

diffused light of the sky caused the photographic reversal of the first image.

Photography thus gives no support to the view that dark lightning has a real physical existence; and Lord Kelvin's letter printed in *NATURE* of August 10 (p. 341), together with that by Dr. W. J. Lockyer in last week's number, show conclusively that when it is visually observed it is an effect due to fatigue of the retina.

THE RECENT ERUPTION OF ETNA.

PROF. A. RICCO, Director of the Etna Observatory, informs us that on July 19, at 8 a.m., Mount Etna threw out from its central crater an enormous mass of vapour, stones, lapilli, and cinders, which were lifted to a height of several kilometres, and afterwards covered all the south-east slope of the volcano as far as Zofferana Etnae (altitude 600 m.), where the roads are covered by nearly a centimetre of volcanic ash. A number of stones struck the dome of the Etna Observatory (which is about a kilometre from the central orifice), so that about thirty holes were made in the iron plates, six millimetres in thickness, which cover this dome; five of these holes have a diameter of 30 centimetres, and the stones causing them fell into the observatory containing the refractor. Two stones also pierced the floor, and embedded themselves in the basement; and one broke three steps of the observing chair. Another pierced the wooden base surrounding the foot of the refractor; fortunately, this and the other apparatus of the observatory received no damage. Two other stones passed through the roofs of the side-rooms.

Round the observatory there are about fifty holes, caused by the fall and penetration of the stones in the sandy soil.

A heap of straw which was near the stables of the observatory was reduced to ashes, which proves the high temperature of the eruptive materials; moreover, holes were also burnt in the wooden flooring where it had been pierced by stones.

The steam of the eruption condensing in the air gave place to a warm and acid rain in the higher parts of the volcano, and lower down it caused ordinary rain.

The column of steam had by nine o'clock spread itself enormously in the sky nearly over Catania (a distance of 30 km.), and caused a marked darkening. By 9.30 the column had disappeared.

The eruption was accompanied by no perceptible movement of the earth, except a slight shock at the lower end of the Valle del Bove. The instruments at Catania only indicated a very slight oscillation. At the Etna Observatory two seismometers showed horizontal and vertical movements. The eruption was also accompanied by detonations, which were heard very slightly as far as Catania.

On July 25 there occurred a similar eruption, but of less importance.

PROFESSOR BUNSEN.

ON Wednesday morning, August 16, the illustrious Heidelberg chemist breathed his last, after a long life wholly devoted to the furtherance of science. In April 1881 I communicated to the columns of this journal a sketch of the work of him whose death at the ripe age of eighty-eight all lovers of science now have to deplore. We can only now call attention to the magnitude and extent of that work, and lay on the grave of one of the truest and noblest of men the tribute of our admiration and respect. As expressing the position held by Bunsen amongst the standard-bearers of science, I may, perhaps, be forgiven for quoting the opening sentences of what I wrote eighteen years ago, as I cannot find more appro-

priate words to indicate what all feel who know what his work was.

"The value of a life devoted to original scientific work is measured by the new paths and new fields which such work opens out. In this respect the labours of Robert Wilhelm Bunsen stand second to those of no chemist of his time. Outwardly the existence of such a man, attached, as Bunsen has been from the first, exclusively to his science, seems to glide silently on without causes for excitement or stirring incident. His inward life, however, is on the contrary full of interests and of incidents of even a striking and exciting kind. The discovery of a fact which overthrows or remodels our ideas on a whole branch of science; the experimental proof of a general law hitherto unrecognised; the employment of a new and happy combination of known facts to effect an invention of general applicability and utility; these are the peaceful victories of the man of science which may well be thought to outweigh the high-sounding achievements of the more public professions."

In the columns which follow the above will be found a statement of the chief experimental researches which have not only raised Bunsen by the common consent of all who can understand the results of accurate and far-reaching methods to the highest point of scientific honour, but also of those more popular discoveries which have made his name a household word in circles far wider than those of purely scientific appreciation. Now, therefore, it is only necessary to recall the main facts of his life work; to note, in the first place, that his desire to unravel the secrets of nature was unalloyed by any attempt to make capital out of any application of his discoveries. "To one man," he often said, "comes the duty of discovery, to another that of applying that discovery to practical uses." Like our great countryman Faraday, Bunsen consistently refused to be drawn away from the paths of purely scientific investigation, and, though too clear-sighted a mind to belittle the importance of the application of scientific discovery to every-day life, rightly judged that to him belonged the undoubtedly higher and nobler work of enlarging the boundaries of knowledge.

The next thing to be noted about Bunsen's work is its originality and its accuracy. It matters not whether we look into his purely chemical investigations, at his chemico-geological researches, or at those—perhaps the most remarkable amongst the many questions he answered—which lie on the borderland of physics and chemistry, in every case we rise from the study not merely feeling that we have to do with a master's mind and hand, but that each investigation is stamped by an original mode of treatment and by an accuracy of thought and of manipulative power which, it is not too much to say, has rarely if ever been equalled.

In no instance was this rare combination of mental and manual dexterity more strikingly shown than in his investigation of the compounds of caesium, the rarest of the two alkali metals which he discovered by means of spectrum analysis. In order to prepare the pure salts of this metal, some scores of tons (I write this away from books, and therefore cannot give the exact figures) of Dürkheim mineral water had to be evaporated, and from this residue it was only possible to obtain some five or six grams of the pure chloride. Nevertheless, from this comparatively minute quantity Bunsen succeeded not only in preparing and analysing all the important salts of caesium, but in ascertaining by goniometric methods their exact crystalline form. So that he was able to supply all the information requisite to a complete understanding of the position of this new element and its compounds to those of its well-known relations potassium and sodium.

Then look at his gasometric methods. He was the first to attempt anything like exactitude in the measurement of

gases. And when he had perfected his methods, no improvements as regards accuracy were forthcoming. Other quicker and, perhaps, more handy processes have since come into vogue; but it was Bunsen who taught men how to handle and to separate and measure gaseous substances.

Next take his researches in chemical analytical methods. There we find again that all he touches he adorns. Whether in the delicate and complicated silicate analyses, in blow-pipe work and flame reactions, in volumetric methods, in separations of closely allied metals, such as antimony and arsenic, or those of the cerite earths, we see the same master's touch. Then his physico-chemical researches, his ice-calorimeter, his photo-chemical investigations, about which I am able to speak with special authority; his methods of ascertaining the specific gravity of gases by their rates of diffusion, and many other distinct lines of research, all well known and recognised as classic, exhibit the same wonderful power.

About his more popularly-known discoveries it is not necessary here to speak, save to say that the Bunsen battery and the Bunsen burner have rendered his name a household word all the world over, whilst his application of spectrum analysis to the investigation of terrestrial matter has done more than all the investigations of past time to increase our knowledge of the chemical composition of the earth's crust.

But this experimental work, great and important as it is, is not the greatest or most important work which he accomplished. It is as a teacher and as an example that the name of Bunsen is and will be chiefly honoured and remembered. It is only those who have had the benefit of working under and with him who can fully understand the feelings of affection and respect with which they regard his memory. To those who had the privilege of his intimacy, of whom I can happily lay claim to be one, his friendship will remain as an abiding source of gratification. As an investigator he was great, as a teacher he was greater, as a man and a friend he was greatest.

HENRY E. ROSCOE.

NOTES.

THE Royal Society has received through Mr. Chamberlain the following memorandum by the Governor of the Straits Settlements:—

The Government of the Straits Settlements desires to invite the attention of Radcliffe's travelling Fellows, and of holders of scholarships for medical and physical research, to the study of the tropical disease called Beri-beri. This disease caused in the hospitals of the Colony 730 deaths in 1896 and 692 in 1897. This Government will be glad to assist any scholar who desires to engage in the scientific investigation of this disease in the Colony by providing him with furnished quarters, rent free, by giving him free access to all the hospitals and facilities for studying the cases therein, by defraying the cost of his passage to the Colony, and in any way which may be agreed upon hereafter between the scholar and the undersigned.

By Command of the Governor,

J. A. SWETTENHAM,
Colonial Secretary, S.S.

Colonial Secretary's Office,
Singapore, July 20.

It may be added that Dr. Hamilton Wright, late of Montreal, has recently been appointed pathologist to the Straits Settlements. He will be provided with an adequate laboratory, on the furnishing of which he is now engaged. The opportunities for pathological research will therefore be extremely good.

THE eighteenth annual Congress of the Sanitary Institute was opened at Southampton on Tuesday, when about seventeen

hundred delegates attended. Sir William Preece, K.C.B., the president, delivered his inaugural address, in which he dealt with the principles underlying practical applications of sanitary engineering.

MR. A. H. MILNE, hon. secretary of the Liverpool School of Tropical Diseases, informs us that in response to a request from Major Ross that workers should be sent out to join him at Sierra Leone, the school is despatching, as an assistant to him, Dr. R. Fielding Ould, of the Liverpool School of Pathology, who has had special experience in private bacteriological research. It is to be hoped that the Government will take the matter in hand, and will help the work of the expedition.

WE learn from *Science* that Dr. A. B. Meyer, Director of the Dresden Museums, is now in the United States on a commission from the Saxon Government to inspect American museums before the new buildings are erected at Dresden. He is accompanied by Prof. P. Wallot, who is one of the international commission of architects selected to decide on the plans of the University of California in accordance with Mrs. Hearst's arrangements.

A *Reuter* telegram from Potsdam states that the new observatory and the great refractor, recently erected at the Astrophysical Observatory there, were inaugurated on Saturday, August 26, in the presence of the German Emperor.

OUR photographic readers may be reminded that all entries for the Royal Photographic Society's forty-fourth annual exhibition, to be held at the Gallery of the Royal Society of Painters in Water Colours from September 25 to November 11, close on Wednesday, September 6, at 9 p.m.

THE Allahabad *Pioneer Mail* states that an Austrian scientific party will visit India towards the latter end of October to observe the display of Leonid meteors which will take place in November. Two observation stations are to be fixed at Delhi, some five miles apart, telephonic communication being maintained under arrangements made by the Telegraph Department.

DR. A. CANCANI, formerly assistant at the geodynamic observatory at Rocca di Papa, has been selected to succeed Dr. G. Agamennone as assistant in the central office of meteorology and geodynamics at Rome. Dr. Cancani is well known to seismologists for his work in connection with the velocity of earthquake-waves, and for the improvements which he has made in the pendulums designed for recording the undulations from distant earthquakes.

REFERENCE has already been made to the fact that the section of the tree under which Dr. Livingstone's heart was buried, containing the inscription carved by his followers, has been obtained for preservation in the Royal Geographical Society's collection of relics. The *British Central Africa Gazette*, published at Zomba, gives the following particulars of the journey to obtain the section:—Mr. Codrington, Deputy Administrator for the British South Africa Chartered Company north of the Zambesi, left Fort Jameson (Mpezeni's) on April 24, and reached Chitambo on May 9. From the present village of Chitambo he travelled with Chitambo ten miles E.S.E., three miles to the Msumba river or swamp, and then seven miles to the Luwe river. These streams flow into the Lulimula river, and that into the Luapula. Chitambo states that his father was interred under the *Mpundu* tree close to the spot where Livingstone's heart was buried. The following measurements were taken of the tree: Round base, 13 feet 5 inches; round bottom of inscription, 10 feet 1 inch; round top of inscription, 10 feet; height of bottom of inscription from ground, 4 feet 5 inches. The bark was cut off by Livingstone's men in order