

THURSDAY, JULY 14, 1910.

TOTEMISM UNVEILED.

Totemism and Exogamy: a Treatise on Certain Early Forms of Superstition and Society. By Prof. J. G. Frazer. In four vols. Vol. i., xix+579; vol. ii., ix+640; vol. iii., ix+583; vol. iv., v+379; eight maps. (London: Macmillan and Co., Ltd., 1910.) Price 2l. 10s. net the four vols.

PROF. FRAZER is a great artist as well as a great anthropologist. He works on a big scale; no one in any department of research, not even Darwin, has employed a wider induction of facts. No one, again, has dealt more conscientiously with each fact; however seemingly trivial, it is prepared with minute pains and cautious tests for its destiny as a slip to be placed under the anthropological microscope. He combines, so to speak, the merits of Tintoretto and Meissonier. What, then, we may ask, of the philosophical result, of the theory which should emerge from all this acreage of minute workmanship?

In "Totemism and Exogamy" (so far the most voluminous of his anthropological treatises) he admits—the passage is an interesting one—that he has

"never hesitated either to frame theories which seemed to fit the facts, or to throw them away when they ceased to do so; my aim in this and my other writings has not been to blow bubble hypotheses which glitter for a moment and are gone; it has been by a wide collection and an exact classification of facts to lay a broad and solid foundation for the inductive study of primitive man."

To the mind of the truly scientific inquirer, the theory of a subject is a continuously modified machine, the object of which is at once to sort the elements of a combination and to re-combine them, so that by a turn of the handle the observer can reproduce the original process in all or any of its parts. Such a machine only arrives at perfection after a long evolution guided by the "method of trial." Prof. Frazer in anthropology, as Darwin in biology, is content to try new models, and to fit new parts, not with the meticulousness of static curatorship, but with the abandon of experimental genius.

This method and its result are illustrated in a very perfect way by that portion of the book which is concerned with totemism. This portion (if we may express our own belief at the risk of offending Prof. Frazer's characteristic modesty), is actually "The Complete History of Totemism, its Practice and its Theory, its Origin and its End." Commencing with a reprint of the first (1887) edition of "Totemism," a model of its kind, a brief and digested survey of the then known facts (and in its working hypotheses innocuous enough to serve as an introduction for the complete treatise), he next reproduces his first tentative theory in "The Origin of Totemism" (*Fortnightly Review*, 1899), namely, that the essence of it is the "external soul," as suggested in "The Golden Bough" of 1890, only to discard it, in the light of the remarkable discoveries made by Messrs. Spencer and Gillen in Central Australia, for another form, a system of magic, "designed to supply a community

with all the necessaries of life, and especially with the chief necessary of all, with food," a notable picture of cooperation tinged with superstition. Next, in the reprint, "The Beginnings of Religion and Totemism Among the Australian Aborigines" (*Fortnightly Review*, 1905; articles expanded from "Observations on Central Australian Totemism," in the *Journal of the Anthropological Institute*, vol. xxviii., 1899), he reproduces his third hypothesis.

As this, in the present writer's opinion, when completed by the discoveries of Dr. W. H. R. Rivers, and fully expounded in vol. iv., is the final explanation of the mystery of totemism, and as even its author admits that "here at last we seem to find a complete and adequate explanation of the origin of totemism," it calls for detailed attention. In 1899, Messrs. Spencer and Gillen described the Arunta and Kaitish method of determining the totem.

"A person derives his totem neither from his father nor from his mother, but from the place where his mother first became aware that she was with child. Scattered all over the country are what Messrs. Spencer and Gillen call local totem centres, that is, spots where the souls of the dead are supposed to live awaiting reincarnation, each of these spots being haunted by the spirits of people of one totem only; and wherever a pregnant woman first feels the child in her womb, she thinks that a spirit of the nearest totem centre has entered into her, and accordingly the child will be of that local centre, whatever it may be, without any regard to the totem either of the father or of the mother."

This Prof. Frazer terms conceptional totemism.

"The theory on which it is based denies implicitly, and the natives themselves deny explicitly, that children are the fruit of the commerce of the sexes."

He gives probable reasons for this apparently strange ignorance.

Turning now to the summary and conclusion in vol. iv. of the present work, we read:—

"Obviously, however, this theory of conception does not by itself explain totemism. . . . It stops short of doing so, by a single step. What a woman imagines to enter her body at conception is not an animal, a plant, a stone, or what not; it is only the spirit of a human child which has an animal, a plant, a stone, or what not for its totem. . . . For the essence of totemism . . . consists in the identification of a man with a thing, whether an animal, a plant, or what not. . . . Absolutely primitive totemism . . . ought to consist in nothing more or less than in a belief that women are impregnated without the help of men by something which enters their womb at the moment when they first feel it quickened."

The "missing link" was found in the Banks' Islands by Dr. W. H. R. Rivers. Here the natives "identify themselves with certain animals or fruits and believe that they themselves partake of the qualities and character of these animals and fruits. . . . The reason they give for holding this belief and observing this conduct is that their mothers were impregnated by the entrance into their wombs of spirit animals or spirit fruits, and that they themselves are nothing but the particular animal or plant. . . ."

The theory, as thus completed, "accounts for all the facts (of totemism) in a simple and natural manner."

Hence, as secondary results, the practice of abstaining from killing and eating the totem, and conversely of occasionally eating a little; the belief that men have a magical power over their totems, particularly that of multiplying them; the belief that people are descended from their totems; and that women sometimes give birth to these animals or plants; the fact that people often confuse their ancestors with their totems; and, lastly, the fact that totems comprise an immense range of organic, physical, and artificial objects, the reason being

"that there is nothing from the light of the sun or the moon or the stars down to the humblest implement of domestic utility which may not have impressed a woman's fancy at the critical season and have been by her identified with the child in her womb."

One great merit of the theory, it will be seen, lies in this—that it rests upon a psychological phenomenon of universal occurrence. In a very interesting section, the author connects the facts of totemism with the "longings," the *envie*, of pregnant women. The persistence of the belief and the difficulty of explaining away the physical results of "maternal impressions" on the offspring are most significant. As the author observes, if totemism existed to-day in England, the child of the lady who had a "longing" for raspberries, would, being marked with a raspberry, clearly outlined on the back of the neck, have had a raspberry for its totem. The possibilities latent in such world-wide ideas may explain, suggests the author, the remarkable preservation of clan type in clan exogamy.

"The children of each clan take after their mothers or their fathers, as the case (that is, of residence) may be, according as the mental impressions made on pregnant women are derived mainly from their own clan or from the clan of their husband."

We are glad to see that the author recognises, and continually emphasises, the primary independence of totemism and exogamy; they "are fundamentally distinct in origin and nature, though they have accidentally crossed and blended in many tribes." Throughout the book exogamy is treated as an accidental adjunct of totemism. Yet a complete explanation of its origin and evolution is attempted. In our opinion, this explanation is unconvincing. By a curious irony, J. F. McLennan, the discoverer of both institutions, never essayed an explanation of totemism, but concentrated his mind on an explanation of exogamy, now shown conclusively to be erroneous. Prof. Frazer, on the other hand, found in totemism his first interest, and his explanation of it constitutes his greatest triumph, while in dealing with exogamy he seems to be engaged on a secondary problem. An excellent discussion of theories is followed by a comparison of the action of exogamy to that of scientific breeding. His account of the development of exogamy from an original prohibition of the "marriage" of brothers and sisters is masterly enough, and we are grateful for it. That the later prohibitions were deliberate we cannot doubt; it is when he follows Messrs. Howitt, Spencer, and Gillen in asserting that the first dichotomy of the primitive group, for the prevention of brother-sister unions, into

two halves was also deliberate, that we feel unsatisfied. He rests on an assumed and unexplained superstition (as to the evil effects of incest) in the primitive mind. Nor does he explain how a group, however small, could be divided into two. On what principle could it be done? Here he ignores Mr. J. J. Atkinson's theory of primal law.

Nearly two thousand pages are occupied with an ethnographical survey of totemism, an invaluable compilation. The maps, including that of the distribution of totemic peoples, are a new and useful feature. The notes and corrections bring the reprints up to date.

A. E. CRAWLEY.

A THEORY OF PREHISTORIC RHODESIA.

Prehistoric Rhodesia. By Richard N. Hall. Pp. xxviii+88. (London: T. Fisher Unwin, 1909.) Price 12s. 6d. net.

MR. R. N. Hall, the South African excavator, is not very tolerant of criticism. He is up again, and running full tilt against Dr. Randall Maciver, who, in "Mediæval Rhodesia," dared to try to demolish his prehistoric Semitic Zimbabwe theory. Whether Dr. Maciver was right in all his contentions as to the stratification of Zimbabwe, the Nankin china found in it, and so forth, cannot be decided until after he has replied to Mr. Hall's objections as stated in this book. We have little doubt that his reply will finally dispose of these objections, which, of course, Mr. Hall was perfectly justified in advancing if he felt that Dr. Maciver had not handled the evidence rightly. It is, however, a pity that in doing this Mr. Hall allows a certain tone of bitterness to appear in his references to his antagonist.

Mr. Hall is still dominated by the idea that he can find Semitic traces in South Africa. But, again, he brings forward no satisfying proofs of any tangible Semitic influence there. Round towers with conical tops are no proof of Semitic connection. It is not only the Semites who have built such. "Cones" are no speciality of the Semites. In support of the idea that Cones mean Semites, Mr. R. N. Hall brings forward references to Messrs. L. W. King and H. R. Hall's book, "Egypt and Western Asia." Mr. R. N. Hall's note referring to this supposed support for his theory reads as follows:—

"In King and Hall's 'Egypt and Western Asia' reference is made to 'the great cone' at Sinai in the Elamite kingdom (p. 159); to the remains of a 'temple-tower' at Ninib at Babylon (p. 166); to the 'temple-towers' erected by Gudea at Shirpurla in southern Babylonia (p. 217); to 'massive temple-towers' at Samarra on the Tigris (p. 284); to 'cones' in Assyria (p. 392); and to the 'temple-tower' of Ashur (p. 410)."

Now, apart from the extraordinary solecisms "at Sinai in the Elamite kingdom," and "at Ninib at Babylon" (does Mr. R. N. Hall not know where Elam was, where or what Sinai is, or that Ninib was a god?), on referring, incredulously, to the work of Mr. L. W. King and his coadjutor, Mr. R. N. Hall's namesake, we find that this note of the South African Mr. Hall's is one of the oddest farragos of mis-

quotations and miscomprehensions that we have ever seen. The "great cone" at Sinai in the Elamite kingdom" (which is as if one were to say "at Mont Blanc in Russia") is the representation of a mountain-peak on the well-known stela of the Babylonian king Naram-Sin, which represents that monarch conquering his enemies in a mountainous country, presumably Elam. How Mr. Hall has got Sinai in appears from a neighbouring sentence, in which Messrs. King and H. R. Hall say that Naram-Sin "made an expedition to Sinai." But that does not matter; what does matter is that Mr. Hall quotes Messrs. King and Hall as speaking of this "great cone" as if it bore out his theory, as if it were a building, whereas what they actually say is "the great cone in front of Naram-Sin, which is probably intended to represent the peak of the mountain." What right has Mr. Hall, then, to refer to the authors of "Egypt and Western Asia" at all? If he disagrees with them as to the interpretation of the cone on the monument, let him say so. But the relief showing the king before the "cone" in question is dead against him in that case.

The "'temple-tower' at Ninib at Babylon" is the "ziggurat" or "temple-tower" of the temple of *Nabû* at *Birs Nimrûd*, which is the site of the ancient Borsippa, not Babylon; and these ziggurats were not conical at all, nor do King and Hall, either in connection with that at Borsippa or that at Shirpurla, mention anything like a cone in connection with them!

The "'massive temple-towers' of Samarra on the Tigris" are a gem. Samarra is a comparatively modern city, with mediæval walls, over which one sees the gilt domes of two mosques, and a peculiar minaret rather like that of Ibn Tulûn, at Cairo. Messrs. King and Hall, writing picturesquely, say:—

"Such a picture as that of the approach to the city of Samarra, with its mediæval walls, may be taken as having its counterpart in many a city of the early Babylonians. The caravan-route leads through the desert, and if we substitute two massive temple-towers for the domes of the mosques that rise above the wall, little else in the picture need be changed."

Mr. Hall has too hastily assumed that these massive temple-towers were conical, or even domed, like the modern mosques. The analogy need not be taken so literally as all that!

Finally, the "'cones' in Assyria" which Mr. R. N. Hall says are mentioned on p. 392 of Messrs. King and Hall's book are the objects thus referred to on that page:—

"Last year a small cone" [*sic*: Messrs. King and Hall do not speak of "cones" in the plural, as Mr. Hall misquotes them] "or cylinder was found, which, though it bears only a few lines of inscription, restores the names of no less than seven early Assyrian viceroys whose existence was not previously known."

These small objects, measuring about nine inches or a foot long, are usually called cones, but they are more properly nail-shaped. What they have to do with Mr. R. N. Hall's theory of conical buildings being Semitic it is hard to see.

The examination of this footnote was interesting, but is not calculated to strengthen one's faith in Mr. Hall's theory, and his authorities do not seem to bear him out so much as he thinks. A more careful study of Semitic lore will probably lead him later to see, himself, the weak points of his dogma. As for the supposed Semitic traits of the Makaranga, on which he lays such stress (p. 400), we fail to see in the long list given by Mr. Hall any peculiarity which is common to Semites and Makaranga only; most of these characteristics are shared by every negro tribe in Africa, and the fact that some of them were also shared by the Semites proves no more than that primitive people all the world over have similar customs, especially with regard to marriage, ritual cleanliness, and the like matters. In this list, also, Mr. Hall shows an inability to distinguish between strong and weak evidence. What is the use to his thesis of such an absurdity as his thirty-eighth resemblance between the Makaranga and Semites,

"Iron rods were the insignia of old Ma-Karanga chiefs, and it was illegal for any ordinary member of the tribe to own such an article. These iron sceptres have their parallel in Semitic countries, where gold was of more value than iron, and are mentioned in the Scriptures"?

What is the point of the solemn information "where gold was of more value than iron" in this particular connection?

We really believe that Mr. Hall does himself and his theory an injustice in his unskilled manner of presenting his ideas and his inability to distinguish between good and bad evidence. Thus the rather "muzzy" photograph facing p. 39⁸ which purports to show the "Semitic Appearance of a Karanga, Zimbabwe," is absolutely bad evidence. Where is this supposed Semitic appearance? In this negro's rather large nose? Does not Mr. Hall know that the purest Semites of Arabia have straight noses, not at all like the "Jewish" type?

Were it pruned of these and other absurdities, Mr. Hall's theory would command serious attention, for it is by no means impossible that Arab traders may have penetrated as far south as Sofala, even so early as the time of the Himyar kingdom, and have exercised a civilising influence on the negro tribes, as the Portuguese did on the tribes of Benin. But granted what one knows now of the capability of certain negro tribes to evolve cultures of their own, Mr. Hall is a bold man to deny the possibility of the truth of Dr. Maciver's theory, that the buildings of Zimbabwe are the work of a native race of comparatively modern times, independent of foreign influence. In any case, until the question of the "Nankin china" is finally settled, it is of little use for Mr. Hall to go on drawing "evidence" of supposed Semitic connections in South Africa, which are presumably no older than the early Middle Ages, from "cones" in Mesopotamia of any date between 3000 and 1500 B.C., especially since these "cones," when examined, turn out to be either mountains, or square, flat-topped towers, or votive offerings, a few inches high, which are shaped like nails!

THE MARINE FAUNA OF JAPAN.

Beiträge zur Naturgeschichte Ostasiens. Edited by Dr. F. Doflein. Japanische Alcyonaceen. By Prof. W. Kükenthal. Pp. 86+Tafel v. Price 4 marks. Japanische Gorgoniden. Teil i. Die Familien der Primnoiden, Muriceiden, und Acanthogorgiiden. By Prof. W. Kükenthal and H. Gorzawsky. Pp. 71+Tafel iv. Price 3.60 marks. Japanische gorgoniden. Teil ii. Die Familien der Plexauriden Chrysogorgiiden und Melitodiden. By Prof. W. Kükenthal. Pp. 78+Tafel vii. Price 6 marks. Hydroidpolyphen der japanische Ostküste. Teil i. Athecata und Plumularidæ. By E. Stechow. Pp. 109+Tafel vii. Price 5 marks. Japanische Antipatharien. By E. Silberfeld. Pp. 30+Tafel ii. Price 2.50 marks. Japanische Medusen. By O. Maas. Pp. 52+Tafel iii. Price 4 marks. Japanische Actinien. By Dr. A. Wassilieff. Pp. 52+Tafel ix. Price 2.70 marks. Japanische Ctenophoren. By Dr. Fanny Moser. Pp. 77+Tafel ii. Price 5 marks. Über japanische Seewalzen. By E. Augustin. Pp. 44+Tafel ii. Price 3 marks. (München: K. B. Akademie der Wissenschaften, G. Franz'schen Verlags, J. Roth, 1906-9.)

IT has been known for some time to zoologists that the southern coasts of Japan possess a very rich and varied marine fauna. The *Challenger* expedition gave us some indication of it, and various special memoirs by Japanese writers that have appeared in recent years have served to maintain and stimulate our interest in it. But the nine memoirs dealing with the collections made by Dr. F. Doflein in the Sagami and Sendai bays during the years 1904-5 bring home to us with great effect the amazing wealth with which our Japanese friends are favoured in respect of their submarine zoological treasures.

Dr. Doflein is a fortunate, and also undoubtedly a skilful, collector, for he has not only obtained a very large quantity of material, and succeeded in bringing it home in an excellent state of preservation, but he has been able to enlist the services of a number of eminent zoologists with special knowledge of the various groups, and to publish these memoirs in sumptuous style. Judging from the series already published, there can be little doubt that the results of Dr. Doflein's expedition will form a very important contribution to our knowledge of the systematic zoology of the Japanese waters.

For the three memoirs on Alcyonaria, Prof. Kükenthal, of Breslau, is very largely responsible, and those who are interested in this group of Cœlenterata will find in them descriptions of a large number of new species, profusely illustrated by coloured plates and photographs. Prof. Kükenthal is so well known as a leading authority on the Alcyonaria that it is hardly necessary to remark that his elaborate descriptions of the new species and his profound knowledge of the history and literature of the group give his contributions to the series a very high position. But although there is a great deal that is new in these three memoirs, there is no new genus that strikes us as being particularly interesting or important. Among

the Alcyonacea, the genus *Spongodes* (which has been re-named *Dendronephthya* by the author) is represented by fifteen species, of which six are new to science, and *Nidalia* by seven species, of which five are new. The genus *Alcyonium*, on the other hand, is represented by only one species, which is described under the new specific name of *Alcyonium gracillimum*. A new species of *Siphonogorgia* having been found in Sagami bay, the author takes the opportunity of giving us a very valuable summary of the characters of all the known species of the genus, including in the list the species formerly separated under this generic name *Chironephthya*.

The title "Japanische Gorgoniden" given to the other two memoirs on Alcyonaria is rather misleading, as the family Gorgonidæ has not yet been dealt with; but it is nevertheless in the suborder Gorgonacea rather than in the Alcyonacea that the richness of the Japanese fauna is so pronounced. The genera *Chrysogorgia*, *Melitodes*, and *Plumarella* appear to be particularly well represented, and in the family Plexauridæ two new genera, *Anthoplexaura* and *Paraplexaura*, are described, as well as several new species of the older genus *Euplexaura*.

The memoir on the hydroid polyps by Stechow is in some respects the most remarkable and valuable of the series, and special attention may be directed to the interesting introductory statement, and particularly to his valuable tabular scheme of the classification of the hydrozoa. Many previous attempts have been made to bring into one system the hydroid and medusoid forms belonging to this class. On careful analysis and consideration, this system will probably be found by systematists to be the best that has yet been suggested. Of the many interesting hydroids that are described in this memoir, the most remarkable is the one to which the new generic name *Hydrichthella* is given. It was found epizoic on the new alcyonarian *Anthoplexaura* described by Kükenthal. It is a curious coincidence in zoology that the only other example of a hydroid epizoic upon an alcyonarian was also described last year. On January 30, 1909, a paper by Miss W. Coward was read before the Koninklijke Akad. van Wetenschappen of Amsterdam on a new hydroid (*Ptilocodium*) epizoic on specimens of the genus *Ptilosarcus* collected by the *Siboga* expedition. In the same year Stechow described the genus *Hydrichthella* on *Anthoplexaura*. There can be little doubt that the two genera are very closely related, but it is more than probable that it will be found advisable to join them in one generic group. If this be done the question of priority will arise, and the name will be *Ptilocodium* or *Hydrichthella* according to the publication of Stechow's memoir before or after January 30.

The genus *Dendrocoryne* of Inaba found in Japanese waters has created some special interest of recent years owing to its relationship to the genus *Ceratella*, that occurs in Australian waters, on the east coast of Africa, off Hawaii, and elsewhere. The points of difference between *Dendrocoryne* and *Ceratella* do not appear to some authors sufficiently im-

portant or constant to justify their separation into two genera, but a very strong protest must be made against this author's practice of reviving the obsolete generic name *Solanderia* for *Cerattella* and throwing the literature into confusion thereby. M. Haime, who examined the type-specimen of *Solanderia* (Duch. and Michel.), declared that it was undoubtedly a *Gorgonid*. The genus was therefore rightly ignored by Gray, and the magnificent memoir by Baldwin Spencer on *Cerattella fusca* has firmly established the proper generic name once and for all time.

Of the other memoirs in this series, the space at our disposal does not allow us to make more than passing notice. We observe some excellent coloured plates in the account by Maas of the Japanese medusæ, and we are glad to observe that the wandering genera *Gonionemus* and *Olindioides* are becoming more definitely settled in the order *Trachomedusæ*. The *Ctenophora* do not seem to be very well represented in the Japanese fauna, but Dr. Fanny Moser's memoir on this group is a very important contribution to our knowledge of several of the important genera, as the author takes the opportunity to give a critical summary of all the known species of the *Lobatae*, *Beroidæ*, and *Cestidæ*.

Silberfeld adds to his account of the few new Japanese *Antipatharia* a useful list of all the species of the order that have been described since the publication of Brook's *Challenger* monograph.

The memoirs by Augustin on the *Holothuria*, and by Wassilieff on the sea anemones, fully maintain the high standard of excellence that marks the earlier numbers.

S. J. H.

THE CAMBRIDGE PUBLIC ORATOR.

Orationes et Epistolæ Cantabrigienses (1876-1909).
By Dr. John Edwin Sandys. Pp. xiv+290.
(London: Macmillan and Co., Ltd., 1910.) Price
10s. net.

THIS very attractive volume, bound in the light blue which stands for the colour of Cambridge, contains the Latin speeches and letters which for thirty-three years Dr. Sandys has delivered as public orator for the University of Cambridge. In 1909 Dr. Merry, the public orator of Oxford, published his admirable orations, delivered in the Sheldonian Theatre during thirty years, and in the same year, by a curious chance, appeared a volume containing 141 brief speeches delivered by three successive public orators of Trinity College, Dublin—Drs. Palmer, Tyrrell, and Purser.

It was a strange coincidence that in the course of a year the two great universities of England and the most ancient university of Ireland should have given to the world these characteristic effusions of university sentiment. This form of literary composition will appeal in a different way to different minds. But none will fail to see in it a somewhat interesting specimen of an art now obsolescent and destined, perhaps, soon to pass away, which recalls the time when Latin was the *lingua franca* of the learned world, and when the universities affected to convey their sentiments only in the learned tongue.

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So long as this time-honoured custom is observed, it will recommend itself by the happy classical turn of phrase and the ingenious adaptation of Latin idiom to very post-classical themes, to which the public orator must often have recourse; and of these arts Dr. Sandys is a past-master. His career in Cambridge was most brilliant, and among other distinctions he won the coveted Porson prize. He was at once designated successor as public orator to that great composer in Greek and Latin, the late Sir Richard Jebb. His orations are characterised by an elegance of Latinity and a felicity of allusion quite worthy of his distinguished predecessor. The public orations not only excite the interest of scholars, but sometimes evoke humorous comment from the undergraduates, as when Dr. Travers-Twiss at Oxford found a flight of superlatives (in which such speeches naturally abound) capped from the gallery by a new adjective. "Illustrissimus, præclarissimus," said the orator; "et Travers-Twissimus" was the contribution of an inglorious undergraduate rival.

The *éloges* in the volume before us are not only charming examples of polished Latinity, but they are admirable specimens of brief and pointed criticism. A man's work is often summed up in a few words which could not be bettered in as many pages. One specimen of this delicate art will serve *instar omnium*. The great poet and critic, Matthew Arnold, writes thus to Dr. Sandys:—

"A thousand thanks for the printed copies of your speeches which you have so kindly sent to me. I am glad the speeches are in this permanent form. For myself I can only say that I could wish the next age (if the next age inquires at all about me) to read no other and no longer character of me than yours."

The reader should turn to the *éloge* (No. 71, p. 39) to see that the words of Matthew Arnold are justified. For those who have not the book we will make an extract, which shrewdly characterises Arnold's dealings with the Philistines, his *εὐτραπέλια*, "cultured insolence," as Aristotle calls it, and another which compares his style to the Thames by which he was born, "Though deep yet clear, though gentle yet not dull":—

"Quam suaviter subamarus est quotiens Attico quodam lepore et salibus quicquid insulsum est irridet, Graeca quadam elegantia quicquid barbarum est contemnit. De gravioribus vero argumentis, quanto animi candore, quanta subtilitate, disputat. Idem poëta quam venustus, quam varius."

"Equidem crediderim Thamesin ipsum inter rura illa fluentem, ubi poëta ipse natus erat, alumno suo exemplar suum praetulisse, suum ingenium inspirasse; qui amnis, poëtarum laudibus celebratus, tranquillus at non tardus it, profundus at pellucidus idem est."

How happily he alludes to the work of Huxley:—

"Olim in oceano Australi, ubi rectis 'oculis monstra natantia' vidit, victoriam prope primam, velut alter Perseus, a Medusa reportavit; varias deinceps animantium formas, quasi ab ipsa Gorgone in saxum versas, sagacitate singulari explicavit; vitæ denique universae explorandae vitam suam totam dedicavit."

And we must quote his reference to Joseph Chamberlain's "grand refusal" of the Home Rule Bill, and his allusion to the great statesman's love for orchids.

"Idem cum nova quaedam de Hibernia consilia sibi periculosa esse viderentur, maluit a duce suo, maluit etiam ab amico suo, discedere quam insulas nostras in uno coniunctas, quod ad sese attineret, sinere divelli. Ipse inter senatores suffragiis electos partium suarum ductor constitutus, socios suos quam fortiter ducit, adversarios quam acriter oppugnat! Etenim, quamquam in rerum natura eos potissimum flores diligere dicitur, qui solis a radiis remoti in horto secluso ab aperto caelo delicate defenduntur, ipse vitae publicae solem atque pulverem numquam reformidat, quolibet sub caelo ad dimicationem semper promptus, semper paratus."

But we cannot indulge in quotations which would reach to infinity. In nearly six hundred specimens of the art of Dr. Sandys there is hardly one from which could not be quoted some felicitous phrase or allusion. The letters written in the name of Cambridge are as happy. Among these, specially interesting are the letter to the American Cambridge and that to Lord Morley. The volume is one to which the scholarly reader will recur again and again with interest and admiration.

R. Y. TYRRELL.

PSYCHICAL RESEARCH.

Spirit and Matter before the Bar of Modern Science.

By Dr. Isaac W. Heysinger. Pp. xxviii+433. (London: T. Werner Laurie, 1910.) Price 15s. net.

THE venue of Dr. Heysinger's elaborate though very readable work is the debatable land where three rival powers meet—religion, philosophy, and science. He shows very clearly that these three explainers are to some extent merging; the sharp distinctions are vanishing. Religion is freeing itself from rigid metaphysical dogmas, philosophy is becoming more concrete, and science is becoming more philosophical—is recognising that it cannot provide ultimate explanations of anything. The hope of the future is in a spiritual interpretation of the universe. This interpretation is being forced upon us as the only possible one by the recent advances in psychology and psychical research.

In dealing with spiritualism and occult phenomena generally, Dr. Heysinger takes up a sane and scientific position. He demolishes Hume's argument of "impossibility," quoting Huxley in support of the view that nothing can safely be called impossible outside mathematics and formal logic. As to miracles, either ancient or modern, the really scientific man will say:—"It is a question of evidence; I will make no *a priori* decision, either for or against." The evidence brought forward during the last twenty-five years, by such men as Sir Oliver Lodge, Sir William Crookes, Prof. James, Dr. A. R. Wallace, F. W. H. Myers, and other careful investigators, seems sufficient to establish at least a *prima facie* case. Nevertheless, as the author is careful to point out, it must not be rashly conceded that all psychic phenomena are due to the agency of disembodied spirits; many of these phenomena are probably the work of the subliminal consciousness of some living person, or even of some impersonal world-soul, as many philosophers have thought; but, in many cases, the evidence seems to be sufficient to justify at least a provisional hypo-

thesis that the minds of discarnate people are somehow still producing effects in our material world, by some such process, perhaps, as telepathy. The phenomena are various in kind, from planchette-writing to "apparitions"; but they point in the same direction—to survival of human personality past the wrench of bodily death, and consequently to a spiritual interpretation of experience.

The present reviewer is a member of the Society for Psychical Research (though belonging to its "sceptical wing"), and has devoted much time and thought to the subject for many years. He is dubious about "materialisations," and has lurid opinions about "slate writing by spirits" (or, rather, about the mediums who produce it), but personal experience has convinced him that things do happen, sometimes, which seem inexplicable by orthodox hypotheses. The thing to do is to maintain a rigorously scientific attitude, to observe the phenomena with all possible keenness and precaution against fraud or illusion, and to beware of drawing hasty inferences. Darwin collected facts for many years before he "permitted himself to speculate" concerning explanations. It is perhaps too much to expect that such caution should be shown by psychical researchers, for the subject is more intimately connected with our deepest interests; but it is nevertheless desirable. On the other hand, it can truthfully be said that there is more foolishness shown by the ignorant disbeliever who has never investigated than by the man who has learnt a little and is apt to believe too much.

Dr. Heysinger's book may be warmly recommended. Not the least of its good features is its tremendous armoury of quotations—showing very wide reading—from all the leading investigators.

J. A. H.

PSEUDOCYTOLOGY.

The Plant Cell, its Modifications and Vital Processes. A Manual for Students. By H. A. Haig. Pp. xxx+799. (London: C. Griffin and Co., Ltd., 1910.) Price 6s. net.

WRITERS of elementary text-books might be expected to take some trouble to ensure that their statements are, at any rate as far as possible, accurate and clear. It is a matter of common experience that failures in both respects are not uncommon, and the author of the book before us has compiled a volume which may have some merits, but they are hardly those which the ordinary student will appreciate.

To start with, we may remark that some of the illustrations and photographs are decidedly good, but that the text strikes us as useful chiefly as an exercise in criticism for more advanced students. What are we to make, for instance, of such statements as the following:—"The various forms of 'pits' occurring in the walls (of tracheids) may possibly be of use in sap conduction, but, as a matter of fact, these pits function more as a means of exit for the protoplasm after it has finished its work in the Xylem elements." The confusion (on p. 115) between normal and homotypic nuclear division is absurd. *Germination* of pollen, &c., is wrongly and very misleadingly described as *maturation*.

The development of the angiospermic embryo seems to be confused with that of the fern, and the development of the archegonium (called by the author the oogonium), so far as it is intelligible, is quite incorrect. By the way, the chemiotactic substance emitted from the archegonium is said to be "malic acid or an enzyme."

Few botanists will agree with the view that the homosporous fern-prothallium can be properly, or otherwise than misleadingly, regarded in the light of a "fusion of two prothallia produced by the germination of a potentially double (male and female) spore."

Turning to the part of the book dealing with physiological topics, we find the statement that "Much of the reserve starch in the tuber is formed at first in plastids, and by the time the tuber is full grown, all the plastids have been converted into starch," and, in a footnote, we are further gravely informed that "some of the starch is, however, formed in the tuber by the translocation of carbohydrate from the cells of remote parts." It would have been of interest to know what proportions of the starch do and do not respectively owe their origin to this process.

The above citations, which could easily have been added to, may suffice to exhibit the side of the book which a teacher would find defective or effective according to the use he made of it with his students.

But it may be said that it is not fair to judge a book on the "plant cell" by the same canons that would apply to a work more ostensibly on botany, structural, morphological, and physiological. But, as a matter of fact, the volume is really compiled on these lines, and if it were to be criticised from a cytological standpoint the verdict would be far more disadvantageous. It is a pity that the author has not more fully and carefully surveyed his proposed field of work before writing a book. He has evidently aimed at clearness, and, with more knowledge and care, may still produce a useful contribution.

BIOLOGY AND HUMAN LIFE.

Science from an Easy Chair. By Sir Ray Lankester, K.C.B., F.R.S. Pp. xiii+423. (London: Methuen and Co., Ltd., 1910.) Price 6s.

IN this volume of forty-three collected papers, the popularisation of science surely reaches high-water mark. To be vividly interesting without offending against accuracy, to season an abundance of solid fact with ideas so that the result is an intellectual feast, to illustrate scientific method by stratagem so subtle that the reader does not know he is being educated—that is what Sir Ray Lankester has achieved. He calls it "Science from an Easy Chair," and so be it; but we hope the delighted reader will realise that it is science from a rich experience of lifelong observation and research. Since Huxley, no one has had a deeper influence on British zoology than the author, and even these parerga show the hand of a master.

Some of the papers are good tracts for the times. The first one, entitled "Science and Practice," with the hygienic triumphs at Panama for its text, illustrates what science can do, if it be allowed, for "the establishing of the kingdom of man." The pages

headed "Darwin's Theory Unshaken" should be of use to those who mislead the public by declaring that Darwinism is dead. Other papers show, very briefly, of course, what a living Darwinism has to say about the re-stocking of our villages, the feeble-minded, and various disquieting features of our British birth-rate and death-rate. Apart from such serious questions, it is interesting to notice how many of the papers have a practical point—the poison-vine in England; oysters; the heart's beat; sleep; cholera; sea breezes, mountain air and ozone; oxygen gas for athletes and others; hop blight; phyloxera; clothes moths; and more besides. This is symptomatic of our times, but it is also what we expect from the author of "The Kingdom of Man," that masterly exposition of the sound doctrine that science is for life—*savoir, prévoir, pourvoir!*

Another set of papers deals with subjects in regard to which much progress has been recently made. Among these we find the extraordinary story of the common eel, illustrated by a beautiful coloured drawing which shows the contrast between the mature "silver" eel and the immature "yellow" eel. Another of this type is the account of the human skull from the Chapelle-aux-Saints, in the Corrèze, of the Heidelberg lower jaw, and other recent additions to the data from which the pedigree of man is being patiently worked out. We may also notice the interesting account of the new fresh-water medusoids. A third set—not that we are attempting to classify the forty-three—includes a number of delightful natural-history sketches, such as one on gossamer (where, by the way, it seems to be suggested that the somewhat mysterious parachute-making habit is confined to autumn), or another on honey-dew, or another on the jumping-bean. It seems to be a rotatory easy-chair from which this pleasant science comes, for the author takes the whole world for his province, from microbes to comets, from the land of azure blue to "the starres that wonne on highe," not forgetting either to write of dragons. Quite by itself, with a delightful *note personnel*, is the account of Metchnikoff's day with Tolstoi last year. We hope for many more volumes of the "Easy Chair Series." J. A. T.

ALPINE FLOWERS.

(1) *Alpine Flowers and Gardens, Painted and Described.* By G. Flemwell. Pp. xiv+167. (London: A. and C. Black, 1910.) Price 7s. 6d. net.

(2) *Summer Flowers of the High Alps.* By Somerville Hastings. Pp. xxvi+85. With an index and 39 colour plates from direct colour photographs by the author. (London: J. M. Dent and Sons, Ltd.; New York: E. P. Dutton and Co., n.d.) Price 7s. 6d. net.

(1) A SERIES of twenty well-executed colour prints appears to be the *raison d'être* of this volume on alpine flowers and gardens. The author, who is also the artist, knows his Alps and alpine flowers well, and has contrived to write an interesting and instructive account of the alpine flora in its various aspects. He

is without doubt an enthusiast on the subject, and something of a poet as well, but it is unfortunate that poetical descriptions and Latin names of plants are but ill-assorted companions, and the frequency of the necessary names detracts considerably from the purely æsthetic pleasure of perusing the volume.

The Alps, with their flora, are described at the different seasons of the year, and the beauties of each are duly eulogised; to our thinking, however, the concluding chapters on the abuse and protection of alpine plants, and on some gardens in the Alps, are the most worthy portions of the volume. In the former chapter the good work done by the "Swiss League for the Protection of the Natural Beauties of the Alps" receives well-deserved commendation, for it is largely owing to its efforts that much wanton destruction of alpine plants by the thoughtless tourist and so-called lover of plants is gradually being stopped. In the final chapter the *Thomasia* gardens, near Bex, Rambertia, at the summit of the Rochers de Naye, and Linnæa, at Bourg St. Pierre, are described.

The author wonders why we in England have not attempted to create alpine pastures; he seems to forget the peculiar beauty of English pasture as it is with its buttercups, cowslips, and orchis, daisies and red sorrel. Very possibly he might find that English grasses ere long would hold the field where once his less resisting alpine plants were planted. On laying down this book we cannot but feel that Mr. Flemwell is more at home with the brush than with the pen, and that in writing a book on alpine flowers and gardens he would have produced a more useful volume had his fancies been more restrained.

(2) This work is an interesting contrast to the preceding, and affords an example of the present limitations of the art of colour photography. In a few cases, as, for instance, the plates of *Trifolium alpinum* (plate xi.) and *Saxifraga aizoides* (plate xx.), the results are good, but in many of the others the green of the leaves or of the background has come out badly. Blue and violet flowers are perhaps the least successful; it may be that the original photographs have suffered considerably in reproduction, but from the examples before us we cannot entirely agree with the author that "the pictures are true portraits of the flowers 'at home.'" A page or so of descriptive text accompanies each illustration, and there is a general introduction to the volume occupying sixteen pages which in some places needs textual revision; for instance, we do not imagine that the author means to suggest that Baedeker or Bradshaw is either an efficient or an inefficient plant press.

OUR BOOK SHELF.

A Manual of Practical Farming. By John McLennan. Pp. xi+298. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1910.) Price 6s. 6d. net.

The number of books dealing with special branches of science applied to agriculture is great and is steadily increasing; we have books on agricultural chemistry, botany and entomology, on the soil, on

fertilisers and feeding-stuffs; there are also a number of large treatises and encyclopædias on agriculture. But only few writers have attempted to produce a small, handy book on practical agriculture dealing with the subject as a whole; the majority have been deterred by the difficulty of reducing so wide and complex a subject to the necessary small dimensions.

Mr. McLennan has essayed the task that many have avoided. His aim has been to give the farmer useful practical instruction, and also to set forth "the results of scientific research as far as known and as far as they square with practical experience." In the first object he will probably be found to have succeeded; he clearly knows the men for whom he is writing, and furnishes facts and illustrations that will be useful and will also show what has been accomplished by competent workers. The average American farmer does not yet get all he might out of his land. To some extent the untrained amateur is a factor in the case, as he is beginning to be in England, and our author has something to say about the would-be poultry farmer who came out from the city without any knowledge, but "full of literature on the subject, built elaborate houses, runs, brooders, and incubators, purchased high-priced eggs and costly fowls. He could figure out a comfortable living for himself and family, with freedom from city cares. He usually remained two years; the feed bills exceeded the receipts for eggs; the roup got his hens, and lice got his chickens; his enthusiasm waned, and he went back to his counter."

In his second object—the presentation of the scientific aspects of agriculture—our author is less successful. He shocks us on the very first page by saying that "the soil and the subsoil are primarily composed of molecules; that is, minute grains of rock of varying size and forms. These are simply a result of the action of the elements, such as frost, rain, wind, and heat, in breaking down and disintegrating the surface rock." This is a typical example of the "science" set out for the reader. If the author could persuade some scientific friend to read through the book and make the necessary alterations for the second edition its value would be much enhanced.

Leitfaden der Mineralogie. By Prof. Julius Ruska. Pp. viii+144. (Leipzig: Quelle und Meyer, 1910.) Price 2 marks.

THIS "Guide to Mineralogy" is intended for the use of younger boys in German schools who have not yet received instruction in mathematics, physics, and chemistry. Although it is customary to defer the study of mineralogy until after the latter subjects have been started, it is the author's belief that it is a subject that of itself can be made intelligible and interesting to younger boys. After a brief introduction of four pages, in which hardness and specific gravity are dealt with, he plunges into the subject, explaining such terms and principles as are necessary when occasion arises. The order in which the more common minerals are described follows the usual classification into elements, sulphides, oxides, carbonates, &c. Commencing with sulphur, an opportunity is given to explain some of the principles of crystallography in connection with the rhombic system of crystals; and under the sulphides, galena, zincblende, and iron-pyrites, the three important classes of the cubic system are described. A large amount of information is given in a very concentrated form, and possibly such an essence of mineralogy might not agree with quite young boys.

A striking feature of the book is its wealth of illustrations. Besides the sixty-nine figures on the coloured

plates, there are 215 figures in the text, all of which appear to have been specially drawn for the book, and many are quite original. The coloured figures are reproduced by the three-colour process, and are on the whole satisfactory, though one or two are scarcely recognisable. The text-figures include line-drawings of the forms of crystals, and excellent half-tones representing actual crystals and mineral specimens.

To the English student of mineralogy such a book might be used with advantage as a German reading book. The sentences are short and not involved.

A Synopsis of the Orthoptera of Western Europe. By Dr. Malcolm Burr. Pp. 160. (London: Oliver Janson, 1910.) Price 3s.

THE present work appeared in instalments from 1903 to 1909 in the *Entomologist's Record*, and in its present form will be extremely useful as an introduction to the subject, and as a tourist's guide, especially as its small size renders it more convenient than Brunner von Wattenwyl's work on European Orthoptera, or that of Tümpel's on those of Central Europe. Dr. Burr's work includes all the countries west of (and including) the neighbourhood of Vienna. For eastern Europe we have (for those who can use it) the great Russian expansion of Tümpel's book by Jacobsen and Bianchi, which includes all the Orthoptera of central and eastern Europe, and Palæartic Asia.

Dr. Burr has given short but careful descriptions of genera and species, and also tables of species under the genera, and he has very properly included the more important naturalised species, such as *Periplaneta australasiae*. Orthoptera are, however, very liable to be carried about from one place to another, and mere casual visitors are very properly only mentioned by name, as on pp. 17, 18, &c. A long-legged Japanese grasshopper, *Diastramma marmorata*, not mentioned by Dr. Burr, has several times been captured recently in London.

Prehistoric Man. By Joseph McCabe. Pp. viii + 128. (London: Milner and Co., Ltd., n.d.) Price 1s. net.

THIS book gives an excellent popular exposition of the present state of our knowledge of prehistoric anthropology. The chapters on Palæolithic man and his implements are full of interest. Within the last few years a considerable number of more or less complete Palæolithic skeletons have been discovered in France and elsewhere, and great additions have been made to our knowledge of man in this distant epoch. In this little volume will be found a lucid description of the latest discoveries. The author is not content to give a mere list of more or less disconnected data, but always endeavours to weave his material into a continuous evolutionary story. This tendency, though admirable in a popular writer, appears in some cases to lead to a slight distortion of the facts in order to make them fit into the theory. For example, the Palæolithic race represented by the Grimaldi, Galleyhill, and other remains is assigned to the later Palæolithic, though the geological evidence appears to be pretty clear that these remains belong at least to the middle Palæolithic. The Gibraltar skull has recently been shown by Dr. Keith to have been the first Palæolithic skull found (1843) in Europe, and to represent one of the most primitive races. This discovery does not appear to have been known to the author.

The chapters on the Neolithic and Bronze ages show that our knowledge of these periods is still in a very unsatisfactory condition, but that is not, of course, the fault of the author of this work.

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- (1) *Metallografia applicata ai Prodotti Siderurgici.* By Umberto Savoia. Pp. xvi + 205. (Milan: U. Hoepli, 1909.) Price 3.50 lire.
- (2) *Lo Zinco.* By Prof. R. Musu-Boy. Pp. xiv + 219. (Milan: U. Hoepli, 1909.) Price 3.50 lire.

BOTH these little treatises belong to the excellent series of "Manuali Hoepli," and, like other members of the series, are written by specialists in their respective subjects. They possess the merit, common to practically all other works of this series, of imparting in the fewest possible words the most essential facts and principles. The treatise on the metallography of iron is essentially a practical guide for the laboratory worker. Its author was sent from Italy to study the methods adopted in the laboratories of Le Chatelier, Fremont, and Guillet, and on returning home established the metallographical laboratory of the Milan steel works. The author has selected for description the methods he has found best suited in practice, and has illustrated the work by nearly 100 of his own microphotographs of steel in its different states.

The treatise on zinc is of a more general character, and calls for little comment. It deals with the ores, methods of extraction, history, statistics, and uses of the metal.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Ooze and Irrigation.

MAY I be allowed to reply to some inquiries?

(1) It is thought by some that my remarks applied especially to foreign lands. Let me point out that the ooze of our English rivers is often just as fertile as that of the Nile, and that the number of annelids found in the ooze is enormous. This may be illustrated by reference to the Thames. The late Frank Buckland tells us that when he kept fish he "fed them with red worms collected from the Thames mud. These worms cost 4s. 6d. a quart; the price of Thames worms, like everything else, has increased considerably." Now whether these worms were true annelids, or merely the larvæ of insects, the point is the same. In the case of Tubifex and its allies, a quart would mean many hundreds of thousands. Mr. Shrubsole, myself, and others, have frequently examined the ooze from various parts of the Thames, and the number of different species of mud-frequenting worms is very great, while it is utterly impossible to estimate the total of individuals.

(2) Another interesting point is continually coming under my observation. When a number of annelids taken from the ooze is examined, it is found that the tail, which is in constant rhythmical motion in the water, is festooned with numbers of symbiotic vorticels. These move to and fro in the water, and are constantly capturing the bacteria and other lowly forms of life with which the putrid water is laden. So far as I am aware, no biologist has ever given this fact, or the action of the vorticels, any detailed study with a view to ascertaining their action, and their relation to their host on the one hand, and the water and soil on the other.

(3) It would be of great value to science if someone would carefully examine the ooze before and after passing through the bodies of annelids, and ascertain what is the nature of the change that has taken place. Is there any difference between the quantity of nitrogen in pure mud and that which has been digested?

These and many other problems having a vital bearing on agriculture need attention, and it is to be hoped that

at least a small portion of the time of the new commission will be devoted to a subject of such importance.

Malvern.

HILDERIC FRIEND.

In some interesting remarks upon this subject (*NATURE*, pp. 427, 489), the Rev. Hilderic Friend suggests—and I believe he is correct in assuming for the first time—that the alluvial mud of such a river as the Nile derives its fertility, not from the nature of the sediment itself, as usually supposed, nor entirely from bacteria, but from the multitudinous remains of annelids that live in the mud.

That there is "need for careful study of the alluvium of rivers from this point of view," and any other, is to be freely admitted. If we except the study of pre- and post-Pleistocene deposits carried out by Mr. Clement Reid, and summarised in his "Origin of the British Flora," there is scarcely another work that can be mentioned dealing with the subject. It is true that lately the Geological Survey have become alive to the necessity of introducing details as to the fertility or otherwise of the soils derived from the geological formations surveyed. But these are isolated, and are but the necessary outcome of previous activities of agricultural experimental stations. But neither have these latter undertaken any systematic study of the character and constituents of river alluvium. The nearest approach to a treatise on the subject is Darwin's "Earthworms," and his work, whilst dealing with terrestrial forms and their influence in fertilising, renewing, and enriching the soil, strangely enough bears out Mr. Hilderic Friend's suggestion as to the cause of alluvial fertility.

For without earthworms, what would the soil be? *Ergo*, without fluvial annelids, what would the alluvium be—but a sterile accumulation of sand? Here we may add that where worms are too plentiful on land bad results follow, so too we may assume, accepting the worm-fertilising theory as correct, that an excess of annelids tends to cause, as on land, putrefaction, as may be illustrated by the case of ponds overstocked with blood-worms, causing the appearance of blood, which was a fruitful source of superstition in former days, notably at Garendon in this district.

But apart from theoretical considerations, based on the hypothesis that *Tubifex* and other annelids do tend to increase fertility, we may attempt to draw an analogy with former conditions, and so to some extent corroborate Mr. Friend's very probable theory.

All who have made any study of the palæontology of the Trias (referring here specially to Britain) are familiar with the extreme barrenness of great thicknesses of both Lower and Upper Keuper relieved alone by certain limited horizons at which a definite flora and fauna is to be met with.

It has been assumed, and there is apparently no great reason against this on a purely faunistic basis, that the Trias is a desert formation; but on other grounds, and also from a study of the flora and fauna, I have come to the conclusion (during a study of the Midland Trias, in which I am aided by a Government grant from the Royal Society) that the whole of the Triassic formation is a *delta* formation, in other words, that from the Bunter (first suggested to be a delta deposit by Prof. Bonney) upwards conditions similar to those in the Nile area prevailed during Triassic times, and were responsible for its formation. Locally, wind acted on rocks, but formed no deposit.

Now it is a remarkable fact that in the deposits in the British Keuper, in which alone plant-remains have so far been discovered, or where carbonaceous deposits occur, that a common associate of the plant-remains is a form of track or casting which has usually been ascribed to annelids or crustacea; and we must not overlook the fact that annelids alone are not the predominating component of the fauna of alluvial tracts, but Protozoa in their myriads, occasionally sponges, Crustacea (minute and large), insects, scorpions, and molluscs form a large proportion of the bulk of alluvial deposits. Of these, annelids and Crustacea are most likely to be preserved, and are most often discovered in the rocks. So that it seems that only where annelid life in Triassic times was abundant was plant-life in evidence, just as now only where the Nile is alluvial does it yield productive results, due, apparently, to the same cause. The analogy I have drawn

strengthens Mr. Friend's theory, and, moreover, if the worms be found to be actually conducive to fertility (by experiment or otherwise), my case for the delta-origin of the Trias will receive additional confirmation.

It would seem to us that no more fitting study could be made by the lake surveys that are now going on in different parts of the kingdom than the very probable connection between worms and alluvium, for it seems that Mr. Friend has more or less proved his case without much need for argument. This affords another instance of the utility of beings hitherto supposed to have no useful part to play in the history of time or things.

July 2.

A. R. HORWOOD.

A Singular Mammal called "Orocoma."

In a letter of the Jesuit Father Cat at Buenos Aires, dated May 18, 1729 ("Lettres difiantes," éd. Lyon, 1819, tom. v., p. 466), the following passage occurs:—

"Outre ces animaux, il en est un qui m'a paru fort singulier: c'est celui que les Moxes appellent *orocoma* [or *ocorome*, according to the "Abrégé d'une Relation espagnole," in the same tome, p. 66]. Il a le poil roux, le museau pointu, et les dents larges et tranchantes. Lorsque cet animal, qui est de la grandeur d'un gros chien, aperçoit un Indien armé, il prend aussitôt la fuite; mais s'il le voit sans armes, il l'attaque, le reverse par terre, le foule à plusieurs reprises, et quand il le croit mort, il le couvre de feuilles et de branches d'arbres, et se retire. L'Indien, qui connoit l'instinct de cette bête, se lève dès qu'elle a disparu, et cherche son salut dans la fuite, ou monte sur un arbre, d'où il considère à loisir tout ce qui se passe. L'*orocoma* ne tarde pas à revenir accompagné d'un tigre qu'il semble avoir invité à venir partager sa proie; mais ne la trouvant plus, il pousse des hurlemens épouvantables, regarde son compagnon d'un air triste et désolé, et semble lui témoigner le regret qu'il a de lui avoir fait faire un voyage inutile."

In asking what mammalian species this "*orocoma*" is, and whether there is the slightest foundation for this story, I fully know I am showing my great ignorance. I hope the Editor and his readers will forgive me, taking into account the entire absence of a scientific reference library in this part.

KUMAGUSU MINAKATA.

Tanabe, Kii, Japan, June 15.

Pwdre Ser.

WHEN a boy, at the latter end of the 'thirties of last century, I was told by a well-known man of the name of West—lock-keeper on the river Witham at Lincoln—that he had seen a star fall on the south common there, where he had a cow grazing, and that, on going up to it, he found nothing but a lump of jelly. At this distance of time I cannot recall all he said, but I remember he described the object as shining and as about the size of a plate. I have no recollection of his calling it luminous.

Up to this time I have always thought my informant was under an illusion, but, after Mr. McKenny Hughes's article, there seems to be something more than I was aware of in the account he gave me.

Highfield, Gainsborough, July 2.

F. M. BURTON.

Curve Tracing and Curve Analysis.

I HAVE unwittingly done an injustice to Mr. R. H. Duncan's book on "Practical Curve Tracing" (vol. lxxxiii., p. 461). I judged by the review of it in *NATURE* of June 9 that it deals only with the subject indicated by its title. After writing to you regretting that no author deals with practical curve analysis, I bought Mr. Duncan's book, and find that, after describing each class of curve and how to trace it, he gives clear directions for reversing the process and deducing a formula from a given curve. So far as it goes, the book excellently meets the want which I expressed, and my only regret is that the author has not developed the subject a little further.

A. P. TROTTER.

London, July 5.

THE AKIKUYU OF EAST AFRICA.¹

IT may be said at once that this is a very valuable contribution to the ethnology of Africa. In its thoroughness it recalls work characteristic of the latest German school. A trifling defect is the trick which both authors have of separating their African words into syllables, no doubt to facilitate immediate pronunciation by the unlearned; but, although this plan might be recommended in certain important words at their first appearance, it becomes irritating to the eye when perpetuated throughout the book, and sometimes the separation of syllables cuts athwart the etymology of root-words. The same remarks apply to the introduction of the apostrophe after the initial "m" or "n." To anyone really versed in Bantu studies this apostrophe is anathema, as it is quite unnecessary. A writer fastidious about Bantu prefixes supplies a *hyphen* between the prefix and the root, and not an *apostrophe*.

Perhaps, without ungraciousness, another criticism might be added—that the book would have been even more valuable than it is if the authors had either been more widely read in regard to other African studies or had submitted their MS. to a specialist in comparative African ethnology in England or Germany, who could have explained many points which are acknowledged as obscure by the authors, and enabled them to have instituted the most interesting comparisons. The book is such a good one, so likely to take a permanent place as a standard work, that it is to be hoped in a further edition these suggestions may be taken note of.

The Akikuyu (*A-* is a corruption of the plural prefix, *Ba-*, *ki-* is probably the eighth prefix often applied to "languages," "sorts," or "kinds," and the root of the name is really *kuyu*) are a collection of clans of Bantu-speaking negroes which inhabit the elevated plateaus of equatorial East Africa on the eastern side of the great Rift Valley. In language, and perhaps partly in racial origin, they are akin to the Bantu tribes round the slopes of Mount Kenia and the riverside people of the Tana River; also, less markedly, to the A-kamba of the East African plains between these highlands and the sea coast. The Akikuyu specially are greatly interfused with Masai blood, so that many of them have a strong facial resemblance to the Masai, though not so tall in stature. It is very seldom that one meets amongst them the rather prognathous Pigmy type observable here and there amongst the nomad Ndorobo, who dwell on the fringe of their territory to the north. Obviously, they are a remnant of the Bantu invasion of East Africa, of a generalised negro type which at one time or another has intermixed very freely with the Masai, retaining, however, their own Bantu dialect. This, by some centuries of comparative isolation, has become distinctly peculiar in the form of its prefixes and some elements of its grammar. The dense forests of their plateau country have enabled them to resist complete extermination and absorption at the hands of the Masai, when some century ago that bold offshoot of the Nilotic peoples overran the countries between the Victoria Nyanza and the Indian Ocean.

According to the traditions collected by Mr. and Mrs. Routledge, the Akikuyu were preceded in their occupation of these forests by a diminutive race known as the Agumba, and also by the Ndorobo. The last-named is a nomadic people of very mixed elements—composed partly of Bushmanlike Pigmies

and degraded Hamites—which ranges in scattered hunting colonies all over equatorial East Africa. The Agumba may have been the Bushmanlike Pigmy race which seems to have inhabited East Africa in ancient times, and to have left many traces of its presence in existing tribes between Abyssinia on the north and Nyasa on the south. Or, again, the Agumba may have been a branch of the Congo Pigmies, the physical type of which can apparently be traced as far east at the present day as the western slopes of



FIG. 1.—Costume of a Neophyte as he dances prior to Initiation to Manhood. From "With a Prehistoric People."

Mount Elgon. According to the traditions collected by the authors, these Agumba finally went westwards to "a big forest."

Mr. and Mrs. Routledge think that the root-word *kuyu* refers to the great fig-trees which are abundant in the forests of the Akikuyu country, fig-trees, probably, that produce bark cloth. But it may also be a word meaning "up above," the lofty region, from the Bantu root *kulu*, *gulu*, or *zulu*, the letter *l* being

¹ "With a Prehistoric People. The Akikuyu of British East Africa." Being some Account of the Method of Life and Mode of Thought found existent amongst a Nation on its First Contact with European Civilisation. By W. Scoresby Routledge and Katherine Routledge (born Pease). Pp. xxxii+392. (London: Edward Arnold, 1910.) Price 21s. net.

much disliked in many of these East African Bantu dialects, and either dropped or changed into a *y* sound. Certainly, according to the traditions of the Akikuyu, their upland country was until a hundred years ago (more or less) a region of unbroken forest (we may add, West African in its flora and fauna) which was nourished by an exceedingly heavy rainfall. This great equatorial forest of Africa obviously extended at one period right across the continent to the shores of the Indian Ocean. It has left traces of its peculiar flora and even fauna in the islands of Zanzibar and Pemba, and on the north coast of Lake Nyasa. This must have been a forest which contained not only the West African antelopes and pigs, birds, spiders, and butterflies, still found in Kikuyuland, but the gorilla and chimpanzee, and other types which once ranged uninterruptedly between West Africa and Further India. Consequently, Kikuyu-

very well known for his own ethnographical and linguistic studies of East African peoples.

Specially noteworthy are the illustrations and description of the Kikuyu "bull-roarer" used in various ceremonies, the modelling of fetishes (human figures), blacksmith's work, and initiation ceremonies, with their appropriate dances and costumes. In the interesting article on the medicine-man, the etymology of his name—Mundu Mugū—is not quite rightly hit off (in the quotation from Mr. McGregor). Mugū is really a contraction of the prefix and root of the widespread Bantu word *Mu-logu*, or *Mu-logo*, meaning magician, either good or bad. This root *-logo* ranges mainly over western Bantu Africa, and assumes sometimes very altered forms, such as *-doki*, *-lozi*, *-roho*. It is a parallel to the equally widespread root *nganga*; but *-logo* has to do rather with the evil side of magic or of spiritual influence, while *nganga* may well have been in its origin applied to some new wisdom from the north, something to do with iron-working or superior knowledge of a practical, material kind. (For instance, *Bu-nganga* in some Bantu languages means "gunpowder.")

There is an appendix to the book which gives an interesting note by the late Colonel J. A. Grant on iron-smelting in East Africa.

In their bibliography dealing with the Kikuyu and their language, the authors omit any reference to the present writer's vocabulary of Kikuyu in his work on the Uganda Protectorate. For various reasons, this vocabulary, though short, is

of interest, as it represents the dialect of the westernmost part of the Kikuyu range, and is therefore interesting for comparison with the nearest (but very dissimilar) Bantu dialects of the regions immediately to the east of the Victoria Nyanza.

H. H. JOHNSTON.



FIG. 2.—A Medicine Man. From "With a Prehistoric People."

land, from the point of view of palæontology, would, if there were any Tertiary or alluvial deposits (dried-up lakes, &c.), probably yield as interesting results in its exploration from that point of view as in ethnology and botany.

The book under review, besides giving these interesting details as to the traditions and chronology of the Akikuyu, describes the people and their pursuits, their food and cookery, agriculture, domestic animals, arts and crafts, warfare and weapons, blood-drinking, betrothal and marriage, and general position of women, dances, initiation ceremonies, religion, conceptions of God, notions as to life after death, medicine, folk-lore; and also the position of this interesting people under the new British Administration. The authors have received much assistance from Mr. C. W. Hobley, one of the principal officials of East Africa, who is so

of interest, as it represents the dialect of the westernmost part of the Kikuyu range, and is therefore interesting for comparison with the nearest (but very dissimilar) Bantu dialects of the regions immediately to the east of the Victoria Nyanza.

H. H. JOHNSTON.

TEMPERATURES IN THE FREE ATMOSPHERE.¹

DR. WAGNER has given us a comprehensive discussion of the temperature results obtained with registering balloons in Europe during the period July, 1902-June, 1907, and has incidentally furnished an excellent practical tribute to the collective publication

¹ "Die Temperatur Verhältnisse in der freien Atmosphäre [Ergebnisse der internationalen unbemannter Ballonaufstiege]." By Dr. Arthur Wagner. Beiträge zur Physik der freien Atmosphäre. Bd. iii. Heft 2-3. (Leipzig: Verlag von Otto Nemnich.)

of the international observations under the direction of Prof. Hergesell. The author's primary object was to deal with the annual variation of temperature, but he has found room also for the consideration of many associated questions. Altogether 380 ascents were considered, all of which reached 8 km. and twenty-nine of which reached 16 km. Doubtful observations were rejected.

The principal features in the annual variation of temperature are as follows. From the surface up to 3 km. the date of minimum temperature gets later and the annual range decreases by about 4° C. From 3 to 10 km. the minimum temperature occurs at the beginning of March, but at still greater heights there is a comparatively sudden jump back to the beginning of January. The annual range increases from 3 to 7-8 km. by about 4° C., then decreases up to 10 km. by about 6° C., and finally remains nearly constant from 11 to 16 km. The results agree, on the whole, with those obtained by the present writer and Harwood from a slightly different period of observation. Dr. Wagner deduces, from a consideration of the first two terms of the Fourier series expressing the variation, that the difference between the maximum and the mean temperature exceeds that between the mean and the minimum, and that this asymmetry increases with height; it appears doubtful if it is justifiable to neglect the third term, which increases with height and tends to diminish the asymmetry mentioned.

The effect of water vapour on the gradient of temperature is shown in the differences between winter and summer. The following table gives the gradients for summer (June, July, August) and winter (December, January, February), (1) from the present paper; (2) from the report of the present writer and Harwood; (3) for ascending saturated air:—

Height km.	1)		2)		3)	
	Winter	Summer	Winter	Summer	Winter	Summer
1-2	3'3	5'3	2'2	5'6	5'6	5'1
2-3	4'5	5'0	4'3	5'6	6'5	5'4
3-4	5'7	5'6	5'6	5'4	6'8	5'5
4-5	6'2	6'1	6'5	6'0	7'3	6'0
5-6	7'0	6'6	7'0	6'3	7'9	6'5
6-7	6'9	6'9	7'3	7'1	8'6	7'1
7-8	7'0	7'4	7'6	7'3	9'0	8'0
8-9	5'9	7'2	6'6	7'3	9'3	8'5
9-10	5'0	6'1	5'1	7'1	9'6	9'0
10-11	3'5	3'9	3'6	4'3	—	—

From 3 to 8 km. the gradient is less in summer than in winter, while the difference between the "saturated" adiabatic gradients is greatest from 2 to 8 km. The approximation to the adiabatic state is closer in summer than in winter.

Dr. Wagner attributes the annual variation to convection and conduction from the earth's surface, to condensation of water vapour, and to radiation, solar and terrestrial. A further cause ought to be included, viz. the transference of energy in a horizontal direction. The effect of conduction might fairly be neglected, since even at 100 m., if conduction alone were active, the amplitude of the yearly variation would be less than 1/100th of the amplitude at the surface. The decrease of the amplitude up to 3 km. appears to be a result of the action typified by v. Bezold's law. The increase above 3 km. is probably rightly attributed to the effect of the increased water vapour on the average gradient in the summer months. Condensation of water vapour is, moreover, held responsible for the relatively slow cooling of the middle layers from summer to autumn, but it is probable that the above-mentioned horizontal transference of energy and the radiation also contribute to

this effect. The radiation tends to increase the temperature of the earth and lower atmosphere when the amount of water vapour is increased, if the effect is not counterbalanced by increased reflection of solar radiation from clouds. In this connection it may be pointed out that there is no experimental evidence to justify the assumption repeatedly made that the air between 3-4 and 8 km. may be regarded as diathermanous. At 5 km. the average vapour pressure is not much below 1 mm., and the experiments of Paschen and Rubens and Aschkinass show that for a vapour pressure of 1 mm. half the radiation of a full radiator between 12 and 20μ would be absorbed by a path of about 400 m., and half that between 5 and 8μ by a path of 50 m., while the CO₂ absorption would add slightly to the absorption in the former region; and these results are affected but little by the later experiments of Scheiner and von Bahr.

Dr. Wagner finds that the departures of the temperature in different localities from the general mean values are small except for south Europe, where the temperature is considerably above the mean in the convective region, and for east Europe, where the converse is the case. The peculiarity in the latter region is largely due to the influence of Pavlovsk, lat. 60°, which is the only station in the region besides Koutchino, lat. 56°.

The mean value of H_c, the height at which the advective region is reached, for different regions is as follows:—

Central	North	South	East	West Europe
10'54	10'18	11'07	10'22	10'62 km.

Dr. Wagner deduces from these results that the value of H_c decreases from ocean to continent, as well as from equator to pole. It is true that radiation effects alone would tend to make H_c less over a dry continental area than over the ocean at the same or a higher temperature, but it is doubtful if such an effect can be traced in these figures, according to which north Europe (Berlin and Hamburg) has a lower value than east Europe (Pavlovsk and Koutchino).

In considering the variation of temperature with the pressure distribution, Dr. Wagner wisely adopts the plan of eliminating the annual variation, and, as he uses no ascents from east or south Europe, the correction for the local variation of temperature is inconsiderable. It ought, however, to be remembered that, although the mean temperatures of the year are not far different, say, for Paris and Vienna, the corrections to be applied to ascents made in the same month at those two places are not necessarily the same. Dr. Wagner's results corroborate those previously found in proving that cyclones are in general colder than anticyclones, but a consideration of special cases led to the important conclusion that for rapidly moving systems these conditions were reversed, a result foreshadowed by the work of Hanzlik.

The mean temperature in October at 2 km. over Berlin on p. 95 is wrongly given as 0'6° C., and this error is mainly responsible for the peculiar change in the half-yearly variation at that height. In differentiating Δ*b* on p. 99 the variation of T is not negligible. It is simpler to proceed from the fundamental equations, which lead to the result that the height at which Δ*b* is a maximum is given by

$$h = RT_M^2 / T_h = RT_0 \text{ nearly,}$$

where

$$\frac{h}{T_M^2} = \int_0^h \frac{dh}{T^2}$$

and T_h is the temperature at the height *h* and T₀ that at the surface.

The paper includes useful tables giving the pressure and the density at different heights, the variation of temperature on surfaces of equal pressure, and the temperatures in different quadrants of cyclones and anticyclones.

It is full of interest, and stands as an example of the "thorough" policy of Prof. Hann, to whom, indeed, it would not do discredit. E. GOLD.

THE GULF STREAM DRIFT AND THE WEATHER OF THE BRITISH ISLES.

ALTHOUGH it has been known for very many years that the climate of these islands and of northern Europe generally is far milder than it would otherwise have been owing to a large body of warm water flowing past its shores from the south-west, it is only within recent years that attempts have been made to trace any detailed connection between the state of the Gulf Stream Drift¹ and the weather.

Now that systematic hydrographic observations have been accumulating for a number of years it is becoming possible to attack seriously this interesting problem, and the results so far obtained certainly look promising.

The immediate causes of the weather in the British Isles are undoubtedly to be sought in the various atmospheric disturbances which arrive from the Atlantic, but there can be no doubt that another very important factor to be considered is the temperature of the adjacent seas. This is influenced by the Gulf Stream Drift.

The problem is, however, complicated by the fact that there is some doubt as to whether the Gulf Stream Drift may not be a direct result of the atmospheric circulation in the huge cyclonic system which rests over the North Atlantic, with its centre at Iceland.

Be that as it may, there is undoubtedly a very intimate connection between the oceanic and atmospheric circulations in the North Atlantic region, so that if the atmospheric circulation becomes more vigorous, the Gulf Stream Drift moves faster, and *vice versa*. This is well shown in a paper by Meinardus in the *Meteorologische Zeitschrift*, xxii., 398, 1905. Such a connection was, however, to be expected, not only if the Gulf Stream Drift were directly due to the atmospheric circulation, but also if, as seems more probable, both were due to the same cause, namely, the excessive cooling at the poles of the earth, coupled with the rotation of the earth about its axis. On this view both the oceanic and atmospheric circulations are of the nature of convection currents, and primarily due to the same cause, but in the course of ages these two distinct circulations have so adjusted themselves that any change in the one rapidly causes a corresponding change in the other.

It seems probable, therefore, that the Gulf Stream Drift, owing to its inertia and its great heat capacity, should have a similar effect to that of the flywheel of an engine, and tend to obliterate the disturbances due to the more unstable and variable atmospheric circulation. In this case the Gulf Stream Drift should have a very considerable regulating influence on the general type of weather prevailing in the British Isles.

Let us consider the probable influence on the temperature and on the rainfall. In the winter the temperature of the Gulf Stream Drift is higher than that of the land, while in the summer it is lower.

¹ The warm water flowing round the British Isles to Scandinavia used to be called the Gulf Stream. The Gulf Stream proper is now considered not to extend further east than Newfoundland, while its fan-like extension which crosses over to Europe is known as the Gulf Stream Drift.

Consequently during the winter time the winds blowing from the Atlantic tend to raise the temperature of the land, while in the summer they tend to lower it, and it is clear that variations in the temperature of the Drift must be expected to affect the temperature of the winds blowing over it, and consequently the temperature on land as well. Such effects on the land temperature will probably be far more important in the winter than in the summer, owing to the relatively greater power of the solar radiation during the summer.

The effect on the rainfall will be equally marked, for the amount of moisture carried by the winds and available for precipitation as rain depends largely upon the temperature of the sea over which they have blown. The warmer the sea the more moisture is taken up and the more precipitation may be expected on the neighbouring land.

In this way, for instance, it is possible to account for the low rainfall last year in the western parts of Great Britain and Ireland—parts which are usually very wet—for during 1909 the temperature of the Gulf Stream Drift was below the normal, and hence the winds blowing from it were not so heavily charged with moisture as usual.

The somewhat lower land temperature seems to have just about compensated for this by the time the winds reached the east of Great Britain, so that the rain fell there instead of in the west. The result of this was an abnormally high rainfall in the east, and with the low one in the west the rainfall over the British Isles as a whole was exactly equal to the average.

It will be very interesting to see if this is what may be generally expected in years when the Gulf Stream Drift is weaker than usual.

There is clearly a possibility of being able to predict the general character of the weather in these islands several months in advance from the results of hydrographic observations. It is, of course, a very complex question, and at present one cannot be too confident, but I am certainly of the opinion that such predictions will be possible.

In another place I have thrown out the suggestion that, as the February hydrographic observations made in the Irish Sea this year were almost identical with those of last year, there was some probability that the weather during 1910 would be somewhat similar to that of last year. It was never expected that the suggestion would attract the attention it has done, but it is interesting to note that the May hydrographic observations are also very similar to those of last year—if anything, even less favourable.

H. BASSETT.

PROF. G. V. SCHIAPARELLI.

PROF. SCHIAPARELLI, whose death we briefly announced last week, for many years occupied a prominent position in the world of science. Half a century has passed since he began his career as second assistant in the Brera Observatory of Milan, and nearly as many since he was elected to fill the position of director. In that position he exhibited much energy, and increased the reputation of the observatory. But his greatest success came to him early, and though he worked long and diligently, giving evidence of patient industry and practical skill as an observer, he will be remembered mainly for having satisfactorily established the connection between meteors and comets. It was a brilliant discovery founded on acute penetration and sound reasoning. It was, moreover, a discovery that the public were able to appreciate, and by popular applause he was lifted at once into the front rank

of astronomers. He was entitled to all the renown which he acquired. For though others may have entertained similar views and expressed them more or less distinctly, they fell short of demonstration. Prof. Kirkwood, for example, had put the pertinent question, "May not our periodic meteors be the débris of ancient but now disintegrated comets, whose matter has become distributed around their orbits?" At a moment when we are remembering with gratitude the eminent services of the distinguished Italian astronomer, there is no necessity to stir old controversies; but when so many, from the time of Halley, have been so near a solution of the puzzle, it may quicken our appreciation of his genius to remember that he carried the question one step beyond his predecessors, removing it from the grounds of conjecture to the certainty of conviction. In this connection it is not out of place to recall the remarkable series of letters that Schiaparelli addressed to Father Secchi in 1866, models of close reasoning leading to a successful result. But as is frequently the case when a brilliant discovery is made, it is possible to detect a certain amount of luck contributing to the final outcome.

Schiaparelli's crowning success was the recognition of the similarity of the orbit of the August meteors with that of the comet of 1862. That this particular comet of long period should have returned to the sun only a few years previously to the discovery, and that its path had been well determined, was a most fortunate circumstance, and one that not only strengthened the evidence of identification, but affected the popular estimate of the certainty of the result. Similarly, with the near coincidence of the return of the comet of 1866 with the great November shower, and less conspicuously that of the 1861 comet with the April Lyrids, astronomers had the advantage of dealing with trustworthy elements. If these comets had passed through perihelion without being observed an important link would have been wanting in the chain of evidence. As it is, these earliest cases of identification are the most conspicuous and the surest examples of a relation, as significant as it was unexpected. For his part in the happy result Schiaparelli was deservedly awarded the gold medal of the Royal Astronomical Society in 1872.

In some other directions the work of Schiaparelli has not received the same complete recognition. In 1877, when Mars was in a favourable position for observation, he announced the detection of the famous canals which have since been the subject of fierce dispute and controversy. Whether these "canals," interrupting the continental areas, are existent and permanent phenomena has been much questioned; though the doubts expressed do not relate so much to the existence as to the interpretation that has been placed upon them. Schiaparelli regarded the "gemination" of the canals as a periodical phenomenon depending on the seasons, and was firmly convinced of their alternate obliteration and reappearance. The only point on which we need insist here is the effect that his industry and acuteness of vision have had on the development of astronomical observation. It has been the means of attracting a vast amount of attention to the planet, has enormously increased the activity of observation, and led to the training of a class of observers, who have taken up the subject of planetary markings with avidity. Schiaparelli has written much on the appearance of Mars, and a very large literature has collected round this subject, due largely to his initiative.

Another subject with which his name will be connected is the attempt to derive the times of rotation of Mercury and Venus. Our information on this topic

is vague, and the data uncertain. Notwithstanding the care bestowed on the observations, and the plausible nature of his deductions, his results have been accepted with some hesitation. From his patient watching, and from the length of time devoted to the study, his conclusion that Mercury turns on its axis in the same time that it revolves round the sun is entitled to very great consideration. This result was published in 1882, and it was not until some years later, 1890, that he declared that Venus behaved in a similar manner to Mercury. The long interval showed that Schiaparelli did not jump to conclusions, and the limits he assigned to the rotation, between six and nine months, prove that he was not inclined to accept a hypothesis, however specious, in favour of the results of observation.

These three conclusions, having reference to the connection of meteors with comets, to the surface markings of Mars, and to the velocity of rotation of the interior planets, are no small achievement in the life of one astronomer. It need not be said that they do not exhaust his scientific activity. A vast amount of routine work, of double-star measurement, and of the position of planets, stands to his credit. He was the author of some 250 papers in various journals, and his memory is as much entitled to our respectful homage for his industry as for his originality.

W. E. P.

PROF. J. G. GALLE.

WITH deep regret we have to announce the death, on July 10, at ninety-eight years of age, of the veteran astronomer Prof. J. G. Galle, the doyen of the Associates of the Royal Astronomical Society, into which body he was elected in 1848. For many years he had been connected with the Berlin Observatory, and will be remembered as the last of the little band of astronomers who were associated in the discovery of Neptune. Galle it was who had the good fortune to carry to complete fruition the successful analyses of Adams and of Le Verrier. It was his lucky chance to compare Bremiker's map with the sky, to detect the planet, and establish its identity by determining the motion. He long outlived all his companions and associates in that historic scene enacted in the Berlin Observatory on September 23, 1846, the antecedents of which have been told so many times that it is unnecessary to refer to them here more particularly. It is more pertinent to recall, as more likely to have been forgotten, that he was one of the first to have seen the "crape" ring of Saturn. When this discovery was announced in 1850, simultaneously by Bond and Dawes, Galle directed attention to some observations he had made twelve years earlier, in 1838-9, in which he had actually measured the diameter of this interior dusky ring. The observations were communicated at the time to the Berlin Academy, but Galle did not insist on their importance, as he could not persuade himself that the phenomenon was permanent and not due to the effect of contrast.

From Berlin, Galle went to Breslau, and there he proposed that method of determining the solar parallax, by observations of small planets, which has since proved so successful. His earliest attempts in this direction were applied to measures of Phocaea, and later, from observations of Flora, he deduced the value of $8'8''$. This was at a time when astronomers were beginning to discard Encke's value of $8'58''$ in favour of Le Verrier's $8'95''$. In another direction it is not possible to overlook a very distinct service which Galle rendered to astronomy. His catalogue of cometary orbits has long been a standard work

of which many astronomers have proved the usefulness. But comets and meteors long had great attractions for the aged astronomer. It will be remembered that he was among the first to point out a connection between the April meteors and Comet I, 1861, and to direct attention to the fact that Biela's comet would explain the appearance of the Andromeda shower.

Galle remained at Breslau in full scientific activity until 1897, when he retired to Potsdam after a long life earnestly devoted to astronomy, the interests of which he did much to forward by his zeal and energy.

THE HON. CHARLES STEWART ROLLS.

IT is with deep sorrow that we have to record the death of the Hon. C. S. Rolls by an accident on Tuesday last, during the aviation meeting at Bourne-mouth. It seems that Mr. Rolls went up in his biplane for the alighting competition, and during the descent the newly fitted tail-piece of his aeroplane suddenly broke, and the whole machine collapsed and fell to the earth from a height of forty or fifty feet. Mr. Rolls was picked up unconscious and died almost immediately from concussion and laceration of the brain.

Charles Stewart Rolls was the third son of Lord and Lady Llangattock, and was born in 1877 and educated at Eton and Trinity College, Cambridge. From his early youth he was deeply interested in things mechanical, and his brief career, so sadly brought to an end, shows how successfully he utilised his mechanical capacity.

Different from many men, Charlie Rolls, as his friends called him, when he set about doing anything, always entered deeply into the subject in a thoroughly scientific manner. Whether the object on hand was connected with cycling, ballooning, motoring, or aeroplaneing, in the last two of which he was a pioneer, it was always the same, and his mind was continually bent on finding out the "whys" and the "wherefores," and improving the existing state of things. The thoroughness with which he was always associated was strongly brought to my notice in the many balloon trips that I made with him, and his inquiring turn of mind was often displayed when perched up aloft in the clouds. Perhaps the best example is instanced in the quiet manner in which he spent weeks in practising gliding before finally mounting the full-sized aeroplane.

It has been said of Rolls that he was born restless, and those who knew him know how true this description was. Yet he was never flurried, but always calm and collected. It was this trait in his character that probably made him so successful in his manifold ventures.

In the death of Rolls, Britain has lost her most daring and brilliant aviator, and his friends mourn the loss of a dear comrade. WILLIAM J. S. LOCKYER.

NOTES.

WE congratulate Sir William Crookes, F.R.S., on the new honour conferred upon him, namely, that of appointment to the Order of Merit, announced in the *London Gazette* of Friday last.

THE death is announced, at the age of forty-eight years, of Prof. Hugo Erdman, professor of inorganic chemistry in the Berlin Technical High School.

THE annual meeting of the Imperial Cancer Research Fund will be held at the Royal College of Surgeons, on Wednesday, July 20, Mr. A. J. Balfour presiding.

THE *Globe* states that Herr Frick, who for many years has been engaged in exploration and scientific research, particularly in South America, where he studied the habits and customs of the Indian tribes, has been murdered by Indians in southern Bolivia.

THE death is announced in the *Athenaeum* of Prof. T. Zona, of the University of, and observatory at, Palermo; also of Prof. A. P. Sokoloff, formerly the holder of the chair of geodesy at St. Petersburg, and more recently the vice-director of the Pulkowa Observatory. Prof. Sokoloff retired from the latter position in 1905 in consequence of ill-health.

THE following officers of the Royal Society of Medicine were elected last week for the year beginning on October 1 next:—*president*, Sir Henry Morris, Bart.; *honorary treasurers*, Sir W. S. Church, Bart., and Sir F. H. Champneys, Bart.; *honorary librarians*, Mr. R. J. Godlee and Dr. Norman Moore; *honorary secretaries*, Dr. A. Latham and Mr. H. S. Pendlebury.

AT the annual business meeting of the Museums Association, held last week in York, Mr. H. M. Platnauer was elected president, and Messrs. C. H. Hunt and Deas vice-presidents. A resolution was adopted by the meeting expressing the desire that, in any revision of the grants-in-aid to provincial museums, the Board of Education would consider the advisability of continuing assistance towards the purchase of science objects.

AMONG the communications to be brought before the eighth International Physiological Congress at Vienna in September next are the following:—demonstration of method of testing colour perception spectrometer and demonstration of lantern test for colour-blindness, by Dr. Edridge-Green; the changes produced by radium in normal cells, by Dr. A. S. Grünbaum; and the summation of stimuli, by Drs. F. S. Lee and M. Morse.

THE thirty-ninth meeting of the French Association for the Advancement of Science will be held at Toulouse on August 1 to 7. The president for the year is Prof. C. M. Gariel. Among the names of the presidents of the numerous sections, we notice the following professors of the University of Toulouse:—Prof. Emile Mathias, physics; Prof. Victor Paquier, geology; Prof. M. Leclerc du Sablon, botany; and Prof. Ch. Fabre, agronomy. M. Emile Marchand, the director of the Observatory of Pic du Midi, is the president of the section of meteorology.

THE annual meeting of the British Pharmaceutical Conference will be held at Cambridge on July 26 and 27. In his presidential address, Mr. F. Ransome will deal mainly with the cultivation of medicinal plants and with medicinal plant investigation. Among the subjects of papers promised for the meeting are:—the bacteriological testing of disinfectants; an insect pest in belladonna; the proposed essential oil monographs; phosphoric acid and ammonium phosphate; the limitations of water analyses reports, both bacterial and chemical; and note on the periodicity of the properties of the elements: new arrangement.

WE have been favoured with a copy of the preliminary programme of the fifth International Congress of Photography, which is to be held in Brussels on August 1 to 6 next, from which we learn that section i. (organised by the Société française de Photographie) will deal with photo-chemistry and the scientific applications of photography; section ii. (organised by the Association belge de Photographie), the technique of photography and the industrial applications of photography; and section iii.

(organised by the Institut international de Bibliographie), photographic documents and legislation relating to documentary photography. As has already been stated in these columns, the correspondent for the United Kingdom is Mr. Chapman Jones, 11 Eaton Rise, Ealing, W.

THE death occurred at Washington, on June 26, of Prof. Cyrus Thomas, a veteran authority on the diverse subjects of ethnology and entomology. He was born in Tennessee in 1825, and from 1850 until 1865 he practised law. For the next four years he was pastor of a Lutheran Church. He was then successively an assistant on the U.S. geological surveys of the territories, professor of natural sciences at the Southern Illinois Normal University, State entomologist of Illinois, a member of the U.S. Entomological Commission, and (since 1882) a member of the staff of the U.S. Bureau of Ethnology. His earlier writings were on entomological topics, but his most numerous and best known works were concerned with the North American Indians of prehistoric times.

A LIST of the Civil List Pensions granted during the year ended March 31, 1910, has just been published as a Parliamentary Paper. Among the pensions granted in recognition of scientific work we notice the following:—Mr. Thomas Bryant, in recognition of his services towards the advancement of surgery, 100*l.*; Mrs. M. L. Gamgee, in consideration of the valuable contributions to physiological science of her husband, the late Prof. Arthur Gamgee, 70*l.*; Mrs. E. J. Seeley, in consideration of the valuable writings on geology and palæontology of her husband, the late Prof. H. G. Seeley, 70*l.*; Miss H. S. Murphy, in consideration of the services rendered by her father, the late Prof. E. W. Murphy, in furthering the use of chloroform, 50*l.*; Mr. J. Sully, in recognition of his services to psychology, in addition to his existing pension, 95*l.*; Mrs. Joanna Calder Fraser, in consideration of the value of the investigations in anatomy and embryology of her husband, the late Prof. A. Fraser, 70*l.*; Miss Julia Dobson, in recognition of the important services rendered by her brother, the late Surgeon-Major G. E. Dobson, F.R.S., to zoological science, in addition to her existing pensions, 15*l.*

PROF. T. H. CORE, formerly professor of physics in the Owens College, Manchester, died on July 9 at Withington, near Manchester, in his seventy-fourth year. When the late Balfour Stewart was appointed professor of natural philosophy in the Owens College in 1870, Mr. Core came from Edinburgh to take up the post of professor of physics, a post which he held until his retirement in 1905. Up to the appointment of a professor of applied mathematics in 1881, he took charge of the more mathematical parts of the physics teaching, but as time went on he withdrew from the more advanced work, and for several years before his retirement only lectured on experimental mechanics. He was an extremely clear lecturer, and many Owens' men who have distinguished themselves in science owe their first love of their subject to Prof. Core. He was in great demand as a popular lecturer on scientific subjects throughout the cotton towns around Manchester, and acted as examiner to many of the better schools of the district. He was of a retiring disposition, and never took a prominent part in university politics. Outside his teaching work, his principal interest lay in astronomy, and he was one of the founders, and the first president, of the Northern Astronomical Association.

It is with regret that we learn of the death of Dr. Wilhelm Winkler, who since 1887 made valuable observations of sun-spots, double stars, comets, &c., at his

private observatory at Jena. Born at Eisenberg in 1842, Dr. Winkler studied at Leipzig, and developed a practical, as well as mathematical, ability, which displayed itself in the making of watches and clocks. Then in 1875 he set up a 4½-inch Steinheil refractor at Gohlis, and made position-measures of comets, observations of occultations, &c. Later, in 1878, he commenced daily observations of the solar surface, communicating his results to Prof. R. Wolf and then to Prof. Wolfer. As ill-health prevented him from observing regularly, he directed observations made by his wife, and so kept up the continuity of the records. Removing to Jena in 1887, he employed a 6-inch refractor, fitted with clock, circles, and micrometers, for the observation of double stars. Unhappily, about two and a half years ago, a sarcoma necessitated the removal of his left eye, and this, with other serious complaints, considerably curtailed his astronomical work and caused him much suffering, which lasted until his death on June 17. Dr. Winkler's genial presence and devoted labours will, however, be sorely missed by his numerous friends and fellow workers.

WE notice with regret the announcement of the death, on July 9, of Mr. Harry W. Cox, at the age of forty-six. Mr. Cox was one of the first in this country to realise the importance to the medical profession of Röntgen's discovery, and to take up the design and manufacture of X-ray apparatus. He commenced at once to manufacture coils, interrupters, and accessory apparatus for the application of the X-rays in medical diagnosis, and to import X-ray tubes and other adjuncts to enable medical men in this country to apply the new discovery. He was always ready to work out new ideas and designs, and probably his most noteworthy achievement was to place on a practical basis the stereoscopic method of localising foreign bodies, with its corollary, the cross-thread method of localisation. The stereoscopic method also enables a picture to be obtained of the position of parts in cases of fracture and dislocation. In his investigations he exposed himself freely to the action of the X-rays, and, like so many of the pioneers in this work, he contracted X-ray dermatitis in a severe form. The disease progressed slowly but relentlessly, and he died after several years of suffering. Now that the danger of undue exposure to X-rays is understood, and efficient protective apparatus has been constructed, there is no need for an operator to take any risks, while patients run no risk whatever; for the exposures necessary for purposes of diagnosis are short, while for purposes of treatment the dose can now be accurately measured and regulated. There is thus great cause for gratitude and honour to those who, at the expense of permanent injury to themselves, have enabled their successors to work in this field in safety.

A TABLET in memory of Richard Hakluyt was unveiled in Bristol Cathedral on Thursday last. Among those present were Sir Clements Markham, K.C.B., F.R.S. (representing the Royal Geographical Society), Sir W. Lee Warner (representing the India Office), Admiral Sir Lewis Beaumont (of the Navy Records Society), Mr. W. Phillips (of the American Embassy), and Mr. A. Gray (of the Hakluyt Society). Sir Clements Markham said that Westminster Abbey, where Hakluyt was buried, or Christ Church, Oxford, where he was a student, would have formed a fitting place for that memorial, but, on the whole, Bristol had the better right. It was from that ancient port that there were sent the first voyages of discovery which occupied Hakluyt's thoughts and researches. At Bristol he was canon for more than thirty years, and

there he must have conducted his researches and collected information. The most important feature in Hakluyt's character was his strenuous continuity of aim through life. He set himself to remedy two great evils of his time—the ignorance of English seamen in matters relating to the scientific branches of their profession, and the loss of records and stories of ancient voyages and travels. Besides writing and lecturing, he travelled a great deal, collecting stories and information, and set on foot work such as was now carried on by the Royal Geographical Society and other organisations. He was one of the founders of our Colonial Empire.

IN distributing the prizes last week to the students of Guy's Hospital Medical School, Prof. Howard Marsh said that medicine had now become a department of biology, and it had given a powerful impetus to the study of biological science. The result had been the discovery of a new world of micro-organisms, of the existence of which nothing was known before the days of Pasteur and Lister. By far the greater number of diseases were due to the presence of micro-organisms. Who could doubt that in the next thirty years tuberculosis, which in England caused the death of 70,000 persons every year and the spoiling of the lives of probably twice that number, would be entirely swept away? Science was the acquisition of facts, and the results of research had been one of the marvels of our time. How should research be carried out? Could the man in the street tell them that? Was any man who knew nothing of biology in a position to save life? How was such a man justified in bringing charges of inhumanity and cruelty against men of science, and saying that what was being done ought to be put down by the strong hand of the law? When the public knew what advances had been made, and were told by such men as Lister and Paget that they had been gained by the only method by which they could have been achieved, who was competent to contradict them? And when it was understood that what was being done was done under Government supervision, and that no man could perform an experiment without a special licence, would not the public be satisfied that the matter was in safe hands? Would they not go further, and be grateful to those who, with unending labour, rendered such great services, and would they not extend to them their full confidence and support?

THE Milan correspondent of the *Daily Chronicle* states that an Italian Royal Commission, appointed to inquire into the condition of the Leaning Tower of Pisa, has reported that the structure is in danger of collapse. The tower was begun in 1170, and took nearly a couple of centuries to complete. "Our explorations," say the members of the commission, "led to the wholly unforeseen and distressing discovery that, instead of being founded upon a massive, spacious base, as was generally believed since Grassi, in 1831, and Rohault de Fleury, in 1859, published their collections of plans, the actual foundation simply consists of ring-shaped masonry exactly corresponding in girth to the huge cylindrical mass superimposed thereon. In fact, the diameter of the inner ring foundations is 7 metres 40 centimetres, which is precisely that of the space inside the tower. This discovery, taken together with the further astonishing fact that the foundations are merely 3 metres (9 feet 9 inches) beneath the surface, constitutes henceforth incontrovertible proof that the campanile was originally built perpendicularly, and that its leaning propensities, which are becoming more and more accentuated, are due to other causes than the intention of its constructors." It is stated that the tower is farther from the vertical than it was eighty years ago.

The reasons given for this difference are principally that the base of the tower has always been immersed in water, and that a deep cistern dug quite near seventy years ago with the unsuccessful object of draining a basin around the foot of the tower made matters worse. The tower was also considerably weakened by earlier excavation for a basin for mensuration purposes.

IN a letter to the current issue of the *Lancet*, Dr. H. W. Thomas, of the Liverpool School of Tropical Medicine, gives an interesting account of the special screening against mosquitoes which has been effected on a freight boat of the Booth Line sailing from Liverpool to Porto Velho, a small place up the Rio Madeiro, a tributary of the Amazon. The screening of the ship is so arranged that the living quarters of the crew and officers are protected from mosquitoes. Each port-hole is provided with a movable screened frame, which is so adapted that the port-hole can be closed and screwed down without withdrawing the screen. The entrances to the main deck are protected by wire gauze spring doors, and at each side of the ash-shoot, which is of necessity open to the ingress of mosquitoes, extra sets of screened doors are placed. The doors and port-holes of the outside bridge deck cabins are also screened; the doctor's quarters and the hospital are situated further aft, and are thoroughly screened. The interior arrangements permit of no old-fashioned water reservoir over the wash-basin in the cabins, and running water is supplied everywhere. The slops from the basins run into pipes emptying directly over the side. This arrangement very satisfactorily deprives the *Stegomyia* larvæ of breeding places in the cabins. The ventilator pipes in the cabins and along the alleyways are each protected by a wire gauze screened frame, which slips into a grooved moulding fixed round the shaft, and is kept in place by three small buttons. The screening is composed of 18-mesh phosphor-bronze wire, a material which is more suitable for a moist, humid climate than brass or copper.

THE *Journal of Hygiene* for April (vol. x., No. 1) contains a report on an investigation of "grouse disease" by Drs. Cobbett and Graham-Smith. It was found that the diseased birds generally harbour large numbers of intestinal worms, in particular a "strongylus" (*Trichostrongylus pergracilis*), which may occur in hundreds or even thousands. The conclusion is that the disease does not appear to be a specific bacterial infection, but that those birds which are more or less severely affected by strongyli suffer injury, partly by interference with nutrition, partly by the absorption of irritating or poisonous substances, which weakens them, and in bad weather may prevent them from gaining a living, and also renders them susceptible to various bacterial infections. Messrs. Hewlett, Villar and Revis also contribute a second part of their investigations on the nature of the cellular elements present in milk. Further evidence is presented showing that the cells are not leucocytes, that they may be present in enormous numbers in perfectly healthy cows, and that they are not necessarily indicative of any inflammatory condition.

IN the first part of *Folk-lore* for the current year Dr. W. H. R. Rivers publishes a paper on the position of the father's sister in Oceania, particularly with reference to Banks' Island. The problem to be explained is the close connection between an individual and his father's sister in the case of people among whom the rule of matrilinear descent prevails. This relation closely resembles that of a man with his maternal uncle in patrilinear races, and it has therefore been suggested that the relation in Banks'

Island may be a survival in mother-right of a preceding condition of patrilinear descent. This theory Dr. Rivers dismisses as quite opposed to all known facts. The theory which he finally adopts is that when, for instance, a fragment of a man's umbilical cord and parings of his nails are given to the sister of his father, the intention is to entrust them to her as the representative of a group which, according to rules of descent, is necessarily foreign, and therefore hostile, in the hope that she may be able to prevent any member of that group from working black magic against her nephew. It is also possible that this strange relation indicates an increasing recognition of the kinship of the father, who deposes his sister to perform certain acts as an assertion of his paternity, thus bringing her functions into line with those which, according to one view, belong to the Couvade.

THE remains of the gigantic extinct Australian marsupial, Diprotodon, have just been re-arranged in a newly constructed wall-case in the Geological Department of the British Museum (Natural History). The restored skeleton of the animal, for which bones and plaster casts were given by the South Australian Museum, through Dr. E. C. Stirling, F.R.S., occupies the greater part of the case. It displays especially well the massive carpal and tarsal bones and the diminutive toes, which are so characteristic a feature. The limb-bones from Queensland, described by Owen, are arranged on a shelf above the skeleton, and include the first discovered femur, which was originally mistaken for that of an elephant. The skull, as described by Owen, was purchased in a restored state in a sale-room, and has now been carefully divested of all superfluous plaster, proving that the restoration erroneously increased its length by 4 inches. With the skull are several well-preserved jaws showing all the teeth. Palæontologists are still awaiting with interest the promised complete description of Diprotodon by Drs. Stirling and Zietz, of the South Australian Museum.

AMONG other additions to the exhibited collection in the Geological Department of the British Museum (Natural History) may be mentioned a new model of the skull and mandible of the gigantic extinct lemur, *Megaladapis insignis*, from Madagascar. Thanks to the explorations of Dr. H. F. Standing in the swamps, the model is no longer in any respect hypothetical. It clearly suggests an animal adapted for an aquatic life, and the characters of the known limb-bones confirm this suggestion. To the table-case near the fossil lemurs has just been added a plaster cast of the much-discussed Palæolithic human skull from Galley Hill, in Kent. The original specimen still remains in a private collection.

IN the *Entomologists' Monthly Magazine* for the current month, the Rev. F. D. Morice records a male saw-fly from Brockenhurst new to the British fauna. Provisionally the specimen is referred to *Neurotoma mandibularis*, a Continental species hitherto known only by the female. A detailed description, in Latin and English, is appended.

British Birds for July opens with an obituary notice, accompanied by an excellent portrait, of the late Mr. Boyd Alexander, who, it will be remembered, was murdered on April 2 by hostile natives in the heart of Africa to the north-west of Abeshr, in the Wadai. In another article Mr. W. Farren records, with illustrations, the nesting of the marsh-warbler in Cambridgeshire in June, 1909; only one previous instance, and that many years ago, is known of the species breeding in that county.

It has been pointed out by a correspondent that in a note upon a paper by Prof. Steinmann on ammonite phylogeny (*NATURE*, vol. lxxxii., p. 289, January 6) the author was somewhat misrepresented. It was stated "that, in place of being a member of the 'Circumnodosi' group, Heterotissotia is really related to the Triassic Ceratites, of which it is to be regarded as the Cretaceous descendant." It should have read "that Heterotissotia is nearly related to the Triassic Ceratites, and especially the 'Circumnodosi' group, of which it is to be regarded as the Cretaceous descendant."

IN the May number of *Spolia Zeylanica* Mr. T. Southwell records the capture of a large female saw-fish (*Pristis cuspidata*) on the Ceylon pearl-banks in December last. The specimen, which measured 15 feet in length, and weighed about 17 lb., was of special interest on account of containing twenty-three intra-uterine embryos. All these embryos were in a horizontal position; but while some had their beaks close to the aperture of the cloaca, others were exactly opposite. They measured 14 inches in length, and in each the yolk-sac was united to the abdomen by a placental stalk 5 inches long. The teeth, from twenty-three to twenty-eight in number on both sides, were arranged irregularly, varying between alternation and a distribution in pairs.

IN the same issue (*Spolia Zeylanica*, vol. vi., p. 174) Mr. H. O. Barnard states, as the result of personal observation, that the alleged partiality of cobras for music is a myth. "The sole effect, so far as I could see, was to arouse their curiosity, as they would project their heads out of their holes equally well for any kind of noise, from the shrill piping affected by snake-charmers down to the tinkling noise made by dragging a chain past their dwelling, or even that made by light and repeated tappings with a switch close to their holes. It would appear, however, that the tone must be high, as grave sounds, such as tomtom beating or deep notes from a flute, had no effect upon them." Mr. Barnard likewise confirms the observations, made in the London Zoological Gardens, as to the absence of a "fascinating" influence of serpents on birds.

IN No. 1745 of the Proceedings of the U.S. National Museum Prof. T. D. A. Cockerell discusses the bees of the genus *Nomia*, with the description of several new species. All the American members of the group are referred to the typical genus, although an alternative classification is mentioned, in which *Nomia* would be excluded from the American fauna. If this scheme were adopted, there would, however, be difficulties with regard to the non-American forms, which are not easy to classify. "The group," it is added, "is a peculiar one, and apparently its little morphological jokes must not be taken too seriously."

THE gipsy moth is so important a pest that a laboratory has been established at Melrose Highlands, Massachusetts, known as the Gipsy Moth Parasite Laboratory, where a complete study may be made of the parasites. Mr. J. C. Crawford has issued a description of several members of the families Chalcididae, Perilampidae, Pteromalidae, and Eulophidae occurring in the United States or introduced from Europe or Japan and known to be parasitic on the moth. The paper is published by the United States Department of Agriculture, Bureau of Entomology.

THE *Agricultural Journal of British East Africa* does not confine itself entirely to agriculture, but includes papers on other subjects connected with the Protectorate. Part iv. of vol. ii. contains, as special agricultural papers, accounts

of the Guayule rubber industry and of Ceara rubber in German East Africa, in addition to papers on tea cultivation at Limoru. Among the more general papers is an interesting diary of a journey made by Mr. E. Battiscombe down the Tana River; photographs are reproduced showing typical views and native huts.

THE current issue of the West Indian Bulletin (No. 4, vol. x.) contains a description by Mr. Joseph Jones of some cacao grown at the Dominica Botanic Station. The root disease of sugar-cane (*Marasmius sacchari*) is also discussed, and found to be prevalent in all districts of Antigua, although planters do not readily recognise it, and therefore cannot apply remedial treatment as early as is desirable. There is an interesting paper by Mr. G. Moody Stuart on implemental cultivation, in which attention is directed to the necessity for using the best and most efficient tillage implements, some suitable types of which are described.

THE theoretically ideal method of dealing with insect pests is to encourage their natural enemies, but it is of limited application, because complications invariably set in sooner or later. The natural enemies of the sugar-cane pests were recently described in the *Agricultural News* (No. 209). Several parasites are known of the sugar-cane borer (*Sphenophorus obscurus*), one being a Tachinid fly, one a Histerid beetle, and one a beetle of the family Elateridæ. Attempts are being made in Hawaii to introduce the natural enemies of the pests occurring there.

WE have received a little booklet, "How to Use Nitrate of Soda," with a preface by Dr. Bernard Dyer, in which summaries are given of various field trials with this fertiliser. Several old misconceptions are dealt with; it is shown that nitrate of soda is not a mere stimulant, but a true plant food, and that it does not exhaust the soil. The necessity for potassic and phosphatic manuring and for periodical liming is also emphasised. Whilst primarily intended for practical men, the pamphlet is also of interest as showing what has been done with artificial manures.

A REPORT describing the experiments made during 1909 at the Harper Adams Agricultural College, and in the counties of Staffordshire and Shropshire, has lately been issued. One of the most notable features is the cropping power of a wheat, Browick grey chaff, recently introduced to the district by the college authorities; other wheats selected from Fife are also under investigation. We have also received the report on experiments with potatoes made in 1909 by Mr. Stewart, of the Edinburgh and East of Scotland Agricultural College. The effect of a change of locality on the vigour of the plant was well marked; apparently the best change is from a later or colder district to one earlier or warmer. Thus in the south-east of Scotland it was found advantageous to procure seed from the north, just as in England it is found profitable to procure seed from Scotland or Ireland.

REFERENCE is made in the *Kew Bulletin* (No. 5) to the flowering of the Burmese rose, *Rosa gigantea*, in the Himalayan section of the temperate house, this being the first record for the gardens. Another interesting item is the production of carpophylls on a plant of *Cycas Micholitzii*, which is being cultivated in the water-lily house.

THE current number of the *Kew Bulletin* (No. 5) opens with a report, by Dr. J. M. Dalziel, on the botanical resources of Yola province, northern Nigeria. Shea kernels (*Butyrospermum Parkii*) and gum are the chief commercial vegetable products. The author was not able

to trace the sources of the gum beyond recognising that it is obtained from species of *Acacia* and *Combretum*, notably *Acacia senegal* and *Combretum verticillatum*, with admixtures of inferior gum from such sources as *Anogeissus leiocarpa* and species of *Albizzia*. Odorous resin is obtained from two species of *Boswellia*—new to science—and *Daniella thurifera*. Diagnoses of new Lauraceæ from the Malayan region, by Dr. J. S. Gamble, include a dozen species of *Cryptocarya* and ten of the genus *Beilschmiedia*.

IN the first issue of the meteorological chart of the North Atlantic for July, published by the Meteorological Committee, the synchronous weather charts show that from June 9–12 inclusive an area of high barometric pressure remained nearly stationary in the neighbourhood of the Azores, and afterwards travelled slowly eastward and north-eastward, causing a gradual improvement in the weather over the British Isles. Icebergs have been sighted with increasing frequency on the Banks of Newfoundland, drifting south, but the total number is below the normal. It is stated that navigation opened earlier this year than for some years past, owing to the exceptionally favourable conditions of the ice, not only in the St. Lawrence, but also in the White Sea and the Baltic. The first steamer reached St. Petersburg on April 18, only a week later than the earliest date of arrival there on record.

THE Bulletin of the Manila Weather Bureau for November, 1909 (recently received), contains particulars of two notable typhoons which crossed the Philippine Archipelago during that month. The first, on November 6–7, was remarkable for the unusual violence which it displayed in the Visayas and the China Sea, and for the changes in direction of the track while traversing the China Sea. Attention is directed to the occurrence at two stations of ball-lightning, which is said to be extremely rare in the neighbourhood of a cyclonic vortex. The second storm, November 12–23, was distinguished by the extraordinary development which it acquired in the China Sea, and especially by the fact that for several days it remained practically stationary to the east of the Parcel Islands; from November 18 to 21 the mean velocity of translation was only about 1.5 miles per hour. The tracks of the typhoons are laid down, and isobaric charts drawn from all available observations and reports; much credit is due to the Weather Bureau for its persistent efforts to throw light on the behaviour of these destructive storms.

THE present summer has so far proved cool and unsettled, and to the present it has given cause for suspicion that the season may prove as unfavourable as that of last year. The summary just issued by the Meteorological Office for the five weeks ended July 9 shows the mean temperature for the period to be in fair agreement with the average, but there has so far been a marked absence of high day temperatures. The rainfall has been in excess of the average over the whole of England and Ireland, but there has been a slight deficiency of rain in Scotland. The greatest excess for the five weeks is 1.69 inches in the south-east of England and 1.54 inches in the Midland counties, whilst in nearly all districts the excess is more than an inch. The duration of bright sunshine is deficient in England and Ireland, but there was a slight excess in Scotland. At Greenwich, the mean conditions for June were for the most part in fair agreement with the normal, but the weather was by no means agreeable. The rain fell at the commencement and end of the month, the aggregate measurement being 2.11 inches,

which is only 0.07 inch more than the average, but rain fell on sixteen days. The mean temperature was about 1° above the normal, and the duration of bright sunshine was twelve hours less than usual.

MESSRS. R. W. PAUL have issued a pamphlet entitled "The Equipment of a Modern Elementary Electrical Laboratory," in which a standardisation of instruments is advocated with the view of attaining an interchangeability of instruments, shunts, and multipliers so that any one instrument may be easily adapted for measuring a wide range of currents and voltages. The instrument recommended for the use of elementary students is the unipivot galvanometer, which has a range of 240 microamperes unshunted, and may therefore be used instead of a mirror galvanometer for many experiments. An appendix gives a list of experiments suggested for an elementary course in electrical engineering and the apparatus required for carrying them out. We think that Messrs. Paul advocate too strongly the advisability of making the carrying out of experiments easy to the student. A great part of the benefit to be derived from an experimental course lies in learning to overcome practical difficulties, and students brought up on experiments that are so carefully prepared as to eliminate such difficulties do not, as a rule, become skilful experimenters in the more advanced stages.

VOL. vii. of Contributions from the Jefferson Physical Laboratory of Harvard University contains 463 pages of reprints of fifteen papers which have appeared in the American scientific periodicals during the past year. Of these papers, we have already noticed one in these columns, that on certain thermal properties of steam, by Mr. H. N. Davis. Another of exceptional interest, by Mr. H. W. Morse, deals with the evaporation from a solid sphere. The spheres experimented on were of iodine, and had radii between 0.2 and 1 millimetre. They were supported on a thin lamina of glass attached to the end of a thin fibre of glass, the other end of which was clamped firmly in a horizontal position, *i.e.* the micro-balance of Salvioni. The evaporation took place in a large box with glass sides, through which the deflection of the micro-balance was measured by means of a microscope. The rate of evaporation proved to be proportional to the radius of the drop, and not to its surface.

AN advance copy has reached us of the catalogue of mathematical and scientific instruments to be on view at the International Exhibition at Brussels this year. This catalogue has been prepared under the auspices of the Board of Trade by the National Physical Laboratory; it refers only to the exhibits of British manufacturers. It includes detailed descriptions and illustrations of many of the instruments. A glance through this catalogue gives a very good idea of the rapid advances that are being made in the design of physical apparatus. It is invidious to select any names of exhibitors; it is enough to say that most of the leading makers of electrical, optical, surveying, navigational, and meteorological instruments are amongst them, and that the addition of historical references and lists of original publications makes the book a valuable one for reference. The price is only sixpence post free on application to the director, Exhibitions Branch, Board of Trade, Broadway, Westminster. We may add that the catalogue has been compiled free of cost to the exhibitors, and it is hoped that the prospect of the publication of a similar catalogue for the International Exhibition at Turin next year will induce other firms to avail themselves of the many facilities which the new Board of Trade department now affords to exhibitors.

WE have received from Messrs. Baird and Tatlock (London), Ltd., a copy of the gas-calculator designed by Dr. R. C. Farmer. The diagram consists of four vertical lines; the two on the left are graduated in temperatures for wet and dry gas respectively; the line on the right is graduated in pressures (mm.). A celluloid strip bearing a black ruled line is laid across the observed pressure and temperature of the gas, and the corrected volume of 1 c.c. of gas is read off directly on the middle line. The latter is also graduated to read the logarithm of the weight of 1 c.c. of nitrogen. It is claimed to give the volume with an accuracy of 1 part in 5000, and this we have found to be the case if 0.00367 be taken as the coefficient of expansion of the gas in question. The diagram is extremely rapid and convenient in use, but it should not be lost sight of that an accuracy of 1 in 5000 is not possible with the more expansible gases.

THE synthesis of camphoric acid, as announced by Komppa in 1903, is adversely criticised by M. Blanc (of the Sorbonne, Paris) and Dr. J. F. Thorpe in a recent communication to the Journal of the Chemical Society. One of the critical stages in the synthesis consists in the methylation of a diketopocamphoric acid with the view of completing the total of ten carbon atoms present in the molecules of camphor and of camphoric acid. Using the ester of the acid, the methylation-product is a crystalline substance melting at 85° to 88°, and was supposed by Komppa to have the new methyl-group attached to carbon; it is now shown that the methyl-group is easily removed by cold caustic potash, and is undoubtedly attached to oxygen and not to carbon; the reduction of the compound to camphoric acid would therefore involve an important molecular re-arrangement, and even if it were effected could scarcely be regarded as a direct building up of the camphor molecule.

WE have received from the Thermal Syndicate, Ltd. (Wallsend-on-Tyne), its list of pure fused silica ware. The manufacture of articles from fused silica has engaged the attention of experimenters for a long time; but, owing to the high fusing point of quartz, the difficulties met with in manufacturing articles were very considerable. The Thermal Syndicate has developed a most successful process for fusing and working silica in an electric furnace. Only in 1904, a basin of 25 cubic centimetres capacity was considered an achievement; but at the present time, pipes 12 inches in diameter and 30 inches long, and vessels of 50 litres capacity, are being manufactured. The articles manufactured by the Thermal Syndicate which are placed on the market under the trade name "Vitreosil" are of very varied character. The ware is used in the manufacture of sulphuric acid, for nitre pot pipes, and for the basins for cascade concentrators, of which there are more than 600 in use in the British Isles, representing an output of about 22,000 tons of acid. It is also used to a smaller extent in the manufacture of nitric acid, and for making the pipes which carry the gases from the roasters in the manufacture of hydrochloric acid. It can be used for making condenser worms, small electrolytic tanks where the process requires the maintenance of a high temperature, and so on. The great advantage of "Vitreosil" is that it is practically unaffected by temperature changes, the coefficient of expansion being about one-seventeenth that of glass. Owing to this property, its high fusibility and its resistance to acids, quartz is now being very largely used for the manufacture of laboratory apparatus.

THE issue of the "Statesman's Year-book" for 1910 has been published by Messrs. Macmillan and Co., Ltd. This is the forty-seventh annual publication of an invaluable work of reference. The information throughout the 1500 pages has been corrected to the latest available date, and the changes made necessary by the death of King Edward VII. and the accession of King George V., as well as those arising out of the Union of South Africa, have been recorded. The proposed changes in the administration of the Belgian Congo are indicated; the sections on China and on the Anglo-Egyptian Sudan have been improved. Among matters of current interest, reference may be made to the articles on "Second Chambers" and the results of the census of production. As usual, the annual provides a number of new maps, and among them may be mentioned those showing the development of the Congo, the proposed Central Scotland and Georgian Bay Ship Canals, the United South Africa and South African railways, and South America, showing the railways. Altogether, this edition of the "Year-book" is well up to the high standard one associates with Dr. Scott Keltie's editorship. The price of the book is 10s. 6d. net.

MESSRS. REBMAN, LTD., hope to publish during the present month a new book by Dr. Bernard Hollander entitled "The Mental Symptoms of Brain Disease," with a preface by Dr. J. Morel, Belgian State Commissioner in Lunacy.

A SECOND edition of Dr. Washington's "Manual of the Chemical Analysis of Rocks" has been published by Messrs. John Wiley and Sons in New York and Messrs. Chapman and Hall, Ltd., in this country. The first edition appeared in 1904, and was reviewed in these columns on January 5, 1905 (vol. lxxi., p. 219). The present issue has been revised and somewhat enlarged.

OUR ASTRONOMICAL COLUMN.

HALLEY'S COMET.—Dr. Ebell's ephemeris for Halley's comet is continued in No. 4423 of the *Astronomische Nachrichten*, and gives the positions, &c., up to September 18. On July 16 the comet will be in R.A. 10h. 59m., dec. $-4^{\circ} 27'$, and its estimated magnitude will be 6.3, so that further observations in these latitudes are impossible. The distances from the earth and sun, on that date, will be 197 and 162 million miles respectively.

Owing to its apparent proximity to the sun, the comet could not be extensively photographed at any one observatory, but it is hoped that when the results from various observatories come to be compared, there will be a fairly continuous record which will enable the changes in the tail to be closely followed. An example of such change is afforded by the negatives secured at Johannesburg on April 21 and Kodaikanal on April 22, the latter showing, among other changes, a large contorted streamer on one side; the similarity to the tail of Morehouse's comet is thus emphasised.

A spectrum of the comet, taken at Mount Wilson, was described by Prof. Fowler, at the last meeting of the Royal Astronomical Society, as being of the usual type. Dark Fraunhoferic lines, due to reflected sunlight, are shown in the narrow strip of the spectrum due to the nucleus, and in that of the coma the bands at $\lambda\lambda$ 473, 421, and 388 are seen. Prof. Fowler suggested that the unequal intensities of the five heads in the cyanogen, 388, band were, possibly, indications of a rather low pressure condition. A comparison of this spectrum with that of Daniel's comet (1907), taken by Prof. Campbell, shows that they are practically identical.

In the *Comptes rendus* (No. 1) for July 4 Prof. Eginitis describes the appearance of the comet at Athens since its inferior conjunction. An increased activity of the nucleus ejected large masses of matter to great distances, and on May 31 an aigrette was seen, which was brighter than the nucleus itself and turned away from the sun; this was made up of straight streamers 50' long diverging to form

an angle of 60° . It was also noticed that, after the passage, the tail became much more brilliant than before, an effect which the author ascribes, in great part, to the change in the relative positions of the comet, the sun, and the observer. From this he deduces that the brilliancy of the tail is largely due to reflected sunlight, and suggests that it affords further evidence that the tail is, to an appreciable extent, made up of fine, solid particles.

Photographic and visual observations of the spectrum, made at the Madrid Observatory since the conjunction, are described by Father Iniguez. Photographs taken on June 1, 3, and 6 show the continuous spectrum and seven superposed monochromatic images of the coma. The three least refrangible of these were observed in May, and of the four new ones the two brightest are in the extreme ultra-violet, beyond the continuous spectrum. The plate taken on June 1 shows each of the three less refrangible bands doubled. Three of the four more refrangible bands are well defined, and their wave-lengths are given as 437, 425, and 391; the other is broad, extending from λ 399 to λ 407. The visual observations indicate an intrinsic change in the band recorded as λ 567 on May 27 and as λ 559 on May 30; on the former date the red edge was sharp, whereas on the latter it was diffuse, and was not the most intense part of the band. The green band at λ 512 on May 27 and λ 516 on May 30 was sharp and apparently composite, and the difference of wave-length is attributed to a relative change in the intensities of the components *inter se*. Apparently the band at λ 472 did not change. The visual and photographic observations of the tail showed various, although not pronounced, changes, which are discussed in the note; until May 6 the tail was of the first type, but from then until the passage of the comet it was of the second, reverting to type i. after the passage.

PREVENTION OF DEW DEPOSIT UPON LENS SURFACES.—In a paper published in No. 7, vol. lxx., of the *Monthly Notices*, Mr. Franklin Adams states that the Mervel Hill photography of the northern hemisphere stars could have been completed in two years instead of nearly six if some means had been devised for preventing the deposition of dew on the lens surfaces.

He then describes a method by which the difficulty has now been overcome. An air-pump, driven by a motor, delivers a current of dried air on the lens surfaces, inside the camera, and on the film of the plate, thus preventing the dew deposits. The air is dried by forcing it over pumice stone soaked in sulphuric acid and then over glass wool.

A VARIABLE STAR AS A TIME CONSTANT.—Having regularly observed a variable star, No. 33 in the Harvard list, in the cluster M. 5 (Libra), Prof. Barnard discusses its light-changes in No. 4409 of the *Astronomische Nachrichten*. This star was compared with a neighbouring star, which is designated *k*, and for ten years its period has apparently remained unchanged. Therefore Prof. Barnard suggests that it, and other similar variables, might prove useful for providing a check on the constancy of the earth's rotation, or any other possibly variable elements of the solar system. It rises sharply to a maximum, at which it seems to remain for only a few minutes, and then declines quickly until it is as bright as *k*; after that the decline is more leisurely. At minimum the magnitude is 14.6, and the increase is rather more than 1.2 magnitudes, the period being $0.50147+d$. To facilitate observations of this interesting time-standard, Prof. Barnard gives an ephemeris which is useful up to the year 1918.

RADIATION AND ABSORPTION.—In discussing various astronomical phenomena, the observer often has to study numerous laws concerning radiation and absorption, and this frequently necessitates looking them up especially. To obviate waste of time in this direction, Prof. Humphreys brings together, in No. 4, vol. xxxi., of the *Astrophysical Journal*, the chief laws, and discusses the general formulæ by which they are expressed. Thus the equations for the Doppler, Maxwell-Bartoli, Zeeman, and other effects are explained, and the most convenient formulæ for general use are collected in an invaluable summary which should prove of great convenience.

THE FIFTH INTERNATIONAL CONGRESS OF ORNITHOLOGISTS.

THE fifth International Congress of Ornithologists took place in Berlin from May 30 to June 4. Like all the former congresses of its kind, it was well attended, although only a single American and comparatively few English ornithologists were present.

The opening address of the president, Prof. Anton Reichenow, of Berlin, was a lucid, though necessarily short, review of the progress of ornithology within the last 150 years and its present status.

The Hon. Walter Rothschild delivered a lecture on the former and present distribution of the so-called *Ratitæ*, embracing also some very interesting recent investigations by Mr. C. W. Andrews on the egg-shells of certain ostriches, especially some pieces of the egg of a fossil ostrich, found last year by Messrs. Rothschild and Hartert in the Algerian Sahara. Baron Loudon gave descriptions of the bird-life in Talysh and Transcaspiæ; Prof. Koenig narrated his journey up the Nile to Lado and Gondokoro; Dr. Otto Hermann explained the activity of the Royal Hungarian Central Bureau of Ornithology; Dr. Thienemann that of the "Vogelwarte Rossitten," especially the method and results of his experiments with "ringed birds"; while the other lectures held in the general meetings were about bird-protection and the preservation of "nature's monuments" as connected with bird-life. Numerous communications were made and lectures delivered in the various sections, their number being so great that in some of the sections the time available was hardly sufficient, and discussions had sometimes to be cut short. Of the lectures in the sections, mention can only be made of a few, as most of them were only of interest to specialists.

The proceedings of section i. (systematic, palæontology, anatomy, and geographical distribution) were opened with a lecture by Dr. Hartert, on "what we ought to do and what we ought not to do." The speaker pointed out many evils and shortcomings in the technical treatment of modern bird-study; he specially urged greater care to avoid new synonyms, demanded better descriptions, more cooperation, &c. He pointed out the necessity of liberality in lending specimens to competent persons and institutions, and regarded museums which did not lend material to others as behind the times. He also made clear the necessity of greater care in preparing and preserving the material for study, especially bird-skins, held that they should be more exactly and more securely labelled, and discussed various other technical details.

Mr. Friedrich Rosenberg spoke about the development of the Colymbidæ, Prof. Jacobi discussed the development and systematic position of the "Impennes," and Geheimrat Prof. Virchow gave the results of his study on the mobility of the nuchal vertebrae in the Spheniscidæ.

Prof. Neumann discussed zoogeographical problems, specially referring to the necessity of careful geographical study in connection with the description of subspecies of birds, and their distribution.

In section ii. (migration) a number of lectures were given, of which that of Rittmeister von Lucanus, about the height at which birds migrate, appeared to be of special interest.

In section iii. (biology, oology, acclimatisation), Mr. Lucanus also made very important statements regarding the psychology of birds. Dr. and Mrs. Heinroth lectured on the biology of certain Anatidæ, and on the breeding in captivity of *Caprimulgus* and *Locustella*.

Graf Zedlitz dealt with the breeding-seasons of African birds.

Dr. Weigold gave interesting details about the former and present status of bird-life on Heligoland, and recommended the continuation of regular observations on that island "before it would be too late."

In section iv. (bird-protection) the necessity for the prohibition of the introduction of feathers and bird-skins for millinery purposes was urged, and the question of international bird laws discussed.

Section v. was devoted to poultry and other domesticated birds, and appeared to be well attended.

At the meeting of the International Ornithological Committee it was decided that the *Ornis* should not be con-

tinued in the form of a regular periodical, but of irregular volumes containing the proceedings of the various ornithological congresses, and special scientific treatises, in the event of material and means being available for the purpose.

In every town a congress has its peculiar features. While some of the characteristics of the fourth Congress of Ornithologists in London were the excursions to Tring and Woburn Abbey, and the visit to the Bempton Cliffs, with their breeding-colonies of sea-fowl, the congress at Berlin was remarkable for the various liberal entertainments in the town. The city gave a dinner in the famous Town Hall, the Zoological Garden Society a luncheon, the Ornithological Society a supper, and one evening was pleasantly spent in the natural history theatre, called "Urania."

An illustrated guide and excellent map of Berlin were presented to every member, also a reprint of Lichtenstein's very rare "Verzeichniss einer Sammlung von Säugethieren und Vögeln aus dem Kaffernlande," of 1842, a description of the "Vogelwarte Rossitten," and various other pamphlets and booklets. E. H.

THE DANGERS OF FERRO-SILICON.¹

FERRO-SILICON, averaging about 13 per cent. silicon and made in the blast-furnace, has been used in steel works, and to a certain extent in iron foundries, for many years. Steel castings were made with about 0.3 per cent. silicon to help in the prevention of blow-holes, and at the same time to aid in giving the properties required by engineers; and in foundries the ferro-silicon is used to add to mixtures of iron, such as those containing large percentages of scrap, that would otherwise yield a hard casting, as the added silicon has the effect of changing the combined to free or graphitic carbon on cooling. Within the last few years much richer ferro-silicons have been made in electric furnaces, and have found a ready sale. They are useful for special crucible steels and for certain steels for electrical work, and also for adding silicon in the ladle in the case of basic open-hearth practice, as there it is impossible to do this efficiently on the hearth, though it is easily done in the acid process.

With the electrically produced high-grade ferro-silicon came trouble. The present writer remembers the great interest taken in the earliest recorded case of this trouble as given by Dr. Dupré and Captain Lloyd at the Iron and Steel Institute in May, 1904. Owing to a fire having occurred on a vessel, the cargo, including 50 per cent. grade ferro-silicon brought from Trieste, was discharged on December 17, 1903. On January 12, 1904, the forty-eight drums containing the ferro-silicon were removed to a warehouse in Bootle, and whilst being rolled from the truck on to the concrete floor one drum exploded. Dr. Dupré and Captain Lloyd, after careful investigation, pronounced the explosion to be due to PH_3 evolved owing to the action of damp air, and gave a weighty and serious warning with regard to the handling and storing of this comparatively new product.

So explosions and spontaneous ignition came in the train of the new material; but it was to make its powers felt in another way. On the S.S. *Vaderland*, Antwerp to New York, over a hold in which ferro-silicon was stored, fifty steerage passengers were made ill and eleven died, of whom nine were buried at sea, and two corpses landed at New York, as plague was feared. In March, 1906, two children died on a Rhine boat. On October 21, 1905, two children died on board a "keel" on the Keadby Canal; the father and mother were taken seriously ill, but recovered on deck. In February, 1907, on the *Olaf Wyjk*, Gothenburg to Antwerp, four passengers died. In May, 1908, on the S.S. *Uleaborg*, Stockholm to St. Petersburg, the crew and second-class passengers were taken ill, and two died. On October 29, 1908, on the keel *Harry*, Captain Bamfield and the mate, his grandson, started from Goole with ferro-silicon on board, apparently consigned as "scrap iron." On the night of Friday, October 30, the mate was

¹ "On the Nature, Uses, and Manufacture of Ferro-silicon, with Special Reference to possible danger arising from its Transport and Storage." Local Government Board Report, 1909. By Dr. S. M. Copeman, F.R.S., S. R. Bennett, and Dr. H. Wilson Hake. Pp. viii+115. (Cd. 4958.) Price 1s. 11d.

taken seriously ill and removed. The captain took his wife and grandson on board and proceeded, but all three were taken ill. Bamfield died on November 6 and his grandson on the previous day. The cause of death was certified under that convenient term "ptomaine poisoning," but was afterwards proved to be due to fumes from the ferro-silicon of 50 per cent. grade (actual analysis, 53.9 per cent. silicon).

It required, however, yet another tragedy, with the added scare of cholera, to compel investigation, and this was provided by the case of the S.S. *Ashton* in December, 1908, on which, after a voyage of twenty-four hours only, from Antwerp to Grimsby, all the occupants of the emigrant quarters, fortunately only five in number, died between 6 p.m. on December 12 and 12.30 p.m. on the following day. This time cholera was feared, but examination by the Government bacteriologist at once negated this view. Mrs. Bamfield wrote on December 17, 1908:—"It has occurred to me since reading the account of this poisoning that there may be some of this (scrap) in the S.S. *Ashton*." Immediately these deaths were reported in the newspapers, Mr. Hodgson, Mrs. Bamfield's son-in-law, wrote to Dr. Simpson, medical officer of health for Grimsby, making a similar suggestion, and that this was the cause of the deaths (p. 20):—"It was apparently in consequence of this letter that attention came to be directed to the possibility of the deaths on the S.S. *Ashton* having been due to the presence of the ferro-silicon on board, suspicion having arisen, in the first instance, that the fatal illness of the passengers was due to cholera." This was abundantly proved, and resulted in the elaborate investigations of which this report is the record.

The report is a valuable one, showing that the authors have recognised the difficulties and grappled with them. The original should be in the hands of all interested in ferro-silicon from a medical, a shipping, or a metallurgical aspect. As the authors themselves state, further investigation is yet required, although rules that will almost ensure safety have been found.

Ferro-silicons of low grade, containing not more than 15 per cent. silicon and made in the blast-furnace, are beyond suspicion, and as safe to handle and to store as ordinary pig iron. The high-grades, 25 to 95 per cent. silicon, made in the electric furnace, and imported to the extent of about 4000 tons per annum, mostly from France, but to a less extent from Austria, Scandinavia, &c., include the dangerous varieties. The bulk has been made to 50 per cent. grade for little apparent reason other than ease in calculation of mixtures, a matter that may excite surprise until it is remembered that a manager, with his hundred worries per day, tries to avoid the hundred-and-first, in case it might prove "the last straw." The gases given off may at first have included acetylene, owing to the ferro-silicon being made in calcium carbide furnaces, but as that is never done now the poisonous gases given off are phosphoretted hydrogen and arseniuretted hydrogen, roughly 90 to 95 per cent. of the former to 10 to 5 per cent. of the latter. All are agreed that until more is known of the fundamental causes, those varieties around 50 per cent. silicon are most dangerous, and should neither be made nor bought. La Chambre Syndicate des Forces hydrauliques states that 30 to 40 per cent. and 47 to 65 per cent. grades should be avoided, but the remarkable omission of 40 to 47 per cent. grades is not supported by any experimental proof. The authors recommend the manufacture or use of only those varieties below 30 per cent. or above 70 per cent. silicon content for the present.

The section on the functions of ferro-silicon in steel manufacture hardly gets to the root of the real idea sometimes, but is near enough for general readers; and technical men are not likely to refer to this section of the report. It will be read for the results of the experiments and general investigations carried out and the opinions formed on the results, and these can be recommended. The report contains, besides matter already indicated, reports of conferences with Sheffield firms using ferro-silicon, investigations at places of manufacture, a description of the manufacture of ferro-silicon, conclusions and recommendations, Dr. W. Hake's chemical investigations, and Mr. Bennett's report on the composition and structure of ferro-silicon.

As the PH_3 is only formed in contact with moisture, the

material used to be packed in sealed drums, and sometimes was coated with paraffin wax; but this does not deal with the gas present in the cavities, and only transfers the danger, for drums exploded on opening and men removing the paraffin were made ill, so that these methods should be abandoned.

The report recognises an important point that is still obscure (p. 109):—"Dr. Heroult expressed himself as decidedly of opinion that the specially undesirable qualities exhibited by this particular grade (50 per cent.)—tendency to spontaneous disintegration and evolution of poisonous gases—were related to the amount of aluminium present in the alloy. He was unable . . . to advance any definite reasons for the opinion he had formed." Mr. Bennett later expressed the same opinion, and suggested that, as the heat of formation of Al_2O_3 is very great, the presence of a large percentage of aluminium is indicative of very high temperature reactions in the furnace, and that these reactions are favourable to the formation of compounds which readily break up into poisonous and explosive gases."

This can hardly be so, for Prof. Arnold, who, it is understood, will present a report later, has had one lot of ferro-silicon divided into two portions and melted in two crucibles. When molten, to one only was added 3 per cent. aluminium, and the two portions were cast into separate ingots. The present writer, being interested in the experiment, broke a piece off each ingot, and, dipping them in water, noticed that one had no particular odour, but the other smelt very strongly, the latter proving to be that to which aluminium had been added. A too enthusiastic repetition of the experiment as a test produced just a feeling of discomfort which the fresh air soon dispelled, this last being a point of much importance, as where lives were saved it was practically the governing remedy. "Two of the passengers also left their cabins and, although very weak, succeeded in getting on deck. These two survived" (p. 15). No. 5 of suggested regulations may be quoted:—"Storage places at docks or at works where ferro-silicon is used should have provision for free access of air, and should be situated at a distance from work-rooms, mess-rooms, offices, &c." (p. 115).

The main conclusions of the report have been mentioned, but all interested in the subject should obtain a copy, as the details of the investigations are well worthy of study.

A. MCWILLIAM.

THE POSITION OF THE NEGRO AND PYGMY AMONGST HUMAN RACES.¹

A FULL analysis of the structural features of the negro shows that in many points he is more highly specialised than the less pigmented races of mankind, while in other characters he has remained more primitive. Although on the Continent there is a decided tendency amongst anthropologists to trace the descent of the human race through a non-anthropoid stock, yet those most familiar with the anatomy of the Primates still agree with Huxley's doctrine that the community of structure shared by man and anthropoids pointed to a direct community of origin. The deeply pigmented skin was a primitive feature; the gorilla was the negro amongst anthropoids; the three species of chimpanzee varied as the period of life at which pigmentation appeared. All available evidence points to a pigmentation of the early human stock, but speculations are handicapped by an ignorance of the functional value of pigment. It appears to protect the deeper tissues from certain injurious rays which are intermediate to heat and light. The skulls of Palæolithic Europeans show so many resemblances to those of Australian aborigines that a legitimate suspicion may be raised as to whether or not they did not also share some degree of the aboriginal pigmentation. The Palæolithic Gibraltar woman, whose skull is preserved in the Museum of the College of Surgeons, shows no community with the negro in the characters of her nose. The nose of that skull is altogether unlike that of any human race now known; it shares some features with the gorilla, while

¹ Abstracts of four Hunterian Lectures on "The Anatomy and Relationships of the Negro and Negroid Races," given at the Royal College of Surgeons, England, by Prof. Arthur Keith.

in others it appears to foreshadow the prominent nose of the modern European.

The evidence of the nose of Palæolithic man leaves the question of pigmentation of the early European open. The distribution of pigmentation among modern races could be explained best by supposing that the appearance of the fairer races—the Caucasian and Mongolian—was one of the more recent events of human evolution, and that the site of their evolution was in the central populations of the more northern parts of the Old World. The frizzled hair of the negro was a highly specialised feature. Their thick everted lips, unlike the thin anthropoid lips, at first sight seem also to be so, but when the arrangement of the labial musculature is examined, it is seen that the negro's lips are more anthropoid than the European's; but the European form, notwithstanding their apparent thinness, appears to be a modification of the negro form. The high and prominent cheek-bones of the negro are due, not to an absolute greater breadth of the face, but to the fact that the muscles of mastication have become specialised in different directions in the negro and European; in the negro the masseter muscle, which arises from the cheek-bone, is particularly large, whereas in the European it is the temporal muscle, which has its fixed basis on the side of the skull, that retains the greatest relative development.

The apparent breadth of the negro's face is largely owing to the fact that the basal part of the skull, to which the neck muscles are attached, is small. The small attachment of neck is a feature of the young of all Primates, and also one in which the negro has assumed a less anthropoid form than the European. The prognathism of the negro is due to several factors; it is chiefly due, not so much to a larger, but to a healthier dental development, which ensures a due forward revolution of the jaws during the eruption of the permanent teeth, thus providing an ample air-way in the pharynx. In Europeans the revolution forwards of the jaws showed a distinct tendency to become arrested prematurely, thus contracting the pharynx. The negro condition was the more Simian, but it is also one which modern Europeans would willingly share with him, because of its functional merits. Sir William Flower's method of estimating prognathism gave misleading results. The most accurate method of stating the development of the jaws was to give the area of the palate and the total size of the teeth.

Some of the most characteristic features of the negro race were to be seen in their foreheads. While Palæolithic Europeans showed the Simian beetling brows and receding forehead, features still shown in some degree by modern white races, the great majority of African negroes were characterised by prominent foreheads and a complete absence of that condition which might be described as supra-orbitalism. It is true that some tribes on the west coast, the oceanic negroes, and the Tasmanians still retain this primitive character. Indeed, the outstanding feature of the negro's skull is a tendency to retain characters of the immature skull of other races. Those who know the psychology of the negro best ascribe to his brain the boyish nature here ascribed to his skull.

The pygmies, usually described as Negritos, are true negroes in which the tendency to assume immature characters has become hereditary to an extreme degree. They are widely distributed. Sir Harry H. Johnston has shown how they are scattered amongst the forest tribes from the west coast almost to the east coast of Equatorial Africa; they stretch southwards almost to the Cape, and isolated communities are found as far eastwards as the Philippines and New Guinea. Two explanations may be offered for their distribution:—(1) they are remnants of a race that was spread formerly throughout the southern half of the Old World; (2) they are modifications produced locally from the larger negro. The second explanation is apparently the correct one, for the Congo pygmies share all the physical features of the Bantu except size; the Bushman has the characters of the Hottentot, while the pygmies of the far east find their nearest representatives in the negroes of the Oceania. Recent advances in our knowledge of human pathology make this supposition of the origin of pygmies more probable. Disturbances in the

secretion of certain glands, such as the pituitary and thyroid, lead to the production of the characters of Palæolithic features in some individuals and true dwarfism in others. In the Miocene period the large-bodied Primates had already appeared; primitive men were certainly not pygmies in size.

An analysis of the cranial features of the aborigines of Tasmania and of Australia shows that we have in these two races an early stage in the differentiation of the negro and negroid races of mankind. The Tasmanian is the most primitive type of negro yet discovered; the Australian, on the other hand, although deeply pigmented and less Simian in some features than the Palæolithic European, is the most primitive representative of the negroid race. Negroid as he is, the native Australian represents a stage in the evolution of the dominant non-negroids of the northern hemisphere. It is a remarkable fact that the negro and negroid races occur side by side, not only in Austral-Asia, but in Asia proper and in Africa. The negro Semangs of the Malay Peninsula live with the negroid Sakai as neighbours; the Veddahs of Ceylon are not far from the negro of the Andamans; even in Quaternary Europe the negro race discovered by Dr. Verneau in the caves of Grimaldi were early successors, if not contemporaries, of Palæolithic man. The Grimaldi negroes find their nearest modern representatives in the Oceanic, not the African, negro; equatorial Africa and northern Europe were the probable centre in which the black and white races had reached their present degree of structural evolution. The two centres were linked together, and always had been linked, by racial zones which showed intermediate characters. Modern anthropologists are inclined to ascribe the characters of intermediate races to intermarriage. Interbreeding had certainly played a part, but probably a small one. The truer explanation seems rather to lie in regarding intermediate races as representing intermediate stages of physical and mental evolution.

TREES AND FORESTS.

THE botanical gardens at Peradeniya, Ceylon, are celebrated for their vegetation splendour, so that a list of beautiful flowering trees recommended by the curator, Mr. H. F. Macmillan, will appeal to many outside the range of those for whom the Circular (vol. iv., No. 20) of the gardens is immediately intended. In the author's opinion, the leguminous tree *Amherstia nobilis* is not to be excelled, although *Lagerstroemia flos-reginae* passes under the name of "pride of India," and *Poinciana regia* is the famous "flame-tree." The *Amherstia* was introduced to Ceylon from Burma, and it is remarkable how many of the plants mentioned have been imported from the tropics of the New and Old World. *Gliciridia maculata* is a recent introduction from the West Indies; *Solanum macranthum*, the "potato-tree" from Brazil, is noteworthy as the only species of the order that grows to the size of a tree.

A description of the indigenous trees of southern Rhodesia, together with their vernacular names and products, is provided by Mr. C. F. H. Monro in the Proceedings of the Rhodesia Scientific Association (vol. viii., part ii.). An important matter is the production of timber suitable for mining, construction, and agricultural purposes. The most useful timbers are yielded by *Copaifera mopani*, *Pterocarpus angolensis*, *Photinia mahobohobo*, and *Parinarium mobola*. *Baikiaea plurijuga* is known as Rhodesian teak; *Azela cuanensis* supplies the local mahogany, while a somewhat similar, handsome wood is furnished by *Faurea saligna*, a species of Proteaceæ. The woods of some of these, as also of *Callitris Whytei* and *Terminalia sericea*, are said to be ant- and borer-proof.

Two forest pamphlets (Nos. 12 and 14) recently issued by the Government of India relate to *Berrya Ammonilla*, a tree, belonging to the family Tiliaceæ, that is found principally in Burma, and *Pterocarpus macrocarpus*, a leguminous tree yielding Burma padauk timber. Regarding the former, logs up to 20 feet in length, and measuring 4½ feet in girth, can ordinarily be obtained. The timber is tough, elastic, and straight-grained; it

works and finishes well, so that it would appear to be suitable for export; but the annual outturn is only computed at 1500 tons, and there is a good local demand for construction work, for carriage shafts, draught poles and various agricultural implements. Burma padauk must be distinguished from Andaman padauk, obtained from *Pterocarpus dalbergioides*, which is noted for the brilliant red colour of select logs. Although inferior in colour, Burma padauk is much superior in strength and durability, and is regularly supplied to the Ordnance Department for spokes and felloes of wheels, poles, yokes, and other purposes. Timber which does not comply with the stringent requirements of the Ordnance Department is quite suitable for wheel work, furniture, and interior decorations. Both kinds of padauk have been imported to England and America, but various causes have militated against their successful exploitation in this country.

A forest pamphlet (No. 16) issued by the Government of India is devoted to an account of experiments conducted by Mr. R. S. Hole with the view of determining the best season for coppice fellings of teak. The rainy season—mid-August to October—is frequently selected for felling, although it might be expected that, vegetative activity being then at its height, the development of coppice shoots would be poor. However, the trials carried out, with many precautions, indicate that the worst period for the fellings is from the time, April to August, when vegetative activity commences, up to and for a short time after the full development of the foliage, and that reproduction is most vigorous in the months of March and September. Incidentally, the author notes that good fertile seed has been obtained from nine-year-old coppice shoots of teak.

It is a coincidence that information regarding the importance of trees belonging to the Dipterocarpaceæ should be forthcoming simultaneously from Burma and the Philippines. In the *Philippine Journal of Science* (Botany, vol. iv., part vi.) Mr. H. N. Whitford presents some striking estimates regarding the preponderance of the family in the Philippine forests, according to which Dipterocarp trees may be expected to yield three-quarters of the total volume of merchantable timber growing in a virgin forest area computed at 30,000 square miles. He directs special attention to the value of the woods known locally as "lauan," yielded by species of *Pentacme*, *Shorea*, and *Parashorea*, and "apitong," yielded by species of *Dipterocarpus*; the former are slightly harder but similar to white pine, while the latter compare with the hard pines.

A paper on Indian State forestry, by Mr. S. Eardley-Wilmot, late Inspector-General of Forests, is published in the *Journal of the Society of Arts* (April 1). He mentions that the forest department has control over an area of 240,000 square miles—about one-fifth part of British India—from which $4\frac{1}{2}$ million tons of timber and 180 million tons of bamboos are extracted annually. A rough demarcation of the forests is indicated as follows. They range from a height of 14,000 feet, where birch and firs supply the chief constituents, to the mangrove belts situated at sea-level. At an altitude of 8000 feet rhododendrons, oaks, cedars, and pines flourish in different regions. *Dalbergia Sissoo* and *Acacia Catechu* grow in the submontane forests. The deciduous forests at a lower elevation supply teak, sál, ebony, and ironwood, while important evergreen forests are found near the coast or further inland.

A number of interesting problems receiving attention at the Swedish Royal Forestry Institute are detailed in the *Proceedings (Meddelanden från Statens Skogsförsöksanstalt, part vi., 1909)*, such as the examination of the native forests from an ecological standpoint, the best trees to plant on heath or swamp land, and the improvement of regeneration by the selection of seed. In connection with the last problem, Dr. N. Sylven communicates the results of his attempt to identify different races or types of the spruce; he distinguishes five types, according to their mode of branching, of which the so-called "kamm" type is recommended as the best seed-bearer. An extensive paper by Mr. E. Wibeck deals with the extent of the beech forests in Sweden, showing that the area has decreased greatly in a period of 200 years, having been reduced partly by human agency, by fires, for the manu-

facture of potash, and by excessive cutting, and partly by natural causes, such as the intrusion of the spruce.

Two articles by Mr. R. Thomson on the Jequíé *Manihot* rubber tree, *Manihot dichotoma*, published in the *Indian Forester* (vol. xxxvi., Nos. 1-3), contain suggestions which appear to be worthy of careful consideration. This species, indigenous to the State of Bahia, in Brazil, forms a tree about 20 feet in height, and develops a stem 20 inches in circumference. The author contends that, being much smaller than the Para rubber tree, there is less production of useless material, and that it could be planted more closely, so that by planting 1200 specimens to the acre he estimates a production of 600 lb. of rubber per acre in the fifth year. It is further suggested that climatic difficulties might be overcome by a system of cultivation in rough sheds, such as is adopted in California for growing pine-apples.

TINCTORIAL CHEMISTRY, ANCIENT AND MODERN.

IN his recent presidential address to the Society of Dyers and Colourists Prof. Meldola touched upon several matters of general interest and importance. Referring to the substitution of synthetical for natural dyes, which has entailed great changes in the dyer's methods, he said:—"Such a revolution in an industry of venerable antiquity as has been effected in about half a century has, perhaps, never before been witnessed in the history of applied science. Scientific discovery has, it is true, called new branches of industry into existence, and has thus opened up new fields of human enterprise and outlets for capital and labour. But in this case there has been no new creation; an ancient industry at the touch of science has become transformed.

"If it be asked to what cause or causes this rapid development is due, there can be only one answer—the development of the science of organic chemistry. From the time of Perkin's discovery of mauve in 1856, down to the very latest patents for new dyestuffs, it has been science, and nothing but science, all along the line."

It is, of course, equally true, as Prof. Meldola has himself pointed out elsewhere, that the development of the science of organic chemistry has been greatly accelerated by the large amount of research work carried out in the laboratories of the large German colour manufacturers. In regard to the general question of the interdependence of science and industry, he has been one of the chief propagandists for the last twenty-five years, on the platform and in the Press; and on this matter he said:—"It has long been familiar to students of economics—whether we in this country recognise the doctrine or not—that industrial development is ultimately dependent upon scientific development. Fiscal considerations may have some influence in promoting or retarding an industry, but primarily the financial economist, as well as the political economist, is dependent upon the materials supplied by productive industry, and the production of these materials in the most advantageous way and the addition of new materials to the resources of civilisation is the business of scientific research, and it is, therefore, scientific activity which is the real and solid basis of national prosperity. The nation which fails to realise this principle is bound to go under in the long run in that industrial struggle which is certain to become keener with the progress of science and the severity of competition arising therefrom."

This primarily important matter cannot be too often brought forward, but, at the same time, although we have much leeway to make up before we come abreast with our chief industrial competitors, there are signs that at last the nation is "waking up" to realise the position. The daily Press, as reflecting the average interests of the public, is now paying an increasing amount of attention to scientific matters. It is no doubt an easy matter to be adversely critical in regard to the quality of the science which is served up in our morning paper, but that is easily remedied, and the all-important matter is that science is fast achieving a prominent place as a current newspaper topic.

An adequate historical survey of the modern science of tinctorial chemistry has yet to be written. In his address Prof. Meldola supplied one chapter of such history by relating his personal experiences during the fifteen years (1870-85) he was directly connected with the manufacture of synthetic dyestuffs. It is not possible to summarise this historical survey in the space now at disposal, but the hope may be expressed that Prof. Meldola will find opportunity to write the complete story of the art of dyeing. It would be equally as fascinating as his well-known contributions to Darwinism.

Having given his personal reminiscences of the most prolific period during the rapid modern development of the industry, Prof. Meldola reverted to remote antiquity, and summarised the ancient industrial history of dyeing as described by the elder Pliny in his "History of Nature," written about the beginning of the Christian era. Indigo has probably been used by the natives of India for at least 3000 years, and by processes essentially the same as those used to-day; in fact, until Perkin's discovery of the first coal-tar dye in 1856, the art of dyeing has made comparatively little progress since the ancient Briton stained his body with woad.

The most important dye in ancient times was the Tyrian purple, the use of which was at first confined by law to the Imperial House—hence the expression "born in the purple."

"The modern sequel to this ancient chapter of tinctorial art," said Prof. Meldola, "has been supplied by P. Friedländer, who has extracted the colouring matter from the Mediterranean *Murex brandaris*, and has proved it to be dibromindigo.¹ And thus ancient observation, which found practical application in the utilisation of a certain mollusc as a source of colour, has led to a remarkable biochemical discovery; but we have had to wait some 2000 years for the answer to the question, What was the purple dye of the ancients? Shall we have to wait another 2000 years for the answer to the question, How does the living shell-fish synthesise the generator of dibromindigo?"

Much has been written, and many diverse opinions have been expressed, as to the cause or causes of the loss of the coal-tar colour industry to England. This has been variously attributed to defects in our Patent Laws, to our heavy excise duty on alcohol, and to our unsuitable industrial conditions. In this matter Prof. Meldola sounded no uncertain note. "The answer to this last question has been staring us broadly in the face for over thirty years. It is amazing that there should have ever been any doubt about, or any other cause suggested than the true cause, which is *research*—writ large! The foreign manufacturers knew what it meant and realised its importance, and they tapped the universities and technical high schools, and they added research departments and research chemists to their factories, while our manufacturers were taking no steps at all, or were calmly hugging themselves into a state of false security, based on the belief that the old order under which they had been prosperous was imperishable. It is true that when the effects of the new discoveries began to make themselves felt, one or two factories did add a research chemist to the staff, but the number and the means of work were totally inadequate. I happened to be one of them, and so I speak with some practical knowledge of the conditions. We were but as a handful of light skirmishers against an army of trained legionaries. What could three or four—say half a dozen at a liberal estimate—research chemists, working under every disadvantage, do against scores, increasing to hundreds, of highly trained university chemists, equipped with all the facilities for research, encouraged and paid to devote their whole time to research, and backed up by technological skill of the highest order? The cause of the decline of our supremacy in this colour industry is no mystery—it is transparently and painfully obvious. In the early stages of its decadence it had little or nothing to do with faulty patent legislation

or excise restrictions with respect to alcohol. The decay of the British industry set in from the time when the Continental factories allied themselves with pure science and the British manufacturers neglected such aid, or secured it to an absurdly inadequate extent in view of the strength of the competing forces."

It still remains to inquire the reason for this different attitude towards chemical research which was, and is still, though in lesser degree, adopted by our manufacturers. At the time we lost the industry the skill of the British workman and the enterprise of the British manufacturer were the admiration of the world, but the colour industry did not develop here because our industrial leaders did not lay the foundation of success by subsidising and cultivating chemical research. Why? The answer to this question is to be ultimately found in the utter lack of appreciation of the value and importance of scientific method which existed at that time amongst the public in this country. It would then have been impossible to convince any body of shareholders that it was a sound business proposition to expend yearly many thousands of pounds in research work the outcome of which was problematical. It would, indeed, not be an easy task even in these more enlightened days.

WALTER M. GARDNER.

THE MEDICAL INSPECTION OF SCHOOL CHILDREN.¹

LESS than three years ago there did not exist a medical department of the Board of Education. To-day there lies before us a Blue-book, of 170 pages, detailing, with much substance, the work undertaken or done to establish and regulate the vast system of medical inspection of schools and school children now operative over the length and breadth of England. In modern social history no movement has come so rapidly to maturity as the system of inspection here, for the first time, placed in a connected way before the general and official public. In a lucid preliminary section Dr. Newman briefly sketches the relation of our present developments to the efforts, both here and on the Continent, towards a systematic medical supervision of school children. "In the latter year (1865), the report of the School Commission in Norway did something to bring the importance of school hygiene once more before the general public, and in 1866 Hermann Cohn undertook his classic researches into the eyesight of over 10,000 children at Breslau" (p. 2). Cohn, now dead, was one of the venerable figures at the first International Congress of School Hygiene at Nuremberg. He was still full of energy and enthusiasm. Much occasional and disconnected local work followed, but "the Wiesbaden system marks the introduction of a new conception and understanding of the problem. This system, which has been widely adopted in Germany, treats the child as the centre of interest and his well-being as the end of reform, to which even the most satisfactory school environment is only a means. . . . Throughout the German Empire a large number of school doctors have been appointed, and so some 350 towns and communities have undertaken in a greater or less degree the work of medical supervision of school life" (p. 4)—a good result since the first appointments in Wiesbaden in 1896.

The English movement, though prepared for by many workers in personal and public hygiene, dates from the report of the Royal Commission on Physical Training (Scotland) in 1903. Dr. Newman does not make it perfectly clear why, at this particular juncture in British history, such a report should have been called for; but there is no doubt that the Commission arose out of the revelations of physical inefficiency made during the great South African war, particularly at the recruiting stations. There was then a rising wave of opinion on the need for better physical training in the early stages of life. Incidentally, and, as it were, casually, the supreme need for medical inspection was revealed, and, up to date, this

¹ *Berl. Ber.*, 1909, vol. xliii, p. 765. For this research 12,000 molluscs were extracted, the total yield of pure colour being 0.4 grms. The dibromindigo is formed from its colourless generator, which is a vital product of the organism, by the action of light. The actual compound is shown to be the 6:6-dibromindigo, but the nature of the intermediate generator has not yet been determined.

¹ Board of Education. Annual Report for 1908 of the Chief Medical Officer of the Board of Education. Pp. 170. Cd. 4986. (London: Eyre and Spottiswoode, 1910.) Price 8½d.

is the chief result of the Scotch Commission and the many further inquiries set going by it. Physical training has shared in the benefits of more scientific direction. The rest of the history is written in the statutes and administrative orders and circulars now current in Great Britain. A movement so wide and so costly could have emerged only from a great national awakening, and this report, the first of the new medical department, shows how far advanced the organisation already is. The report contains all the administrative detail necessary to enable the interested sociologist to grasp the significance of the movement.

Naturally, in a first report, questions of organisation and administration bulk relatively large. Dr. Newman makes very clear the relation of the new school medical officers to the public health service. This was a matter of great concern at the outset, but the solution of difficulties seems to have gone forward smoothly, and to-day any dissociation of services is the exception, not the rule. Subordination of the school medical officer to the medical officer of health, or some definite form of cooperation, seems to have been established practically in every educational area. "There is an interdependence and solidarity in these matters which can only be ignored or neglected at the price of inefficiency and failure" (p. 17).

Whole-time medical assistants are the rule, part-time assistants the exception. "There have been no cases of Authorities commencing with a few whole-time assistants and changing to many part-time assistants" (p. 19). This is a very significant fact. Of the 307 educational areas, 160 have been provided with one school medical officer each—the minimum necessary under the Code. In the other 147 areas, "there are in all 616 assistant medical officers"—122 whole-time, 494 part-time. The arrangements for twenty-one other areas have not yet been finally approved, but, approximately, 1084 medical officers are at work "in the school medical service in England and Wales" (p. 18). This is certainly a splendid record. The qualifications of officers, the part played by the teacher, the school nurse, the general scope of the work, all are discussed with quantitative references. It is estimated that, for England and Wales, not fewer than 1,328,000 children were medically inspected during 1907-8, and when to these are added 250,000 "specials," that is, children specially brought under the medical inspector's notice as needing attention, the total amounts to not less than 1½ million children. The general experience with parents is that they have appreciated the work warmly, and sometimes enthusiastically, there being a few, but only a few, complainers.

As to treatment, the facts are, of course, very meagre as yet, but not discouraging. So far as facts are available, the number medically attended to through the parents themselves runs from 20 to 60 per cent. of those brought to their notice by the education authorities. There is here abundant room for organisation and propaganda. The cost of medical inspection, so far as salaries go, runs from 4-79d. per child in average attendance in the counties to 7-64d. in the municipal boroughs and 7-56d. in the urban districts, or, in the same order, from 0-15d. of rate to 0-23d. and 0-28d.—no great outlay for so great a service.

The rest of the volume is taken up with details of the results of medical inspection in the discovery of defects or diseases. The results are necessarily "tentative and fragmentary" (p. 39), but more than enough to justify the institution of the system and to indicate the immense amount of administrative energy now directed to the amelioration of evil conditions, both environmental and personal. Cleanliness is steadily improving under the pressure of definite administrative direction. For instance, in 124 London schools Dr. Kerr found, of 92,185 children examined, 16,060 verminous, and 2228 were excluded for prosecution—the parents of 255 children being prosecuted, and fined in sums varying from 1s. 6d. to 20s. As a rule, the first "notice" is enough to secure cleansing. Ring-worm is diminishing. Teeth are beginning to be treated, as, for instance, in Cambridge. Many other diseases now familiar to the general public are here recorded—adenoidal growths, ear discharges, short sight, &c. There is a good series of paragraphs dealing with tuberculosis, in particular

with phthisis. The results in percentages for phthisis vary widely—from well below 1 to well above 4. Obviously there are differences both in the localities and in the methods of diagnosis. This is a disease that has not yet found its "level" in the professional mind. There are sections dealing with the new syllabus of hygiene, with schools for defective children, open-air schools, and many other matters of current importance.

The report, as a whole, reflects every credit on the system of medical inspection and on the Board of Education itself. Only the experienced administrator can read from these records the enormous difficulties to be overcome and the skill shown in overcoming them.

NOTES ON THE ORIGIN OF THE HAUSAS.¹

NEXT to the Filani, the most important race in northern Nigeria is the Hausa, whose origin is undetermined. These people occupy at present most of the land between the ninth and fourteenth parallels north latitude, and the fourteenth and eleventh meridians east longitude. Their number is variously estimated; perhaps 4,000,000 is fairly accurate. They are the traders and soldiers of West Africa, and are very good agriculturists, and workers in brass and leather, but seem to have been unable to conquer under their own leaders.

The Hausas have not the fine features of the Filani, nor yet the very thick lips and flat noses of the coast negro; they are rather short and stumpy, with woolly hair. Their original country in northern Nigeria consisted of seven States, the "Hausa Bokkoi," to which an equal number, "Banza Bokkoi," were afterwards added. These States were independent of—though dependent on—one another. There are two principal theories as to their origin, viz. (1) that they were indigenous, and (2) that they came from Egypt or Ethiopia. I cannot see why these two apparently opposite ideas cannot be modified and reconciled.

It would seem that the following statements are permissible:—

(1) The religion is in too many points similar to that of the ancient Egyptians to imagine that it was formed quite independently.

(2) The Hausas have the trading and wandering instincts of the Semites, and have travelled voluntarily and without external pressure, whereas the people of most West African negro tribes have kept together, unless conquered and driven out of their country.

(3) The cephalic index is one which we would naturally expect in the descendants of a mixture of races, some having a greater, some a less, index. Because the Arabic element was in the minority, and because of the influence of environment, the Hausa cephalic index is nearer to that of the Egyptian Copts and mixed races than to that of the Arabs. The present Hausa race is a further mixture of the people who came, in A.D. 1000, with the aborigines.

(4) Arabic has had some influence in the formation of the Hausa grammar, as well as supplying about one-third of the words, and so some of the people who formed the Hausa vocabulary must have known Arabic. Again, since two-thirds of the words present no similarity to any Semitic language, it is evident that other elements are present, and some of these are related to Coptic. The word Habeshi was a term of contempt applied by Arabs to mixed races, and Hausa (Ba-haushe) is a modification.

(5) The people came from the East (ancient Ethiopia) and brought the horse. Arabs had horses at this time (1000 A.D.), and the mixture which arrived no doubt spoke a certain amount of Arabic. They may have been Hamites, but it is much more likely that they were a mixture of Hamites and Semites, together with elements of local populations encountered *en route*, and the original inhabitants of the country now forming the Hausa States. There is probably a little Berber blood also, and even a further addition of Arabic. Being ashamed of their humble origin, they invented one for themselves, and called their mythical ancestor Babushe, which is really Ba-(ha)beshi and Ba-hab(eshi) or Ba-haushe.

¹ From a paper by Capt. A. J. N. Treme'ræe in the *Journal of the Royal Society of Arts*, July 8.

MODELS OF METEOROLOGICAL CONDITIONS IN THE FREE AIR.

THE photographs of which Figs. 1 and 2 are reproductions are views of two glass models constructed at the Meteorological Office to represent the temperatures and pressures in a block of atmosphere fifteen miles thick over a triangular portion of the British Isles on July 27 and 29, 1908.

Records of pressure and temperature were obtained by means of balloons carrying small meteorographs, designed by Mr. W. H. Dines, F.R.S. Corresponding values of pressure, temperature, and height were computed from the records.

Balloons were liberated at Ditcham Park, Petersfield; Pyrton Hill, Oxfordshire; Glossop, Derbyshire; Crinan, Argyllshire; and Birdhill, Co. Limerick. The courses of the balloons were in some cases traced for part of the way by means of theodolite observations.

The purpose of the models is to give a representation of the information thus obtained, and to exhibit the meteorological variations in three dimensions. Each model consists of a rectangular base, upon which is drawn an outline map of a portion of the British Isles on the scale of 25 miles to an inch, together with isobars and winds for 6 p.m. on one or other of the two days. Upon the base are erected vertical glass plates, secured at the top by a horizontal plate. In Fig. 1 (July 27) the vertical edges of the prismatic shell thus formed, from left to right, stand over the above-named stations in order, Birdhill being the corner shown at the back. In Fig. 2 (July 29) Ditcham is represented only by a standard bearing arrows to show wind direction. The recording instrument sent up from that station on that day has not been found.

Distances measured vertically along the glass sides of the models represent heights above sea-level on the scale of 5 miles to 4 inches. The vertical scale of the model is therefore twenty times the horizontal scale of the map. The total height represented is 24 kilometres (15 miles).

The observations from each station are plotted on the edges of the models. Isotherms (full lines) are drawn on

the glass sides for every 5° C., the temperature being expressed in absolute measure. The space between the isotherms of 270° and 275° is filled in to indicate the position of the freezing point.

Both models show clearly the two main divisions of the

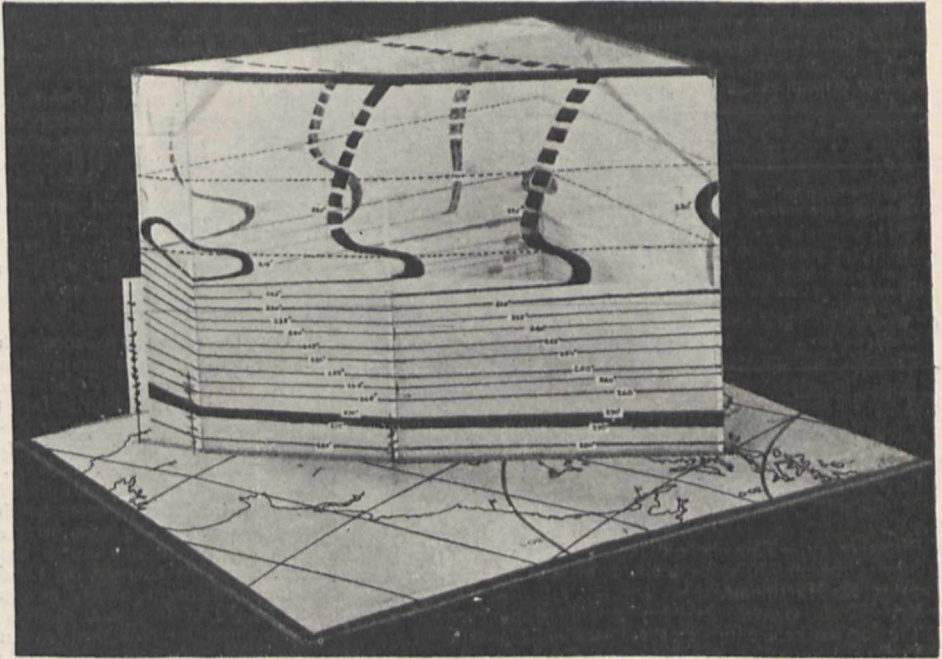


FIG. 1.—From observations taken on July 27, 1908. Block seen from the north-east. Isotherms are shown for each 5° Absolute from 280° A. to 215° A. The space between the isotherms of 270° and 275° is filled in; for other isotherms a thickness corresponding with ½° C. is covered. The beaded lines in the stratosphere are isobars for 0.2 megabar and 0.1 megabar respectively. The arrows on the standards face the wind as determined by observations with theodolites.

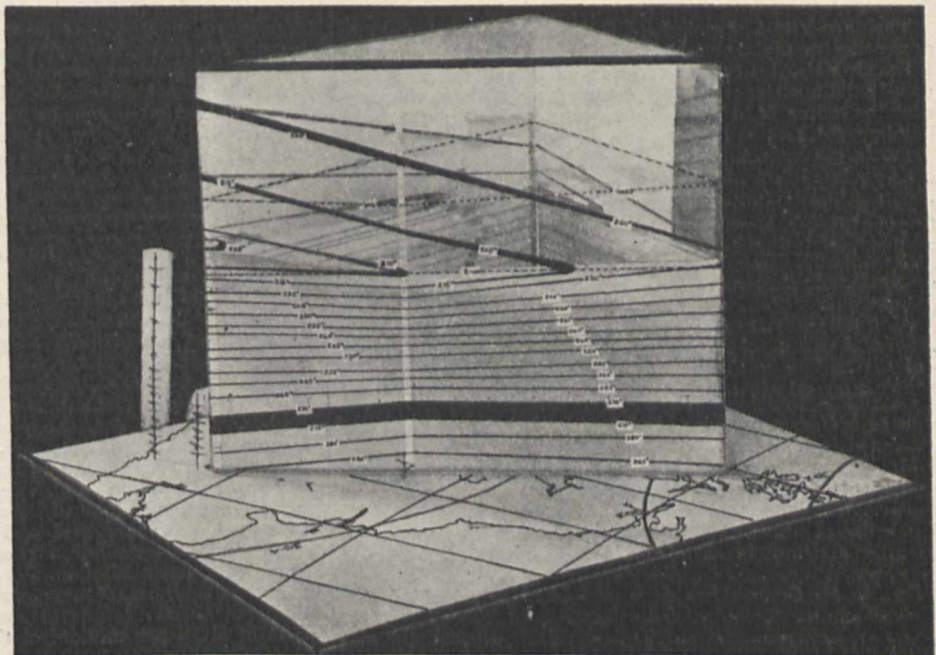


FIG. 2.—From observations taken on July 29, 1908. Block seen from the north-east. Isotherms are shown for each 5° Absolute from 285° A. to 205° A. The space between the isotherms of 270° and 273° is filled in; for other isotherms a thickness corresponding with ½° C. is covered. The beaded lines in the stratosphere are isobars for 0.2 megabar and 0.1 megabar respectively. The arrows on the standards face the wind as determined by observations with theodolites.

atmosphere, viz. :—(1) "troposphere," or lower portion, in which temperature diminishes with height at a nearly uniform rate and the isothermal surfaces are approximately horizontal, and (2) "isothermal region," or

"stratosphere," above the troposphere, in which temperature is nearly constant or increases slowly with height, and the isothermal planes tend to become vertical.

Isobars for one-tenth and one-fifth of an atmosphere (0.1 megabar and 0.2 megabar according to the nomenclature of the Paris Conference of Physicists, 1900) are shown by beaded lines in the upper parts of the figures.

Wind-direction observations are indicated by arrows facing the wind, carried on standards.

The chief points of difference between the two models are the following:—

	FIG. 1.	FIG. 2.
(1) Surface temperature ...	From 280° to 285°	From 285° to 290°
(2) Sea-level pressure... ..	From 1'016 to 1'023 megabar (30'0 to 30'2 in.)	From 1'026 to 1'033 megabar (30'3 to 30'5 in.)
(3) Height of lower surface of stratosphere	9 km.	10 km.
(4) Lowest temperature in stratosphere	About 215°	About 205°
(5) Wind direction at south- east angle	Nearly S. throughout	Nearly N. throughout

Both figures show that the position of the coldest air was at a height of 10–11 kilometres over the most southern portion represented.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The chair of accounting vacated by Prof. Sidney Dawson has been filled by the election of Mr. Charles E. Martineau.

Mr. W. B. Grove has been appointed honorary curator of the fungus herbarium in the Botanical Department.

Prof. R. Saundby has been appointed to represent the University on the General Medical Council for a further period of five years.

Prof. Bostock Hill is to represent the University at the Conference on School Hygiene to be held in Paris in August.

The Pro-Vice-Chancellor (Alderman F. C. Clayton) is presenting to the University a statue of His Majesty King Edward VII., in commemoration of the opening of the new buildings by the late Sovereign. It is understood that the statue is to stand in the entrance hall of the main building.

LEEDS.—Arrangements have now been completed for the establishment of a professorship of coal gas and fuel industries at the University as a memorial to the late Sir George Livesey, upwards of 10,500l. having been subscribed to the fund initiated for the purpose by the Institution of Gas Engineers, and an advisory committee has been formed in connection with the work to be carried out by the holder of the chair.

Dr. J. K. Jamieson, hitherto chief demonstrator of anatomy, has been appointed professor of anatomy in the University.

LONDON.—Sir Henry Roscoe has resigned his membership as a Crown nominee, and Mr. F. D. Acland has been appointed in his place.

Mr. F. L. Golla has been appointed honorary demonstrator of chemical pathology and pharmacology in the physiological laboratory of the University, and Mr. A. D. Mitchell, of Sheffield University, has been appointed scientific assistant in chemistry in the University.

Dr. J. D. Coales has been appointed principal of the Wolverhampton Technical School.

Mr. J. A. Jenkins, for fifteen years registrar of the University College of South Wales, Cardiff, has resigned that position.

On July 8, the honorary degree of Doctor of Laws of the University of Edinburgh was conferred upon Prof. John Chiene, emeritus professor of surgery in the University; Prof. Matthew Hay, professor of forensic medicine, University of Aberdeen; and Prof. W. H. Perkin, F.R.S., professor of organic chemistry, University of Manchester.

The increasing popularity of holiday courses for teachers is an excellent indication of the growing desire of schoolmasters and schoolmistresses to acquaint themselves with improved methods of instruction, and to bring their knowledge up to date by attending during their holidays lectures by experts. The County Council of the West Riding of Yorkshire has arranged a series of vacation courses for teachers, to be held at the Municipal Secondary School, Scarborough, during August next. Among the items in a very attractive programme, we notice a course of ten lectures by Prof. A. Smithells, F.R.S., on solution, and the physics and chemistry of cleansing processes; twelve lectures on the teaching of general elementary science, by Mr. W. Mayhew Heller; and eight lectures on nature-study, by Mr. O. H. Latter. Laboratory work and excursions have been arranged in connection with these courses. There will also be a course in educational handwork, organised by the Educational Handwork Association, during July and August at the same place, and it is possible for students to take a joint West Riding and handwork course.

On December 21, 1909, the London County Council decided to make a maintenance grant of 8000l. to the Imperial College of Science and Technology, South Kensington. In return for this grant it secures the privilege of nominating twenty-five students for one year's free instruction at the Imperial College. These are now to be nominated for the first time. The instruction will be of an advanced nature, and therefore only advanced students who are qualified to enter on the fourth year of the course should apply. There is no restriction as to income, but intending candidates must be ordinarily resident in the Administrative County of London, and must be students at an institution aided, maintained, or approved by the council. The free studentships do not entitle the holders to any maintenance grants, but cover all ordinary tuition fees. No examination will be adopted for the final selection of the students from the applications received. The free studentships will be awarded on consideration of the past records of the candidates, the recommendations of their teachers, the course of study they intend to follow, and generally upon their fitness for advanced study in science applied to industry. It is quite possible that, in special cases, the free places may be extended to two or more years. Application should be made without delay, as entries will not be considered after July 23. Application forms (T. 2/268) can be obtained from the Education Officer, London County Council, Victoria Embankment, London, W.C.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, June 30.—Sir Archibald Geikie, K.C.B., president, in the chair.—Prof. A. D. **Waller**: A new method for the quantitative estimation of hydrocyanic acid in vegetable and animal tissues. The method is colorimetric, and depends on the reaction between potassium cyanide and picric acid, first studied by Hlasiwetz (*Liebig's Annalen*, cx., p. 289 [1859]), and recently applied by Guignard to the detection of minute quantities of hydrocyanic acid (*Annales Sci. Pharmacol.*, 1906, p. 415) and by H. E. Armstrong to the rapid detection of emulsin (*Proceedings*, March 10). The colour-scale is prepared by mixing equal volumes of a recently titrated solution of 1/10000 hydrocyanic acid and of picrate mixture (equal volumes of 0.5/100 picric acid and 5/100 sodium carbonate). From this stock solution (T 50), after twenty-four hours in an incubator at 40°, a colour-scale is prepared by further dilution with picrate mixture, to contain, e.g., 1, 2, 3, &c., parts of HCN per million, of tints T 1, T 2, T 3, &c. The estimation is made by matching the colour of the given fluid or of its distillate into picrate mixture (after suitable dilution if required), with that of the colour-scale. Thus, e.g., if the tint of a distillate from 10 c.c. of blood (dil. × 5) into 25 c.c. of picrate is found = T 5, and the volume of picrate + distillate is 40 c.c., the amount of HCN in the distillate = 5 × 40 millionths gram, i.e. 0.000200. A second distillation shows whether or no the whole of the HCN present has been taken over in the first distillate. Results

of the application of the method to (1) a leaf of *Prunus Laurocerasus*; (2) the blood and tissues of a cat after death by a known amount of HCN; (3) the blood and tissues of a person "found dead."—Prof. A. Dendy: The structure, development, and morphological interpretation of the pineal organs and adjacent parts of the brain in the tuatara (*Sphenodon punctatus*). The "pineal complex" consists of the dorsal sac, the paraphysis, the pineal sac ("epiphysis"), the pineal eye, the pineal nerves and their central connections. There is a well-developed choroid plexus, with special blood-supply, on the roof of the dorsal sac, possessing histological features of considerable interest. The paraphysis is a compound tubular gland, with special blood-supply, differing markedly in histological character from the choroid plexuses. Its lining epithelium forms a syncytium, and its opening, which, in the embryo, lies just in front of the commissura aberrans, becomes shifted upwards in the adult on to the anterior wall of the dorsal sac, by the formation of a "supra-commissural canal," the original opening being blocked up by the anterior choroidal blood-vessels. The histological structure of the pineal sac points to a sensory rather than a glandular function. Its wall is essentially similar in structure to the retina of the pineal eye, consisting of radial supporting fibres, sense-cells, and ganglion-cells and nerve-fibres, and pigment may occasionally be deposited in it. The retina of the pineal eye consists of the same histological elements arranged in essentially the same way, with the sense-cells on the inside and the nervous elements in the middle. The pigment is not lodged either in the sense-cells or in the supporting fibres, but is brought into the retina by wandering pigment-cells. The pigment granules escape from these wandering cells on entering the retina, and stream inwards between the radially arranged elements. The inner ends of the sense-cells project into the cavity of the eye, and are covered each by a little cap, formed apparently by the internal limiting membrane of the retina. The developing lens of the pineal eye increases in size partly as a result of mitotic divisions in a marginal zone of undifferentiated cells. As they approach the centre the cells elongate, and some of them degenerate into a kind of mucus, which is secreted from the inner surface of the lens into the cavity of the eye, where it takes part in the formation of the vitreous body. This process of secretion continues in the adult. The nerve of the pineal sac is from its first appearance median. It joins the roof of the brain between the posterior and superior commissures. The nerve of the pineal eye is shown, especially by its development, to be primarily connected with the left habenular ganglion, which even in the adult has a different shape from that of its fellow of the opposite side. Both nerves persist in a well-developed condition throughout life. The view that the pineal sac and pineal eye are respectively the right and left members of a primitive pair of sense-organs, serially homologous with the lateral eyes, is strongly supported. Altogether six pairs of diverticula are given off from the fore- and mid-brain, viz. the cerebral hemispheres, the optic vesicles of the lateral eyes, the recessus thalami pre-nucleares, the pineal sense-organs, the recessus geniculi, and the optic lobes. These may all be serially homologous with one another, and each may possibly indicate a separate neuromere. There is no commissura mollis and no unpaired plexus medianus in the third ventricle. Reissner's fibre and the sub-commissural organ are very well developed.—J. A. Crowther: The scattering of homogeneous β rays, and the number of electrons in the atom. (1) The scattering of a homogeneous pencil of β rays has been measured for various substances and for rays of different velocity. It has been shown to obey the following statistical laws:—(i) for rays of given velocity the intensity I of the radiation contained within a given cone may be expressed by the equation $I/I_0 = 1 - e^{-k/t}$, where t is the thickness of material passed through, and k a constant depending upon the angle of the cone; (ii) for rays of given velocity the most probable angle of emergence is proportional to the square root of the thickness of material traversed by the rays; (iii) for rays of different velocities, the probable angle of emergence divided by the square root of the thickness traversed is inversely proportional to the product of the mass of the incident β particle into the square of its

velocity. (2) From equations given by Sir J. J. Thomson, the number of electrons contained in atoms of different elements is deduced. It is thus found:—(i) that the ratio of the number of electrons per atom to the atomic weight is constant, the ratio being very nearly 3.0 for all the elements examined; (ii) that the positive electricity within the atom is not in an electronic condition, but is distributed fairly uniformly over the space occupied by the atom. (3) Experiments are described on the absorption of homogeneous β rays. It is shown that the first stage in the absorption of a pencil of homogeneous β rays consists in the scattering of the rays according to the laws already considered. The absorption of the completely scattered radiation is then shown to take place according to an exponential law.—F. Isaac: The spontaneous crystallisation and the melting- and freezing-point curves of mixtures of two substances which form mixed crystals and possess a minimum or eutectic freezing point.—Mixtures of azobenzene and benzylaniline. The results obtained in this research may be thus summarised:—(1) The freezing- and melting-point curves for mixtures of azobenzene and benzylaniline have been determined, and it has been shown that these substances possess a minimum or eutectic point at 26° for the mixture containing 19 per cent. azobenzene and 81 per cent. benzylaniline, and form a series of mixed crystals on one side only of the eutectic, viz. that with excess of azobenzene. This is, therefore, a limiting case of Roozeboom's Type 5, in which two substances, A and B, possess freezing- and melting-point curves which exhibit a minimum eutectic point, and form two series of mixed crystals, i.e. mixed crystals containing excess of A, and mixed crystals containing excess of B. (2) The melting-point curve has been confirmed by actual analysis of the mixed crystals. (3) The supersolubility curve, or curve of spontaneous crystallisation, has been determined for these mixtures by two methods:—(i) by noting the temperature at which a liquid mixture of known composition crystallises spontaneously in a sealed tube; (ii) by noting the temperature at which a known liquid mixture attains its highest refractive index and gives a dense labile shower when placed in the trough of the inverted goniometer. It has been shown that each mixture possesses a definite temperature of spontaneous crystallisation. The supersolubility curve shows a minimum for liquids having approximately the eutectic composition, and runs approximately parallel to the freezing-point curve. It crosses the melting-point curve three times. The nature of the mixed crystals which first separate spontaneously from any liquid mixture on the supersolubility curve has been investigated. The composition of such crystals has been determined by separating them from their mother liquor and finding their melting points. (5) A few thin sections have been ground from the solid mixtures in the neighbourhood of the eutectic, and their structures examined. These structures do not appear to be permanent. After the lapse of some months they completely changed, new crystal needles appearing all over the sections. These changes, however, appear to be very gradual, and to take place with change of temperature.—E. C. Snow: The determination of the chief correlations between collaterals in the case of a simple Mendelian population mating at random. This paper investigates the values which should hold for the correlations between (a) siblings, (b) uncle and nephew, and (c) first cousins, on the Mendelian hypothesis of "unit-characters." The correlations both for gametic and somatic characters are found. For the former, values independent of the distribution of the dominant and recedant characters among the population are obtained. These are (a) 0.500, (b) 0.250, and (c) 0.250. In the case of the somatic correlations, however, the results depend upon the relative numbers of the population possessing the dominant and recedant attributes before crossing. By varying this proportion, different values of the correlations can be obtained, but these are always less than the corresponding gametic ones stated above. The investigation brings out the important point that, on the Mendelian theory of heredity, the similarity between first cousins is quite as close as, or closer than, those between uncle and nephew. Biometric results previously reached have pointed to the same conclusions. This is of great interest from the medical point of view. In medical diagnosis, a man's

uncles and aunts, but not his cousins, are generally considered; but the results of the present paper show that his cousins, usually more numerous, give just as good a knowledge of his constitutional tendencies as do his uncles and aunts.—C. J. T. Sewell: The propagation of sound in a fog. This paper is intended as a sequel to the author's previous paper on "The Extinction of Sound in a Viscous Atmosphere by Small Obstacles of Cylindrical and Spherical Form," in which the loss of energy from the primary waves owing to viscosity was investigated. In the present paper the author has included the additional loss of energy due to heat conduction. The work proceeds on much the same lines as before, and the results obtained are of the same order of magnitude. The chief interest consists in the application of the results to the effect of atmospheric fog upon the propagation and audibility of sound. Waves of high frequency suffer most. If the diameter of the drops of water in a dense fog is assumed to be 0.02 mm., and the density of the fog amounts to $4\frac{1}{2}$ grams per cubic metre, the intensity of sound of wave-length 100 cm. is reduced in the ratio of 1 to ϵ before the sound has travelled a distance of 100 metres. If the wave-length is 1000 cm., this distance is increased to about 350 metres. In any case, the results seem to show that the presence of fog at sea must diminish quite appreciably the audibility of sound.—L. Southorns: A determination of the ratio of mass to weight for a radio-active substance. A determination has been made of the ratio of mass to weight for uranium oxide by comparison with the known value for a normal substance (lead oxide). It had been supposed by Sir J. J. Thomson that a radio-active substance might possess greater mass than the same weight of a non-radio-active substance, on account of the greater store of potential energy which is associated with the former. In the case of uranium oxide, the increase in the ratio of mass to weight would be about 1 in 16,000. The investigation has been made by means of a rigid pendulum fitted with two knife-edges and a hollow bob, into which could be packed either of the substances used. Special means have been employed in order to eliminate errors due to slight variations in the position of the centre of gravity of the pendulum, and to other causes. The results show that the ratio for the uranium oxide does not differ from the normal value by more than 1 in 200,000, and thus that the contemplated effect is absent.—F. P. Burt and F. L. Usher: The relative atomic weights of nitrogen and sulphur. The object of the research was to determine the combining weights of nitrogen and sulphur by the analysis of nitrogen sulphide. The method adopted was briefly as follows:—A weighed quantity of nitrogen sulphide, purified by sublimation *in vacuo* over silver at 100° C., was decomposed by subliming over red-hot quartz wool contained in a quartz tube. The sulphur was deposited a few inches beyond the wool, and the nitrogen was pumped off and estimated in a constant-volume gas burette. Assuming the density of nitrogen, the relative weights of nitrogen and sulphur could be calculated, the sulphur being obtained by difference. The problem was complicated by the impossibility of starting an experiment with the quartz wool in the reaction tube in a gas-free condition. The difficulty was overcome by measuring in blank experiments the quantity of air removable from the hot wool *in vacuo*, and by estimating traces of more condensable gas present by exposing the nitrogen to potash and re-measuring it. The final corrected N/S ratios are as follows, the weight of a "normal litre" of nitrogen in London being taken as 1.25144 grm.:—0.436847, 0.436875, 0.436839, 0.436857, 0.436897, 0.436878, 0.436898. The mean is 0.436870, and the greatest deviation from the mean is 1 in 14,000. From this ratio the atomic weight of sulphur becomes 2.067, if nitrogen be given the very probable value 14.009.—Dr. F. W. Edridge-Green: The relation of light perception to colour perception. It may be easily shown that light perception and colour perception are quite distinct. In fact, we can divide cases of colour-blindness into two classes, according as the defect is (a) one of light perception, or (b) one of colour perception or differentiation without any defect in light perception. Of course, both defects may be present in the same individual. The investigation of these two classes of defective vision is much facilitated by the use of a spectrometer which the author

has devised for the purpose. This instrument is a spectrometer so arranged as to make it possible to expose to view in the eye-piece the portion of a spectrum between any two desired wave-lengths. Tested with this instrument, a normal individual will, as a rule, name six distinct colours, namely, red, orange, yellow, green, blue, and violet, and will mark out by means of the shutters about eighteen monochromatic patches. Occasionally we come across individuals with a greater power of differentiating hues, to whom, as to Newton, there is a distinct colour between the blue and violet, which Newton called indigo. Such individuals will mark out a greater number of monochromatic patches, from twenty-two up to twenty-nine. Those who have defective light perception for certain rays, with normal hue perception, behave exactly in the same way as a normal-sighted person with those rays removed or reduced to the same intensity, and not as if a light-perceiving substance which was sensitive to rays from a considerable range of the spectrum had been removed. Those with defective hue perception mark out with the spectrometer a smaller number of monochromatic patches than the normal, and say that there are five, four, three, two, or one colour instead of the normal six. They behave in every way as if their colour sensations were correspondingly limited. Therefore, if the normal be designated hexachromic, then pentachromic, tetrachromic, trichromic, dichromic, or monochromic correctly describes their colour-vision.—M. G. Sykes: The anatomy and morphology of the leaves and inflorescences of *Welwitschia mirabilis*. An account is given of the anatomy of the leaves, and of the inflorescence axes, cones, bracts, and flowers of both sexes. It is shown that the male and female inflorescences are essentially similar in their method of vascular supply and in their detailed anatomy, and it is concluded that they are homologous. Various characters suggest comparison with the Cycads and the Medulloseæ. From the position of the embryo-sac relatively to the two coverings of the ovule at various stages of development, they are regarded as two integuments. The seed can be closely compared with that of *Lagenostoma*; its differences from this primitive type are referable to changes dependent on the evolution of siphonogamy and possibly insect fertilisation. In both these seeds the free outer integument is regarded as a primitive character, in contrast with the fused integuments of *Cycas* and *Cardiocrarpus*. In all these cases the entire vascular system appears to be integumental. The connection between *Welwitschia* and the Cycads, the Bennettitales, and the Angiosperms, is discussed.—Colonel Sir David Bruce, C.B., Captains A. E. Hamerton and H. R. Bateman, and Captain F. P. Mackie: (1) The natural food of *Glossina palpalis*; (2) mechanical transmission of sleeping sickness by the tsetse-fly.—V. H. Voley and Prof. A. D. Waller: The comparative toxicity of theobromine and caffeine as measured by their direct effects upon the contractility of isolated muscle. It is shown by measurements of the contractility of isolated muscle that the toxicity of theobromine, the base of cocoa, is greater than that of caffeine, the base of coffee and tea, in the proportion of 3:2. The introduction of a second methyl group into the oxy-purine residue, namely, the formation of caffeine from theobromine, thus diminishes the toxic value, a result which is the converse of that observed in the case of the paraffinoid alcohols. The toxic effects of coffee and tea extracts are also studied, and it is shown that the effect of the former is mainly due to the caffeine contents, and not to the tannic acid.—Prof. W. B. Bottomley: The assimilation of nitrogen by certain nitrogen-fixing bacteria in the soil.—Prof. A. B. Macallum: The inorganic composition of the blood in vertebrates and invertebrates and its origin.—Mary T. Fraser and J. A. Gardner: The origin and destiny of cholesterol in the animal organism. Part vii.—The quantity of cholesterol and cholesterol esters in the blood of rabbits fed on diets containing varying amounts of cholesterol.

CAMBRIDGE.

Philosophical Society, June 6.—Mr. W. Bateson, president, in the chair.—H. H. Brindley: Further notes on the procession of *Cnethocampa pinivora*. Lantern-slides were shown illustrating observations on the procession of the caterpillar of this Eupterotid moth, which infests the

pinces of the Landes. The caterpillars march in single file from the nest tree over the sand on fine days in late March and early April, ending the last day's procession by burrowing for pupation. The general impression left by observation of processions is that the larvæ in head-to-tail contact act as one individual, and as such their course of action is very difficult to disturb by artificial interference in respect both of direction of march and general behaviour. Though removal of the leader hardly, if at all, checks the progress of a procession (in a procession of six, for instance, the leaders were removed successively and placed at the rear of the procession six times in fourteen minutes without the procession stopping), the "circulating mass" seems invariably formed on the initiative of the leader. The reason for this frequently occurring event, as, indeed, also the stimuli which determine the behaviour of a procession, remains obscure, while no explanation is forthcoming of the remarkable temporary independence of some larvæ. As in the observations by T. G. Edwards, no irritation of the skin by the poison hairs of the larvæ, in spite of frequent handling, was experienced (Fabre lays much stress on the inconvenience he suffered from this source, so the liability to irritation probably varies in different individuals).—Dr. **Graham-Smith**: The habits of *Musca domestica*.—Dr. N. H. **Swellengrebel** and C. **Strickland**: The development of *Trypanosoma lewisi* in the rat flea (*Ceratophyllus fasciatus*). A development of *T. lewisi* was found to take place first in the mid-gut, later in the hind-gut and rectum of the flea. The forms observed resembled very much the forms of *T. lewisi* in an artificial culture, except that the later stages in the flea, a return to a trypanosome form ("small trypanosomes"), are never found in culture. No such developmental forms were found in a large number of control fleas.—Dr. F. **Ransom**: The absorption of tetanus toxin.—H. **Ackroyd**: The fate of uric acid in the dog.—Dr. **Cobbett**: The absence of living tubercle bacilli from old tuberculous lesions. The author has on several occasions, while working for the Tuberculosis Commission at Stansted, as well as in Sheffield and Cambridge, found that old caseous and calcareous deposits, which were undoubtedly of a tuberculous nature, might contain no tubercle bacilli capable of infecting the guinea-pig.—W. E. **Oixon**: The action of potash salts taken by the mouth. The non-toxicity of potash salts taken by the mouth was shown to be due to the very easy excretion of these salts by the kidneys, so that their concentration in the blood was but slightly increased.—Prof. Sims **Woodhead**: The results of sterilisation experiments on the Cambridge water. Sterilisation by chlorine and chlorine compounds had given most startling results. In a series of preliminary experiments, carried out in the laboratory, it had been found that one part of available chlorine to two million parts of water was sufficient to kill all non-spore-bearing bacteria of the *Bacillus coli* type, and therefore of the typhoid bacillus type, and probably also of the cholera bacillus type, within half an hour even in the presence of the appreciable amount of organic matter that was necessarily added along with the cultures of *Bacillus coli*. Water to which had been added some hundreds of the *Bacillus coli* per c.c. was found after treatment to contain not a single living colon bacillus in 50, 60, and 100 c.c. (The unimportant spore-bearing organisms were not killed.) Having obtained these results in the laboratory, a large experimental plant capable of sterilising more than 80,000 gallons of water per twelve hours, erected at Fulbourn, was used, and three sets of experiments were carried out, one a preliminary series in which the apparatus was run at intervals as required, and then two series of experiments in which the apparatus was run for twelve hours daily for more than a fortnight in each series. The standard of the London Water Board, that there shall be no *Bacillus coli* in quantities of water less than 200 c.c., was taken as the one to be aimed at. In every case, however, quantities of 500 c.c. were examined, and after certain preliminary difficulties had been surmounted, water was obtained in which none of the observers could find the *Bacillus coli* in 500 c.c. The amount of chlorine used in these experiments varied from one part in a million to one in six million parts of water. In the earlier experiments, where up to one part of chlorine in four million

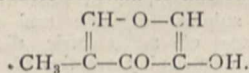
parts of water was used, it was thought necessary to neutralise any remaining chlorine by the addition of sodium bisulphite. After further experiments, where smaller quantities of chlorine were used, this addition was dispensed with, as the water treated, though sterile, did not retain the slightest taste of chlorine. It was suggested, of course, that water so treated might have some effect upon the human organism. All those who were working at Fulbourn drank considerable quantities of this water, and everyone who tried it accepted it as a first-class drinking water.—F. J. M. **Stratton** and R. H. **Compton**: Accident in heredity, with special reference to right- and left-handedness. An examination of the manner in which the inheritance of Mendelian characters would be affected by the action of a constant environmental factor. The assumption is made that a certain proportion of individuals have their characters inverted in appearance by accidental causes, and an application is made to the statistics dealing with the inheritance of the mode of clasping the hands.—R. H. **Compton**: Right- and left-handedness in barley. A study of the two kinds of seedlings of barley, the folded first leaves of which are related to one another as an object to its mirror image. A considerable numerical excess of one kind is found in all the varieties studied. The dimorphism in question is not found to be hereditary, and it appears to be governed neither by the direction of twist of the last foliage leaf below the spike nor by the position of the seed on the spike.—F. T. **Brooks**: The development of *Gnomonia erythrostoma*, the cause of the cherry-leaf scorch disease. The present investigation concerns an examination of the life-history of this fungus from the cytological standpoint, very little work on the Pyrenomycetes having hitherto been done from this point of view.—Dr. A. C. **Dixon**: Jacobi's double-residue theorem in relation to the theory of point-groups.—N. R. **Campbell**: Discontinuities in light emission, ii. The paper is a continuation of one recently presented to the society under the same title. The main object of the research has remained impossible to attain. The subsidiary results do not lend themselves to summary.

PARIS.

Academy of Sciences, June 27.—M. Émile Picard in the chair.—Ph. van **Tieghem**: A new classification of the Inovulæ group.—J. **Boussinesq**: The conservation of true masses in different phenomena, principally luminous, where there appear fictitious variable masses.—Armand **Gautier**: The action of a red heat on formaldehyde. Experiments show products of decomposition to be carbon monoxide, and hydrogen, with a trace of methane.—B. **Galitzine**: A new type of seismograph for the vertical component.—Charles **Nordmann**: The brightness of Halley's comet, and the composition of its light.—Jules **Bailaud**: Photographic observations of a small planet.—L. **Letombe**: A geometrical study of distribution in machines with separate distributors.—H. **Larose**: The propagation of a discontinuity on a telegraphic line furnished with a transmitter.—A. **Debierno**: The atomic weight of the radium emanation. The author shows that by the loss of an α particle, and consequent departure of an atom of helium of atomic weight 4, the radium of atomic weight 226.5 becomes the emanation of atomic weight 222.5.—G. A. **Hemsalech**: The duration of the emission of spectral rays by luminous vapours in the electric spark.—Gabriel **Sizes** and G. **Massol**: A photographic record of the vibrations of a diapason.—Edmond **Bauer**: The emission of gases.—E. **Henriot**: The rays of potassium.—A. **Besson** and L. **Fournier**: The action of hydrogen on sulphur chloride and thionyl chloride under the influence of an electric discharge.—Witold **Broniewski**: The electrical properties of aluminium-silver alloys.—M. **Kohn-Abrest**: The nitrides and oxides obtained from aluminium heated in air.—G. **Urbain**, M. **Blondel**, and M. **Obiedoff**: The extraction of germanium from blende.—L. J. **Simon**: The acid character of oxalacetic ether.—M. **Lespieau**: The hydrogenation of acetylene compounds.—A. **Béhal**: A new tertiary menthol, and the passage of pinene into menthene.—André **Meyer**: The condensation of phenyl-isoxazolone with mesoxalic ester.—René **Maire** and Adrien **Tison**: Some Plasmodiophoracæ.—C. **Gessard**: Blood fibrin.—

Maurice **Nicloux**: The products of decomposition of chloroform in the organism.—M. **Caullery** and A. **Lavallée**: Experimental investigation on the initial phases of infection of *Amphiura squamata* by *Rhopalura ophiocomae*.—Alfred **Angot**: The earth tremor of June 24, 1910.—P. **Vialla** and P. **Pacottot**: The culture of the *Riesleria* of the vine.—A. **Marie**: The neutralising properties of a substance isolated from a normal brain.

July 4.—M. **Emile Picard** in the chair.—J. **Bousinesq**: The probable applicability, to rays or kathode currents, of the principle of mass constancy.—Ch. **Lallemand**: The probable exactness of different evaluations of the altitude of Lake Chad. Taking all accounts into consideration, a shore of 240 metres, in round numbers, seems nearest the truth.—D. **Gernez**: The nature of the product called by the name of black phosphorus.—Armand **Gautier** and P. **Clausmann**: The action of iron and its oxides, at a red heat, on carbonic oxide. Application to some geological data. The resulting products are carbides of iron, free carbon, and carbon dioxide, together with certain iron oxides.—Th. **Schloesing**, fils: The production of nicotine by the cultivation of tobacco.—E. L. **Bouvier**: The pycnogonids with five pairs of paws collected by the Jean Charcot expedition on board the *Pourquoi-Pas?*—A. **Calmotte** and C. **Guérin**: The re-absorption of tuberculous bacilli by cattle following on the injection of mixtures of serum of animals rendered hyper-immune, and bacilli cultivated in series on beef bile.—A. **Perot**: A study of the variation of the wave-length of solar light at the sun's circumference.—D. **Eginitis**: Some phenomena shown by Halley's comet after its passage across the sun. It seems evident that much of the shortening of the tail was due to the angle under which the comet was seen, besides it being not unlikely that some disintegration was brought about by the earth itself.—Fr. **Iniguez**: Physical observations on Halley's comet.—Serge **Bernstein**: Mechanical equations and the calculus of variations.—F. **Ducretet** and E. **Roger**: An apparatus for receiving time on land and on board ship by wireless telegraphy.—P. **Beaulard**: The electric absorption exercised by some alcohols.—Mdlle. L. **Bianquies**: The constituents of radio-activity induced from actinium.—A. **Dufour**: The rotation of a mercuric arc in a magnetic field. Observations on Döppler's phenomenon.—Louis **Malciès**: The appearance of certain dielectric anomalies by changing the state of the insulating medium. Pure vaseline, an insulator at ordinary temperatures, but a conductor in the liquid state, acts as a medium charged with free ions of both signs, the mobility of which, while non-existent when the substance is semi-fluid, only shows itself on the attainment of a clearly liquid state.—Jean **Villey**: An electrometric micromanometer.—Maurice **de Broglie**: The exclusive presence in the gases evolved from some hydrogenated flames of ions altogether analogous to those produced by Röntgen rays. It was observed, notably in the case of hydrogen, ether, aldehyde, acetone, &c., that the flames of combustion gave ions closely agreeing with Röntgen radiation in velocity.—V. **Auger**: Manganate of sodium and its hydrates. It is possible to obtain manganate of sodium by the decomposition of the corresponding permanganate by means of excess of soda.—M. **Barre**: The decomposition of thorium sulphate by water.—Léo **Vignon**: The adsorption of certain colouring matters.—E. **André**: Acetylenic ketones. The author gives the various physical constants for acetyl, propionyl, butyryl, isovaleryl, and caproyl-phenyl-acetylene.—A. **Backe**: Researches on iso-maltol. The author considers the probable formula of this substance to be



—Em. **Bourquelot** and Mdlle. A. **Fichtenholz**: The presence of a glucoside in the leaves of a pear tree, and its extraction.—Paul **Becquerel**: The abiotic action of ultra-violet rays, and the hypothesis of the cosmic origin of life. Although the effect of dryness, low temperature, and cold may serve to retain the vitality of living spores in inter-stellar space, yet the fact that this space is full of ultra-violet radiation, which is shown to have a most destructive effect on spore life, goes far to discredit any theory of the cosmic origin of life.—Maurice **Arthus**:

Cobra poison and curare.—M. **Szroter**: The oxidation of pure oxyhæmoglobin by pure oxygenated water.—Pierre **Girard**: The electrostatic mechanism of osmosis.—C. **Viguiet**: The very rapid maturity of a Spionid larva.—Edmond **Hitzel**: A double bend in the south wall at the base of the peak of Platé, near Chedde (Haute-Savoie).—L. **Cayoux**: The existence of calcareous phosphates in diatoms from Senegal.—L. **De Launay** and G. **Urbain**: The formation of blends, and minerals derived from it.—M. **Ferrot**: Some oscillations of the sea observed at Bonifacio.

NEW SOUTH WALES.

Linnean Society, May 25.—Mr. C. Hedley, president, in the chair.—E. C. **Grey**: The fatty acids of brain lipoids, part i.—E. **Meyrick**, F.R.S.: Revision of Australian Tortricina. The author dealt with the Tortricina of Australia (and New Zealand) in two papers contributed to the society's Proceedings for 1881 (vol. vi., pp. 410 and 629), the number of Australian species therein recorded being 132. The revision increases the number to 434 species, of which about 232 are described as new; the present paper, the first instalment of the revision, is concerned with 290 species, comprised in the Carposinidæ, Phaloniadæ, and Tortricidæ. For this result the author is greatly indebted to the aid of a number of Australian correspondents who forwarded collections; these, together with the material which he had himself accumulated, were taken to the British Museum, and a close comparison instituted with Walker's types, with the result, it is believed, that every one of these was identified satisfactorily. The Tortricina are considered to have originated from the Hilarographa group of the Plutellidæ.

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