

does not imply, that the desirability of some such arrangement has been recognized, and experience proves it to be the case. Yet, with a singular perversity, Amendment of the Law and Repression of Crime occupy their separate arenas of discussion from the first, whilst Economy and Trade maintain a sort of dual existence till towards the end of the Congress, when they are violently thrust apart, and cast as *disjecta membra* upon the world of debate, then rapidly hurrying to its close. Either so many papers should not be accepted in this Section at all, or those accepted should be given fair opportunity of discussion, by being provided for from the outset.

Much interest attached to the address of Mr. Brassey, as President of this Department. That address has now been before the public for some days, and we have not the space, even if we had the inclination, to enter upon a review of it. We shall not, therefore, do so. Like most of the other addresses pronounced at this meeting, it had extremely little to do with Social Science, or any other science at all, and was principally an essay on the Labour Question of the day, that is to say, on the question of how far our national prosperity is likely to be affected by the steadily maintained rise of wages of the last few years, and the greater consequent prosperity of the labouring class. It would be doing but little justice, however, to the author of 'Work and Wages' not to bestow a word of commendation on the liberal and impartial tone which generally characterized his review of recent movements of the labouring class, especially the co-operative movement amongst producers. It is pleasant, also, to be assured on such good authority that our skilled workmen are still, individually, worth two of any other country, and to hear such re-assuring accounts of our iron and coal supplies. Mr. Brassey, in theatrical phrase, "brought down the house" in his remarks on economy of fuel, though he somewhat injured the pleasant impression thus created on his audience when he assured them afterwards that we must not expect ever again to obtain our coal for household purposes at anything like the price to which some years ago we were accustomed. On another question of the day, that of the employment of married women in factories, Mr. Brassey seemed in favour of some further restriction of labour, a proposition which was opposed by Mr. Cooke Taylor in a paper on the subject read immediately after. Next to Dr. Hodgson's admirable address on Education, we are certainly inclined to rank Mr. Brassey's as the most agreeable feature of the meeting.

The impossibility of passing in review the large mass of generally thoughtful matter contributed to this Section for discussion, or of even indicating, with anything like critical nicety, its salient points, must excuse us from entering upon the task; and we will merely say, in conclusion of these remarks, that the Norwich Congress of the Social Science Association was confessedly an agreeable and successful one in a very high degree.

ATOMS.

Chemical Laboratory, St. Mary's Hospital, Oct. 7, 1873.

Owing to absence from town, I have only just become acquainted with your article on the Bradford Meeting of the British Association (No. 2395, p. 359), in reference to which I would crave your indulgence for the following remarks.

In that article you have done me the honour of singling me out (not in the most tasteful manner, perhaps, but that is a matter of opinion) as the representative of a school of chemists, which numbers amongst its adherents many well-known names (as an example of which may be mentioned Sir Benjamin Brodie); the members of this school, though differing amongst themselves on certain details, yet agree on this main point, that they object to view the experimental facts of chemistry and the allied branches of knowledge, *solely* through the medium of one pre-conceived notion as to the ultimate nature of matter.

Speaking for myself, I fail to see the cogency of the reasons which lead a great number of modern chemists to the impression that matter can only

be viewed as being made up of "atoms" of some sixty-five essentially different kinds; these atoms, when connected together in certain ill-defined ways, constituting the "molecules" of which the innumerable compounds now known are conceived as being made up. I admit willingly that this "atomic hypothesis," if once admitted, is in close accordance with very many physical generalizations (*vide* Maxwell's recent lecture on Molecules); that it gives a clearer explanation of many chemical phenomena than has yet been afforded by any view based on other notions as to the ultimate nature of matter (*e.g.*, the notion that there is but one kind of primordial matter, all so-called elements and compounds being, as it were, allotropic modifications of this matter differing from one another in the amount of energy, latent per unit of mass); and that, directly or indirectly, it has done immense service in extending the bounds of knowledge: but, notwithstanding the assertion of the President of the British Association, that there has not been shown to be "any inconsistency in the atomic theory, nor in the conclusions to which it leads," I yet venture to think that this "atomic hypothesis" is not capable of giving a clear explanation of many chemical phenomena now known to us, and that it is not consistent with other so-called Laws of Nature (*i.e.*, hypotheses that meet every case yet propounded by experiment or predicted beforehand).

To take a single case: there is no hypothesis that better deserves the term "Law of Nature" to be applied to it than Newton's fundamental postulate, that two very small portions of matter (and *ergo*, two atoms) attract one another with a force proportionate to the product of their masses, and inversely proportionate to the square of the distance between them. I fail, however, to see how the motions of molecules amongst themselves in diffusion, expansion, friction, &c., are explained in accordance with Newton's hypothesis; nor do I see how the evolution of definite quantities of heat during chemical reactions (*i.e.*, the transformation of certain amounts of atomic motion into molecular motion), and many other analogous phenomena, are accounted for by this "law of force" regulating the mutual action of atoms on one another. On this point I may be in error; if so, I am open to conviction, and will willingly recant my objection to the atomic hypothesis on this score when it is shown that the same hypothesis which accounts for the motions of celestial bodies will also account for those of ultimate atoms, the existence of such atoms being assumed.

Even then, however, I should still retain the conviction, which I have elsewhere expressed, that in teaching the science of chemistry it is preferable, first, to enumerate the facts in language independent of any hypothesis, and then to enunciate the various hypotheses that have been and are held, showing how far each is in accordance or contradiction with the observed facts; rather than to mix up from the outset one particular hypothesis with the facts, so as finally to impress on the mind the manifestly erroneous conclusion that the facts have no existence apart from the hypothesis that more or less clearly explains them.

The President of the British Association states that the objectors to the atomic theory "are unconsciously guided by it." It may be within the memory of such of your readers as are interested in this matter, that some little controversy on this subject was carried on last year in the pages of the *Philosophical Magazine*. This ceased on my part from a conviction of the uselessness of continuing discussion with an antagonist who persistently ignored the main point at issue, *viz.*, the distinction between the meaning attached to the phrase "atomic theory" by Dr. Williamson and his disciples, and that applied to the term "atomic hypothesis" by myself; the former phrase being employed to indicate not merely what is commonly understood as a hypothesis, but also to connote a large number of purely experimental generalizations wholly distinct from the hypothesis propounded to

account for them. That the atomic hypothesis (as these words are understood by the majority of chemists) is in any way whatever, consciously or unconsciously, involved of necessity in the calculation (from experimental data and arbitrary conventions) of a formula (*i.e.*, a set of symbols indicating in brief certain physical and chemical properties and re-actions), is a point that I am wholly unable to see; but, on the other hand, the following quotations (samples of many that might be given as illustrations) demonstrate to my thinking that the habit of mixing up the known and the unknown by using defective language which embodies both forms of idea when the former only should be referred to, is productive of contradictory statements and of unphilosophical modes of thought.

"The so-called Law of Multiple Proportions has no existence apart from the Atomic Theory." (Williamson, *Chem. Soc. Journal*, 1869, p. 339.)

"The Law of Multiple Proportions, being founded on experimental facts, stands as a fixed bulwark of the science, which must for ever remain true; whereas the Atomic Theory, by which we now explain this great law, may possibly in time give place to one more perfectly suited to the explanation of new facts." (Roscoe, 'Elementary Chemistry,' 1st edition, p. 54.)

"This important law (of multiple proportions) which was first clearly established by Dalton, was explained by him by means of his atomic theory." (Miller, 'Elements of Chemistry,' vol. i., p. 15, 1st edition.)

"The atomic theory . . . is the very life of chemistry." (Williamson, *loc. cit.*, p. 365.)

Sir Benjamin Brodie "agreed with Dr. Odling when he said that the science of chemistry did not require or prove the atomic theory." (*Ibid.*, p. 440.)

It is scarcely necessary to point out that the statements of Dr. Williamson are diametrically opposed to the juxtaposed quotations; that the first statement is in opposition to the opinion of most other chemists; and that these discrepancies arise from the abnormal meaning attached to the term "atomic theory" by Dr. Williamson.

For the reasons above stated, I have no wish to re-open a controversy on this subject; but the way in which my name is referred to in the article alluded to, causes me to request space for the insertion of the foregoing remarks, so as to correct any possible misapprehension as to the effect of the eloquent presidential address at Bradford on the opinions of those who object to view facts *solely* through the medium of pre-conceived notions, no matter how attractive or how useful when judiciously employed.

CHARLES R. A. WRIGHT, D.Sc.

COUNT F. DAL VERME.

Trieste, September, 1873.

WILL you kindly allow me space to notice a sad event just reported from Eastern Africa? It may suggest to future explorers a greater measure of prudence than is usually recommended to them by cabinet geographers.

At the end of last May I received a visit from the Count Ferdinand dal Verme, the son of a noble Milanese house. Devoted to engineering studies, he became Director of a Russian Copper-Mining Company in the Urals, at the early age of twenty-five. His noble ambition was to "plant a lance in South Africa," where the Italian nation, the greatest travellers of the Middle Ages, has not yet been adequately represented. In vain his family urged him to follow some less perilous career: he had that passion for exploration which does not listen to reason. During a day at Trieste, I offered him the few suggestions of an old traveller, and inspected his instruments, some of which were designed by himself. His frank and open countenance won my heart, whilst his twenty-seven years and his fine stalwart frame, strong in vitality and energy, made me hope the best for him.

Arrived at Zanzibar, his desire to be "up and doing" made him disregard Dr. Kirk's sensible advice to await the acclimatizing fever in the island. He crossed the channel to the Kingani river, and the

coast climate got the better of him. He returned to Zanzibar, where, after weathering the first attack of three days, he succumbed on the second day to a relapse. His mourning family—father, brothers, and sisters—have only the sad satisfaction of knowing that a French missionary-priest administered to him the last consolations of his faith.

RICHARD F. BURTON.

SOCIETIES.

MICROSCOPICAL.—Oct. 1.—C. Brooke, Esq., President, in the chair.—Mr. N. H. Martin was elected a Fellow.—A paper, by Dr. Maddox, was read by the Secretary, descriptive of an organism found in a pond of fresh water in the New Forest, near Lyndhurst, and which it was proposed to name *Pseudo-amaba Violacea*. The general appearance of the organism was minutely described and figured, and the results of a series of continuous observations upon a "growing slide" under the microscope were detailed.—A paper by Mr. F. Kitton, describing some new species of diatoms, was taken as read, and the attention of the meeting was called by the President to one of great beauty, named by Mr. Kitton *Aulacodiscus superbus*.—Mr. F. H. Wenham made some observations upon the microscopical appearance of glass which had been subjected to the action of the American sand-blast process, showing that the erosion of the surface was entirely due to the percussive force of the particles of sand, and that the results of this were demonstrated by the polariscope. A number of specimens were exhibited in the room.—Mr. C. Stewart also exhibited under the microscope and minutely described a beautiful preparation of the spermatophores of the common snail; he also explained and illustrated the general structure of the generative organs of the male cuttle-fish.

Science Gossip.

MR. MURRAY'S scientific announcements comprise a volume on 'The Moon, considered as a Planet, a World, and a Satellite,' by James Nasmyth, C.E., and James Carpenter, F.R.A.S., late of the Royal Observatory, Greenwich, and a new edition of Prof. Phillips's work on 'The Geology of Yorkshire.'

PROF. REILLY, the Professor of Engineering at the Indian Civil Engineers College at Cooper's Hill, has in the press a treatise on his branch of science.

'AN OUTLINE STUDY OF MAN; or, the Body and Mind in one System,' is the title of a work by Mark Hopkins, D.D. LL.D., which has just appeared in the United States, and shortly to be published in this country by Messrs. Hodder & Stoughton.

A CORRESPONDENT suggests that an organizing officer should be sent in advance of the meetings to form a local museum for the meetings of the British Association. At Bradford it was not known for some time that the museum of the Philosophical Society was open; and some curious collections of weapons were displayed in an upper sky gallery at the *soirée* for one night, which very few knew of, and fewer still saw. In the Anthropological Section, many interesting objects, including the South Sea collection and numerous drawings, were exhibited to those who had the good chance to hear the papers, and were then put out of sight.

A MEMBER of the British Association, commenting on our suggestions for reform, agrees with us that reform is required, but fears that an alteration might take the shape of more exclusively favouring cliques. By some course of manipulation, the Section of Statistics has, he says, for some years been placed under the influence of the strong-minded women, as the arena for their display. This necessarily results in a process of "selection," which is not strictly scientific in its methods and results.

WE have received the *Bulletin de la Société Géologique de France*. One number is devoted to a record of the 'Réunion Extraordinaire à Digne

(Basses-Alpes), from the 8th to the 18th Sept. 1872, and contains many communications of much geological interest. In the second part of the new series is a valuable paper, by M. Th. Ébray, on the 'Constitution Géologique des Terrains traversés par le Chemin de Fer de Chapeauroux à Alais.'

THE screw-steamer *Diana*, chartered for a Polar Expedition by Mr. E. L. Smith, of London, returned to Dundee on Saturday, the 27th ult., having left that port for the Arctic Regions in May last. The expedition never got beyond 81° N., while Mr. Smith, in his expedition of 1871, reached 81° 24' N. He has ascertained that the North Cape is situated on an island separated by a sound from the mainland. Mr. Smith had the great satisfaction of relieving the Swedish Expedition which left Sweden in the summer of 1872, headed by Prof. Nordenskiöld, which he found lying beset in Mosell Bay. This expedition appears to have suffered severely from continuous gales, but much good scientific work has been done. Observations on atmospheric electricity, on the horizontal and vertical forces of the magnetic current, and on the tidal currents, were continuously and successfully carried out. Owing to the unfavourable nature of the ice, little in the way of exploration has been effected by the *Diana*, yet, both geology and natural history have been enriched by Mr. Smith's labours.

THE Geographical Society of France has directed the attention of the Government of Tunis to the condition of the Desert of Sahara, and has asked to have a survey made between the Gulf of Gabes and Lake Farnoun. This arises from a project, brought before the Society by Capt. Boudaire, to create an interior sea in the Desert of Sahara—the bed of the Mel-Rhir, a kind of salt marsh, being 27 mètres below the level of the Mediterranean Sea.

THE *Journal* of the Franklin Institute gives the following as a simple means of determining the presence of organic matter in potable water. A half-pint of the water should be placed in a perfectly clean colourless glass bottle; a few grains of the best white sugar should be added to it, and freely exposed to daylight in the window of a warm room. If the water becomes turbid, sewage contamination may be suspected.

IN the *Journal* of the Franklin Institute for September, 1873, Mr. John M. Mott concludes his papers 'On Lightning and Lightning-rods.' He comes to the following, amongst other conclusions:—"Lightning-rods as usually erected do not afford much protection." "The conducting power of lightning-rods is proportional to their solid contents, and not to their surfaces." "Insulators are of no use in any case." "The rod must be attached directly to the building, the closer the better." "Sharp points for the upper termination of rods are necessary; rods are of but little value without them." These conclusions are, in many respects, so opposed to received ideas, that they require careful examination.

THE *Journal* of the Scottish Meteorological Society for the quarter ending March, 1873, has just been issued. In it we have the first Report of the Committee, formed at the suggestion of the Marquis of Tweeddale, on the Relation of the Herring Fishery to Meteorology. It would appear from this Report that a rise of temperature is coincident with the date of the largest catches of fish, during the fishing season. The Commissioners say, "It is, however, still premature to lay much stress on the striking coincidence of these facts."

FINE ARTS

DORÉ'S GREAT PICTURE OF 'CHRIST LEAVING THE PRÆTORIUM,' with 'Night of the Crucifixion,' 'Christian Martyrs,' 'Franciscus de Rimini,' 'Neophyte,' 'Andronica,' &c., at the DORÉ GALLERY, 25, New Bond Street. Ten to Six.—Admission, 1s.

THE PRIVATE COLLECTIONS OF ENGLAND.

No. V.—DURHAM.

FROM Gateshead, we pass through a varied and rich country to the seat of St. Cuthbert, the

most nobly situated city in England. It appears that, to an unusual extent, nature suffices for the inhabitants of Durham. At least they possess few pictures, and, except the cathedral and a demonstrative, although not particularly bad, equestrian statue in the market-place, there is little to prove that the people care for the arts. What has been done to the Cathedral by Wyatt and others, has been, we suppose, effectual in suppressing æsthetic ardour in the city of the beautiful site. Probably, there are paintings and sculptures in many houses of Durham, of which we heard nothing, but diligent inquiry produced the same answer at all times, that Canon Greenwell alone could be called a collector of works of art. This gentleman is universally known in the antiquarian world, and he has been for many years a zealous and efficient custodian of the MSS. in the Cathedral Library, and other treasures which remain in the church and its adjuncts. As to architecture, the finest modern object we saw in Durham is the superb arcade which carries the railway over the high road. Durham is a city with magnificent opportunities for architecture; fortunately, no doubt, these are reserved for the future, when Sir Gilbert Scott and his young men, having "restored" all our cathedrals, churches, and ruins, may have leisure to furnish up the ancient town on the Wear. We look on the advent of those energetic gentlemen as inevitable in every place, large or small. Otherwise, as we object to "restoring," we would not mention Durham as liable to their operations, lest they should be "called in" to extend the arena of "restoration" beyond the Cathedral, where it is not possible to do much more harm. Of this, exteriorly, it may be said that the grand outline alone remains, and we had better not look too closely into that, for, on approaching the gigantic structure, the tameness and poverty of the details which we owe to successive "restorers" give to the once grand, solemn and beautiful fane a look of meagreness, such as we have seen in certain starved modern specimens of "Early English." There is a big, gaunt church in Gordon Square, St. Pancras, with its poor bones coming, so to say, through its lean ashlar, which for the hungriness of its details is on a par with Durham Cathedral, scraped and chiselled to the core of its enrichments, few as those are.

Canon Greenwell possesses a large collection of objects, discovered by himself in British graves and grave-mounds of unmeasured antiquity. It includes the relics of interments by races which at different and remote periods occupied the island, and is of incalculable value as partially illustrating the modes of life and mortuary customs of the people to whom the graves are due. It appears that in many cases the men and women of those ages anticipated resurrection, and, according to the nature and inspiration of those hopes, such were the objects placed for the use of the friends whose revival was relied on. Besides these, the learned Canon possesses many remains of high intrinsic value, such as ornaments of gold derived from several periods, and displaying the arts as they were practised by their makers. Among these articles are gorgets of gold, bracelets, fibule, rings, &c. The most interesting of these personal treasures is a heavy ring of gold, with an inscription which enables the student to identify it with a Mercian princess, a relative of King Alfred's. The circumstances attending the finding of this relic are such as may lead us to associate it with a journey known to have been undertaken by the princess. This jewel was found by a countryman in, we believe, Warwickshire, and, notwithstanding its weight and appearance,—signs sufficient, one would think, to show that it is of gold,—it was for a considerable time attached as an ornament to a dog's collar.

Canon Greenwell's collection of tools, utensils, and weapons of flint, and other materials, is so rich and so nearly complete as to be among the most valuable and interesting in existence here or abroad. His knowledge of the class of antiquities to which they belong enables him to describe them with a success and vividness which have claimed