

northern limit of Cetus, and traverse Pisces. The short time that the orbit plane of the comet lies above the plane of the ecliptic is shown by the fact that the ascending and descending nodes are passed on January 17.9 and May 18.6, 1910, respectively; on the latter date the comet transits the sun. For seventy-eight days it remains inside the earth's orbit, being at unit distance from the sun on March 11.6 and May 28.7 respectively. At the beginning of March the comet will set about three hours after the sun, and will probably be unobservable from the end of the first week until nearly the end of April; then it will become observable before sunrise.

Numerous visual observations are now being recorded. Among others, Prof. Schorr reports that Dr. Graff saw the comet, with the $9\frac{1}{2}$ -inch equatorial of the Hamburg Observatory, on November 18, as an elongated nebulous mass, whilst Herr H. Thiele saw it with a $4\frac{1}{2}$ -inch comet-seeker. A number of observations are also reported in No. 4373 of the *Astronomische Nachrichten*. According to a *Daily Mail* correspondent, the Greenwich photographs show curious fluctuations of brightness. On November 22 the comet was of the tenth magnitude, whilst on November 30 it was of the twelfth, although on December 1 it was again brighter.

MARS.—In the December number of the *Observatory* the Rev. T. E. R. Phillips briefly reviews the various observations which have been made of the Martian features during the present opposition. His own observations indicate that the polar cap was not symmetrical about the pole of rotation, but was further from the south limb when the central meridian lay between longitudes 300° and 50° than when the other side was presented. The canals, generally, have not been well seen by Mr. Phillips, and only the Euphrates has been seen duplicated. He also refers to the lack of brightness in the white regions so well seen in 1903. Six drawings of the planet, by Mr. Phillips, accompany the note, and illustrate the various points to which the author refers.

OBSERVATIONS OF JUPITER.—In No. 4372 of the *Astronomische Nachrichten* Herren H. E. Lau and C. Luplau-Jannsen describe their observations of Jupiter made during the period January–May of this year. Numerous spots were seen in the different bands, the activity of the southern hemisphere in this respect during the recent oppositions apparently exceeding that of the northern. Band iv. appeared redder than hitherto, and the bright central line more irregular. In April a remarkable projection was seen on the southern edge of band v., darker than the band itself, but apparently partaking of the general motion of that region. Important changes took place in the visibility and form of the Great Red Spot between the end of January and the end of March, and on March 28 the spot itself could not be seen, although its place was partially occupied by a bright egg-shaped mass. A discussion of these changes and a number of measures of the various features also form part of the paper.

In No. 4373 of the same journal Dr. H. H. Kritzing asks that all those observers who have unpublished measures of the position of the Red Spot will kindly communicate the same to him at 7, Hindersinstraße, Berlin N.W.

A SOLAR PHYSICS OBSERVATORY FOR AUSTRALIA.—The importance to solar physics of the installation of a properly equipped observatory in Australia can scarcely be over-estimated, and it is therefore with great pleasure that we learn, from the *Observatory*, that the labours of Dr. Duffield and others in this direction are likely ultimately to become fruitful.

At a meeting held on October 26 a number of prominent Australian officials discussed the matter, and His Excellency the Governor-General, Lord Dudley, in a carefully reasoned speech, pointed out the urgent necessity for the establishment of such an institution. He pointed out that a capital expenditure of at least 10,000*l.*, and an annual expenditure of about 1500*l.*, would be necessary, but if Australia is to use the exceptional advantages of position and climate which it possesses, and to take her place among the other nations in the progress of science, this opportunity should not be neglected. After discussing the matter at length, the meeting agreed to the following

motion:—"That the establishment of a solar observatory is desirable, and that the Federal Government be strongly urged to assume the responsibility of carrying it into effect." Already some 1000*l.* has been raised among private donors, and it has been officially suggested that the Commonwealth Government will materially help the fund, and, in the event of the effort being successful, provide for the maintenance of the observatory. From the opinions expressed by several influential Australian papers it appears very probable that this much needed institution will ere long become established.

THE HAMBURG OBSERVATORY.—We have received from the director, Prof. Schorr, the reports of the Hamburg Observatory for the years 1907 and 1908. In the latter is an account of the removal of the observatory to Bergesdorf and of the new instruments installed therein.

EPHEMERIDES FOR PERRINE'S AND WINNECKE'S COMETS, 1909*b* AND 1909*d*.—Ephemerides for comets 1909*b* and 1909*d* are published in No. 4374 of the *Astronomische Nachrichten* by Dr. Ebell and Prof. Hillebrand respectively. As both these objects are faint, and south of the equator, it is not worth while reproducing the ephemerides here.

A CONTRIBUTION TO APPLIED BOTANY.¹

OWING, it seems, to the dilatoriness of some of the contributors, the annual report of the German Society of Applied Botany for 1908 has only lately appeared. The society, now numbering 260 members, held its sixth meeting at Strassburg early in August, and ought not to require twelve months for the publication of its report. A curious feature in it is the separation of the account of the discussion of the contents of a paper from the report of the paper itself. It would be more convenient if the two were combined, and the paper followed by the speakers' observations in each case. Thus "Diskussion zur Appel," early in the volume, refers to a paper by Appel at the end.

Wittmack directs attention to the confusion caused by the want of uniformity in the views expressed by experts on botanical matters, affecting especially the German Customs' Department. He recommended the appointment of a technical committee and the publication of its decisions in a special bulletin. This was subsequently found impracticable, and the society decided to utilise its annual report for such purposes as far as possible. As Wittmack's article itself indicates, the expert forces of Germany are so systematised in the various industries that there is little need for a new organisation.

In this report the amusing case of the "everlasting plant," *Selaginella lepidophylla*, is described in detail. Wittmack reported that the plant, as imported for sale as a curio, is dead. Brick, of the Hamburg Plant-protection Station, however, reported that the imported plants are often, as several botanists have shown, living. Any such living plant imported into Germany must pay a tax and be examined for freedom from vine-louse and the St. José scale-insect. Fortunately, common sense prevailed, and the plants are now allowed into Germany as curios.

Mez compares *Merulius lacrymans* with other forms of dry-rot, and shows that it, unlike, e.g., *Polyporus vaporarius*, prepares its way by moistening the timber with the "tears" it produces by its respiration, from the carbohydrates derived from the timber destroyed by it. The practical importance of this is great.

Klebahn describes experiments on the solvent action of root-secretions on "agriculture" and other phosphates. Wittmack defines the term "bulbs" as used horticulturally.

Voigt shows how seriously the contract cereal trade through Hamburg is affected by a correct application of the term "wild oats" in grain analysis, Hamburg and Berlin differing in their interpretation of it.

Muth contributes a comprehensive account of the varied part botany should play in the experimental work of agricultural stations, and shows that neither botany nor botanists occupy their rightful position at present in

¹ Jahresbericht der Vereinigung für angewandte Botanik. Sechster Jahrgang, 1908. Pp. xlii+294. (Berlin: Gebrüder Borntraeger, 1909.)

Germany, especially in comparison with applied chemistry and its followers.

H. Fischer, the discoverer of the symbiosis of N-bacteria with microscopic soil algæ, in a valuable article on soil bacteriology, summarising and discussing the results already obtained, urges the necessity of treating the subject as a botanical one and of encouraging botanists to devote themselves to it if advances commensurate with its practical importance are to be made. Thus at present there is, he states, no known method of bacteriological soil investigation which satisfies the requirements of science and practice. Exclusive of the discovery of the N-fixing power of the bacteria of leguminose roots, little of practical value has so far been ascertained. *Azotobacter chroococcum* is, in passing, quoted as a calcicole plant, thus serving, like some flowering plants, as a soil indicator.

Wieler writes on the smoke nuisance as it affects plant life. He shows how little the subject is understood, urges the creation of a smoke institute for the investigation of smoke problems, and the employment in legal cases of smoke experts as judicial arbitrators. Wieler reviews critically the publications of recent years on smoke, and deals especially with the sulphur compounds on which he has himself worked. The prevention of damage to plant life by smoke is a botanical subject.

P. Sonntag describes the results of his examinations of the ductility and breaking point of the bast fibres of some half-dozen different palms, corrects earlier observations on the subject, and shows the practical bearing of the question, e.g., on the selection of fibres for street sweepers.

Count Arnim, well known for his devotion to the production of new varieties of cereals, contributes a stimulating article on the production of new varieties of potatoes. He contends that hitherto the method pursued has been empirical, the object having been to meet the speculative trade demand for new varieties each year. Scientific men are invited to answer certain questions pressing for solution, and to aid the conscientious practical man in the search for trustworthy starch-producing disease-resisting varieties. Results hitherto obtained in potato-culture experiments are of necessity contradictory, not being based on scientific principles.

L. Bernegau deals with the utilisation of dried potato tubers and of the sweet-potato (batatas) in the German colonies of West Africa. The article is of value to all interested in the industrial application of colonial economic products. Other articles by Bernegau deal with the Togo lemon (*Citrus medica*) and with *Cola acuminata* and *C. vera* seeds.

One of the most important papers in the volume is that by F. Muth on the influence of the nature of the seed-bed on the germination of seeds. Contrary to the opinion prevailing in Germany that, though the nature of the seed-bed is of minor importance, strong filter or blotting paper is the best medium, Muth finds, as a result of many trials of every kind of seed, that blotting paper for most seeds does not provide the best seed-bed. He recommends unglazed white or yellow porcelain dishes. The results of the seed-testing in the Government station in Ireland, of which I have charge (more than 2000 tests being made annually), fully support Muth. Further, we find that for cereals a soil-test, apparently not tried by Muth, gives better results than the porcelain dishes. Brick supplies an illustrated account of the diseases of cocoa, rubber, and other tropical plants of cultivation, and Appel a, now somewhat belated, paper on potato leaf-roll.

The report is one which no one concerned with economic botany should overlook, and reveals the many-sided practical bearings of botany.

T. J.

A NEW METHOD IN ANIMAL PSYCHOLOGY.

THOSE who remember the Huxley lecture delivered in 1906 by Prof. Pawlow, in which he complained that the physiology of the sense organs had hitherto suffered from the evil influences of psychology, will turn with interest to a paper entitled "The Method of Pawlow in Animal Psychology," which is contributed to the August number of the *Psychological Bulletin* by Messrs. R. M. Yerkes and S. Morgulis. The method which Prof. Pawlow

introduced consists in studying the modifications of the salivary reflex under various mental conditions. By a simple operation a salivary fistula is formed on the outer surface of the cheek of a healthy dog; the wound quickly heals, and the animal suffers no further inconvenience. The flow of saliva under different conditions is studied by collecting it from the fistula and observing its volume and viscosity in given intervals of time. Pawlow calls the salivary reflex "unconditioned" when (as, for instance, on the introduction of food into the mouth) the stimulus naturally and directly calls forth the reflex. On the other hand, a "conditioned" reflex occurs through artificial and indirect causes. Thus, if a sound of constant pitch is produced near the dog on every occasion when food is given, this particular sound (after adequate practice) is sufficient to cause a secretion of saliva in the absence of food. According to Nicolai, the "reflex" thus obtained is a complicated process, the secretion being connected only indirectly with the sound-stimulus by the mediation of the "idea of eating." When once such a conditioned "reflex" has been established, the interest of the experiment consists in seeing to what extent, if at all, the "reflex" is evoked by modifying the stimulus, e.g. by varying its pitch, timbre, or loudness, or by including the tone in a chord.

The paper gives a lengthy *résumé* of the study of auditory reactions made in this way by Selionyi, one of Pawlow's pupils. A paper by Orbeli, another of his pupils, also written in Russian, is likewise abstracted in considerable detail. This deals with the visual reactions of the dog. The writer concludes that the "study of conditioned salivary reflexes furnishes no indication that rays of light of different wave-length are received as distinct stimuli by the eye of the dog," although such reflexes "are essentially dependent upon the intensity of the light-stimulus." Nicolai likewise fails to find evidence of colour-vision in the dog. It would, however, be rash to conclude from these experiments that dogs are colour-blind. The dogs mostly used in Pawlow's laboratory were a mixed breed of hunting dogs, and it may well be that in this particular breed colour-differences are very ill attended to. Moreover, it is quite conceivable that when an animal has been trained to salivate, say, to a blue stimulus, a yellow stimulus may also cause salivation, and yet may be clearly distinguished in the dog's consciousness from the blue. This shows the weakness of Pawlow's method and the cautions which are necessary in deducing the mental states of an animal from the study of its salivary secretion. To judge from the list of forty-two papers published (mostly in Russian) by Pawlow and his pupils since 1904, the St. Petersburg school of physiologists has unbounded faith in the possibilities of the method.

THE MESSINA EARTHQUAKE.

THE Messina earthquake of December, 1908, will probably occupy the attention of Italian seismologists for some time to come. In the meantime, Dr. Mario Baratta has published a summary of the results at which he has arrived during an investigation made under the auspices of the Italian Geographical Society. The great shock, he remarks, was not announced by any slight movements in the district chiefly affected. The greater part of this district lies in the Calabrian peninsula, bounded by a line which just includes Palmi, San Procopio, San Stefano, and Pellarò. In Sicily the bounding line includes Faro Superiore, close to the north-eastern corner, and passes a short distance to the west and south of Messina; but, even in this region of maximum devastation, there are small areas within which the buildings appear to have been miraculously preserved.

Excluding Reggio and Messina, where the number of victims is still unknown, the mortality reached a maximum at Cannitello, with a percentage of 21.7; in a few places it ranges from 20 per cent. to 30 per cent., more frequently it lies between 10 per cent. and 20 per cent., while in most places it was less than 10 per cent. Besides the principal meizoseismal area, there are other regions marked by an increase of intensity, such as the well-known zones of Monteleone, La Piana, Ferruzzano, &c., so strongly disturbed in 1905, 1783, and 1907 respectively.