

May 12.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, K.G.,
President, in the Chair.

Captain George William Manby was elected a Fellow of the Society.

The following Presents were received, and thanks ordered for them:—

Royal Astronomical Society. Notices of Proceedings. Vol. 2. Nos. 2 and 3. 8vo.

Charter and Bye-Laws, 1831. 12mo.

—*Presented by the Society.*

The Edinburgh Journal of Science. No. 8. New Series. (April 1831.) 8vo.—*David Brewster, LL.D. F.R.S.*

Memoir of the Life and Scientific Labours of the Rev. William Gregor, M.A. By John Ayrton Paris, M.D. F.R.S. 8vo.—*J. G. Children, Esq. Sec. R.S.*

Description of the Skeleton of the Fossil Deer of Ireland, *Cervus Megaceros*. By John Hart, Esq. Second Edition, with an Appendix. 8vo.—*The Author.*

A Key to Bonnycastle's Trigonometry, Plane and Spherical; containing Solutions to all the Problems, with references. 8vo. By Griffith Davies, Esq.—*The Author.*

Recueil de Planches de Pétrifications Remarquables. Par Léopold de Buch. Premier Cahier. folio.—*The Author.*

A paper was read, "On a peculiar class of Acoustical Figures; and on certain forms assumed by groups of particles upon vibrating elastic surfaces." By Michael Faraday, Esq., F.R.S., M.R.I., Corresponding Member of the Royal Academy of Sciences of Paris, &c.

When elastic plates on which sand has been strewed are thrown into sonorous vibrations, the grains of sand arrange themselves in lines which indicate the quiescent parts of the plate, and have been called the nodal lines. This fact was discovered by Chladni, who also observed that the minute shavings cut by the edge of a glass plate from the hairs of the violin bow employed to produce the vibration, collected together on those parts of the plate that were most violently agitated, that is, at the middle of the lines of oscillation, or portions into which the plate is divided by the nodal lines. The same phenomenon is exhibited by lycopodium, or any other very light and finely divided powder. This subject was investigated by M. Savart, who, in a paper read to the Royal Academy of Sciences at Paris in the year 1817, endeavoured to account for this latter class of phenomena by deducing from the primary divisions of the parts of vibrating bodies, certain secondary modes of division, comprising parts that remain horizontal during every stage of

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the vibration, and which therefore may admit of the settlement there of light powders, while heavier powders can be stationary only at the points of absolute rest.

This explanation not appearing to the author to be satisfactory, he made a great number of experiments, which are detailed at length in the present paper, showing that the immediate cause of these motions exists in the surrounding medium, and is to be found in the currents arising from the mechanical action of the plate, while vibrating upon that portion of the medium which is in contact with the plate. These currents are directed from the quiescent lines towards those parts where the oscillation is the greatest, and meeting from opposite sides at these central points, thence proceed perpendicularly from the vibrating surface to a certain distance; and finally, receding from each other, return again in a direction towards the nodal lines. The combination of these motions constitutes vortices carrying with them any light particles which may lie in the way of the currents. While in motion, the powders sustained by these vortices appear in the form of clouds, the particles of which have among themselves an intestine motion of revolution, rising in the centre of the heap, and rolling down again on the outer sides. The powders are collected in the same situations on the vibrating plate, although the plate may be considerably inclined to the horizon, and remain there even when the inclination is so great as to prevent grains of sand from resting on the nodal lines. A piece of gold leaf laid upon the plate was raised up in the form of a blister at that part which corresponded with the centre of the clouds, even to the height of one-twelfth of an inch.

On attaching small pieces of card to different parts of the surface of the vibrating plate, the currents of air are modified in various ways, as shown by the different positions of the clouds, and the production of partial accumulations of the powders. When a tuning-fork is made to vibrate, and a little powder of lycopodium is sprinkled over it, the powder collects into clouds on the middle of the upper surface, and also forms heaps along its sides, exhibiting in a striking manner the intestine revolution of their particles. These effects are also well illustrated by vibrating membranes; for which purpose a piece of parchment was stretched, and tied while moist over the mouth of a funnel, and made to vibrate by means of a horse-hair, having a knot at the end, passed through a hole in the centre of the parchment; the hair being drawn between the finger and thumb, to which a little powdered rosin was previously applied. The phenomena were still more conspicuous when the parchment was made to vibrate under a glass plate held near it. When the interval between the membrane and the glass plate was very small, the whole of the powder was sometimes blown out at the edge, in consequence of the vibrating membrane acting as a bellows.

Reasoning from the theory which the author had framed in explanation of these phenomena, he conceived that if the currents were weakened by placing the apparatus in rarefied air, they would no longer be capable of sustaining the light powders, which would

then be collected, like the heavy powders in air, at the nodal lines. In a denser medium, such as water, the reverse should happen ; the heavy powders should be carried along by the more powerful currents then produced, and would accumulate in the vibrating parts. All these conclusions were found to be fully verified by actual experiment.

May 19.

JOHN W. LUBBOCK, Esq. M.A., V. P. & Treasurer, in the Chair.

The following Presents were received, and thanks ordered for them :—

The Astronomical Remembrancer. Proposed by Captain W. H. Smyth, R.N., F.R.S. : exhibiting the Magnitude, Declination, Right Ascension, and Passage in mean time over the Meridian, of one Hundred of the Principal Fixed Stars.—*Presented by G. Dollond, Esq., F.R.S.*

A Narrative of a Visit to the Court of Sind ; a Sketch of the History of Cutch, from its first connection with the British Government in India till the conclusion of the Treaty of 1819 ; and some Remarks on the Medical Topography of Bhooj. By James Burnes, Esq. 8vo.—*The Author ; through Joseph Hume, Esq. F.R.S.*

Catalogue of the Library of the Royal College of Surgeons in London. 8vo.—*The College.*

Catalogue of the Contents of the Museum of the Royal College of Surgeons in London. Part III. : comprehending the Human and Comparative Osteology. 4to.—*The College.*

A Cast from the Marble Bust of Michael Faraday, Esq. F.R.S. executed by E. H. Bailey, R.A.—*Richard Hollier, Esq.*

A Portrait of Michael Faraday, Esq. F.R.S. engraved by Cousins from the Painting by Pickersgill.—*Messrs. Colnaghi and Son.*

A paper was read, entitled, “ A Table facilitating the Computations relative to Suspension Bridges.” By Davies Gilbert, Esq. V.P.R.S.

The table here communicated is supplementary to those accompanying the paper “ On the Mathematical Theory of Suspension Bridges,” which was published in the Philosophical Transactions for 1826, and is deduced from the first of the tables there given ; but admits of a far more ready application than the former to all cases of practical investigation. It consists of five columns, exhibiting respectively the deflections or versed sines of the curve ; the lengths of the chains ; the tension at the middle points, or apices of the curve ; the tensions at the extremities ; and the angles made by the chains with the horizon at the extremities.

A paper was read, entitled, “ Researches in Physical Astro-