PROCEEDINGS

OF THE

ROYAL SOCIETY OF LONDON.

From November 15, 1894, to March 21, 1895

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peratures. The product so obtained was originally described by Hlasiwetz as "mycomelic acid"; but evidence is brought forward to show that the substance described and analysed by this chemist was in reality urate of ammonium coloured by a yellow body, probably identical with the natural pigment.

5. The identity of the natural and artificial products is demonstrated by the fact that both yield under like treatment a purple derivative, which has a well-marked and easily identified absorption spectrum.

6. The artificial yellow product has not yet been obtained in a pure condition, but it may be so far purified as to exhibit clearly all the general properties of the natural pigment.

7. The natural pigment as prepared for analysis is shown to be almost certainly a chemical individual. Its probable constitution is discussed.

8. It is shown that this yellow substance (denominated in the paper "Lepidotic acid"), together with a closely allied red substance, will account for all the chemical pigmentation of the wing scales of the coloured Pieridae, though modifications may be produced by superadded optical effects. The black pigment found in the group is not dealt with in the paper.

9. The described uric acid derivatives, though universal in the Pieridae, are apparently confined to this group among the Rhopalocera. This fact enables the interesting observation to be made, that where a Pierid mimics an insect belonging to another family, the pigments in the two cases are chemically quite distinct. This is well seen in the genera Leptalis and Mechanitis respectively.

10. The existence of pigments other than scale-pigments is for the first time described; substances, namely, which are found between the wing membranes, and which, in certain genera, are the basis of ornament.

11. The fact that the scale-pigments are really the normal excretory products of the animal utilised in ornament, is emphasised by the observation that the yellow Pierids, on emergence from the chrysalis, are apt to void from the rectum a quantity of uric acid coloured by a yellow substance which exactly resembles the pigment of the wing.

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Bangor:—University College of North Wales. Calendar. 1894—95. 8vo. Manchester 1894. The College.


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Mr. J. Tebbutt.

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Sir B. W. Richardson, F.R.S.


Astronomy and Astro-Physics. August, 1894. 8vo. Northfield, Minn.

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Boletín de Minas Industria y Construcciones. Año X. Num. 5—6. 4to. Lima 1894.

Escuela Especial de Ingenieros.


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The Editors.

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Mr. Ramey.

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The Corporation.

Stourdza (Prince Grigori) Les Lois Fondamentales de l'Univers.
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The Author.

Symons (G. J.), F.R.S., and Wallis (H. S.) British Rainfall. 1893.
8vo. London 1894.
Mr. G. J. Symons, F.R.S.

Thomson (J. J.), F.R.S. Notes on Recent Researches in Electricity
and Magnetism. 8vo. Oxford 1893.
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Mr. Vernon-Harcourt.

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Ward (J. J.) The Hidden Pyramid; or the Mystery of the Great
Pyramid Explained. 8vo. Leeds.
The Author.

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Washington 1893.
Smithsonian Institution.

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1894.
The Author.

Wood-Mason (J.) and Alcock (A.) Natural History Notes from
H.M. Indian Marine Survey Steamer "Investigator." Series II.
No. 1. On the Results of the Deep-Sea Dredging during the
Season 1890—91. 8vo. [London] 1891—94.
Dr. Alcock.

Young (Thomas) Œuvres Ophtalmologiques: Traduites et Anno-
tées par M. Tscherning. 8vo. Copenhague 1894.
The Translator.
Bronze Medal, struck in honour of Dr. John Syer Bristowe, F.R.S.

The obverse bears the effigy of Dr. Bristowe; the reverse depicts a student in his laboratory, and has the words "St. Thomas's Hospital" in the exergue.

Mr. Allan Wyon.

November 22, 1894.

Sir JOHN EVANS, K.C.B., D.C.L., LL.D., Vice-President and Treasurer, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

In pursuance of the Statutes, notice of the ensuing Anniversary Meeting was given from the Chair, and the list of Officers and Council nominated for election was read as follows:—

President.—The Lord Kelvin, D.C.L., LL.D.

Treasurer.—Sir John Evans, K.C.B., D.C.L., LL.D.

Secretaries.—

Professor Michael Foster, M.A., M.D.

The Lord Rayleigh, M.A., D.C.L.

Foreign Secretary.—Sir Joseph Lister, Bart., F.R.C.S.


The following Papers were read:—
II. "On the Temperature of the Carbons of the Electric Arc; with a Note on the Temperature of the Sun." By W. E. Wilson and P. L. Gray. Communicated by Dr. G. J. Stoney, F.R.S. Received November 14, 1894.

[Publication deferred.]


[Publication deferred.]

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Heidelberg:—Universität. Akademische Schriften. 1893—94. 8vo. The University.


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Rostock:—Universität. [Theses. 1893–94.] 8vo. The University.

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Birkenhead:—Liverpool Observatory. Extracts from the Report of the Director of the Observatory, and Meteorological Results. 1892–93. 8vo. Liverpool 1894. The Director.
Greenwich:—Royal Observatory. Astronomical and Magnetical and Meteorological Observations. 1891. 4to. London 1893; Results of Astronomical Observations. 1891. 4to. London 1893; Results of the Magnetical and Meteorological Observations. 1891. 4to. London 1893; Results of the Spectroscopic and Photographic Observations. 1891. 4to. London 1893; Five-Year Catalogue of 258 Fundamental Stars, deduced from Observations extending from 1887 to 1891. 4to. London 1893. The Observatory.
Observations and Reports (continued).


Journals.


Riccò (A.) & Arcidiacono (S.) Osservazioni Pateometriche eseguite nell'Osservatorio di Catania. 8vo. Catania 1894. The Authors
Riccò (A.) & Saija (G.) Confronto della Temperatura all’ Osservatorio Etneo ed all’ Osservatorio di Catania. 8vo. Catania 1894. The Authors.
Schreiber (P.) Ableitung der sogenannten Trägheitskurve auf der Erdoberfläche. 4to. Dresden 1894. The Author.

November 30, 1894.

ANNIVERSARY MEETING.

The LORD KELVIN, D.C.L., LL.D., President, in the Chair.

The Report of the Auditors of the Treasurer’s Accounts, on the part of the Society, was presented as follows:—

“The total receipts on the General Account during the past year, including balances carried from the preceding year (£399 7s. 11d.) and the proceeds of the sale of stock, amount to £10,025 2s. 10d., and the total receipts on account of Trust Funds, including balances from the preceding year and cash received for bonds drawn, amounted to £6,065 8s. 2d. The total expenditure for the same period amounted to £7,227 11s. 10d. on the General Account, and £4,086 6s. 11d. on account of Trust Funds, leaving a balance on the General Account of £2,780 7s. 1d. at the bankers’, which includes £500 Challenger Account, £1,700 Catalogue Account, and £247 8s. 6d. Water Research Account, and a balance of £17 3s. 11d. in the hands of the Treasurer; leaving also a balance at the bankers’ on account of Trust Funds of £1,979 1s. 3d.”

The thanks of the Society were voted to the Treasurer and Auditors.
amount which diffuses through is estimated. On supplying 31 per cent. CO₂ to the lower surface of a leaf of Nerium only 0.035 per cent. appears by diffusion in a slow current of air kept continually passing over the upper surface of the leaf.

Other experiments on the respiration of injected leaves also support the view that the stomatal openings, in spite of their minuteness, offer a very much easier path from the atmosphere to the interior of the leaf than does the cuticle.

Conclusions.—1. Under normal conditions practically the sole pathway for CO₂ into or out of the leaf is by the stomata. Since oxygen diffuses more readily than CO₂ through fine openings, the same probably holds for oxygen and the whole of the gas exchange.

2. Under abnormal conditions, when the stomata or intercellular spaces are blocked and the surrounding tension of CO₂ is great enough, passage of CO₂ by osmosis through the cuticle may take place.

3. That such closure of stomata as is held to take place in darkness does not prevent the distribution of gas exchange closely agreeing with that of the stomata.

4. That the exhalation of CO₂ in bright light by a leafy shoot in Garreau’s well-known experiment is not the expression of any physiological truth for the leaf, but only due to the imperfections of the conditions; to the presence of immature parts, or of tissues not sufficiently green or not fully illuminated. Mature isolated green leaves fully illuminated assimilate the whole of their respiratory CO₂ and allow none to escape from them.
Transactions (continued).


Transactions (continued).
The Institute.
The Society.

Observations and Reports.
India:—Tide Tables for the Indian Ports for the Year 1895. 2 parts. 8vo. London. India Office.
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The Bureau.
The Surgeon-General.
The Department.
The Survey.
The Observatory.
The Minister.

Journals.
Department of Agriculture, Sydney.
The Editor.
Boletín de Minas Industria y Construcciones. Año X. Num. 8. 4to. Lima 1894.
Esecuila Especial de Ingenieros, Lima.
British Horological Institute.
The Editor.
The Editor.
R. Stazione Agraria, Modena.
Year-Book of Pharmacy. 1894. 8vo. London.
British Pharmaceutical Conference.

Edinburgh 1894.
The Author.
The Author.
St. Louis, Mo. 1894.
The Author.

Mr. H. B. Woodward.


MS. vol. inscribed "Philosophia Universalis pertinens ad Gabrielem Collenno." Sm. 4°. 784 pp. Date, 1694–96.

Mrs. W. Topley.
In the last part of the paper the medical aspects of this research are discussed. It is suggested that emotional syncope is due to paralysis of the splanchnic area, and a case is quoted where compression of the abdomen immediately removed the syncopal condition. The same treatment, or that of elevation of the abdomen, is suggested for conditions of shock, chloroform collapse, and after severe haemorrhage.

Finally, a parallel is drawn between some of the results of this research in reference to monkeys and those obtained by Dr. George Oliver on man, by measuring the diameter of the radial artery with his ingenious instrument, the arteriometer.

The Chairman announced that a paper on a newly-discovered gas having been promised by Lord Rayleigh and Professor Ramsay, this paper would on January 31 be taken as a subject for discussion under a Resolution of Council passed last session, whereby in each year certain Ordinary Meetings were to be "devoted each to the hearing and consideration of some one important communication, or to the discussion of some important topic."

The Society adjourned over the Christmas Recess to Thursday January 17, 1895.

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Transactions.


Transactions (continued).


The Academy.

Observations and Reports.


Portugal:—Direction des Travaux Géologiques. Flore Fossile du Portugal: Nouvelles Contributions à la Flore Mésozoïque, par le Marquis de Saporta. 4to. Lisbonne 1894.


Sydney:—Observatory. Meteorological Observations. June, 1894. 8vo. [Sydney.] The Observatory.


Journals.


The Registrar-General.


It is now twenty-eight years since I discovered that the lines seen in sun-spots were subject to widening,* and that different lines were widened at different times.

It was not, however, till 1879 that I was enabled to commence daily routine work of such a nature that all observations were comparable inter se. This desideratum was secured by limiting attention to the twelve lines most widened between F and D.

In 1886† I gave an account of some of the early results obtained by this research. I have recently commenced the complete discussion of the whole series of observations to the present year.

This discussion, involving 21,000 lines widened during the period in question, has necessitated three special researches: the first, dealing with the lines with which, contemporaneously, coincidences have been found in the laboratory; the second, dealing with those the origin of which is so far unknown; and the third, with the distribution of both sets of lines in spots in relation to the sun-spot period.

To make the work as definite as possible, I am, in the first instance, confining the inquiry concerning the known lines to lines of iron based upon the examination of the pure electrolytic iron referred to in a previous communication.‡

The following statistics will show the relation of these iron lines to the Fraunhofer lines in the region F—D over which the spot work extends. In the table, “terrestrial line” means a line which has been photographically recorded by myself or my assistants in the spectrum of some metal or another during the past twenty-four

† Ibid., vol. 40, p. 347.
‡ Ibid., vol. 54, p. 359.
heated to redness and quenched in oil at 14° C. It was found that this hardening process increased the resistance 4 per cent. and 7 per cent. in different samples.

APPENDIX III.

This effect may be illustrated by an example. A transformer was kept in a tank of heated oil, the temperature of which was kept between 110° and 140° C. Readings of its loss were taken occasionally as below, the magnetisation being the same in all cases, the current being applied only at the time and for the purpose of the test.

This test has not yet been in progress long enough to show the slow rise very clearly.

<table>
<thead>
<tr>
<th>Description</th>
<th>Watts</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>On immersion</td>
<td>33.13</td>
<td>Jan. 1, 1895</td>
</tr>
<tr>
<td>After 20 minutes</td>
<td>32.19</td>
<td></td>
</tr>
<tr>
<td>&quot; 40 &quot;</td>
<td>32.1</td>
<td></td>
</tr>
<tr>
<td>&quot; 1 hour &quot;</td>
<td>32.0</td>
<td></td>
</tr>
<tr>
<td>&quot; 1 &quot; 20 minutes &quot;</td>
<td>32.0</td>
<td></td>
</tr>
<tr>
<td>&quot; 2 hours 30 &quot;</td>
<td>31.54</td>
<td></td>
</tr>
<tr>
<td>&quot; 24 &quot;</td>
<td>28.88</td>
<td></td>
</tr>
<tr>
<td>&quot; 2 days &quot;</td>
<td>29.6</td>
<td></td>
</tr>
<tr>
<td>&quot; 3 &quot;</td>
<td>30.67</td>
<td></td>
</tr>
<tr>
<td>&quot; 4 &quot;</td>
<td>31.5</td>
<td></td>
</tr>
<tr>
<td>&quot; 6 &quot;</td>
<td>36.0</td>
<td></td>
</tr>
<tr>
<td>&quot; 7 &quot;</td>
<td>33.6</td>
<td></td>
</tr>
<tr>
<td>&quot; 8 &quot;</td>
<td>36.6</td>
<td></td>
</tr>
<tr>
<td>&quot; 9 &quot;</td>
<td>32.6</td>
<td></td>
</tr>
<tr>
<td>&quot; 18 &quot;</td>
<td>32.9</td>
<td></td>
</tr>
<tr>
<td>&quot; 29 &quot;</td>
<td>33.9</td>
<td>Jan. 29, 1895</td>
</tr>
</tbody>
</table>

Presents, January 17, 1895.

Transactions.


Transactions (continued).


The Institute.


The Director.


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The Society.


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Irkutsk:—East Siberian Section, Imperial Russian Geographical Society. Izvestiya. [Russian.] Tom. XXV. No. 1. 8vo. Irkutsk 1894.

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Transactions (continued).


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Transactions (continued).


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Santiago:—Sociedad Nacional de Minería. Boletín. Año XI. No. 70. 4to. Santiago de Chile 1894.


Throndhjem:—Kong. Norske Videnskabers Selskabs Skrifter. 1892. 8vo. Throndhjem 1893.


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Calcutta:—Meteorological Department. Monthly Weather Review. June, 1894. 4to. Calcutta; Meteorological Observations made at Seven Stations in India. June, 1894. 4to. [Calcutta.] The Department.


San Salvador:—Observatorio Astronómico y Meteorológico. Observaciones Meteorológicas, 1892. 8vo. San Salvador [1894]. The Observatory.


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R. Stazione Agraria, Modena.
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Dubois (E.) Pithecanthropus erectus: eine menschenaehnliche Uebergangsform aus Java. 4to. Batavia 1894.
The Colonial Minister, The Hague.
Du Hamel (J. B.) Opera Philosophica. 2 vols. in 1. 4to. Norimberge 1681.
The Linnean Society.
Gaudry (A.) Les Pythonomorphes de France. 4to. Paris 1892.
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The Author.
The Author.

Lubbock (R.) Dissertatio Physico-Chemica, inauguralis, de Principio Sorbili, sive communi Mutationum Chemicarum Causa, Quaestionem, an Phlogiston fit Substantia, an Qualitas, agitans. 8vo. *Edinburgi* 1784. The Linnean Society.


Schreiber (P.) Meteorological Observations considered with Special Reference to influence on Vegetation. 8vo. *Chicago* 1894. The Author.


Spencer (J. W.) Deformation of the Lundy Beach and Birth of Lake Erie. 8vo. *New Haven* 1894; The Duration of Niagara Falls. 8vo. *New Haven* 1894. The Author.

cerned, give no evidence of anything different from what obtains in
Monotropa uniflora and Corallorhiza multiflora—phanerogamous plants
destitute of chlorophyll.

Some of the more important facts ascertained in the investigation
may be thus briefly stated:—

1. Iron, firmly combined, is a constant constituent of animal and
vegetable chromatin. Another compound, less rich in iron, is found
in nucleoli.

2. The chromophilous substance in ferment-forming cells contains
iron, and the cytoplasm of Protozoan organisms, which also probably
secretes ferment, yields evidence of the presence of a firmly combined
iron compound.

3. A firm compound of iron is present in the chromophilous sub-
stance of the cytoplasm of Fungi.

4. Of the non-nucleated organisms, Bacteria, owing to their
minuteness, have, with one exception, given little evidence of the
presence of an organic iron compound; but in the Cyanophyceae the
chromophilous portions of the “central substance” contain iron, and
iron may be also demonstrated in the peripheral granules formed of
the so-called cyanophycin (Palla).

IV. “Micro-metallography of Iron. Part I.” By Thomas
Andrews, F.R.S. Received December 15, 1894.

[Publication deferred.]

Transactions.

Bergen:—Museum. Aarbog. 1893. Svo. Bergen 1894; On the
Development and Structure of the Whale. Part 1. By G.
Guldberg and F. Nansen. 4to. Bergen 1894.

Berlin:—Gesellschaft für Erdkunde. Verhandlungen. Bd. XXI.

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Dublin:—Royal Irish Academy. Proceedings. Third Series.

Hermannstadt:—Siebenbürgischer Verein für Naturwissenschaften.
Hermannstadt 1892.

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Calcutta:—Meteorological Department, Government of India. Monthly Weather Review. July, August, 1894. 4to. Cal-
Observations and Reports (continued).

*cutta*; Meteorological Observations recorded at Seven Stations in India. July, August, 1894. 4to. [Calcutta.]

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Astronomy and Astro-Physics. October—December, 1894. 8vo. Northfield, Minn.

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Physikalische Gesellschaft, Berlin.


British Horological Institute.

Journal of Comparative Neurology. December, 1894. 8vo. Granville, Ohio.

The Editor.


Curateur de l’Arrondissement Scolaire du Caucase.


Massachusetts Inst. of Technology.


Rev. P. Armani.


The Publisher.

Hunt (H. A.) An Essay on Southerly Bursters. 8vo. [Sydney 1894.]

Mr. H. E. Hunt.


The Author.

Riepler (S.) Die Präcisions-Uhren mit vollkommen freiem Echappement und neuem Quecksilber-Compensationspendel. 8vo. München 1894.

The Author.
January 31, 1895.

(In the Theatre of the University of London.)

The LORD KELVIN, D.CL., LL.D., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

I. "Argon, a New Constituent of the Atmosphere." By LORD RAYLEIGH, Sec. R.S., and WILLIAM RAMSAY, F.R.S., Professor of Chemistry, University College, London. Received January 31, 1895.

(Abstract.)

I. Density of Nitrogen from Various Sources.

In a former paper* it has been shown that nitrogen extracted from chemical compounds is about $\frac{1}{2}$ per cent. lighter than "atmospheric nitrogen."

The mean numbers for the weights of gas contained in the globe used were as follows:—

<table>
<thead>
<tr>
<th></th>
<th>Grams</th>
</tr>
</thead>
<tbody>
<tr>
<td>From nitric oxide</td>
<td>2.3001</td>
</tr>
<tr>
<td>From nitrous oxide</td>
<td>2.2990</td>
</tr>
<tr>
<td>From ammonium nitrite</td>
<td>2.2987</td>
</tr>
</tbody>
</table>

are well seen also in the indium spectrum No. 5 from 3850 to 3514.1. The enlargements of these prismatic spectra, however, cannot compare with the grating spectra, the air lines being, as far as possible, suppressed in the former.

I do not attribute much importance to the fact that argon gives two spectra; the red appears to be the spectrum of the first order, or the spectrum of the lower temperature which corresponds thereto; the blue is the line spectrum, or spectrum at the higher temperature.

I have photographed simultaneously from the same spark the two spectra of nitrogen as rendered by atmospheric air.

It is therefore more likely that argon is one substance and not two. Whether it is a compound or an element is a question into which the following considerations may enter. There are at present no gaseous substances known which can withstand the temperature of the condensed spark without exhibiting the spectra of one or other of the elements of which it is composed. If, therefore, argon were N₂, it would disclose the spectrum of nitrogen. As the spectrum is not that of any known substance, it follows that, if a compound, it must be a compound of a new element.

A Letter from Prof. Fitzgerald upon the Atomicity of Argon was read.

*Transactions.*


Royal Society. List of Members. 1894. 4to. [Edinburgh.] The Society.


Transactions (continued).


Louvain:—L'Université Catholique. Annuaire 1895. 12mo. Louvain [1894]; Programme des Cours. Année Académique. 1894–95. 8vo. Louvain 1894; Theses. 8vo. Louvain 1894; and Sundry Excerpts from the ‘Revue Catholique.’ 8vo. The University.


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The Survey.

London:—Board of Trade. Circular from the Board of Trade to the Railway Companies of the United Kingdom on the subject of Colour Vision. Folio. London 1894.

H.M. Stationery Office.

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Department of Agriculture, Sydney.

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University of Nebraska.

Delebecque (A.) Atlas des Lacs Français. [Planches 8—10]; [And 7 Excerpts. Svo. and 4to.]
The Author.
Oscillations of a Rotating Ellipsoidal Shell containing Fluid. 299

Hale (G. E.) On some attempts to Photograph the Solar Corona without an Eclipse. 8vo. [Chicago] [1894]. [With an Excerpt.] The Author.
Muybridge (Eadweard) Descriptive Zoopraxography, or the Science of Animal Locomotion. 8vo. Chicago 1893. The Author.

February 7, 1895.

Sir JOHN EVANS, K.C.B., D.C.L., LL.D., Vice-President and Treasurer, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:


(Abstract.)

The paper contains an application of the analysis used by M. Poincaré, in his memoir “Sur l’équilibre d’une masse fluide animée d’un mouvement de rotation,”* to the determination of the free oscillations of a system consisting of a fluid mass contained within a rigid ellipsoidal envelope, rotating about one of its principal axes. It is found that, when such a system is oscillating in one of its fundamental modes, the disturbances of the fluid are all expressible by means of Lamé functions, the functions involved being all of the same order; and a method of obtaining the frequencies of these oscillations, similar to that used by M. Poincaré for a fluid ellipsoid with a free surface, is given.

The oscillations, however, which involve Lamé functions of the second order, demand exceptional treatment in consequence of the fact that these alone imply any disturbance of the containing shell. Poincaré’s analysis, with slight modifications to adapt it to the

* ‘Acta Mathematica,’ vol. 7.
small stream motion relative to the others, and so to diminish the
mean pressure and the number of collisions per unit of time. The
actual state of the medium is a compromise between the two opposite
tendencies.

Transactions.
Basel:—Naturforschende Gesellschaft. Verhandlungen. Band X.
Batavia:—Bataviaasch Genootschap van Kunsten en Wetenschap-
pen. Notulen van de Algemeene en Bestuursvergaderingen.
Deel XXXI. Aflevering 3, en 4. Deel XXXII. Aflevering
1, en 2. 8vo. Batavia 1893–94; Catalogus der Ethnolo-
Batavia 1894; Nederlandsch-Indisch Plakaatboek 1602—1811.
Twalfde Deel, 1795—1799. 8vo. Batavia 1894; Tijdschrift
voor Indische Taal, Land en Volkenkunde. Deel XXXVII.
Aflevering 1—5. Deel XXXVIII. Aflevering 1 en 2. 8vo.
Deel XLVIII. 1ste Stuk. 8vo. Batavia 1893.
The Academy.
Giugno-Dicembre. 8vo. Firenze. The Library.
1894. The Society.
Institution of Civil Engineers. Abstract of Proceedings. Session
Institution of Electrical Engineers. Journal. Vol. XXIII.
Pharmaceutical Society of Great Britain. Pharmaceutical
London. The Society.
Transactions (continued).


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Transactions (continued).


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Santiago:—Sociedad Nacional de Minería. Boletín. Año XI. No. 72. 4to. Santiago de Chile 1894.

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California:—State Mining Bureau. Twelfth Report of the State Mineralogist. (Second Biennial.) Two years ending September 15, 1894. 8vo. Sacramento 1894.

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Observations and Reports (continued).


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The Editor.


The Editors.


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Society of Public Analysts.


The Editors.


Sir B. W. Richardson, F.R.S.


Smithsonian Institution.


The Editor.


The Editor.


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Mr. W. Crookes, F.R.S.


Éclairage Électrique (L'). Tome I. Nos. 4—15. 4to. Paris 1894.

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Journals (continued).

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British Horological Institute.

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Compass Observatory, Cronstadt.

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The Selborne Society.

The Editor.

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The Editor.

The Editor.

8vo. Modena 1895.
R. Stazione Agraria, Modena.

Symons's Monthly Meteorological Magazine. July—December,
1894. 8vo. London.
Mr. G. J. Symons, F.R.S.

Abney (Capt. W. de W.), F.R.S. Colour Vision; being the
Tyndall Lectures delivered in 1894 at the Royal Institution.
8vo. London 1895.
The Author.

Albert 1er (Prince de Monaco) Sur les Premières Campagnes
Scientifiques de la Princesse Alice. 4to. Paris 1895.
H.H. The Prince of Monaco.

Alfarābīs Abhandlung der Musterstaat; aus Londoner und Oxford
Handschriften herausg. von Dr. Friedrich Dieterici. 8vo. Leiden
1895.
The Editor.
Prof. Fitzgerald. On the Equal Partition of Energy among the Degrees of Freedom of Atoms is not inconsistent with the various Internal Movements exhibited by the Spectra of Gases.” By Professor G. F. Fitzgerald, F.R.S. Received February 7, 1895.

It has been generally held that a sufficient freedom of internal motion in an atom to explain the spectra of gases proved that the theorem as to equal partition of energy among all degrees of freedom could not hold, and various suggestions have been made as to why the proof, as given by Maxwell, Boltzmann, and others, fails in this
B. Experiments conducted with Sterilised Soil.

5. Two pots of soil, sterilised by steam, were infected with the crushed roots of diseased cabbages. The soil in one pot was mixed with quicklime, that in the other with bone manure, having an acid reaction. A healthy cabbage seedling was planted in each pot, and at the end of two months the plant in the pot containing lime was perfectly healthy, whereas the plant in the soil containing acid bone manure was badly diseased.

6. Two pots containing soil mixed with quicklime and acid bone manure respectively had a diseased cabbage seedling placed in each. At the end of two months the disease was more developed in both seedlings than at the time of planting; proving that the presence of lime will not arrest the disease when the plants are once attacked.

Summary.

The foregoing observations and experiments demonstrate the following points:—

1. That in addition to cultivated plants, several common weeds belonging to the order Cruciferae are attacked by the Plasmodiophora. Hence the necessity for preventing the growth of such weeds in fields and hedge-banks.

2. That the germs of disease are present in soil that has produced a diseased crop, and retain their vitality for at least two years.

3. That the development of Plasmodiophora is favoured by the presence of acids, and checked by the presence of alkalies, agreeing in this respect with the fungi rather than with bacteria.

4. For the purpose of sterilising infected soil, experiments prove that either a dressing of lime or a manure containing potash salts is effective, the last being most valuable, as it not only destroys the germs in the soil but also arrests the disease in seedling plants, and at the same time supplies one of the ingredients necessary for the healthy growth of turnips.
Transactions (continued).


Observations and Reports.


Journals.


Studies from the Laboratory of Physiological Chemistry, Sheffield Scientific School of Yale University. Vols. I—III. 8vo. New Haven 1885–89.


Beddoe (Dr. John) Sur l’Histoire de l’Index Céphalique dans les Iles Britanniques. 8vo. Paris [1895].


Tommasi (Prof. Annibale) Rivista della Fauna Raibiana del Friuli. 8vo. Udine 1890; La Fauna del Calcare Conchigliare (Muschelkalk) di Lombardia. 8vo. Pavia 1894.
burning in a confined space of air, produce an atmosphere of almost identical composition with that of air expired from the lungs.

3. The extinctive atmospheres produced by the combustion of the flames of candles and of lamps, and the air expired from the lungs after inspiring fresh air, are respirable with safety.

4. The extinction of an ordinary candle or lamp flame is not necessarily indicative of the unsuitability of an atmosphere to maintain life when it is breathed.

Transactions.


The Society.


The Society.


The School.


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Transactions (continued).


Observations and Reports.


Welch (Charles) History of the Tower Bridge and of other Bridges over the Thames built by the Corporation of London. 4to. *London* 1894. Bridge House Estates Committee.
the deviations from the average occurred with a frequency indicated by the theoretical law of error. The measurements of the aboral arm-length did not agree so well, possibly owing to dimorphism. The relative probable error of the smaller larvae was greater than that of the larger ones, in the proportion of 63 to 57. As most of the smaller larvae were obtained in the summer months, with presumably not quite mature ova, it is probable that the variability in the size, as well as the actual size of the larvae, is affected by the time of the year in which the fertilisations are made. The variability is also affected by the temperature of development, it reaching a maximum at 18° to 20°. The variability of the organs of echi- nomerma larvae is much greater than in the case of higher animals. Thus the probable error of the body-length is 6:1 per cent., of the aboral arm-length 11:3 per cent., and of the oral arm-length 9:4 per cent.

**Presents, February 28, 1895.**

**Transactions.**


**Observations and Reports.**


March 7, 1895.

Sir JOHN EVANS, K.C.B., D.C.L., LL.D., Vice-President and Treasurer, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

In pursuance of the Statutes, the names of the Candidates for election into the Society were read, as follows:—

Allen, Alfred Henry, F.C.S.
Barrett, Professor W. F.
Barry, J. Wolfe, M.Inst.C.E.
Bateman, Sir Frederic, M.D.
Bell, Robert.
Binnie, Alexander Richardson, M.Inst.C.E.
Blake, Rev. John Frederick, M.A.
Bourne, Professor Alfred Gibbs, D.Sc.
Bovey, Henry Taylor, M.A.
Bryan, George Hartley, M.A.
Burdett, Henry Charles.
Callaway, Charles, D.Sc.
Cardew, Philip, Major, R.E.
Clowes, Professor Frank, D.Sc.
Collie, J. Norman, Ph.D.
Corfield, William Henry, M.D.
Downing, Arthur Matthew Weld, M.A.
Elgar, Francis, LL.D.
Eliot, John, M.A.
Elwes, Henry John, F.L.S.
Etheridge, Robert, F.G.S.
Gray, Andrew, M.A.
Green, Professor Joseph Reynolds, D.Sc.
Griffiths, Ernest Howard, M.A.
Hamilton, Professor David James, M.D.
Harcourt, Leveson F. Vernon, M.Inst.C.E.
Haswell, Professor William A., D.Sc.
Head, Henry, M.D.
Heycock, Charles Thomas, M.A.
Hickson, Sydney John, M.A.
Hill, George Henry, M.Inst.C.E.
Hinde, George Jennings, Ph.D.
Holden, Henry C. L., Major, R.A.
Howes, Professor George Bond, F.L.S.
Kipping, F. Stanley, D.Sc.
Landsdell, Rev. Henry, D.D.
Lockwood, Charles Barrett, F.R.C.S.
The pressure by weights was invariably higher than by crusher; at 5 tons (by crusher) the difference was about 11 per cent., at 6 tons about 9 per cent., at 13 tons about 11 per cent., at 16 tons about 16 per cent. At 5, 6, and 13 tons there is usually (but not always) less difference between the individual pressures by crusher given above than between the weights pressures; at 16 tons there is decidedly greater regularity in the crusher results than in those by weights; the crusher pressures are, however, the means of series, which favours them somewhat.

Presents, March 7, 1895.

Transactions.
Santiago:—Sociedad Nacional de Minería. Boletín. Año XI. No. 73. 4to. Santiago de Chile 1894. The Society.
March 14, 1895.

The LORD KELVIN, D.C.L., LL.D., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The Croonian Lecture was delivered as follows:—

CROONIAN LECTURE.—"On the Nature of Muscular Contraction." By TH. W. ENGELMANN, Professor of Physiology in the University of Utrecht. Received February 25, 1895.

I beg your kind attention for a few moments to some observations and considerations on the nature of muscular contraction. Besides its general biological interest, the subject may claim a particular interest for the members of this Society, for the venerable institution of these Croonian Lectures is especially devoted to the furtherance of the study of muscular life, and, moreover, the Royal Society has, through its Fellows, from Robert Hooke down to our friend Professor Schäfer, produced numerous researches on muscular structure and action which may be said to belong to the most valuable part of our scientific property.

It will not be my task to recall to your mind all those eminent Fellows of this Society who have helped us to get a clearer insight into this subject, yet I cannot refrain from reminding you of one of these men, who is honoured throughout the whole world as one of
As with all problems of natural philosophy we must forego the complete solution, and content ourselves with approximations to truth, so now we will refrain from calling out with Archimedes, εὖρηκα, but rather be mindful of the words of the apostle:

οὖχ ὡς ἤδη ἐλαβον, διόκοι δὲ εἰ καὶ καταλάβω.

Transactions.


Transactions (continued).


Observations and Reports.

Calcutta:—Meteorological Department, Government of India. Monthly Weather Review. September, 1894. 4to. Calcutta; Meteorological Observations recorded at Seven Stations in India. September, 1894. 4to. [Calcutta.]


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Journals (continued).
British Horological Institute.
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8vo. Modena 1895. R. Stazione Agraria, Modena.

Bell (Sir C.), F.R.S. Letters, selected from his Correspondence with his brother, G. J. Bell. 8vo. London 1870.
Mrs. Francis J. Bell.
The Publisher.
The Author.
Jefferson City 1890 [and nine other Pamphlets on Missouri.]
8vo.
The Author.
Stas (J. S.), For. Mem. R.S. Œuvres Complètes. 3 vols. 4to.
Bruxelles 1894.
Stas Memorial Committee.
Presents, March 21, 1895.

Transactions.


Copenhagen:—Danish Biological Station. Report. 1893. 4to. Copenhagen 1894. The Station.


Kazan:—Imperial University. Scientific Notes. [Russian.] 1895. No. 2. 8vo. Kazan. The University.


Lund:—Universitet. Års-skrift. Tom. XXX. 4to. Lund 1893—94. The University.


Transactions (continued).

The Württemberg Government.

Observations and Reports.

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Journals.

Department of Agriculture, Sydney.

Boletín de Minas Industria y Construcciones. Año X. Num. 10. 4to. Lima 1894.
Escuela de Ingenieros, Lima.

Brioschi (F.) Notizie sulla Vita e sulle Opere di Arturo Cayley. 8vo. Roma 1895.
The Author.

The Author.

Account of the appropriation of the sum of £4,000 (the Government Grant) annually voted by Parliament to the Royal Society, to be employed in aiding the Advancement of Science (continued from vol. lv, p. 305).

April 1, 1894, to March 31, 1895.

<table>
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<td>Brought forward ........................</td>
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<tr>
<td>J. Holm and J. R. Erskine-Murray—for Experimental Investigations on Contact Electricity of Conductors</td>
<td>200</td>
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<tr>
<td>G. M. Minchin—for the Measurement of the Electromotive Forces developed in certain Photoelectric Cells by the Light of the Moon, the Planets, and the Fixed Stars, by means of improved appliances</td>
<td>25</td>
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<td>O. Lodge—for assistance in experiments intended to elucidate the connection between Ether and Ordinary Matter</td>
<td>50</td>
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<tr>
<td>Owen Glynne Jones—for the Determination of the Viscosity of Liquids by the measurement of the limiting speed of bodies falling through the liquid under the action of gravity</td>
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<tr>
<td>H. H. Turner (for Joint Permanent Eclipse Committee)—for Observations of the Total Solar Eclipse of August, 1893, in Norway and in Japan</td>
<td>250</td>
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<tr>
<td>P. L. Gray—for a Research on Radiation and especially on the Connection of Radiation with the Temperature of the Radiating Surface, &amp;c.</td>
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<tr>
<td>Prof. W. Ramsay—(1) for Continuation of Experiments on Molecular Surface Energy, especially on that of Fused Salts, Mixtures and Solutions (£25); (2) for Continuation of Researches on the ratio between the Specific Heats of Ethyl Oxide (£25)</td>
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<td>Prof. Dewar—for an Attempt to produce Liquid Hydrogen, and thereby study the Properties of Matter near the Zero of Absolute Temperature</td>
<td>400</td>
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<tr>
<td>Alfred E. Tutton—for the Purchase of a Goniometer to be used in a Research on the connection between the Atomic Weight of the Elements contained in the Crystallised Substance and the Goniometrical and Optical Constants</td>
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<td>W. E. Wilson—for Apparatus in aid of further Research on the Radiation from Sun Spots and different parts of the Sun</td>
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<td>Dr. J. A. Harker—for Researches (1) on the Latent Heat of Steam; (2) on the Specific Heat of Water, at temperatures from 0°—40°</td>
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<td>The Incorporated Kew Committee (per C. Chree)— for a Research on the behaviour of Aneroid Barometers when exposed to a variety of Descending and Ascending Pressures</td>
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Carried forward ........... £1,335 0 0
Appropriation of the Government Grant.

Brought forward ............ £ 1,335 0 0

C. F. Cross—for a Research on the Special Chemistry of the Celluloscs, the Physiology of their Elaboration, and their Feeding Value ........................................ 100 0 0

Dr. S. Schryver—for Investigation of the Oxidation Products of Turpentine Oil ........................................ 20 0 0

W. H. Perkin, jun.—for (1) Continuance of Investigation on Camphoric, Camphoronic, and all Allied Acids; (2) an Investigation on the Synthetical Formation of Unsaturated Closed Carbon Chains .......................... 60 0 0

R. Threlfall—for Preparation of Pure Selenium, and Exact Determination of its Electrical Properties ............... 162 10 0

Dr. F. R. Japp—for an Investigation of the Reactions of Ketones, Diketones, and Allied Compounds .................. 75 0 0

J. N. Collie—for (1) the Preparation of various Oxy-Compounds of Pyridine, Picoline, and Lutidine; (2) the Preparation of the Corresponding Chlorine Derivatives; (3) the Preparation of the Acids obtained by the Oxidation of the Chlorides by means of Permanganate of Potash .................................................. 20 0 0

W. A. Shenstone—for Continuing the Investigation of the Influence of Silent Discharge on Oxygen and other Gases in the purest state attainable .......... 30 0 0

W. P. Wynne—for Continuation of the Study of Quinoline Sulphonic Acids, and of certain Toluene Derivatives ........................................... 50 0 0

Prof. W. R. Dunstan—for a Continuation of the Investigation of the Aconite Alkaloids, both in respect of their Chemical Nature and Relationships, and of their Physiological Action ........................................ 200 0 0

Prof. W. R. Dunstan—to Determine the Precise Conditions which are necessary for the “Rusting” of Iron .......... 30 0 0

Dr. Percy Frankland—to Continue a Research on the Chemical Changes which are brought about in Pure Fermentation ............................................. 125 0 0

Dr. Forsyth-Major and Dr. Woodward—to enable Dr. Forsyth-Major to visit Madagascar, to investigate deposits yielding the Tertiary and Quaternary Faunas, and to secure specimens of living Vertebrata ........... 300 0 0

R. Lydekker—for Continuation of the examination and description of Fossil Vertebrates of Argentina contained in the Museums of La Plata and Buenos Ayres ........................... 130 0 0

Carried forward ............ £2,637 10 0
### Appropriation of the Government Grant.

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R. Irvine—for Assistance and Apparatus to be used in an Investigation of the Composition of Ocean Waters

Dr. John Murray—for (1) the Examination of Deep Sea Deposits received from various Localities; (2) a Research on the Pseudomorphic and other Changes induced by Metallic and Ammoniacal Salts in the Constituents of Marine Deposits.

Dr. Thomas Johnson—for the Investigation of the Irish Marine Algae; their Structure, Life-History, and Distribution

Cecil C. Duncan—for the Continuation of a Series of Observations on the Structure and Cause of the Movements of the Diatomaceae

West India Committee (per G. Murray)—for carrying on the Work of the Committee, and particularly to send a Collector to Margarita

Sandwich Islands Committee (per D. Sharp)—to investigate the Fauna of the Sandwich Islands in continuation of the work of the Sandwich Islands Committee.

A. Willey—for an Expedition to the South Seas for the purpose of working out the Development and Life-History of the Pearly Nautilus

F. Galton (for a Committee)—for an Inquiry into the Measurable Characteristics of Plants and Animals

Prof. D'Arcy Thompson—to send a Collector to Jan Mayen's Land, Spitzbergen, and East Greenland, for the purpose of obtaining Zoological Specimens, and of making observations

Prof. T. W. Bridge—for further Researches in (a) Skeletal Anatomy of the Teleostean Fishes; (b) Morphology of the Skull in certain Ganoid Fishes

J. G. McKendrick—for a Research on the Functions of the Cochlea

Dr. Risien Russell—for a Comparative Investigation of Red and White Muscle

B. Moore—for a Research on the Effect of Removal of Certain Organs on "Stoffwechsel" in Dogs and Monkeys

W. D. Halliburton—for Continuation of Research on Nucleo Albumins and their Influence on Intravascular Coagulation

Carried forward $3,562 10 0
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<tr>
<td>Dr. Leonard Hill— for the Continuation of a Research on Intra-cranial Pressure</td>
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<td>J. W. Washbourn— for an Experimental Inquiry upon the Nature of Immunity, especially with reference to the Pneumococcus</td>
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<td>V. Harley— for an Investigation of the Respiratory Gas Exchange in Diseases of the Respiratory and Circulatory System</td>
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<tr>
<td>Robert Boyce— for the Study of the Descending Degenerations in the Brain and Spinal Cord, and of the Seat of Origin and Paths of Conduction of the Motor Impulses</td>
<td>40 0 0</td>
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<tr>
<td>C. A. Ballance and G. S. Shatlock— for Continuation of the Research into the Pathology of Cancer</td>
<td>100 0 0</td>
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<td>Dr. A. E. Garrod— for further Researches on the Urinary Pigments</td>
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<td>W. M. Bayliss— for a Research on the Mode of Action of the Vaso-motor Centre, with especial reference to Central Excitation of Vaso-dilators</td>
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<tr>
<td>S. M. Copeman— for a Study of the Pathology of Variola and Vaccinia</td>
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<tr>
<td>E. H. Starling— for further Research on the Physiology of Lymph Formation</td>
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<td>Dr. R. T. Hewlett— to prepare a Supply of “Tetanus Antitoxine,” and to Investigate the Nature of the Substance or Substances which confer Immunity and which Neutralise the Tetanus Toxines</td>
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<td>Dr. Sherrington— for Further researches on the Topography and Mode of Reflex and other Nervous Actions which employ the lower half of the Spinal Cord in the Monkey</td>
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<td>A. F. Stanley Kent— for a Study of the Changes occurring in the Nuclei and Protoplasm of Cells from various Animal Tissues as the result of experimentally produced injurious conditions</td>
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<td><strong>Total</strong></td>
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### General Fund

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<th>Cr.</th>
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<td>By Appropriations, as above</td>
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<td>&quot; Parliamentary Grant</td>
<td>4,000 0 0</td>
<td>Less appropriations lapsed or</td>
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<td>&quot; Repayments</td>
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<td>&quot; Interest on Deposit</td>
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<td><strong>£4,758 19 0</strong></td>
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### Reserve Fund

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<td>By Balance, March 31, 1895</td>
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<td>&quot; Transfer from General Fund</td>
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