the physical configuration, the average is less than 30 inches from Dover westward as far as the east shores of the Isle of Wight. On proceeding still farther westward, the annual rainfall slowly but steadily rises, till on rounding Prawle Point in Devonshire it begins to exceed 40 inches, and with this increase of the rainfall there is a still more striking increase of temperature in the winter months.

The whole of the results arrrived at in this inquiry show conclusively that the key to the distribution of the rainfall of the British Islands is the direction of the rain-bringing winds in their relation to the physical configuration of the surface.

Looked at broadly, there are four very distinct causes of rain, viz. (1) the moist south-westerly winds; (2) rains, often very heavy rains, from the east, extending but a little way inland; (3) the annual fall of temperature from August to January; and (4) those peculiar influences that have their fullest development in the thunderstorms of summer over low-lying extensive plains.

The rainfall of the British Islands has been examined with reference to its seasonal distribution in relation to the physical configuration of the surface. The mean amount of each place for the past twenty years has been calculated for the twelve months, these being reduced to thirty days each. The mean of these twelve months being taken, the mean monthly rainfall of the year was then ascertained, and with this latter mean each monthly mean was compared, and its excess, or defect, entered in percentages on twelve maps.

The moist south-westerly winds acquire their maximum anuual predominance in December and January, and as these winds come loaded with the vapour of the Atlantic the rainfall rises above its monthly mean over nearly the whole of Scotland. Two patches, however, are to a great extent exempt, these being the districts lying on the lee side of the greatest stretch of mountainous land, viz. to the north-east of the Grampians and to the east of the Moffat and Lead Hills. Similarly, in England, during these months, the rainfall is considerably above the average over the whole of the dry districts extending from the Tweed southwards, and bounded on the west by the water-partings of the Mersey and the Severn, and on the south by the Thames, including the northern slopes of Kent.

During the great annual fall of temperature from August to January the greatest excess over the mean monthly rainfall occurs in September and October, when the fall of temperature is most rapid, south-westerly winds very prevalent, and heavy rains with easterly winds, chiefly the easterly winds of cyclones, of most frequent occurrence. In these months the rainfall reaches the annual maximum over large districts in the east of Scotland, and over all but the whole of England.

In northern and extreme western districts nearly all thunderstorms occur during the winter months, whereas few occur in eastern and central districts at this season; but nearly all occur in the summer months—a remark which applies with greatest force to the more extensive level, or comparatively level, portions of the country. Now, from the frequent occurrence of the thunderstorms and thunder-showers, the annual rainfall of these districts approaches to, and in not a few cases reaches, the annual maximum in the summer months. The local excess begins to show in June, and is extended in July much more decidedly over the agricultural districts of England and Scotland that are best suited for the ripening of wheat and barley. In August there is shown a still further development and extension of the summer rains over these and adjoining districts. It is to be noted, however, that during this time the rainfall remains under the average over the extreme south-western, southern, and south-eastern districts of England. In these characteristics of the summer rainfall these important agricultural centres resemble the climates of Central Europe, where the rainfall rises to the maximum during the summer months.

The following are the annual amounts of the rainfall, in inches, in certain districts and along certain lines radiating from Glasgow:—Glasgow 40·20, Bresley Hill 37·33, Bothwell Castle 29·98, Dalziel House 30·50, Lanark 35·66, Wiston 45·33; Queen Park 36·24, Newton Mearns 52·63, Black Loch 57·60; Paisley 45.37, Castle Semple 52·10, Blair 53·62, Ardrossan 41·03; Kilbarchan 57·28, Kilmalcolm 57·28, Greenock 64·25, Overton 71·45; New Kilpatrick 48·05, Dumbarton 48·25, Cameron House 62·95, Luss 80·45, Firkin 96·05, and Ardlui 115·46. These figures show in a striking manner the extraordinary variations of climates there are in the immediate neighbourhood, or within easy reach, of Glasgow. Quite recently an inquiry was set on foot in Berlin, where numerous rain-gauges were planted with the view of arriving at some clear understanding as to the amount of observational information required in order to state definitely what the actual rainfall of a district is. Might I suggest to the Mathematical and Physical Section of the Philosophical Society that a similar investigation be taken in hand, and forty or more rain-gauges be added to those already in use. In a few years not only would they be able to answer the question proposed by the Berlin meteorologists, but in answering it they would state with satisfactory precision the character and limits of the various local climates which differ so widely from each other in the neighbourhood of Glasgow.

THE AUSTRALIAN MUSEUM, SYDNEY[1]

(1) THE Museum has been, during the year 1884, as in previous years, open to the public daily, except on Mondays, when it is necessarily closed for the purpose of cleaning. The largest attendance on any one day was on December 26, when 1643 persons were registered at the doorway. The greatest Sunday attendance was 1315, on April 13. The average daily number of visitors throughout the year was 262 on week-days and 853 on Sundays. The total for the year is 126,040.

(2) The collections are still being increased by means of purchases, exchanges, collecting expeditions, and donations. A list of these additions, under their separate heads, will be found in Appendices V., VI., VII., VIII. Among these may be specially mentioned several pairs of large antelopes from South Africa, a full-grown ourang-outang of the larger species (*Simia satyrus*), and several of the smaller species (*S. morio*): a fine specimen of the Chimpanzee (*Troglodytes niger*); two whales, one from Kiama (*Physeter macrocephalus*), and one from the coast of England, belonging to the extremely rare species known as Rudolf's Whale (*Balænoptera borealis*); casts of gigantic fossil remains from the British Museum, including *Elephas ganesa*, *Mastodon andium*, *Toxodon platensis*, *Sivatherium giganteum*, *Megalania prisca*, &c.; and large and important ethnological collections.

(3) Great alterations and improvements have been effected by the erection of additional wall-cases, constructed upon the best principles and at considerable cost, for the reception of large collections of skeletons and Australian fossil remains; and for groups of Birds of Paradise, and other exhibits of great interest from New Guinea and elsewhere. Additional cases and cabinets have been provided for the mineral collections, and others are in course of construction for similar purposes.

(4) Want of sufficient space in the present building is still felt as a serious drawback to the usefulness of the Museum. The Trustees nevertheless gladly express their obligation to the Government for the provision now made for further accommodation. An additional shed has been erected, which is used as a store for timber and other material. A large iron workshop has also been provided, and another of similar dimensions is in course of erection. These are to be used for the storage of spirits and bottles, and for workrooms in connection with spirit specimens.

(5) Catalogues, not only of the various collections in the Museum, but also of all branches of Australian Zoology, are still in course of preparation; but no new publications have been issued during the past year.

(6) Mr. Ramsay's visit to Europe in connection with the International Fisheries Exhibition enabled him to examine various Museums, Zoological Stations, and Aquaria, and has been productive of much advantage to this Museum. A report, with particulars of his proceedings and details of his arrangements for purchase and exchange of specimens, will be found in Appendix XI.

(7) The exhibits which are sent to the Calcutta Exhibition have been presented by the Trustees to the Government of India.

(8) The Teaching Collection, consisting of skeletons, models, and specimens illustrative of comparative anatomy and natural history, which for some years past occupied the north room in the upper floor of the Museum, has been transferred to the University. This collection was specially prepared for teaching purposes, and, as most of the specimens were already represented in the Museum, and it occupied space which could be better used for the display of other objects of interest, the

[1] Report of the Trustees for 1884.

Trustees felt themselves justified in making the transfer. Although this collection is now at the University, its ownership remains with the Trustees.

9. There has been no change in the Board during the year, by death or otherwise.

10. Annexed to this Report are the following Appendices :—

I.—Annual Balance-sheet.
II.—Attendance of Visitors.
III.—Attendance of the Trustees.
IV.—Work done by Taxidermist and Articulator.
V.—Specimens collected.
VI.—Specimens purchased.
VII.—Exchanges.
VIII.—Donations.
IX.—Books acquired.
X.—Duplicate Books.
XI.—Mr. Ramsay's Report.

(Signed) ALFRED STEPHEN,
Crown Trustee and Chairman

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The Special Board for Medicine have presented to the Vice-Chancellor the following Report with a view to its communication to the Senate :—"The Board have considered the requirements of the Previous Examination from the point of view of its suitability as a preliminary examination for students entering on the study of medicine, and have come to the conclusion that in the interests of mental training these requirements may with advantage be modified. They would desire to see introduced an adequate examination in the elementary mechanical principles of Physics, meaning thereby—the fundamental notions of matter, motion, and energy, and the simple laws which govern their relations ; the physical properties of matter in the solid, liquid, and gaseous states ; and the application of these properties and laws in the case of simple instruments and machines. An examination in these principles need not involve any but the most elementary mathematics, yet it could be made to exercise the student in clearness of conception, in accuracy of statement, and in soundness of reasoning. These qualities are in a special degree essential to students of medicine, but from our Report of November 11, 1885, it would appear that in these respects the preliminary training of many who propose to become students of medicine has not been satisfactory. The subject we propose is already well taught and appreciated in many good schools, and it appears to us extremely desirable that the University should encourage all schools to improve themselves in this direction by including the subject in its Previous Examination. It is not for the Board to say whether the subject should form part of the Previous Examination proper (though many considerations might be urged for this plan), or be required as an additional subject in place of the present examination in Elementary Mechanics. They are, however, persuaded that, if introduced in some form, the examination would be for all students at least of equal value to the present examination in additional subjects, and for students whose work at the University is to consist largely in the study of nature it would be of considerably greater value."

Mr. H. D. Rolleston, of St. John's College, has been appointed Assistant Demonstrator of Physiology, in succession to Mr. Green. Mr. Rolleston was placed in the First Class in the Natural Sciences Tripos, Part I., in the Easter Term, 1885.

SCIENTIFIC SERIALS

Annalen der Physik und Chemie, No. 12, December 1885.—J. Fink, on the influence of pressure on the electric resistance of electrolytes. Cailletet's apparatus was used for producing compression, Kohlrausch's induction apparatus for the electric measurements. A solution of hydrochloric acid (5·02 per cent.), having a resistance of 7·490 Siemens' units at 1 atmo., fell to 7·335 at 200, and to 7·126 at 500 atmos. A weaker solution (0·98 per cent.) showed a diminution of 7·39 per cent. in its resistance at 500 atmos. A similar solution of zincic sulphate showed a diminution of 11·74 per cent. The diminution is proportional up to 300 atmos.—E. Edlund, on the transition-resistance in the voltaic arc. The conclusion is against the existence of such a resistance.—K. Wesendonck, on the fluorescence of naphthalin-red.—H. W. Vogel, on the relation between absorption by colouring matters and their sensitising action on bromide of silver.—G. Kötschau, studies on fluid motions. Some very extraordinary figures are produced by careful introduction of a coloured liquid into an uncoloured one.—F. Himstedt, a determination of the ohm. This paper describes the method, depending on a knowledge of the coefficient of mutual induction of two coils, which has already been discussed by Lord Rayleigh, and which is similar to that of Roiti. The final result gives as equivalent to the ohm a column of mercury of 1 square millimetre section and 105·98 centimetres length.—W. B. Brace, on the magnetic rotation of the plane of polarisation, and some special cases of refraction. It is shown that there may be in a calc-spar crystal three rays which suffer no double refraction. Experiments are also described concerning prisms of heavy glass in a magnetic field.—G. Stern, position of the commutator in electro-dynamic machines. A discussion of Clausius' formulæ with respect to the relation of the current to the angle of lead.—E. Mach and J. Wenzel, a contribution to the mechanics of explosions.—K. L. Bauer, apparatus for demonstrating that electricity resides only on the surface of a conductor. This is a modification of Biot's apparatus, consisting of two concentric hemispheres, and convenient means of insulating and discharging.

Journal of the Russian Chemical and Physical Society, vol. xvii. fasc. 7.—On the part played by contact actions in the phenomena of dissociation, by D. Konovaloff.—Thermic data for some combinations of the aromatic series, by E. Werner, being numerical data as to the heat of neutralisation of saligenin and oxybenzoic aldehydes and acids, and mellic acid.—On the oxidation of oleic and elaidic acids by permanganate of potassium, by A. Saytzeff.—Notes by MM. Albitzky, Nikolsky, and Ustinoff.—On the motion of a solid body having cavities filled with a homogeneous liquid, by M. Joukowsky, being the second part of a mathematical inquiry into ellipsoidal, cylindrical, and such other cavities as have the shape of a rotation-body, and also several cavities connected together.—On the collision of absolutely solid bodies, by M. Schiller, second part, being a further mathematical development of the theory, together with answers to Prof. Joukowsky's observations.—On the influence of an electric current on the resistance of selenium and its sensibility to light, by N. Hesehus, being an explanation of the experiments of Fritts by the theory of allotropic dissociation.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 17, 1885.—"On the Formation of Vortex-Rings by Drops falling into Liquids." By Prof. J. J. Thomson, M.A., F.R.S., and H. F. Newall, M.A.

When a drop of ink falls into water from not too great a height, it descends through the water as a ring, in which there is considerable rotation about the circular axis passing through the centres of its cross-sections ; as the ring travels downwards, inequalities appear, and the ring breaks up into a number of smaller rings, which in turn may again subdivide.

It is shown that capillarity plays no essential part in the formation of the rings ; in fact, it may be said that, with very few exceptions, rings are formed only when a liquid is dropped into one with which it can thoroughly mix. There are very many cases in which rings are formed when there is no possibility of capillary action, such as when the liquid into which the drop falls is the same as the drop itself.

The drops were observed by instantaneous illumination ; and it was seen that the drop enters the liquid as a sphere, becomes flattened as it descends, and finally breaks into a ring more than half an inch below the surface.

When a sphere moves through a liquid, the tangential velocity of the liquid is different from that of the sphere. If the sphere be a liquid drop, there is no absolute discontinuity in the motion, but only a very rapid change, so that there is a finite alteration in a very small distance. This is equivalent to a vortex-film covering the sphere, the lines of vortex-motion being horizontal circles. If the liquid be viscous, the vorticity will diffuse inwards and outwards. The drop, as it falls, becomes flattened, on account of the resistance to its fall ; and if by