

Dybowski in 1880; but some of them must be considered as new varieties, or as new species of the same genus. Thus the author describes and figures the new varieties: *Lubomirskia baicalensis*, Pall., var.  $\epsilon$ , and *Lubomirskia intermedia*, Dyb., var.  $\beta$ , and the new species, *L. Tcherskii* and *L. fusifera*. The paper is fully summed up in French. The same number contains a note on *Polysonium germanicum*, Brandt, by M. Rimsky Korsakoff; a paper, by W. Schimkevitch, on some new species and varieties of *Pantopoda* from the Arctic Ocean (Barents's Sea), in which the new forms *Annothea borealis*, *Nymphon rubrum*, var. *intermedium*, *Nymphon grossipes*, var. *armatum*, *Tanystylum hakianum*, *Phoxihilus bahmii*, are described and figured. The author also gives the plates which are intended to show that the two species, *Phoxihilus vulgaris* and *Ph. charybdeus*, are different. M. Eugène Schultz describes the new species *Loxosoma harmeri*; and A. Yaschenko gives a catalogue of the fishes in the museum of the St. Petersburg University.

### SOCIETIES AND ACADEMIES.

#### LONDON.

**Royal Society, February 27.**—"A Method for rapidly producing Diphtheria Antitoxines." Preliminary note. By Dr. G. E. Cartwright Wood.

In this preliminary communication<sup>1</sup> a method was described by means of which, firstly, an animal can be rendered immune towards large quantities of diphtheria poison; secondly, such animals can be made to produce powerful diphtheria antitoxines. The distinctive feature of the method consists in the use of the products produced by the growth of the diphtheria bacillus in albuminous fluids made by the addition of serum to ordinary peptone broth. This fluid is, after three or four weeks' growth at 37° C., filtered through a Chamberland candle and heated for an hour at 65° C. This liquid, which is described as "serum" toxine, probably depends for its action on the presence of the diphtheria albumoses described by Sidney Martin. It gives rise on injection to little or no local reaction, but to a marked rise of temperature, which is still more pronounced when the injection is repeated. The ordinary toxine obtained by the growth of the diphtheria bacillus in fresh peptone broth, or in putrid broth (Spronck's method), was also made use of, and this is referred to in the paper as "broth" toxine.

In the first experiment (Horse No. 1) 380 c.c. of serum toxine was injected during the first fourteen days for the purpose of immunising the animal, and thus protecting it against the subsequent introduction of the much more irritating and deadly broth toxine. During the next fortnight it then received 310 c.c. of broth toxine in three injections without being markedly affected, and was then bled at the end of this period. The antitoxic value of the serum was then found to be ten normal units, 1/100th of a c.c. protecting against ten lethal doses of broth toxine, a result obtained by the ordinary method only after ten weeks treatment.

In the second experiment (Horse No. 2), the animal received 1350 c.c. of serum toxine mixed with 51 c.c. of antitoxine during the first fortnight. During the next two weeks it received 950 c.c. of broth toxine mixed with 350 c.c. of serum toxine. When the animal was bled at the end of a month, 1/1000th c.c. was found to protect a guinea-pig against ten lethal doses of broth toxine.

In the third experiment (Horse No. 3), the horse received the serum toxine without the addition of antitoxine, and, as will be seen from the following table, the results were even more striking.

	Antitoxic value of serum.	Amount of toxines injected.
7th day ...	$\frac{1}{3000}$ c.c. ...	1200 c.c. serum toxine.
14th day ...	$\frac{1}{3000}$ c.c. ...	980 c.c. serum toxine.
21st day ...	$\frac{1}{8000}$ c.c. ...	650 c.c. serum toxine and 1050 c.c. weak broth toxine.
28th day ...	$\frac{1}{12500}$ c.c. ...	1100 c.c. serum toxine and 1200 c.c. stronger broth toxine.

The high antitoxic value of the serum obtained from horses Nos. 2 and 3 suggested that the serum toxine might be made

<sup>1</sup> The investigation has been carried out in the laboratories of the Royal Colleges of Physicians and Surgeons, and I should like here to express my great indebtedness to the Laboratories Committee for the facilities there afforded to me. I must also thank them and, through them, the Honourable Goldsmiths' Company, from whose Research Fund a grant was placed at my disposal.—G. E. C. W.

use of at a later stage, as well as for the purpose of rapidly immunising the animals. When mixed with the ordinary toxine, and injected as usual, although the results obtained were better, they were not so striking as one might have expected. On examining more in detail the protocols of the horses in which the best results had been obtained, it was observed that these had been under more or less continuous treatment with the toxines, both toxines being injected in as large amounts, and as frequently as possible, so that the animal was kept in a chronic condition of local and constitutional reaction. For the purpose of determining whether the favourable result was due to this "cumulative" action of the toxines, four horses, which had been under the ordinary treatment for periods varying from nine months to a year, were treated in the following way. They received one evening each 300 c.c. of serum toxine prepared by Spronck's method, and on the following morning an injection of weak broth toxine, the latter being usually repeated daily during the rest of the week. This treatment was continued during the following week, and the serum then tested for its antitoxic value. The results are seen in the following table.

	Strength of serum before treatment.	Strength of serum after 16 days' treatment.	Amounts of toxines injected during the 16 days.
Horse No. 4 ...	$\frac{1}{6000}$ c.c. ...	$\frac{1}{20000}$ c.c. ...	650 c.c. serum toxine and 2350 c.c. weak broth toxine.
Horse No. 5 ...	$\frac{1}{4000}$ c.c. ...	$\frac{1}{15000}$ c.c. ...	600 c.c. serum toxine and 1800 c.c. weak broth toxine.
Horse No. 6 ...	$\frac{1}{3000}$ c.c. ...	$\frac{1}{7500}$ c.c. ...	650 c.c. serum toxine and 2350 c.c. weak broth toxine.
Horse No. 7 ...	$\frac{1}{4000}$ c.c. ...	$\frac{1}{7500}$ c.c. ...	650 c.c. serum toxine and 2350 c.c. weak broth toxine.

These results indicate clearly that the rapid productions of anti-toxine depended on the increased sensitiveness of the animal, owing to the injections being repeated before the previous ones had had time to pass off. Some preliminary experiments have indicated that this cumulative action may be produced in an even more marked degree by the use of other toxines than those produced by the diphtheria bacillus.

It is claimed for this method that powerful diphtheria antitoxines can be easily produced in a shorter space of time than has hitherto been possible, and that, as a consequence, the amount of serum necessary to be injected is greatly reduced, while its greater strength will permit of the patient receiving at the beginning of treatment a sufficient quantity of the serum at one injection, when, as is universally recognised both by animal experiment and clinical experience, its curative action is exerted most markedly.

March 19.—"On the Relations of Turacin and Turacopyrphyrin to the Colouring Matter of the Blood." By Prof. Arthur Gamgee, F.R.S.

In a recent paper read before the Royal Society, the author has shown that the intense absorption band in the extreme violet, which is observed in the spectrum of highly diluted solutions of hæmoglobin and its compounds, is (with slight changes in its position) exhibited by certain of the derivatives of the blood colouring matter, e.g. by hæmochromogen and the compounds of hæmatin, and by that remarkably interesting coloured but iron-free derivative of the latter body, hæmatopyrphyrin.

Having found that no organic body which he had examined exhibits an absorption band occupying the position, or possessed of the remarkable intensity, of the extreme violet band under discussion, it seemed as if the latter owed its origin to a group of atoms existing in, and perhaps characteristic of, the blood colouring matter, which group remains intact in certain of the products of decomposition of the complex hæmoglobin molecule, whereas it does not exist in certain other of the derivatives of the hæmochromogen or hæmatin moiety of the molecule, such as bilirubin and urobilin. It appeared interesting to determine whether turacin, which, as Prof. Church first showed in 1869,<sup>1</sup> presents two absorption bands in the visible spectrum, which have a remarkable resemblance to those of oxy-hæmoglobin,

<sup>1</sup> A. H. Church, "Researches on Turacin, an Animal Pigment containing Copper," *Roy. Soc. Proc.*, vol. xvii. (1869) p. 436; *Phil. Trans.*, vol. clix. (1869) pp. 627-636.

would exhibit in the extreme violet or the ultra-violet, an absorption band similar to that of the compounds and certain of the derivatives of the blood colouring matter. It was found that solutions of turacin in caustic soda or ammonia, so dilute as to be almost colourless, and to exhibit, when a stratum 10 mm. thick was examined, only a faint shading in the position of the stronger of the two turacin bands in the green, absorbed the extreme violet and ultra-violet rays of the spectrum *precisely as* highly diluted solutions of the acid compounds of hæmatin (e.g. hæmatin hydrochloride dissolved in glacial acetic acid). The earlier observations were made by allowing the spectrum of a beam of sunlight reflected into the dark room from the mirror of the heliostat, and which had passed through the solution of turacin, to fall upon a fluorescent screen of the double cyanide of platinum and barium, when an intense absorption band at the commencement of the ultra-violet was visible to the naked eye. This observation was subsequently confirmed by taking a series of photographs of the spectrum, employing solutions of turacin of various degrees of concentration.

It thus appears that turacin, like the acid compounds of hæmatin, exhibits an absorption band, which is exactly on the boundary of the ultra-violet proper, and which extends further and further into the ultra-violet, as the concentration of the solution increases.

The identity of the spectrum of turacin with that of the hæmatin compounds was so complete that it led the author to surmise the existence of a close relationship between the copper-containing body and the iron-containing colouring matter of the blood. Without any knowledge of Prof. Church's second investigation, published in 1892,<sup>1</sup> in making an oral preliminary communication of his first results to the International Physiological Congress at Berne, in September, 1895, the author expressed his conviction that turacin contains the same atomic group which is the cause of the extreme violet and ultra-violet absorption band in the spectrum of highly dilute solutions of hæmoglobin and its derivatives, and predicted that by removing the copper from turacin, it would be possible to obtain a turaco-porphyrin similar to the body (hæmato-porphyrin) which results from the removal of the iron from hæmatin. It was only after the completion of the experiments necessary for the elucidation of this point, that the fact of his having been anticipated in this matter by Prof. Church was brought under the notice of the author.

The results of the present work offer, however, an independent and additional confirmation of Prof. Church's results.

The facts placed on record in this paper point to the essential identity of turaco-porphyrin and hæmatoporphyrin, and when taken in connection with the identity of the ultra-violet spectrum of turacin, and of the acid hæmatin compounds, appear to establish that turacin contains the atomic group, which is the cause of the characteristic extreme violet and ultra-violet absorption exerted by hæmoglobin, its compounds, and principal derivatives.

**Entomological Society, April 1.**—Prof. Meldola, F.R.S., President, in the chair.—Mr. Champion exhibited, on behalf of Mr. Blatch, specimens of *Quedius riparius*, Kellner, captured in February last on the banks of running streams at Porlock, Somerset. He remarked that the insect was an interesting and unexpected addition to the British list, and the second recent novelty from the west country, the other being *Ochthebius lejolisi*, Muls. and Rey, found at Ilfracombe in June last by Mr. Bennett. He added that Mr. Waterhouse had informed him that he had seen specimens of the *Quedius* from Wales and Scotland. Mr. Champion also exhibited a small collection of Coleoptera made by Mr. O. V. Aplin in Southern Tunis during various expeditions inland from Gabes. The collection included some interesting Tenebrionidæ of the genera *Pimelia* and *Adesmia*. Mr. Aplin noticed specimens of these insects impaled by shrikes.—Mr. Goss exhibited, for Mr. Cameron, an apterous male of *Mutilla contracta* taken at Barrackpore, India. The specimen was stated to be the first recorded instance in this species of a wingless male, and was also abnormal in having the thorax incised laterally.—Dr. Sharp, F.R.S., called attention to the fact that at a recent meeting of the Society (March 20, 1895) a specimen of a supposed dimorphic form of one of the species of *Dytiscus* was examined, and Prof. Stewart inquired whether any anatomical examination had been made of the sexual organs. He said that in the *Comptes rendus* Soc. Bordeaux, 1894, there was an account of the examina-

<sup>1</sup> A. H. Church, "Researches on Turacin, an Animal Pigment containing Copper," *Phil. Trans.*, vol. 183 (1892), A, pp. 511-530.

tion of the sexual organs of the supposed second form of *D. marginalis* by M. Peytoureau, who came to the conclusion that it was really a distinct species.—Prof. Poulton, F.R.S., exhibited examples of the type labels now in use in the Hope Collection at Oxford, and illustrated their employment by projecting on the screen, by the lantern, a photograph of the Westwood types of African *Eusemia* described in F. Bates' "Matabele Land" (London, 1881). He said that such labels, having been once set up in type, could be reproduced in electrotype very cheaply and efficiently. Mr. Verrall said he was of opinion that no species should be described from a single type, but from many specimens, and he wished every so-called "type" could be destroyed as soon as a species had been described from it. Mr. Blandford explained the system of labelling types in the Brussels Museum. Dr. Sharp, Prof. Meldola, Mr. McLachlan, and Prof. Poulton continued the discussion.—Mr. Blandford exhibited a series of lantern slides showing the uses to which photography could be put in entomological illustration. The photographs shown included various *Saturniide*, *Vanesside*, species of *Mamestra*, *Tipula*, *Ophion*, *Carabus*, *Lucanus*, *Sitones*, &c., as well as one or two examples of insect-injury, and a view in Windsor Park showing oaks defoliated by *Tortrix viridana*. Prof. Meldola expressed surprise that photography had hitherto been so little employed in the illustration of works on entomology.—Prof. Poulton read a paper entitled "On the Courtship of certain European Acridiide." He said that these observations upon the courtship of Swiss Acridiide were made in exceedingly favourable weather at the end of August and beginning of September last year. He was much indebted to Mr. F. Jenkinson and Mr. V. F. Dickins for many independent observations and valuable confirmation. The observations were almost all made in the neighbourhood of the Weisshorn Hotel, high above Vissoye, in the Val d'Anniviers. Prof. Meldola expressed great interest in the paper, and said that the observation of the habits of insects in the field seemed to be much neglected by many entomologists. Dr. Sharp remarked that there was a greater variety in the organs capable of producing sound in the Orthoptera than was generally supposed.—Mr. G. F. Hampson read a paper entitled "On the Classification of Three Subfamilies of Moths of the Family Pyralidæ: the *Epipaschiinæ*, *Endotrichinæ*, and *Pyralinæ*."

## PARIS.

**Academy of Sciences, April 7.**—M. A. Cornu in the chair.—Applications of the theory of divergent series capable of summation, by M. E. Borel.—Some remarks on the X-rays, by S. P. Thompson. An account of the phenomena observed with a fluorescent screen in a Crookes' tube during the gradual production of a vacuum. At a very high vacuum, the rays penetrate bones as well as flesh, and hence there is a certain degree of exhaustion for which the difference between the transparency of the bone and flesh is a maximum.—On electrified Röntgen rays, by M. A. Lafay.—A condition for the maximum power of Crookes' tubes, by MM. J. Chappuis and E. Nugues. The radiation of a Crookes' tube, as measured by the rate at which its rays discharged an electrometer, was found to vary with the rate of vibration of the commutator of the Ruhmkorff coil employed. For the coil used by the authors, ten breaks per second produced the maximum effect; rates higher or lower than this were less effective.—Thermal studies of some oxybromides, by M. Tassilly. Determinations of the heats of solution of the hydrated oxybromides of the alkaline earths.—Action of hydrobromic and hydriodic acids upon phosphoryl trichloride, by M. A. Besson.—At a temperature of 400°-500° in presence of pumice, hydrobromic acid acts upon phosphoryl trichloride giving the complete set of substitution derivatives POCl<sub>2</sub>Br, POClBr<sub>2</sub>, POBr<sub>3</sub>, and PBr<sub>3</sub>. Hydriodic acid acts somewhat differently, a solution of the gas in phosphoryl trichloride slowly reacting at the ordinary temperature giving phosphorus triiodide and metaphosphoric acid.—On a sample of rice over a century old, by M. Balland. The sample on analysis differed from ordinary rice only in a lower percentage of fat.—Elongation of the lower limbs due to castration, by M. Lortet.

## BERLIN.

**Meteorological Society, March 3.**—Prof. Börnstein, President, in the chair.—Prof. Hellmann spoke on Indo-Germanic superstitions as to weather, which are still widespread among the people, and are based upon a belief in the importance of the twelve days from Christmas to Epiphany, or

from January 1 to 12, as determining the weather forecasts for the whole ensuing year. These rules are contained in a work, "Die Bauernpraktik," of which the first German edition appeared in 1508, and having attained a wide circulation over western and northern Europe, was translated into English, French, Danish, Swedish and Bohemian, and passed through numberless editions in the sixteenth and seventeenth centuries. There is an immense amount of this work, but the speaker had succeeded in tracing out manuscripts of the thirteenth century, and the writings of the Venerable Bede in the ninth, as the source of the book. From Bede's writings—which deal not only with weather forecasts, but contain also a "Thunder-book," which is still popular in Sweden—it is evident that the author had translated a Greek manuscript. Certain passages in Pliny refer to Democritus as the source of some of the forecasts, and of the significance of the twelve days mentioned above. But the superstition as to these days is of still older date, for statements which, although incomplete, are, on the whole, similar to those in the "Bauernpraktik," are found on the Babylonian tablets, and the speaker hence concluded that the superstition is of Babylonian origin.

**Physiological Society, March 6.**—Prof. du Bois Reymond, President, in the chair.—Prof. Zuntz read a communication by Messrs. Asher and Lüscher, in Bern, in which they describe the first results of an investigation of the electrical changes in the oesophagus during deglutition. Using german-silver wire electrodes and a capillary electrometer, they observed a movement of the mercury whenever a wave of contraction passed over the portion of the oesophagus included between the electrodes.—Dr. Rothmann spoke on secondary degenerations of the pyramidal tracts resulting from unilateral extirpation of the cortical centres for the extremities.—Prof. Zuntz spoke on the results of his investigations on metabolism, which had shown that the performance of 1 kgm. of work requires the consumption of 28 kgm. of chemically equivalent energy, whether it be derived from proteids, from fats, or from carbohydrates. Chauveau had recently come to the conclusion, based on experiments, that sugar alone is used up in a muscle doing work, and that when the animal is fed with fat the latter is preliminarily changed into sugar by the liver. The speaker showed that this assumption involves the occurrence of a very complicated chemical process, during which a large part of the energy of the food must be set free in the liver and remain unused. Chauveau had also stated that the same amount of energy is used up in positive as in negative work, and against this view the speaker advanced the results stated above for positive work, while, on the other hand, during the negative work of descending an incline with the lesser declivity, less chemical energy is consumed, thus corresponding to the lessened work. As the declivity becomes gradually greater, the amount of chemical energy increases, at a certain stage is equal to the work done, and then increases rapidly beyond the ratio given above for positive work.—Dr. Rawitz reported on an investigation of the well-known statement made by Darwin that imperfect albinos—animals with white hides and blue eyes—are deaf. Having become possessed of a white dog with blue eyes, he had found, by experiments lasting over three weeks, that this dog really was deaf. After killing the dog, he found that the cortical auditory centres of both sides were atrophied, being on one side reduced to half the normal amount, and on the other to one-third. The cochlea of the inner ear was also wasted away, and the auditory ossicles ankylosed.

March 20.—Prof. du Bois Reymond, President, in the chair.—Dr. René du Bois Reymond discussed Stieda's theory of the homology of the limbs, in detail with reference to the bones and muscles, and briefly as to the blood-vessels and nerves.—Dr. Epstein demonstrated a new turbine, a new perimeter, and a new kymograph constructed for the purpose of experimenting on the influence of colour-perception on blood-pressure.—Prof. Thierfelder reported on two further experiments, made in conjunction with Dr. Nuttall, on animals free from bacteria. In one of these, two guinea-pigs were fed for thirteen days, in the other for ten days, aseptically with milk and biscuit. The animals remained in every respect normal, and gained in weight to the same extent as others fed with ordinary milk and biscuit. Their urine contained ethereal sulphates, although the alimentary canal was free from bacteria.

*Note.*—In the report of the Physiological Society on p. 503 of NATURE, column 2, line 37 from the top, for "height of circulation" read "height of contraction."

NO. 1381, VOL. 53]

## PHILADELPHIA.

**Academy of Natural Sciences, March 10.**—A paper entitled "Summary of New Liberian Polydesmoidea," by O. F. Cook, was presented for publication.—General Isaac J. Wistar made a communication on the apparent capricious distribution of iron oxide as colouring matter in the rocks of the anthracite coal region. At several points, apparently, the accessible supply of iron was exhausted by complete distribution in the strata under process of deposit with intermediate and subsequent periods during which new supplies appear from some source not yet clearly explained. Prof. A. P. Brown stated that it had been suggested by Russell that the red colour of certain formations may have originated from the subaërial decay of iron-bearing rocks, and the subsequent deposit of this material as sediment forming the red rock. As far as the ash of coal is concerned, it is probable that the colour is due to the way in which pyrites is contained either in the coal itself or in the slate adjoining. Coal containing separable pyrites would give white ash, while if the pyrites is intimately mixed in the coal the ash will be red.—Mr. James Willcox and Prof. Angelo Heilprin commented on the evolutionary value of the large collection of fulgurs presented to the last meeting, the former claiming that about twenty-five species had been reduced by the presence of complete series of intermediate forms to three or four.

## BOOKS, PAMPHLETS, and SERIALS RECEIVED.

**BOOKS.**—The Heart of a Continent: Captain F. E. Younghusband, 2nd edition (Murray).—Argon and Newton: Lieut.-Colonel W. Sedgwick (Whittingham).—British Sea Birds: C. Dixon (Bliss).—Les Rayons X: Dr. C. E. Guillaume (Paris, Gauthier-Villars).—Report of the Commissioner of Education for the Year 1892-93, Vol. 2 (Washington).—Queen's College, Galway, Calendar for 1895-96 (Dublin, Ponsoby).  
**PAMPHLETS.**—Prof. Röntgen's "X" Rays, and their Applications in the New Photography (Glasgow, Bauermeister).—Die Denkschöpfung, &c.: A. Bastian (Berlin, Dümmlers).—The Magnetic Circuit: Dr. H. du Bois, translated by Dr. Atkinson (Longmans).  
**SERIALS.**—Journal of the Royal Statistical Society, March (Stanford).—Engineering Magazine, April (Tucker).—Journal of the Franklin Institute, April (Philadelphia).—Science Progress, April (Scientific Press).—Imperial University, College of Agriculture, Bulletin Vol. ii, No. 6 (Tokyo).—Studies from the Yale Psychological Laboratory, Vol. 3, 1895 (New Haven).—Ethnologisches Notizblatt, Heft 3 (Berlin, Haack).—American Journal of Science, April (New Haven).—American Naturalist, April (Philadelphia).—Strand Magazine, April (Newnes).

## CONTENTS.

	PAGE
Old and New Theories of Evolution. By Dr. Alfred R. Wallace, F.R.S. . . . . .	553
The Atomic Theory again . . . . .	555
<b>Our Book Shelf:—</b>	
Blochmann: "Die Mikroskopische Thierwelt des Süßwassers."—W. A. H. . . . .	556
Williams: "Manual of Lithology."—G. T. P. . . . .	556
<b>Letters to the Editor:—</b>	
The Sacred Tree of Kum-Bum.—W. T. Thiselton-Dyer, C.M.G., F.R.S. . . . .	556
The Röntgen Rays and Optically Active Substances.—Prof. Percy F. Frankland, F.R.S. . . . .	556
Radiographs by Fluorescent Screens.—Dr. L. Bleekerode; J. William Gifford . . . . .	557
Abnormal Rainbows. (Illustrated).—C. E. Peek . . . . .	557
Family Data.—Prof. Karl Pearson . . . . .	557
The Retinal Circulation.—George J. Burch . . . . .	558
Jupiter and his Period of Rotation. By W. J. S. L. . . . .	558
The Life of Joseph Wolf. (Illustrated.) . . . . .	559
Charles Chambers, F.R.S. . . . .	561
<b>Notes.</b> . . . . .	561
<b>Our Astronomical Column:—</b>	
Mira Ceti . . . . .	565
An Exhibition of Astronomical Photographs . . . . .	565
The Sun's Rotation . . . . .	566
The Tsetse Fly-Disease. (Illustrated.) By Walter F. H. Blandford . . . . .	566
The Action of Light on the Iris, demonstrated by a New Pupilometer. By Prof. Charles Henry . . . . .	568
Immunisation against Serpents' Venom, and the Treatment of Snake-bite with Antivenene. I. (With Diagram.) By Prof. Thomas R. Fraser, F.R.S. . . . .	569
University and Educational Intelligence . . . . .	572
Scientific Serials . . . . .	573
Societies and Academies . . . . .	574
Books, Pamphlets, and Serials Received . . . . .	576