the other column giving the same reduced to sea-level. This mode of publishing the observations will, it is evident, furnish the materials for the discussion of important questions of an international character, which could not be attempted if the observations at the higher stations were published only as reduced to sea-level pressures.

IN No. 13 of the *Journal d'Hygiène*, Dr. de Pietra Santa urges with well-timed earnestness the importance to medical men of keeping steadily in view the two-fold function of climatology, which is, in the first place, to collect, by means of accurate instruments and simple methods, regular meteorological observations; and in the second place, to observe and study carefully the influence of these phenomena in their physiological and pathological relations. In the latter case the attention must be directed to types and sequences of weather which meteorologists have scarcely yet made subjects of investigation.

M. BALARD, whose death we announced last week, was born at Montpellier, Sept. 2, 1802. When quite young he manifested a strong passion for reading and study. He was early attracted to chemistry and physics, and while still young was made assistant *préparateur* and then *préparateur* in chemistry to the Faculty of Sciences. At the age of twenty-four years he discovered the element Bromine, and about 1833 was appointed Professor of Physics to the Montpellier School of Pharmacy and Professor of Chemistry to the Faculty of Sciences. He manifested great perseverance and energy in his researches on the utilisation of sea-water for obtaining various saline bodies, and it was while at Montpellier as professor that he made his fine experiments on hypochlorous acid and amylic alcohol. In 1843 he succeeded M. Thénard at the Sorbonne, and in 1846 he was, besides, appointed Superintendent of Lectures at the Upper Normal School. In both positions he acquired a high reputation for his solid instruction and his eminent qualities as a professor. In 1854 he was appointed Professor of General Chemistry at the Collége de France, a post which he held till his death. He shortly after quitted his position at the Sorbonne to become Inspector-General of Superior Education. In this capacity he never lost an opportunity of impressing upon teachers the great importance of introducing experimental science into schools; the want of apparatus he considered no difficulty, as for such simple experiments as are required in a school, the teacher, he thought, might easily devise his own apparatus. In 1846 he was made a member of the Academy of Sciences, and other well-deserved honours were awarded him. M. Balard's efforts and discoveries were mainly directed to the economic applications of science, and in this respect he has done much valuable work; and in the future his researches in the utilisation of sea-water may probably turn out to be of even greater practical value than they have hitherto been. M. Balard was a man who made many friends, was warm-hearted and benevolent, and was loved and respected by all who knew him. He has left no written work behind him, but his personal influence in the advance of science in France has been great.

MR. TORRENS has given notice that on April 24 he will ask the Prime Minister if the Government will give effect to the report of the Civil Service Commissioners recommending an improvement in the condition of the staff of the British Museum.

WE are glad to know that the idea has been broached in New Zealand and Australia, though in a very quiet way, of a union between the various Australian colonies for the prosecution of Antarctic exploration. The idea seems to have been suggested by the action of the mother-country in sending out the Arctic expedition, and we hope it may grow and take substantial shape. It seems to us that it would be a very proper and creditable thing for the Australian colonies to take up Antarctic exploration as their special department.

A CORRESPONDENT, Mr. F. Green, writing from Cannes, France, states that on the 8th instant, for the first time this year, he heard the Cuckoo in a valley amongst mountains sixteen miles to the westward of that place. The first time last year that he heard it in the same neighbourhood was on the 10th of April.

ON April 2 at 5.55 A.M., an earthquake was felt at Berne. Two movements took place from east to west. The duration at was two seconds; doors were opened, and church bells were rung by the shocks. In Neufchatel a strong detonation was heard; the oscillation was very strong in the lowest part of the city, and clocks struck the hour before the appointed time. Persons who were in the streets declared that warm wind was blowing for some seconds. A few hours afterwards a rain-spout occurred near Mainz, in Rhenish Hesse. A number of houses were struck by a thunderbolt and ignited, many others were flooded by the water falling from the mountains, and people drowned by an instantaneous flood.

THE additions to the Zoological Society's Gardens during the past week include two Chestnut-backed Colies (*Colius castanonotus*) from the River Daude, W. Africa, presented by Mr. Henry C. Tait; a Sclater's Muntjac (*Cervulus sclateri*) from China, presented by Mr. W. H. Medhurst; a Mandrill (*Cynocephalus mormon*), two Yellow Baboons (*Cynocephalus babouin*), a Sooty Mangabey (*Cercocebus fuliginosus*), a Monteiro's Galago (*Galago monteiri*), an African Civet Cat (*Viverra civetta*), a Servaline Cat (*Felis servalina*), a Banded Ichneumon (*Herpestes fasciatus*), a Senegal Touracou (*Corythaix persa*), an Angolan Vulture (*Gypohierax angolensis*), a Marabou Stork (*Leptoptilus crumeniferus*), three Broad-fronted Crocodiles (*Crocodilus frontatus*), from W. Africa, presented by Lieut. V. S. Cameron; two Secretary Vultures (*Serpentarius reptilivorus*), from S. Africa, deposited; three Wild Boars (*Sus scrofa*), born in the Gardens.

EXPERIMENTAL RESEARCHES ON THE EFFECTS OF ELECTRICAL INDUCTION, FOR THE PURPOSE OF RECTIFYING THE THEORY COMMONLY ADOPTED[1]

II.

THE physicist Munck, of Rosenschöld, in his memoir on electrical induction, and on the dissimulation of electricity,[2] concludes that the opposite electricity of the inductor ought to be regarded as bound, since it is connected with the same inductor and cannot be discharged by the induced body.

M. Riess continues to criticise Lichtenberg.[3] He unwittingly admits the existence of dissimulated electricity, since he says "that inductive electricity remains in part dissimulated." He afterwards says, "What has been published on the subject of *bound, latent, dissimulated* electricity has had a pernicious effect upon the science." But if I am not deceived, it is quite the opposite way, as will be seen from my experiments, by which all the objections urged by Riess against the new theory of electrical induction, published by Melloni and verified by me, are overthrown in the clearest possible manner.

Wullner says,[4] "The principal mistake made by Faraday, and on which his reasonings are based, is the hypothesis that induced electricity of the first kind has not the power of acting in an outward direction. It is true that the illustrious English physicist does not explicitly state this hypothesis; but without it his experiments lose all their value." Then according to Wullner, the absence of tension in induced electricity of the first kind is implicitly admitted by Faraday. We shall see that my experiments prove how little evidence there is of tension.

Verdet is not deceived[5] when he adduces the contradiction into which the physicists fall who deny that induced electricity of

1 An Exposition of the Two Theories of Electrical Induction. By M. Paul Volpicelli. Continued from p. 438.

2 "Pogg. Ann.," vol. 69, pp. 44 and 223.

3 "Pogg. Ann.," vol. 73, p. 371.

4 "Lehrbuch der Experimental Physik," 1st ed., vol. ii., p. 695. (Leipzig, 1863.)

5 "Ann. de Chem. et de Phys.," 3rd series, t. 42, p. 374, note 10.

the first kind is devoid of tension, when they treat of the experiment known as the induced cylinder. Yet the same physicists, Verdet says, admit this want of tension when they treat of the plate condenser, in the instrument known as Volta's condenser, as if these two experiments were not identical. It is clear, he says, that a similar restriction of the same hypothesis is not established, and that if there be dissimulated electricity upon two conducting discs placed near each other, it ought also to exist, although in a less proportion, on two cylindrical or spherical conductors, such as are ordinarily employed in experiments. All this is confirmed by De la Rive;[1] "the experiments of Melloni," he says, "appear to me to account for these anomalies in a satisfactory manner."

In Gehler's Vocabulary[2] we read that Munck, agreeing with Plaff, did not admit the theory of Riess.

Prof. Tyndall thus expresses himself on the subject under discussion[3]:—"When an insulated conductor is under the influence of an electrified body, its repelled electricity is free; but its attracted electricity is held *captive* by the inducing electrified body. If for a moment we put the induced inductor into communication with the earth, its free electricity is dissipated; and if we remove to a distance the inducing electrified body, the *captive* electricity becomes *free*, and is distributed over the surface of the induced conductor." This manner of conceiving the phenomenon of electrical induction agrees perfectly with the new theory of Melloni, which, we maintain, satisfactorily explains the same phenomenon.

Finally, Melloni communicated to the Paris Academy of Sciences[4] (July 24, 1854) his ideas on electrical induction, and maintained, adducing all his reasons in support, that there was ground for amending the theory of induction commonly adopted, that it must be admitted that induced electricity of the first kind did not possess tension, and that the homonym of the inductor is found on every point of the induced body, including the extreme point nearest to the inductor.

After having given this brief but complete *résumé* of the various opinions which have been enunciated on the question, showing that there have never been wanting eminent physicists to maintain that induced electricity of the first kind is entirely devoid of tension, I shall now recount my own observations and experiments, by which, if I am not mistaken, I have proved the truth of Melloni's theory of electrical induction.

EXPERIMENTS.—The experiments I am about to describe should be made when the air is sufficiently dry, as then only are the results perfectly satisfactory.

First Experiment.—Upon the conducting cylinder, induced and insulated, the following five facts are proved:—1. On the same cylinder the two opposite electricities exist without neutralising each other. 2. If the extremity of the cylinder nearest to the inductor is put into communication with the earth, it is *only* the homonym of the inductor which is dissipated and not at all the opposite electricity. 3. Of the two kinds of electricity which are in the cylinder, the homonym of the influent *alone* is dissipated by contact with the air. 4. Points applied to the extremity of the cylinder nearest to the inductor allow only the homonym of the inductor to escape and not at all the opposite electricity. 5. Induced electricity of the first kind is not transferred from the induced body to the inductor, but the electricity of the inductor may certainly be transferred to the induced body.

These five experimental facts cannot be logically explained by the old theory of electrical induction, but only by the new, showing that induced electricity of the first kind does not possess tension, *i.e.*, that it is entirely dissimulated, and that induced electricity of the second kind, *i.e.*, the homonym of the inductor, is entirely free on all points of the induced object.

Second Experiment.[5]—In the communication referred to in the note are analysed the phases of divergence produced in the gold-leaf electrometers applied to the extremity of the insulated induced body nearest to the inductor. The same phases were obtained by means of two simultaneous inductions, the one principal, which came from the inductor, the other secondary, which came from the analyser.

On this ground it is concluded that these phases, when they are fairly interpreted, prove that the homonym of the inductor exists also on the extremity indicated, and that on this account the induced electricity has no tension. In the same experiment it was seen how these phases may be misleading, if we do not examine carefully the simultaneous effects of the two inductions indicated. The explanation of this experiment allows a much greater development than that of Melloni, published by M. Regnault in the "Comptes Rendus," t. 39, p. 177 (July 24, 1854).

Third Experiment.—When, into the inductive sphere of an electrified body, *a*, is introduced,[1] with the necessary precautions, another insulated body, *b*, the electricity of the inductor, *a*, always attracts and completely dissimulates the induced body, *b*, the opposite electrical condition, expelling the homologue, and rendering it completely *free*. But this is not all. There is another fact, which has not yet been indicated, viz., that if we bring close to or remove away from the inducing body, *a*, another body, *c*, then part of the dissimulated electricity in the induced *b* becomes *free* in the former case, while in the second case it increases in *b*, at the same time that the opposite condition is developed in it.

In the paper above cited all the experiments confirming this result are given, from which we conclude that the induced electricity of the first kind does not possess tension.

Fourth Experiment.—The first experiments made for the purpose of discovering if electrostatic induction can be effected in curved lines, are due to the illustrious Faraday, who, in one of his latest papers, says that by his experiments he believes he has established the possibility of this induction; perhaps the facts which I have discovered, and which are completely verified when the atmosphere is dry, may establish its certainty. These experiments, by which is proved the existence of curvilinear induction, will be found described in "Comptes Rendus," t. 43, p. 719.

Fifth Experiment.—This fifth experiment[2] contains an account of six considerations and of five experiments, by means of which it is shown that induced electricity of the first kind does not possess tension, and that the induced insulated cylinder shows at all points the existence of the homonym of the inductor.

Sixth Experiment.—In this[3] are described several experiments which show the existence of curvilinear induction, and prove at the same time that the separation of the gold-leaf electrometers, applied to the extremity of the induced body furthest from the inductor, is produced principally by this influence, and to a very small extent by the homonym of the inductor.

Seventh Experiment.—In this[4] is shown, in a different manner, that induced electricity of the first kind has no tension, and that on any point of the induced body there is always found the homonym of the inducing, not excepting the extremity nearest to the inductor, provided that the proper means is employed, as described in the communication referred to.

Eighth Experiment.—In this[5] are analysed the objections made by M. Riess to some of my experiments on electrical induction, and the doctrine of Melloni on this subject is confirmed by other facts. The conclusion is that the objections of M. Riess are not justifiable, and that if this eminent physicist had repeated the experiments which he criticises, he would have found them to be genuine, and would not have declared them to be inexplicable. It is now more than sixteen years since I made this reply to M. Riess, always communicating other experiments bearing on the same point; but, so far as I know, he has raised no other objections to the theory of Melloni.

Ninth Experiment.—In this communication[6] eight reasons are adduced to show that induced electricity has no tension. The same reasons do not hold good on the old theory, while Melloni's new theory of electrical induction explains them completely. This new theory does not entirely overturn the old, as some have mistakenly believed; the former only essentially modifies the latter in some of its parts.

Tenth Experiment.—This is a reply to the note of M. Gaugain, in which he observes that, notwithstanding the various experiments adduced by M. Volpicelli, it is still strongly maintained that induced electricity of the first kind possesses tension.[7]

Eleventh Experiment.—In this are advanced various observations, some on tension, both electro-statical and electro-dynamical, and others on electrical induction.[8]

Twelfth Experiment.—In this communication it is observed

1 "Archives des Sciences Phys. et. Nat. de Genève," t. 26, p. 323, note 1.
2 Vol. ii. p. 131. (Leipzig, 1843.)
3 "Les Mondes," 2nd series, vol. xxiii. p. 566, § 79.
4 "Comptes Rendus," t. 38, p. 177.
5 Published in the "Comptes Rendus," t. 40, p. 246 (Jan. 29, 1855).

1 "Comptes Rendus," t. 41, p. 553 (Oct. 8, 1855).
2 Ibid., t. 44, p. 17 (May 4, 1857).
3 Ibid., t. 47, p. 623 (Oct. 18, 1858).
4 Ibid., t. 47, p. 664 (Oct. 23, 1858).
5 Ibid., t. 48, p. 1162 (June 27, 1859).
6 Ibid., t. 59, p. 570 (Sept. 26, 1864).
7 Ibid., t. 59, p. 962 (Dec. 5, 1864).
8 Ibid., t. 61, p. 548 (Oct. 2, 1865).

that continuous electrophoroi furnish, when carefully examined, a clear proof that induced electricity does not possess any tension. In fact, in the case of these machines, as in that of frictional machines, the conducting spikes of the prime conductor possess the two opposite electricities co-existent on the same points; this is easily shown by means of a very small proof-plane.[1]

Thirteenth Experiment.—It is shown, by means of Geissler's tubes submitted to the electrical influence, that induced electricity of the first kind has no tension.[2]

Fourteenth Experiment.—Here it is observed that the proof-plane, whether submitted or not to electrical induction, always receives by contact a charge greater than that which is free on the element which it has touched. Then the *coïbent*, always indispensable in the construction of the proof-plane, receives, by infiltration, a certain quantity of electricity, besides that obtained by communication with the metallic part. This infiltration or absorption varies not only with the nature of the *coïbent*, but also with its quantity, within certain limits. This communication [3] contains other observations on electrical induction, and it is concluded that on the extremity of the induced body nearest to the inductor, the two opposite electricities coexist, and that consequently induced electricity of the first kind has no tension. It is also concluded that the homonym of the inductor is always found on whatever point of the induced body this may be, and that the homonym indicated is the only one to be dissipated, because it alone is the only one endowed with tension.

Fifteenth Experiment.—In this is explained Nicholson's duplicator, which is satisfactory, since it is based on the want of tension in induced electricity of the first kind.[4]

Sixteenth Experiment.—In this is shown how we may shield from curvilinear induction the electroscope which hangs from the extremity of the induced body nearest to the inductor. From this experiment it is concluded that the divergence of the straws is due principally to curvilinear induction, and that induced electricity of the first kind does not possess tension.[5]

Seventeenth Experiment.—In this is analysed a little known electrostatic phenomenon; and from this analysis it follows that induced electricity of the first kind has no tension.[6]

Eighteenth Experiment.—It is shown mathematically that electric induction does not traverse conducting masses. It is afterwards observed that first the Florentine academicians and then Faraday admitted this truth. It is also observed that if we admit that induced electricity of the first kind possesses no tension, we arrive at the conclusion given below by means of experiment.[7]

CONCLUSION.—Upon an insulated conductor submitted to the electric influence—1. Induced electricity of the first kind does not possess tension. 2. It is found in greater quantity at the extremity of the induced body nearest to the inductor, and diminishes always as it approaches the other extremity. 3. Induced electricity of the second kind, *i.e.*, the homonym of the inductor, is found on every point of the induced body, not excepting the extremity nearest to the inductor; it continually increases in proportion as it approaches nearer to the other extremity, and is always free.

1 "Comptes Rendus," t. 67, p. 843 (Oct. 26, 1868).
2 Ibid., t. 69, p. 730 (Sept. 27, 1869).
3 Ibid., t. 74, p. 860 (March 25, 1872).
4 Ibid., t. 75, p. 257 (July 29, 1872).
5 Ibid., t. 76, p. 169 (Jan. 20, 1873)
6 Ibid., t. 76, p. 1296 (May 26, 1873).
7 Ibid., t. 78, p. 901 (March 30, 1874)

SCIENTIFIC SERIALS

Mind—A Quarterly Review of Psychology and Philosophy. Edited by George Croom Robertson, M.A., Professor of Philosophy of Mind and Logic, in University College, London. Jan. 1876.—*Revue Philosophique de la France et de l'Etranger.* Dirigée par Th. Ribot. Première Année. Janvier 1876: Paris.—The growing importance of psychology has been asserted by the simultaneous appearance of a French and an English review, especially devoted to its interest. In scope and character the two publications are identical. One aim of the projectors of *Mind* seems to be to obtain a decision of the question: Is psychology a science? "Nothing less, in fact, is aimed at in the publication of *Mind*." The first number opens with a lecture on "The Comparative Psychology of Man," read before the Anthropological Institute, by Mr. Herbert Spencer. It is one mass of valuable suggestions, and every reader will follow with interest the divisions and sub-divisions under which Mr. Spencer recommends that the subject should be studied.—Next follows under the title "Physiological Psychology in Germany," a rather lengthy account, by Mr. James Sully, of a work by Prof. Wundt of Leipzig. The other leading articles are in their order:—"Consistency and Real Inference," by Mr. John Venn; in which the comparative merits and defects of the conceptualist and material views of logic are considered. Towards the end of the article Mr. Venn refers to what he calls an irrelevant difficulty which sometimes puzzles the student of Mill. How, asks the student, can Mr. Mill, while professing to be an idealist, lay it down that logic has to do with the facts or things themselves, rather than with our ideas about them? We do not see that the consistency of Mr. Mill would be very conclusively vindicated even were it the fact that he did not allow his idealism to interfere with his logic more than does an idealistic astronomer allow his metaphysics to affect his astronomy. But does not Mr. Mill fall back on his idealism when in his discussion with Mr. Herbert Spencer as to the number of terms in the syllogism, he maintains that the things named in the premises and conclusion of a syllogism are our sensations or expectations of sensations, while Mr. Spencer holds the things spoken of to be so many separate objective entities? In an able and interesting paper, Mr. Henry Sidgwick discusses "The Theory of Evolution in its Application to Practice," and finds that when guidance is needed in ethics or politics the doctrine of evolution will not help us. A distinction between "Philosophy and Science," is next worked out by Mr. Shadworth H. Hodgson, in which he displays all his remarkable delicacy of thought. He finds the peculiar scope of philosophy to be "ultimate subjective analysis of the notions which to science are themselves ultimate." We doubt if Mr. Lewes would admit that this is not included in his conception of philosophy as embodied in the really great work on which he is now engaged. An excellent article on "Philosophy at Oxford," is contributed by the Rector of Lincoln College, which it is perhaps not too much to hope may bear some practical fruit. Coming last and occupying the place of the novel in the magazine, is "The Early Life of James Mill," to be continued, by Prof. Bain. In addition to being of intense interest to all who care for mental science, it has been eagerly read and discussed by many who have read nothing else in *Mind*. Short Critical Notices and Reports, and neat little Notes by the editor and others, complete the volume. We sincerely hope Prof. Robertson will be able to keep the *Review* up to the standard of this first number. To make it a commercial success will not be an easy task, for though philosophy has of late been a marketable commodity, that has been when distributed among many periodicals.

Of the *Revue Philosophique* we can say only a very few words. The first number opens with a most interesting and suggestive account, by M. Taine, of observations he made on the acquisition of language by a female child. His speculations about words entirely invented by the child and carrying with them natural meanings, as also his reasonings from the childhood of the individual to that of the race, are ingenious and plausible. He concludes with some excellent remarks on Max Müller's view that in *rational* language we find the distinctive characteristic of man. According to M. Taine the use of words, sounds carrying with them a vague general connotation, is, like the use of ornaments and the use of tools, in common with numerous other indications, an evidence that the stage human has been reached. The psychological condition of this superiority, he continues, will be found in a greater aptitude for general ideas, and its physiological condition in a larger and finer development of brain. In the second article the doctrine of final causes is ably discussed by M. P. Janet, from various points of view. He concludes, however, by maintaining a form of the doctrine, which, as far as we can see, without being able to serve any practical end, supposes a theory that lies wholly outside the boundaries of science. Mr. Herbert Spencer's lecture on "The Comparative Psychology of Man," of which we have already spoken, comes next. The remainder of the number is taken up with reviews of books.

THE *Journal of the Chemical Society* for February contains the following papers:—On the presence of liquid carbon dioxide in mineral cavities, by W. N. Hartley. The author's researches have been chiefly confined to quartz, evidence of the nature of the enclosed liquid being furnished by the specific gravity of the liquid as compared with water (which was also contained in the cavities), and by observing the critical temperature. The author is of opinion that the fluid-cavities of sapphires and rubies also contain carbon dioxide.—On certain bismuth compounds, by