

quickly on either side into a band lying between wave-lengths of 555 and 495 $\mu\mu$, and this band vanishes more slowly, diminishing in breadth as it does so. The colour of this band does not appear to the eye to be the characteristic colour of this part of the spectrum, but a pale yellowish-grey, which becomes darker as extinction approaches. The position of the final glow corresponds almost exactly with the line E of the solar spectrum, and coincides closely with the region of greatest brightness in the ordinary solar spectrum. The whole phenomenon is thus seen to be the exact reverse of what is observed to take place when solid bodies begin to glow. Opinion is still divided as to the cause of the after-glow in Geissler tubes, but the author considers that the results of various researches seem to show that the phenomenon must be considered to be the result of chemical modification of the contents of the tube.

THE following excerpts from the Report for 1892 of the U.S. National Museum have lately been distributed by the Smithsonian Institution. "Japanese Wood-cutting and Wood-cut Printing," by Mr. T. Tokuno, edited and annotated by Mr. S. R. Koehler. Mr. Tokuno is the chief of the Bureau of Engraving and Printing Department at Tokio, and the information which he has given to the National Museum will be welcomed by all who are interested in the art of the wood-cutter and in the arts of Japan, more especially as his communication is believed to be the first authoritative statement on this subject made by a native of Japan thoroughly qualified for the task. "The Crump Burial Cave," discovered on the southern branch of the Warrior River, Alabama, is the subject of a paper by Mr. Frank Burns. The cave is about four hundred feet above the river, and in it were found a number of wooden coffins, indicating that the aborigines used it as a burial cave. In a note to the paper, Mr. T. Wilson, the curator of pre-historic anthropology in the Smithsonian Institution, points out that while this method of coffin burial was unusual, if not previously unknown in the United States, yet there are several instances of similar burials among the prehistoric peoples of other countries. Mr. Wilson has a paper on an extensive series of minute stone implements collected by Mr. A. C. Carlyle in the Vindhya hills or mountains in central and north-western India, and now in the National Museum. The implements are said to belong to the neolithic period, but Mr. Carlyle has also found others belonging to the palæolithic period in the same locality, and he believes that the evidence of the archæology of the district shows that there was no hiatus between the palæolithic and neolithic periods, and that the series of implements run from one period to another, their differences being accounted for by the general progress from the lower to the higher civilisation. "The Comparative Oology of North American Birds" is the subject of another excerpt. In this Dr. R. W. Schufeldt brings together a large amount of information of interest to ornithologists, and presents it in a manner which will greatly facilitate the study of the variations in the matter of form and colouration of the eggs of birds of different countries.

MESSRS. CASSELL AND CO. have commenced a new issue, in monthly parts, of Mr. W. F. Kirby's admirable and comprehensive work on "European Butterflies and Moths."

MR. C. F. JURITZ's report on work done in the Analytical Laboratory and Mineralogical Museum at the Cape of Good Hope, during 1893, has just been issued.

It was a happy inspiration that led to the publication of the series of little books on "The Country Month by Month," by Mrs. J. A. Owen and Prof. G. S. Boulger. The June number of the series points out the beauties of nature in the same attractive style that distinguished previous volumes. Messrs. Bliss, Sands, and Foster are the publishers.

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MR. A. F. CALVERT, the author of several works on Australia and its resources, has collected a number of facts and fancies with regard to "The Coolgardie Goldfield" in Western Australia, and his compilation has been published by Messrs. Simpkin, Marshall, and Co. The evidence adduced goes to show that the Coolgardie district is richly auriferous, and that the only great drawback to its development is the scarcity of water.

FOLLOWING the lead of other London Polytechnic Institutes, that at Battersea has started a journal—the *Battersea Polytechnic Review*. We hope that the new journal will not become merely a medium for recording cricket matches and social gatherings. Schemes of courses of study in various branches of science, art, and technology might be profitably included in its pages; and also lists of good books to read, and notes on recent work; while brief descriptions of the Polytechnics on the continent would create a spirit of emulation that would certainly help to develop the work of the Institute in the proper direction.

EACH of the papers in *Science Progress* is an important addition to scientific literature. The contributors to this monthly review of current investigations are always men in thorough touch with their subjects, and the result is that they summarise all that is worth knowing on the matters treated by them. The contents of the June number are as follows:—"Pure Yeast and its Relations to Brewing Operations," by Dr. A. K. Miller; "Electrosynthesis," by Dr. James Walker; "Glycogen," by Prof. W. D. Halliburton, F.R.S.; "Mesozoic and Kainozoic Geology in Europe," by Mr. Philip Lake; "The Localisation of Enzymes in Plants," by Prof. J. R. Green; and "Recent Additions to our Knowledge of the Ancient Sediments," by Mr. J. E. Marr, F.R.S.

THE additions to the Zoological Society's Gardens during the past week include a Two-Spotted Paradoxure (*Nandinia binotata*) from West Africa, presented by Mr. Joseph Wills; a Raccoon (*Procyon lotor*) from North America, presented by Mr. H. Burgess; a Grey Parrot (*Psittacus erithacus*) from West Africa, presented by Mrs. Lemming; two Goliath Beetles (*Goliathus druryi*) from West Africa, presented by Captain A. S. Mitchell; a White-handed Gibbon (*Hylobates lar*) from the Malay Peninsula; two Gazelles (*Gazella dorcas*, ♂ ♀) from Suakin, deposited; a Beech Marten (*Mustela foina*), a Pine Marten (*Mustela martes*), European, a Silky Bower Bird (*Ptilonorhynchus violaceus*), a Garrulous Honey-eater (*Myzantha garrula*) from Australia, four Vinaceous Turtle Doves (*Turtur vinaceus*), four Cape Doves (*Cena capensis*) from Africa, a Timneh Parrot (*Psittacus timneh*) from Sierra Leone, two Stanley Cranes (*Tetrapteryx paradisea*) from South Africa, purchased; two Hamadryads (*Ophiophagus elaps*) from India, received in exchange.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL CONGRESSES AT UTRECHT AND VIENNA.—An astronomical congress will be held at Utrecht on Friday, the 10th, Saturday, the 11th, and Monday, the 13th of August. Notices of motion and other communications should be addressed to one of the committee before August 7. Dr. H. Gyldeń, of Stockholm, will preside. Herren H. Seeliger, of Munich, and R. Lehmann-Filhés, of Berlin, are acting as secretaries.

The preparations for Section 2 (Astronomy) of the meeting of German men of science and physicians, to be held this year at Vienna, from Sept. 24 to 30, are under the direction of Prof. E. Weiss, Dr. J. Palisa, and Dr. J. Holetschek. Papers and subjects for demonstration should be announced to them at once, so as to form part of the provisional programme to be issued early in July. Intending exhibitors at the scientific

exhibition, to be held in connection with the meeting, should write to the "Ausstellungs Comité der Naturforscher-versammlung, Wien., Universität."

PROPOSED ASTRONOMICAL CONGRESS IN 1896.—At the end of a paper read at the last meeting of the Royal Astronomical Society, Dr. Gill propounded the following questions, which we reprint from the *Observatory*. (1) Whether, in the opinion of astronomers generally, steps should be taken for a more complete and harmonious organisation and partition of the astronomical world from the year 1900? (2) Are astronomers prepared to enter upon a preliminary study, discussion, and experiment on the practical methods by which the art of observation may be raised to a higher level of accuracy, and its results be derived and published in a more systematic and homogeneous system? (3) If these questions are answered in the affirmative, would it be desirable to hold an international astronomical congress, say in 1896, to discuss and make the necessary preliminary arrangements, and then let the definitive programme and partition of work be made at another general congress to be held in the year 1899?

THE LAW AND GREENWICH TIME.—Is there any legal authority for the use of Greenwich Time throughout Great Britain? The editors of the *Observatory* point out that in the Statutes (Definition of Time) Act 1880, 43 and 44 Vic. cap. 9, it is enacted that whenever any expression of time occurs in any Act of Parliament, deed, or any other legal instrument, the time referred to shall, unless it is otherwise specifically stated, be held in the case of Great Britain to be Greenwich Time, and in the case of Ireland, Dublin Time. It is remarked, however, that Sir James Stephen says, in the Larceny Act, "Criminal Law Digest," p. 247, sec. 3, in referring to the expression "of the clock":—"It may be worth while to observe that the expression 'nine of the clock,' 'six of the clock,' indicates *mean* as opposed to *solar* time; but a question might arise as to whether they mean local mean time or the mean time commonly observed at any given place. London time, or, as it is called, railway time, is now very generally observed, and there is a difference of more than twenty minutes between London and Cornwall. Local mean time is the natural meaning." In the case which led our contemporary to look up the matter, a defendant arrived at a court at the local (Carlisle) time appointed by the court to sit, but found that the court had met by Greenwich Time, and had decided against him. The difference of interpretation of the time appointed led to the granting of a new trial.

THE WORK OF HERTZ.¹

THE untimely end of a young and brilliant career cannot fail to strike a note of sadness and awaken a chord of sympathy in the hearts of his friends and fellow-workers. Of men thus cut down in the early prime of their powers there will occur to us here the names of Fresnel, of Carnot, of Clifford, and now of Hertz. His was a strenuous and favoured youth; he was surrounded from his birth with all the influences that go to make an accomplished man of science—accomplished both on the experimental and on the mathematical side. The front rank of scientific workers is weaker by his death, which occurred on January 1 of the present year, the thirty-sixth of his life. Yet did he not go till he had effected an achievement which will hand his name down to posterity as the founder of an epoch in experimental physics.

In mathematical and speculative physics others had sown the seed. It was sown by Faraday, it was sown by Thomson and by Stokes, by Weber also doubtless, and by Helmholtz, but in this particular department it was sowed by none more fruitfully and plentifully than by Clerk Maxwell. Of the seed thus sown Hertz reaped the fruits. Through his experimental discovery, Germany awoke to the truth of Clerk Maxwell's theory of light, of light and electricity combined, and the able army of workers in that country (not forgetting some in Switzerland and France and Ireland) have done most of the gleanings after Hertz.

This is the work of Hertz which is best known; the work which brought him immediate fame. It is not always that public notice is so well justified. The popular instinct is generous and trustful, and it is apt to be misled. The scientific eminence accorded to a few energetic persons by

¹ A Lecture delivered at the Royal Institution on Friday, June 1, by Prof. Oliver Lodge, F.R.S.

the popular estimate is more or less amusing to those working in the same lines. In the case of Hertz no such mistake has been made. His name is not over well known, and his work is immensely greater in every way than that of several who have made more noise.

His best known discovery is by no means his only one. I have here a list of eighteen papers¹ contributed to German periodicals by him, in addition to the papers incorporated in his now well-known book on electric waves. I would like to suggest that it would be an act of tribute, useful to students in this country, if the Physical Society of London saw their way to translate and publish a collection of, at any rate, some of these papers.

Portrait Slide.

The portrait which I show is not a specially pleasing one. It is from a photograph taken by Mr. Yule, one of the band of foreign students who flocked to Hertz's laboratory at Bonn. It is excellent as a photograph, though it fails to represent Hertz at his best; perhaps because it was not taken till after the pharyngeal trouble had set in, which ultimately carried him off.

In closing these introductory and personal remarks, I should like to say that the enthusiastic admiration for Hertz's spirit and character, felt and expressed by students and workers who came into contact with him, is not easily to be exaggerated. Never was a man more painfully anxious to avoid wounding the susceptibilities of others; and he was accustomed to deprecate the prominence given to him by speakers and writers in this country, lest it might seem to exalt him unduly above other and elder workers among his own sensitive countrymen.

Speaking of the other great workers in physics in Germany, it is not out of place to record the sorrow with which we have heard of the recent death of Dr. August Kundt, Professor in the University of Berlin, successor of von Helmholtz in that capacity.

When I consented to discourse on the work of Hertz, my intention was to repeat some of his actual experiments, and especially to demonstrate his less known discoveries and observations. But the fascination exerted upon me by electric oscillation experiments, when I, too, was independently working at them in the spring of 1888,² resumed its hold; and my lecture will accordingly consist of experimental demonstrations of the outcome of Hertz's work rather than any precise repetition of portions of that work itself.

In case a minority of my audience are in the predicament of not knowing anything about the subject, a five minutes' explanatory prelude may be permitted, though time at present is very far from being "infinitely long."

¹ Hertz's Papers.

- 1878-79. *Wied. Ann.*, 1880, vol. 10, p. 414. Experiments to establish an Upper Limit for the Kinetic Energy of Electric Flow.
 1880. Inaugural Dissertation (Doctor Thesis) on Induction in Rotating Spheres.
 1881. Vol. 13, *Wied. Ann.*, p. 266. On the Distribution of Electricity on the Surface of Moving Conductors.
 1883. March. *Schlömilch Zeitschrift*, p. 125. On the Distribution of Pressures in an Elastic Circular Cylinder.
 1881 (?) Crelle. vol. 92, p. 156. On the Contact of Solid Elastic Bodies.
 1882. *Verhandlungen des Vereins des Gewerbfleißes* (Sonderabdruck). On the Contact of Solid Elastic Bodies and on Hardness.
 1881. Vol. 14, *Wied. Ann.*, p. 581. Upper Limits for the Kinetic Energy of Moving Electricity.
 1882. *Wied. Ann.*, vol. 17, p. 177. On the Evaporation of Liquids, especially of Quicksilver, in Air-Free Space, and on the Pressure of Mercury Vapour.
 1883. *Wied. Ann.*, vol. 23, p. 279. On the Property of Benzine as an Insulator and as showing Elastic Reaction (Rückstandsbildner).
 1882. *Verhandl. d. phys. Gesellschaft in Berlin*, p. 18. On a New Hygrometer.
 1883. *Wied. Ann.*, vol. 19, p. 73. On an Appearance accompanying Electric Discharge.
 1883. *Ib.*, vol. 19, p. 732. Experiments on Glow Discharge.
 1883. *Zeitschrift für Instrumentenkunde*. Dynamometric Contrivance of Small Resistance and Infinitesimal Self-Induction.
 1884. *Met. Zeitschrift*, November, December. Graphic Methods for the Determination of the Adiabatic Changes of Condition of Moist Air.
 1884. *Wied. Ann.*, vol. 23, p. 449. On the Equilibrium of Floating Elastic Plates.
 1881. *Ib.*, vol. 23. On the Connection between Maxwell's Electrodynamical Fundamental Equations and those of opposition Electrodynamics.
 1885. *Ib.*, vol. 24, p. 114. On the Dimension of a Magnetic Pole in different Systems of Units.
 1837-1839. Papers incorporated in his book, "Ausbreitung der Elektrischen Kraft," translated under the title of "Electric Waves."
 1872. *Wied. Ann.*, vol. 45, p. 23. On the Passage of Cathode Rays through thin Metal Sheets.
² *Phil. Mag.*, xxvi. pp. 229, 230, August 1883; or "Lightning Conductors and Lightning Guards" (Whittaker), pp. 104, 105; also *Proc. Roy. Soc.* vol. 1, p. 27.