sultant and one of its compounds. These figures the author denominates *imperfect resultants*.

In each series of transitions there are certain points which are invariable during all the changes: these are quiescent points, formed by the nodal lines of one figure intersecting those of the other, and the centres of vibration, where the maxima of positive or negative vibration agree in each component mode of vibration. The points of compensation are changeable. Transitional figures appear when the sides of the plate are nearly, but not exactly, equal.

The author next considers the figures obtained on square plates of wood and other substances, having different degrees of elasticity in different directions. He concludes this part of his paper by an account of some optical means of representing the figures noticed by Chladni.

March 21, 1833.

WILLIAM GEORGE MATON, M.D., Vice-President, in the Chair.

A paper was read, entitled, "An Account of two cases of inflammatory Tumour produced by a deposit of the Larva of a large Fly (*Œstrus humanus*) beneath the Cutis in the Human Subject; accompanied with Drawings of the Larva." By John Howship, Esq. Communicated by Charles Hatchett, Esq. F.R.S.

The first of these two cases is that of a soldier stationed on the banks of the Marawina river in Surinam, who had a large boil on the back, from which a maggot was pressed out. The second case, which occurred at Santa Anna, in the district of Maraquita, in Columbia, is that of a carpenter, who had for some months a large boil on the scrotum, from which a living larva was extracted. A description of this larva, drawn up by Mr. Curtis, is given by the author, together with a drawing of the specimen. The author proposes giving to it the name of the *Œstrus humanus*.

The reading of a paper, entitled, "Experimental Researches in Electro-magnetism," by the Rev. William Ritchie, LL.D. F.R.S. was commenced.

March 28, 1833.

The Rev. JAMES CUMMING, M.A., Vice-President, in the Chair.

The reading of Dr. Ritchie's paper was resumed and concluded.

This communication consists of three parts. In the first part the author shows that the common deflecting galvanometer, in which the deflecting forces are assumed to be as the tangents of deflection, is founded on false principles, and consequently leads to erroneous results. The wire forming the coil is of considerable thickness, and therefore there is no fixed zero from which the deflections can be reckoned. The length of the coil, also, being generally short, occa-

sions another serious error, as the theoretical investigation is founded on the supposition of an indefinite length. In proof of the inaccuracy of the indications of the common deflecting galvanometer, the author took two elementary batteries, the plates of one being one inch square, and those of the other two inches. The tangents of the deflections of the needle (proper precautions having been taken for the equally free passage of all the electricity evolved in either case,) were very nearly as 1 to 2, though it is obvious that the real quantities of voltaic electricity were as 1 to 4. The author's torsion galvanometer gave the degrees of torsion nearly as 1 to 4. Other experiments led to similar conclusions.

The author then examines the laws which were supposed to connect the conducting power of a wire for electricity, with its length and diameter, and which, according to Professors Cumming and Barlow, varies directly as the diameter, and inversely as the square root of the length; but, according to MM. Becquerel and Pouillet, directly as the square of the diameter, and inversely as the length. He points out the false conclusions of M. Becquerel, and that he has, in fact, deduced the value of *two* unknown quantities from *one* equation; and that M. Pouillet having arrived at his through the fallacious indications of the common deflecting galvanometer, they are equally erroneous. The author then shows that the law pointed out by Cumming and Barlow is, in ordinary cases, nearest the truth; though, under certain circumstances, the limits of even that law may be passed. Hence, and from a series of experiments with the torsion galvanometer, he arrives at the unexpected conclusion, that there is no determinate law of conduction, either for the length or diameter of the wire, but that it must vary, in every case, with the size of the plates, and the energy of the acid solution used in exciting them. This conclusion the author shows to be in accordance with the views of conduction which he had previously published; namely, that there is no actual transfer of electricity, but that all the phenomena result from the definite arrangement of the electric fluid essentially belonging to the conducting wire.

The second part of this paper relates to certain properties of electro-magnets. No attempt seems to have been hitherto made to investigate the law which connects the lifting power of electro-magnets with their length. The author found, by experiments with two soft iron horse-shoe electro-magnets, to each of which the same short horse-shoe lifter was adapted, and the circuit of one four times that of the other, that their lifting powers were nearly inversely as the square root of their lengths. By increasing the strength of the battery with which they were connected, their lifting powers approached more nearly to a ratio of equality; by diminishing it, the ratio increased in favour of the shorter magnet. Hence the law in this case seems to be as indefinite as in that of common electric induction, and the relation of the powers to vary with the energy of the inducing voltaic influence. By another experiment, the author shows that all that is necessary in preparing a powerful electro-magnet is simply to roll a ribbon of copper about a short bar of soft iron, and to use a short horse-shoe lifter of soft iron. The quality of the iron has great influence on

the power of an electro-magnet; and the author found that the worst part of a bar of the worst iron he could procure made by far the best.

A bar electro-magnet, four feet long, which scarcely retained any power when its connexion with the battery was broken, on being *reconnected* with it, in the *same* direction as before, was *rapidly* converted into a powerful magnet; but after being removed, and its wires now connected with the *opposite* poles, it required a long time to convert it into a magnet of much inferior power; as if the atoms of electricity, having been first put in motion in one direction, are afterwards more easily turned in that direction than in the contrary.

The author failed in his attempts to make a permanent horse-shoe magnet of tempered steel by the touch, with an electro-magnet: not the slightest trace of magnetism was communicated to the steel; on the contrary, a previously magnetized horse-shoe magnet had its power completely destroyed by similar means.

Dr. Ritchie describes a method of making an electro-magnet revolve in a horizontal direction about its centre, by permanent magnets properly arranged. This method consists in changing the poles of the soft iron magnet the moment it passes the pole of the steel magnet, so that attraction is almost instantaneously changed into repulsion, and the motion rendered continuous.

In the third part the author describes a mode of obtaining a continuous current of electricity by the induction of common magnets. Any number of soft iron cylinders, having a coil of copper ribbon covered with thin tape wound round the middle, are fixed in such a manner to a revolving table, that they can be brought in rapid succession opposite to the poles of a permanent horse-shoe magnet: the soft iron cylinders are thus converted into temporary magnets. The copper ribbons are so connected, by means of wires soldered to their ends, with well amalgamated discs beneath, that their contact with them is successively made and broken, as often as the soft iron cylinders pass opposite the poles of the permanent magnet: and a delicate galvanometer is made to form part of the circuit. On putting the revolving table into rapid motion, an electric state is induced on the copper ribbon, and consequently on the continuous circuit, from the moment the magnet has begun to act on it till it has acquired its state of greatest magnetic power. The connexion being then broken, by the wire attached to the end of the copper ribbon leaving the amalgamated disc of copper beneath, the needle would return to its former position were it not prevented by the formation of a new current, from the next cylinder of iron coming within the action of the magnet; and, by employing a greater number of magnets, the developement of the fresh current may be effected before the preceding one has been broken off, and the needle be thus made to show a steady deflection.

The author failed in all his attempts to effect chemical decomposition, even of the most easily decomposable compounds, by means of the nearly constant current of electricity produced by his present apparatus; and previous to making a more powerful one, he wished to ascertain whether water be a conductor of electricity thus developed, or not. For this purpose a film of hot water, of more than fifty square inches, was made to form part of the circuit of the magneto-electric

battery; the whole being properly connected with an exceedingly delicate galvanometer. On making the apparatus revolve rapidly, not the slightest deflection of the needle was perceptible. Hence, if so large a surface of hot water be incapable of conducting as much electricity as would agitate the most delicate astatic needle, though the exciting cause was sufficient to make a wire revolve round a magnet, and overcome the resistance of the mercury through which it was dragged, it would require an enormous power of this kind to *decompose* water. The author, therefore, considers it unlikely that electricity induced by magnets will ever supply the place of the voltaic battery in effecting chemical decomposition; and he concludes by observing, that "as no increase of electro-magnetic power is gained by increasing the *decomposing* powers of a battery, and as action and reaction are equal, it appears improbable that we shall ever obtain high decomposing powers by any increase in magneto-electric induction."

A paper was then read, entitled, "Notice of the Remains of the recent Volcano in the Mediterranean." By John Davy, M.D. F.R.S. Assistant Inspector of Army Hospitals.

The author communicates an account given by Captain Swinburne, dated the 24th of August, of a dangerous shoal, in latitude 37° 9′ N. and longitude 12° 43′ E., consisting principally of black sand and stones, with a circular patch of rock, which has been left by the volcano that lately appeared in the Mediterranean. Captain Swinburne furnished the author with two specimens of the air which was seen rising from the site of the volcano, in small silver threads of bubbles. These were found, upon examination by chemical tests, to consist of between 9 and 10 parts of oxygenous to 79 or 80 of azotic gases.

The author adduces arguments in favour of the supposition that this air is disengaged from sea water at the bottom in contact with the loose and probably hot ashes and cinders composing the shoal, rather than that it arises from the extinct volcano. He is also disposed to extend this theory to the explanation of the gases disengaged from hot springs, which are generally found to consist of a mixture of oxygenous and azotic gases, the former being in less proportion than in atmospheric air, in consequence of its abstraction by oxidating processes from the air originally contained in these waters.

The Society then adjourned over the Easter vacation, to meet again on the 18th of April.

April 18, 1833.

FRANCIS BAILY, Esq., Vice-President, in the Chair.

Thomas Botfield, Esq.; Sir William Burnett, Knt. K.C.H.; Major F. H. Shadwell Clerke, K.H.; Robert Adam Dundas, Esq.; the Rev. Augustus Page Saunders, M.A.; and Thomas Stephens Davies, Esq., were elected Fellows of the Society.

A paper was read, entitled, "On Improvements in the Instruments