

come. And whenever any people forgets the source from which these great things have come, and allows engineering to supplant science, that people is on the way to the civilisation of China."

MESSRS. MARION AND CO. have just commenced the publication of reproductions of a fine series of photographs of "The Empire: its Cities, Palaces and Buildings." The views can be obtained in half-tone process prints or reproduced by collotype process. In the collection of pictures of "Famous Buildings of London," which forms one number of the series, we notice views of the Imperial Institute and the British Museum. The Natural History Museum deserves to be included, but there are few other fine buildings devoted to scientific research and education in London. Fine buildings do not necessarily make fine work, but they facilitate it and show in what regard the nation holds those who contribute to its scientific and industrial progress.

ABSTRACTS of the papers read before the Royal Society of New South Wales appear regularly among our reports of societies and academics. The volume of *Proceedings* containing the complete papers read before the Society in 1900 has now been received, and calls for a note of admiration. Among the subjects dealt with are the sun's motion in space, and the volumes of solids as related to transverse sections, by Mr. G. H. Knibbs; several papers on eucalyptus oils, by Mr. H. G. Smith; customs of Australian aborigines, by Mr. R. H. Mathews, Mr. W. J. Enright and Miss M. M. Everitt; the crystalline structure of some gold, silver and copper nuggets, by Prof. A. Liversidge, F.R.S.; and an experimental investigation of the strength of brickwork when subjected to compressive and transverse stresses, by Prof. W. H. Warren and Mr. S. H. Barraclough.

THE additions to the Zoological Society's Gardens during the past week include a South Albemarle Tortoise (*Testudo vicina*), from the Galapagos Islands, a Conical Eryx (*Eryx conicus*) from India, deposited; a Shag (*Phalacrocorax graculus*), European, purchased; an Axis Deer (*Cervus axis*), born in the Gardens.

#### OUR ASTRONOMICAL COLUMN.

NEW VARIABLE STARS.—The following newly-detected variables are announced in the *Astronomische Nachrichten* (Bd. 157, No. 3751):—

94, 1901, *Cygni*.—

A.G. Bonn (B.D. +41° 41'14")  
R.A. = 21h. 17m. 42s. } (1875°0)  
Decl. = +41° 51'8"

Herr Fr. Deichmuller states that there is a variation of about half a magnitude; the times are not sufficiently continuous to deduce a value of the period.

95, 1901, *Pegasi*.—Dr. T. D. Anderson announces variability in the star B.D. +24° 44'62", whose position is

R.A. = 21h. 37m. 56s. 0 } (1855°0)  
Decl. = +24° 20'6"

The star is sometimes about 10 magnitude, but at intervals becomes much fainter.

96, 1901, *Cygni*.—Mr. Stanley Williams finds from photographs taken with a 4¼-inch portrait lens that variability exists in the star B.D. +29° 42'31".

R.A. = 20h. 49m. 2s. 1 } (1855°0)  
Decl. = +29° 51'8"

The following variations are recorded:—

1901 Sept. 21 ... 10·81 mag.	1901 Nov. 1 ... 9·88 mag.
Oct. 7 ... 10·26 ,,	,, 3 ... 10·47 ,,
,, 14 ... 9·79 ,,	

These indicate a maximum of 9·7 magnitude on 1901 October 21. The star was invisible on plates taken on 1899 October 6 and 9, 1900 October 26, 27 and November 15, so that it must have been fainter than 12 magnitude. The period is at present uncertain.

NO. 1676, VOL. 65]

BRIGHT METEOR OF DECEMBER 4.—A brilliant meteor was seen by several observers shortly after five o'clock in the evening of Wednesday in last week, December 4. Prof. J. P. O'Reilly, writing from Dublin, says:—"At 5h. 11m. p.m. this evening I saw in the south-eastern sky a brilliant meteor, which appeared at a point about 30° above the horizon and had a course about equal in length to the belt of Orion. The fore part was brilliant bluish-white, the after part red sparks. The direction of movement made with the horizon an angle of about 60° to 65°, the inclination of the line of movement being to the south. There were no stars visible by which I could more distinctly fix its position."

Mr. C. Waterer (Highfield, Northdown Avenue, Margate) and two friends saw the meteor while walking towards Kingsgate, near Margate. He remarks, "The trail remained visible to us all for some seconds. We were then looking west, and its direction was approximately from north to south. The time by my watch was 5.35 p.m."

"COMPANION TO THE OBSERVATORY," 1902.—This almost indispensable handbook for the practical observer has recently been issued for the coming year. The contents and arrangement are similar to those of previous issues. A small addition which will be useful to spectroscopists is the list of spectroscopic double stars, with their periods so far as is at present known.

#### THE VARIATIONS IN THE MAMMALIAN EYE.<sup>1</sup>

DR. LINDSAY JOHNSON'S work, in the investigation of the deep anatomy of the mammalian eye as displayed by the ophthalmoscope, has been of a very extensive and persevering, not to say of a very adventurous character; and the volume before us, containing his contribution on the subject to the *Transactions* of the Royal Society, represents no more than a fraction of the material which he has collected, and which he intends, we understand, one day to publish. Not the least interesting part of it will be that which will deal with his methods, with the perils occasionally attendant upon them, and with the contrivances by means of which a living lion and a living whale were compelled to submit themselves to ophthalmoscopic examination. Mirror in hand, Dr. Johnson has not only visited the zoological gardens of many countries, but also the native haunts of many wild creatures; and in the book before us some of his discoveries are displayed in twenty-six plates, containing fifty coloured drawings of eyegrounds, beautifully finished and exquisitely reproduced in chromo-lithography, and in three plates with drawings in black and white, showing variations in the forms of persistent hyaloid artery, rudimentary forms of pecten, and different types of the appendages which are found on the pupillary margins of many of the ungulata.

The general result of Dr. Johnson's observations is to show the existence among mammalia of very wide differences in two respects; first, as regards the vascular supply of the optic nerve and retina; secondly, as regards the presence, coloration and pigmentation of the tapetum.

With regard to the first of these, it may be said that the general type presented by the human eye, that is, the presence of a central artery and vein of the retina, finding entrance and exit among the fibres of the optic nerve, and constituting a practically closed and complete retinal circulation, is more or less preserved in monkeys, lemurs, the carnivora, some of the ungulata, some of the rodentia, and some marsupialia, but is either absent or concealed by tapetum in the Australian fruit-bat, the Indian rhinoceros, Burchell's zebra, the American tapir, the African elephant, the Canadian beaver, the chinchilla, the guinea-pig, the Central American agouti, the Brazilian porcupine, the hairy armadillo, the wombat, the squirrel-like phalanger and the echidna; while among these latter animals there are great differences in the blood-supply of the optic disc itself, which in some of them, as in the Indian rhinoceros and the hairy armadillo, is of a dead white like the whiteness of atrophy in the human subject; while in others, as the zebra, it is abundantly vascular, and is surrounded by a radiation of small

<sup>1</sup> "Contributions to the Comparative Anatomy of the Mammalian Eye, chiefly based on Ophthalmoscopic Examination." By George Lindsay Johnson, M.D., F.R.C.S. From the *Philosophical Transactions* of the Royal Society of London for 1901. Pp. 82, with 26 plates in colour and 4 in black and white. Price 27s.



vessels extending a short distance from its periphery. In many animals the optic disc is deeply excavated up to its margins, and resembles that of chronic glaucoma in the human subject, a state of which the best examples are furnished by the seal, the serval, and the red and white flying-squirrel. The condition presented by the rabbit, in which some of the fibres of the optic nerve carry their sheaths through the lamina cribrosa to form an opaque patch on the retina, is met with in many other animals, but with much variety in the depth and distribution of the opacity.

The coloration of the tapetum varies greatly in different animals; and Dr. Johnson calls particular attention to his drawing of the eye of Monteiro's galago, in which the general yellow of the central part of the fundus is surrounded by a zone of pigmentation precisely resembling what is called "pigmentary retinitis" in the human subject. Dr. Johnson inclines to the belief that the affection so described is not really a disease, but rather a reversion to a type of structure which is the rule in night-seeing animals.

It is impossible to withhold a tribute of admiration from the perseverance with which Dr. Johnson has conducted his researches, or from the beauty of the drawings in which the results of his observations are displayed; but it is for the moment necessary to retain a suspended judgment with regard to the value of his work. As an observer he stands alone; and the drawings which he has made, notwithstanding their great and obvious merit, are as yet mere personal records, liable, it may be, to some disturbing influence from a personal equation. It is much to be regretted that photography has not been made available for taking pictures of the eyeground from which this element of uncertainty would be removed. Even if this were done, it would still be necessary to determine, by more extended portraiture, whether the conditions described are normal ones or subject to variation in individuals. We cordially welcome Dr. Johnson as a pioneer, and we feel sure that he will fully appreciate the necessity for caution in accepting his conclusions.

#### THE COAL-TAR COLOUR INDUSTRY IN GERMANY AND ENGLAND.

WITH the object of ascertaining our present and future prospects in the chemical trade of the world, Mr. A. G. Green, in a paper read before the section of chemistry of the British Association, at this year's meeting, described the relative progress of the coal-tar industry in England and Germany during the past fifteen years. The council decided to print the paper *in extenso*, and the subjoined particulars extracted from it convey an idea of what England has lost by the neglect of the scientific foundations of an industry. The paper may be regarded as a sequel to one by Prof. Meldola published in NATURE fifteen years ago (vol. xxxiv. p. 324), when the position of the industry in Germany and England was described, and a warning was given to British manufacturers.

The exports of coal-tar colours manufactured in England have fallen from 530,000*l.* in 1890 to 366,500*l.* in 1899. Comparing these figures with the rapidly increasing export trade of Germany, it is seen that whereas formerly the English export trade in artificial colours was about one-quarter that of Germany, it does not now amount to a tenth part. It is therefore only too apparent that we have had but little share in the great increase which this industry has experienced during the past fifteen years, and that we have not even been able to supply the expansion in our own requirements. In order to ascertain what proportion of our own needs we at present furnish, I am able to lay before you the following interesting figures, which have been kindly supplied me by the Bradford Dyers' Association and the British Cotton and Wool Dyers' Association, who together form a very large proportion of the entire dyeing trade:—

##### Colouring Matters used by Bradford Dyers' Association.

English, 10 per cent.; German, 80 per cent.; Swiss, 6 per cent.; French, 4 per cent.

##### Colouring Matters used by British Cotton and Wool Dyers' Association.

Aniline Colours.—English, 22 per cent.; foreign, 78 per cent.

Alizarine Colours.—English, 1'65 per cent.; foreign, 98'35 per cent.

The *English Sewing Cotton Company* have also very kindly supplied me with a detailed analysis of their consumption, from which it appears that out of a total of sixty tons of colouring matters and other dyeing materials derived from coal tar, only 9 per cent. were of English manufacture.

The following table of statistics of the six largest German firms gives a fair picture of the present dimensions of the industry in that country (*vide* next page).

The joint capital of these six firms amounts to at least 2½ millions. They employ together about 500 chemists, 350 engineers and other technologists, 1360 business managers, clerks, travellers, &c., and more than 18,000 workpeople. Compared with such figures as these the English colour manufacture assumes insignificant proportions. The total capital invested in the coal-tar colour trade in England probably does not exceed 500,000*l.*, the total number of chemists employed cannot be more than thirty or forty, and the number of workmen engaged in the manufacture does not amount to more than a thousand.

A similar relative proportion is maintained in the number of patents for new colouring matters and other coal-tar products taken by the English and German firms, as is shown by the following table:—

##### Comparison of Number of Completed English Patents for Coal-tar Products taken during 1886–1900 by six largest English and six largest German Firms.

German Firms.	
Badische Aniline Works	179
Meister, Lucius, & Brünig	231
Farbenfabriken Bayer & Co.	306
Berlin Aniline Co.	119
L. Cassella & Co.	75
Farbwerk Mühlheim, Leonhardt & Co.	38
Total of six German firms	948
English Firms.	
Brooke, Simpson, and Spiller	7
Clayton Aniline Co.	21
Levinstein	19
Read, Holliday, & Co.	28
Claus & Ree	9
W. G. Thompson	2
Total of six English firms	86

Nor does the potential loss which we have sustained by our inability to take advantage of a growing industry represent the sum total of our losses. The new colouring matters, made almost exclusively in Germany, have in many cases been introduced as substitutes for natural products, which were staple articles of English commerce. Madder and cochineal have been replaced by alizarine and azo-scarlets, the employment of many dyewoods has greatly decreased, whilst at the present moment logwood and indigo are seriously threatened. Regarding the indigo question so much has been written that I do not propose to occupy space in its further discussion, but will only point out that the complete capture of the indigo market by the synthetic product, which would mean a loss to our Indian dependencies of 3,000,000*l.* a year, is regarded by the Badische Company as so absolutely certain that, having already invested nearly a million pounds in the enterprise, they are at present issuing 750,000*l.* of new debenture capital to provide funds to extend their plant for this purpose! In the last annual report of the company they say: "As regards plant indigo, the directors are prepared and determined to meet this competition in all its possible variations in value. Much strange matter has been published in India as to improvements in the cultivation and preparation of natural indigo, but the illusions of the planters and indigo dealers are destined to be dispelled before facts, which, although they are not known to them, will make themselves more felt the larger the production of artificial indigo becomes."

Besides the loss of material wealth which the neglect of the coal-tar trade has involved to the country, there is yet another aspect of the question which is even of more importance than the commercial one. There can be no question that the growth in Germany of a highly scientific industry of large and far-reaching proportions has had an enormous effect in encouraging and stimulating scientific culture and scientific research in all