 260 pages and lists 5,918 titles. Part II., which is about three times as voluminous, contains at the close a list of journals with abbreviated titles and the topographical classification. More than 1,100 pages are filled with the subject references proper. The system used has been the subject of extended discussion in SCIENCE and calls for no further notice here. The addition to each phylum of a list of names of new genera and species will commend itself to all as a most desirable feature.

Such bibliographic work is not new in the zoological field, and several of the similar enterprises already in existence have achieved noteworthy success. The oldest of these is the *Zoological Record,* which is especially full along taxonomic lines, while the *Zoologischer Jahresbericht* manifests a confessed morphological bias. Both of these, but more especially the latter, include an analysis of the subject matter of publications cited, whereas the admirable literature lists of the *Zoologischer Anzeiger* only hint at the contents of a publication by its classification. The *Bibliographia Universalis* of the Concilium Bibliographicum forms a subject catalogue comparable directly with the publication under consideration. A comparison of this volume with the results achieved by the other agencies noted will constitute a fair test of its value to workers in zoology.

In respect to promptness in appearance the 'International Catalogue' is certainly at an abnormal disadvantage in the first year of its history; whether this is sufficient excuse for its publication from one to two years later than the same material was available through the other agencies will depend upon individual judgment. At least its belated appearance should enable it to equal the results of other bibliographies. A close approximation of titles listed gives over 6,600 for the *Zoological Record,* over 8,000 for the *Zoologischer Anzeiger* and over 8,400 for the *Concilium Bibliographicum* as against the 5,918 entries in author list of the 'International Catalogue.'

The character of the subject catalogue has been tested both topically and taxonomically. On the taxonomic side Professor Weltner, of