

College is too often bound down by the exigencies of examinations to the delivery of certain set lecture courses, and these, together with his own researches and the performance of the many administrative duties that fall to his lot, occupy almost the whole of his time. Let him possess the master-mind of a Hofmann, his hurried visits to his laboratory afford comparatively slight opportunity for the exercise of its full effect on the student. The demonstrator, on the contrary, bears the brunt of the difficult and harassing tutorial work in his close contact with the student in the laboratory, and upon the demonstrator's ability and manner of teaching will depend, in great measure, the student's future style of work. For this a grateful University College gives him rather less than it pays to its janitor, and much less than half the amount received by its travelling dairy-maid!

I am afraid that the cause of this very real injustice will be found, in part, in the influence of our older universities, where until recently lectures were everything and practical work was naught. Members of these universities on college councils still seem to cling to the old idea, and the majority of the remaining members, probably excellent men of business or affairs, have somewhat hazy notions of scientific educational work; the Professors, who alone of the teaching staff obtain representation on the governing body, are, after all, but human, and can scarcely be expected to labour to disabuse them.

I fear that, as a body, demonstrators and lecturers are scarcely influential enough to approach the Chancellor of the Exchequer with a view to his imposing such conditions that the renewal of the Treasury grant shall be made to depend upon the redress of their wrongs; still the injustice of their treatment is undeniable, and perhaps some of your readers can suggest a remedy.

SAVILLE SHAW.

A Solar Halo.

SHORTLY after 7 o'clock in the evening of July 2, a solar halo was observed from Putney Bridge, West London.

The appearance consisted of portions of the inner halo (22° from the sun) situated just at the same height above the horizon as the sun. The halo was of a distinct red on the inside of the circle, followed by yellow and by a faintly bluish white light on the outside. There was also a faint parhelion on the right side, just outside of the halo.

Above the sun, at a point where the vertical through the sun would have cut the circular halo, there was, instead of the latter, an inverted arch of somewhat hyperbolic shape, the arms of the hyperbola extending upwards and enclosing an angle greater than a right angle. The faint prismatic colours of this arch were placed so that the red was nearest to the sun, and the apex of the inverted arch must have been 22° distant from the sun. The height of the sun above the horizon was estimated to be about $14'$, and the phenomenon lasted ten minutes after it had been first observed. The sky was somewhat cloudy.

West Kensington.

H. WARTH.

An Optical Illusion.

WHILE doing some photographic work with a light from a Welsbach burner, which shone through a small ground glass window in a dark-room, I noticed that when a lamp emitting red rays from its vertical sides was placed in a position so that its top was illuminated by the white light from the window, and while in this light it was then moved by hand to and fro in a horizontal plane, the top appeared to be loose, or displaced in opposite directions to the red sides. The top was of bright tin and its surface sufficiently irregular to cast slight shadows, which rendered the effect very marked.

This illusion is no doubt due to a physiological action at the retina, in which the impression produced by the white or grey light persists longer than that from the red, causing an apparent lag of the top. The persistency may be still further accounted for when the fact is borne in mind that the lag could only be obtained with weak lights in a dark-room, and therefore with the pupil of the eye largely expanded, and in consequence a relative increase of intensity of the white over the red light upon retinal areas of different sensibility.

Lamplight or daylight can be used instead of a Welsbach. I found it convenient to vary the intensity and colour of the lights by superposing sheets of coloured tissue-papers.

New Rochelle, N.Y.

F. H. LORING.

NO. 1394, VOL. 54]

Food of Chameleons.

I DO not know whether you care to insert a modest natural history communication, for I apprehend but few of your readers are country naturalists. If you do, it is to this effect.

It is not easy to keep chameleons alive long in this country, owing to the difficulty of procuring their proper diet.

I am keeping a Madagascar one, and he thrives very well. The food he seems to prefer to all other is the common green fly with a metallic lustre; these he takes at once in preference to the finest bluebottles, and when he protrudes his curious long tongue, armed with some glutinous matter, the direction is unerring, and woe to the fly. The chameleonic colour changes are most interesting.

E. L. J. RIDSDALE.

Rottingdean.

Röntgen Rays.

MANY tubes for Röntgen ray researches have the edge of the kathode mirror opposite the short neck, and in such cases the expedient described by Mr. Porter in your issue of the 18th ultimo, can very easily be carried out by fitting an india-rubber ring on this neck, winding two coils of copper wire round it, and leaving two or three inches free at one end, which is then bent so as to bring the point sufficiently near to the kathode loop.

An application of the Röntgen rays has been made in the small local museum here, which promises to make it more generally attractive and useful. Skiagrams of suitable specimens have been taken, and prints from these placed alongside the specimens, so that their external form and the bony structure which supports it may be compared at a glance.

Keith, N.B., July 3.

ALEX. THURBURN.

A Curious Connection.

IF new, perhaps the following fact, observed by me, may be worth publishing. In my kitchen I have a mantle on the gas-burner. At present the mantle is in a dilapidated state, and the light defective. I find, however, that, when the water-tap over the kitchen sink is running, the light greatly increases in brilliancy, maintaining that brilliancy as long as the water is running.

MARGARET MCEVOY.

THE INTERNATIONAL CATALOGUE CONFERENCE.

THE International Conference organised by the Royal Society to consider the preparation and publication of an International Catalogue of Scientific Literature was opened in the apartments of the Society at Burlington House on Tuesday. Upon the importance of such a catalogue it is unnecessary to comment here. The Royal Society has steadily attacked the problem of recording and indexing scientific literature, since the middle of this century, when the great author-index was commenced. More than thirty years ago the Council of the Society resolved that the catalogue according to authors should be followed by an index according to subjects, and a start was made in 1893. But, as Lord Kelvin pointed out in his last anniversary address, "the continuation of such a work was almost beyond the resources of the Royal Society, and therefore about two years ago a Committee was appointed to take into consideration a suggestion that the preparation of complete indexes should be effected by international co-operation." The conference now being held is the outcome of this conclusion. Only by securing international co-operation could such a work as that contemplated by the Royal Society be satisfactorily carried out. It is therefore a matter of extreme congratulation that the proposal has been so warmly supported by Governments and Scientific Societies in all parts of the world, as shown by the distinguished men who have been delegated to take part in the conference. The enterprise is one in which all men of science are interested, but of the magnitude of which it is only possible to have a faint conception. To develop a comprehensive and practicable scheme will be a difficult task, but with a conference constituted like that now

sitting the work will be well considered, and we may confidently expect as a result the outlines of a system which will have international confidence and support.

From the following list of delegates to the Conference it will be seen that nearly all the Governments of civilised countries are represented, and most of the leading scientific societies of the world.

The delegates in attendance are:—AUSTRIA—Prof. Ernest Mach (Member of the Kaiserliche Akademie der Wissenschaften, Vienna); Prof. Edmund Weiss (Member of the Kaiserliche Akademie der Wissenschaften, Vienna). BELGIUM—M. H. La Fontaine (Membre, Institut International de Bibliographie, Brussels); M. Paul Otlet (Membre de l'Institut International de Bibliographie); M. de Wulf (Membre de l'Institut International de Bibliographie). DENMARK—Prof. Christiansen (Universitet, Copenhagen). FRANCE—Prof. G. Darboux (Membre de l'Institut de France); Dr. J. Deniker (Librarian, Muséum d'Histoire Naturelle, Paris). GERMANY—Prof. Schwalbe (Berlin); Prof. Dziatzko (Göttingen); Prof. Walther Dyck (Mitglied der K. Bay. Akad. der Wiss. zu München); Prof. Van't Hoff (Mitglied der K. P. Akademie der Wissenschaften zu Berlin); Prof. Möbius (Mitglied der K. P. Akademie der Wissenschaften zu Berlin). GREECE—M. Avierinos M. Averoff (Greek Consul at Edinburgh). HUNGARY—Prof. August Heller (Librarian, Ungarische Akademie, Buda-Pesth); Dr. Theodore Duka (Membre, Academie Hongroise des Sciences, Buda-Pesth). ITALY—General Annibale Ferrero (Italian Ambassador in London). JAPAN—Assistant Professor Hantaro Nagaoka (University, Tokio); Assistant Professor Gakutaro Osawa (Medical College, Tokio). MEXICO—Señor Don Francisco del Paso y Troncoso. NETHERLANDS—Prof. D. J. Korteweg (Universiteit, Amsterdam). NORWAY—Dr. Jørgen Brunchorst (Secretary, Bergen Museum). SWEDEN—Dr. E. W. Dahlgren (Librarian, Kongl. Svenska Vetenskaps Akademie, Stockholm). SWITZERLAND—M. C. D. Bourcart (Swiss Minister in London); Prof. Dr. F. A. Forel (Président du Comité Central de la Société Helvétique des Sciences Naturelles). UNITED KINGDOM—Representing the Government: Right Hon. Sir John E. Gorst, Q.C., M.P. (Vice President of the Committee of Council on Education). Representing the Royal Society of London: Prof. Michael Foster (Sec. R.S.); Prof. H. E. Armstrong, F.R.S.; Prof. Liversidge, F.R.S.; Mr. J. Norman Lockyer, C.B., F.R.S.; Dr. Ludwig Mond, F.R.S.; Prof. A. W. Rücker, F.R.S. UNITED STATES—Dr. John S. Billings (U.S. Army); Prof. Simon Newcomb, For. Mem. R.S. (U.S. Nautical Almanac Office). CANADA—The Hon. Sir Donald A. Smith, G.C.M.G. (High Commissioner for Canada); CAPE COLONY—Mr. Roland Trimen, F.R.S.; Dr. David Gill, F.R.S. INDIA—Lieut.-General Richard Strachey, R.E., F.R.S. NATAL—Walter Peace, Esq., C.M.G. (the Agent-General for Natal). NEW SOUTH WALES—(Awaits confirmation). NEW ZEALAND—The Hon. W. P. Reeves (Agent-General for New Zealand). QUEENSLAND—The Acting Agent-General for Queensland.

Subjoined is the official report of the preliminary proceedings on Tuesday.

Prof. Foster (Sec. R.S.) moved that Sir J. Gorst act as provisional President for the purpose of organising the Conference.

The resolution, having been unanimously accepted, Sir John Gorst welcomed the delegates.

Prof. Armstrong gave a brief account of the work done by the Royal Society in arranging for the conference, as well as of the work to be accomplished.

The following resolutions were then agreed to.

(a) That each delegate shall have a vote in deciding all questions brought before the Conference.

Que chaque délégué aura un vote pour décider toutes les questions soumises à la Conférence.

Dass jeder Delegirte eine Stimme haben soll bei Entscheidung aller Fragen die vor die Konferenz gebracht werden.

(b) That English, French and German be the official languages of the Conference, but that it shall be open for any delegate to address the Conference in any other language, provided that he supplies for the *procès verbal* of the Conference a written translation of his remarks into one or other of the official languages.

Que l'Anglais, le Français, et l'Allemand seront les langues officielles de la Conférence, mais que chaque délégué pourra s'adresser à la Conférence dans n'importe quelle autre langue, pourvu qu'il remettra pour le *procès verbal* de la Conférence une traduction écrite de ses observations dans l'une des langues officielles.

Dass Englisch, Französisch und Deutsch die offiziellen Sprachen der Konferenz sein sollen, dass es aber jedem Delegirten freistehen soll, bei die Konferenz in einer andern Sprache zu sprechen, vorausgesetzt, dass er für das Protocoll der Konferenz eine schriftliche Uebersetzung seiner Rede in einer der offiziellen Sprachen liefert.

General Ferrero moved that Sir John E. Gorst be the President of the Conference. The motion having been unanimously accepted,

Sir John Gorst nominated as Vice-Presidents: General Ferrero, Prof. Darboux, Prof. Mach, Prof. Möbius, and Prof. Newcomb.

It was further resolved—

(c) That Prof. Armstrong be the Secretary for the English language; that Prof. Forel be the Secretary for the French language; and that Prof. Dyck be the Secretary for the German language.

(d) That the Secretaries, with the help of shorthand reporters, be responsible for the *procès verbaux* of the proceedings of the Conference in their respective languages.

The President and Council of the Royal Society gave a reception to the delegates on Monday; and on Tuesday evening the delegates were entertained at a banquet at the Hôtel Métropole. The chair was taken by the President, Sir Joseph Lister, and there were also present Sir F. Abel, Agent-General for British Columbia, Agent-General for Cape of Good Hope, Agent-General for Natal, Agent-General for New South Wales, Agent-General for New Zealand, Agent-General (acting) for Queensland, Agent-General for Western Australia, Prof. Armstrong, M. Averoff, Prof. Ayrton, Prof. Barker, Belgian Minister, Mr. Bidder, Dr. J. Billings, Sir F. Bramwell, Mr. H. Brown, Dr. Brunchorst, Dr. Brunton, Mr. Burbury, Dr. Champneys, Prof. Christiansen, Mr. Clough, Dr. Dahlgren, Prof. Darboux, Dr. Deniker, M. De Wulf, Dr. T. Duka, Prof. Dyck, Prof. Dziatzko, Dr. Elgar, Mr. C. E. Fagan, Dr. Fick, Mr. Fletcher, Sir W. H. Flower, Prof. Forel, Prof. Forsyth, Prof. M. Foster, Dr. Frankland, Sir D. Galton, Sir Robert Giffen, Dr. Gill, Dr. Gladstone, Sir John Gorst, Greek Chargé d'Affaires, Prof. Greenhill, Mr. Harrison, Prof. Heller, High Commissioner for Canada, Italian Ambassador, Japanese Minister, Prof. J. V. Jones, Mr. Keltie, Lord Kelvin, Mr. Kempe, Prof. Kennedy, Prof. Korteweg, M. La Fontaine, Prof. Lapworth, Prof. Liversidge, Mr. Lockyer, Mr. MacAlister, Mr. McClean, Prof. Mach, Mr. Mackey, Prof. McLeod, Major MacMahon, Mexican Minister, Dr. Mill, Prof. Möbius, Dr. Mond, Mr. R. L. Mond, Dr. Mott, Mr. Moulton, Prof. Nagaoka, Dr. Neale, Prof. S. Newcomb, Prof. Osawa, M. Otlet, Senor Don Paso y Troncoso, Prof. Perry, Portuguese Minister, Prof. Poulton, Mr. Preece, Pres. Soc. Chem. Industry, Lord Rayleigh, Prof. Roberts-Austen, Prof. Rücker, Mr. H. Saunders, Herr Schwalbe, Dr. Sclater, Prof. Sherrington, Prof. Sprengel, Sir Gabriel Stokes, Swedish and Norwegian Minister, Swiss Minister, Capt. Swithinbank, Rev. S. Thompson-Yates, Mr. Spencer

B. Todd, Treasurer Roy. Soc., Mr. R. Trimen, Prof. Unwin, Prof. Van't Hoff, Gen. Walker, Prof. Weiss, Mr. C. Welch, Dr. Wynne.

Sir Joseph Lister, in giving the toast of "Science in all Lands," remarked that it would be impertinent in such company to dwell on the advantages which science conferred upon humanity or upon the pleasures which she gave to those who had the privilege of cultivating her various branches. They were agreed that if the mighty project upon which the conference had met was brought to a successful issue it would very greatly promote the advance of science.

The toast was responded to by the Italian Ambassador (General Ferrero), who said that England had always taken a leading, sometimes the first, place in science from the days of Newton to those of Lord Kelvin, and the Royal Society had worthily represented the nation in its work for the advancement of science.

Prof. Mach also responded, remarking that men of science recognised no distinction of race or nationality, and they were all glad to co-operate with Englishmen in a work in which all men of science were interested, especially as the work was done under the auspices of the Royal Society.

Dr. Billings proposed "Success to the Conference and the Catalogue" in a humorous speech. He suspected that classification began in the Ark. Science was now getting so large and various that the projected summary would be of extreme value; but he did not quite know to what it would lead. If their object in carrying out this catalogue were achieved, they might anticipate a time when men and things and thoughts also would be catalogued. They might look forward down the vista of years to the time when a stranger in Hyde Park would see a passer-by with such a number as 26'053, and would then at once appreciate his status in every respect, and when the novelist would proudly show that his heroine had twenty-six points in her character, while a rival writer had only achieved nineteen.

Prof. Darboux, Prof. Möbius, and Prof. Forel briefly acknowledged the toast.

The Treasurer of the Royal Society (Sir John Evans) proposed "The Guests," and expressed the hope that the deliberations of the conference would be ultimately successful.

Sir Donald Smith, High Commissioner for Canada, responded.

The Belgian Minister proposed "The Royal Society," which he said, was the mother and model of all similar societies in Europe, and was based on the principle that science knew nothing of nationality. The president was a great master of antiseptic surgery; if he could only introduce the principles by which he was so distinguished into the realm of politics and international relations he would be one of the greatest benefactors of the human race.

The President, in response, said the society was proud to take the lead in so important a work as that of the Conference. It had given him personally much satisfaction to learn that the Conference on the first day had been exceedingly successful, and there was no doubt that if this movement was carried out, as they hoped it would be, it would prove of great help to science in all its branches.

ON THE MOTION OF A HETEROGENEOUS LIQUID, COMMENCING FROM REST WITH A GIVEN MOTION OF ITS BOUNDARY.¹

I USE the word "liquid" for brevity to denote an incompressible fluid, viscid or inviscid, but inviscid unless the contrary is expressly stated. A finite portion of liquid, viscid or inviscid, being given at rest, within a

¹ Read at the Royal Society of Edinburgh, by Lord Kelvin, on April 6.

bounding vessel of any shape, whether simply or multiply continuous; let any motion be *suddenly* produced in some part of the boundary, or throughout the boundary, subject only to the enforced condition of unchanging volume. Every particle of the liquid will instantaneously commence moving with the determinate velocity and in the determinate direction, such that the kinetic energy of the whole is less than that of any other motion which the liquid could have with the given motion of its boundary.¹ This proposition is true also for an incompressible elastic solid, manifestly; (and for the ideal "ether" of *Proc. R.S.E.*, March 7, 1890; and Art. xcix. vol. iii. of my *Collected Mathematical and Physical Papers*). The truth of the proposition for the case of a viscous liquid is very important in practical hydraulics. As an example of its application to inviscid and viscous fluid and to elastic solid consider an elastic jelly standing in an open rigid mould, and equal bulks of water and of an inviscid liquid in two vessels equal and similar to it. Give equal sudden motions to the three containing vessels: the instantaneous motions of the three contained substances will be the same. Take, as a particular case, a figure of revolution with its axis vertical for the containing vessel and let the given motion be rotation round this axis suddenly commenced and afterwards maintained with uniform angular velocity. The initial kinetic energy will be zero for each of the three substances. The inviscid liquid will remain for ever at rest; the water will acquire motion according to the Fourier law of diffusion of which we know something for this case by observation of the result of giving an approximately uniform angular motion round the vertical axis to a cup of tea initially at rest. The jelly will acquire laminar wave motion proceeding inwards from the boundary. But in the present communication we confine our attention to the case of inviscid liquid.

The now well-known solution² of the minimum problem thus presented, when the bounding surface is simply continuous, is, simply: that the initial motion of the liquid is irrotational. That the *initial* motion *must be irrotational*³ is indeed obvious, when we consider that the impulsive pressure by which any portion of the liquid is set in motion is everywhere perpendicular to the interface between it and the contiguous matter around it, and therefore the initial moment of momentum round any diameter of every spherical portion, large or small, is zero. But that irrotationality of the motion of every spherical portion of the liquid suffices to determine the motion within a simply continuous boundary having any stated motion, is not obvious without mathematical investigation.

Whether the boundary is simply continuous, or multiply continuous, irrotationality suffices to determine the motion produced, as we now suppose it to be produced, from rest by a given motion of the boundary.

Now in a homogeneous liquid acted on by no bodily force, or only by such force (gravity, for example) as could not move it when its boundary is fixed, the motion started from rest by any movement of the boundary remains always irrotational, as we know from elementary hydrokinetics. Hence, if at any time the boundary is suddenly or gradually brought to rest, the motion of every particle of the liquid is brought to rest at the same instant. But it is not so with a heterogeneous liquid. Of the following conclusions Nos. (1), (2), (3) need no proof. To prove

¹ *Cambridge and Dublin Mathematical Journal*, February 1849. This is only a particular case of a general kinetic theorem for any material system whatever, communicated to the Royal Society, Edinburgh, April 6, 1863, without proof (*Proceedings*, 1862-63, p. 114), and proved in Thomson and Tait's "Natural Philosophy," sec. 317, with several examples. Mutual forces between the containing vessel and the liquid or elastic solid, such as are called into play by viscosity, elasticity, hesivity (or resistance to sliding between solid and solid), cannot modify the conclusion, and do not enter into the equations used in the demonstration.

² Thomson and Tait's "Natural Philosophy," sec. 312.

³ That is to say, motion such that the moment of momentum of every spherical portion, large or small, is zero round every diameter.