

is very far in the distance, if, indeed, it can ever be attained. This fact does not, however, militate in the least against the plausibility of the idea. Although mankind has not yet been able to devise a method of mathematical analysis which will solve at one stroke the gravitational relations of three bodies, nature is not on that account prevented from causing three or more bodies to act on one another with the force of gravity, or astronomers from calculating as nearly as may be the consequences by a process of approximation.

Carried through to its logical conclusion, the idea that atoms are compressible gives one quite a new conception of the molecular mechanics of the universe. The influence of atomic compressibilities may be perceived everywhere, and in most cases each fact seems to fit easily and without constraint into its place in the hypothesis. Even apparent exceptions, such as the abnormal bulk of ice, may be ascribed in a reasonable fashion to superposed effects. A detailed discussion of many applications of the theory is impossible here, but a few may be suggested in order to make clearer its possibilities.

The satisfying of each valence of an atom would cause a depression on the atomic surface, owing to the pressure exerted by the affinity in that spot. The stronger the affinity, the greater should be this distortion. Evidently this conception gives a new picture of the asymmetric carbon atom, which, combined with four other different atoms, would have upon its surface depressions of four unequal magnitudes, and be twisted into an unsymmetrical tetrahedron. The combining atoms would be held on the faces of the tetrahedron thus formed, instead of impossibly perching upon the several peaks. According to this hypothesis, the carbon atom need not be imagined as a tetrahedron in the first place; it would assume the tetrahedral shape when combined with the other four atoms. One can easily imagine that the development of each new valence would change the affinities previously exercised, somewhat as a second depression in the side of a rubber ball will modify a forcibly caused dimple in some other part. Thus a part of the effect which each new atom has on the affinities of the other atoms already present may be explained.

Many other physico-chemical phenomena assume a new aspect when viewed from the point of view of this idea. New notions of the mechanism of the critical phenomena, surface tension, ductility, malleability, tenacity, and coefficient of expansion are gained. The peculiar relations of material and light, such as magnetic rotation, fluorescence, partial absorption, and so forth, may be referred to the modified vibrations of distorted atoms. The deviations from the exact fulfilment of many older generalisations concerning volume (such as the equation of van der Waals already cited, the comparative volumes of aqueous solutions, especially of electrolytically dissociated substances,<sup>1</sup> and the variations in the crystal forms of isomorphous substances) are seen to be a foregone conclusion. Moreover, the theory, although not necessarily dependent on the modern belief that atoms are built up of numbers of much smaller corpuscles, is consistent with that belief; for would not such an entity be compressible?

The more closely the actual data are studied, the more plausible the hypothesis of compressible atoms appears. Ten years' experience with its interpretations leads me to feel that the idea is highly suggestive and helpful in stimulating new search after truth and in correlating and codifying diverse facts. By such fruit are hypotheses justified.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following is the text of the speech delivered by Prof. Love in presenting Sir W. T. Thiselton-Dyer for the degree of D.Sc., *honoris causa*, at the Encaenia on June 28:—

Adest nobis orandus Willelmus Turner Thiselton-Dyer, vir magnam in Botanica laudem adeptus, huius Academiae olim alumnus. Qui cum Dublinii, Coriniii, Londonii hanc

<sup>1</sup> Baxter has very recently discussed this matter from the point of view of the theory of compressible atoms (*J. Am. Chem. Soc.*, June, 1911).

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scientiam profiteretur, docendi rationes ita novavit ut florentissimis totius Europae scholis schola Britannica par fieret. Idem postea regalibus hortis Kewensibus praefectus varia negotiorum genera ad Botanicam pertinentia promovit. Testis est India, Cinchonae Peruvianae, in medendo potentissimae, nunc ferax: testes etiam Taprobane insula et Chryse Chersonesus Heveae Brasiliensis cultrices, cuius arboris virtutes omnibus notissimae sunt. Adeo non solum salutis, sed etiam rei familiari civium hic noster sua opera inservivit.

MR. J. H. PRIESTLEY, lecturer in botany at the University of Bristol, has been appointed professor of botany at the University of Leeds.

MR. JOHN BLAKEMAN, head of the mathematical department of the Leicester Technical School, has been appointed as principal of the Northampton Technical School.

AN endowment fund of 200,000*l.* has been presented to University College, Reading, with a view to enable it to apply for a charter as an independent university. Of the amount mentioned, Lady Wantage has given 50,000*l.*, Mr. and Mrs. George W. Palmer 100,000*l.*, and Mr. Alfred Palmer 50,000*l.* Mr. Alfred Palmer has, in addition, presented to the college the freehold of four acres of land contiguous to the college site, at present held and used for horticultural purposes by the college under lease from him.

We learn from *Science* that a gift of 4000*l.* to aid general research in the study of diseases at the Yale Medical School has been announced from an old student. Further gifts of 2000*l.* toward the endowment of the University clinic, and to the Peruvian exploration fund, for the Yale expedition under Prof. Hiram Bingham, have also been announced. From the same source we find that gifts of 20,000*l.* in lands by Messrs. James B. and Benjamin N. Duke, of 10,000*l.* for a new building by Mr. James B. Duke, and of 2000*l.* by Mr. B. N. Duke for improvements, were announced recently at Trinity College, Durham, N.C.

THE General Assembly of the State of Illinois has granted to the University of Illinois for the next two years the sum of 703,860*l.* *Science* says that this is the largest grant ever made by a State legislature to a State educational institution. The General Assembly has not only recognised the immediate needs of the University, but has looked ahead and made provision for the future by levying a one mill tax for the continued support of the University. It is estimated that this tax will yield an income to the University, two years hence, of about 450,000*l.* a year. In addition, the University will receive from the Federal Government and other sources funds that will bring its income to about 400,000*l.* per annum for the next biennium.

#### SOCIETIES AND ACADEMIES.

LONDON.

**Mineralogical Society**, June 13.—Prof. W. J. Lewis, F.R.S., president, in the chair.—G. S. Blake: Zirkelite from Ceylon. The results of five analyses made on fragments grouped together according to their specific gravity, which ranged from 5.2 to 4.4, showed remarkable variation in the percentage composition, the densest containing about 20 per cent. thoria and little uranium, and the lightest 14 per cent. U<sub>3</sub>O<sub>8</sub> and little thorium; the precise formula is uncertain. A few crystals, some simple and some twinned, were met with; they apparently belong to the hexagonal system ( $cr=53^{\circ} 22'$ ), the observed forms being  $c(0001)$ ,  $m(1010)$ ,  $r(10\bar{1}1)$ ,  $s(20\bar{2}1)$ ,  $d(10\bar{1}2)$ ,  $e(2023)$ , and  $r$  the plane of twinning; they were opaque in mass, but translucent and isotropic in splinters.—Rev. Mark Fletcher: Note on some crystals of artificial gypsum. The crystals, which were formed in the condensing plant of a distillery at Burton-on-Trent, were twinned about 101, and the forms 100, 110, 230, 111 were observed.—L. J.

**Spencer**: The larger diamonds of South Africa. Historical notes relative to the "Excelsior," "Jubilee," and "Imperial" diamonds were given, together with a tabular statement of the weights of the rough and cut tones in carats and grams, and the percentage yield of the cut brilliants from the rough.—**F. H. Butler**: Brecciation in mineral veins. In vein-breccias due to fracture *in situ* (crush-breccias) replacement of country-rock is a characteristic feature. Where the coarse fragments in a vecciated fissure-vein indicate erosion, removal of fine lock débris may be inferred. Fragments that are angular and uneroded and completely isolated by encrusting material often indicate by shape and position their former existence as a single mass. The quiet removal of such fragments into a vein-cavity after reunion, and also the banding, with concomitant contortion of adjoining soft country-rock, by their cement-substance, may be ascribed to the hydrostatic pressure and the solvent and mineralising properties of the waters which furnished that substance. The coarse constituents of breccia may have been crushed *in situ*, or forced from fissure-walls by earth movements, or detached therefrom by aqueous pressure and solution.—**Arthur Russell**: Prehnite from the Lizard district. Two distinct types of crystals, tabular and prismatic, were recently found by the author on hornblende-schist at Parc Bean Cove, Mullion, Cornwall, the former showing the forms 001, 302, 061, and the latter 100, 001, 110, 061, and the rare form 301.

**Royal Meteorological Society, June 14.**—**A. J. Makower, W. Makower, W. M. Gregory, and H. Robinson**: Investigation of the electrical state of the upper atmosphere. The object of the experiments described was to measure the electrostatic potentials at various heights above the ground and the currents that flow down an earthed kite-wire. The method adopted was to send up kites or, in still weather, balloons attached to steel wires, provision being made for detaching sections of the wire from the winding drum so that the lower end might be anchored to a long rod of ebonite in order to insulate it from the ground. When this had been done the wire could either be earthed through a galvanometer to measure the current flowing down the wire, or else be connected to an electrostatic voltmeter having a range of 100,000 volts by means of a metallic line passing through glass tubing supported on long insulators to prevent brush discharges to the surrounding air or leakage to earth. Curves are given embodying the results of a series of flights made during the month of August, 1910, the potentials and currents that were measured being plotted as functions of the heights above the ground. The values obtained for the potential gradient near the ground lie between 0.5 and 1.5 volts per centimetre, and are in agreement with those deduced from the tests of previous experimenters using water-droppers or radium collectors, but it is found that the potential gradient diminishes rapidly as the height above the ground increases. Flights are recorded up to 4000 feet above the ground, at which height the potentials ranged between 40,000 and 60,000 volts, and the currents between 40 and 100 microamperes. Measurements were also made of the time taken by the kites and balloons to attain the full potential of the surrounding air from the moment at which the wire was disconnected from earth. This rate of charging is of interest in aeronautics in connection with the devising of suitable methods of preventing dangerous electric discharges from taking place between a balloon and the surrounding medium after a sudden change of height. The tests showed that the kites and balloons, the collecting area of which was about 150 square feet, charged up according to an exponential law, the exponential coefficient having values lying between 0.1 and 0.23, showing that a potential of half the full value was reached in about 5.5 to 7 seconds. It is argued that the rate of charging up is probably proportional to the radius of the balloon, and so the rate of charging up of large passenger balloons might be deduced from the rates determined with the small balloons used in these investigations. Attempts were made by the authors to discover a connection between the electrical state of the atmosphere and the prevailing temperature, barometric pressure, humidity, and wind

velocity as registered on self-recording instruments sent up at each flight, but it was found that the amount of data collected was not sufficient to make such deductions possible. It seems that such conclusions will not be able to be drawn until continuous experiments extending over a considerable period of time have been made.

**Geological Society, June 14.**—**Prof. W. W. Watts, F.R.S.**, president, in the chair.—**Prof. W. S. Boulton**: A monchiquite intrusion in the Old Red Sandstone of Monmouthshire. An unrecorded monchiquite, intruded into the Upper Old Red formation of Monmouthshire, is described. The manner of its intrusion is doubtful. The disturbance and metamorphism of the contact-rocks are dealt with, as also the rounded lumps of marl and sub-angular chips of sandstone incorporated in the igneous rock. The monchiquite contains large phenocrysts of augite and biotite, generally much corroded. Rounded "nodules" of olivine-augite rock with chromite are also included. A second generation of augite, biotite, and decomposed olivine occurs porphyritically in the ground-mass. The ground-mass is a felt of minute elongated augite prisms, magnetite grains, and flakes of biotite. A complete analysis of the rock is given, which bears out the petrographical evidence that it is a very basic lamprophyre belonging to the monchiquite group. Its age and connection with the only other known intrusion into the Old Red Sandstone of the South Wales area are referred to.—**Notes on the Culm of South Devon: Part I.**—**Exeter district**, by **F. G. Collins**, with a report on the plant-remains by **E. A. N. Arber**, and notes on the Cephalopoda by **G. C. Crick**. The paper is to show that the fauna of the Culm Measures of South Devon proves these beds to be the equivalents of the Pendleside series of the Midlands. The actual fossiliferous localities are eighteen in number, but often the fossils are too poor for determination. It seems advisable to seek more evidence, and an attempt will be made by working due north from Waddon Barton, a point farther to the west.

**British Psychological Society, June 24** (held at Manchester).—**Dr. T. Graham Brown**: Note on the perception of movement in the environment.—**C. Burt**: The experimental investigations of emotional dispositions.—**Dr. H. Watt**: A new classification of experiences.—**Prof. C. S. Sherrington**: A simple teaching apparatus for illustrating Listing's law.—**Prof. J. Lorrain Smith** and **Dr. W. Mair**: A chemical comparison of the brain substance of the child and the adult.

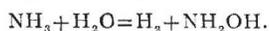
## DUBLIN.

**Royal Irish Academy, June 26.**—**Rev. Dr. Mahaffy**, president, in the chair.—**C. F. Rousselet**: Clare Island Survey: rotifera. Mr. Rousselet collected all the rotifera except the Bdelloida, which are embodied in a special report by Mr. James Murray. The report shows that the rotifer fauna of Clare Island and the neighbouring parts of the mainland differs in no special features from that of many other parts of the British Islands. Mr. Rousselet gives a list of 103 species with their distribution. Some of these had not previously been recorded from the British Islands.—**Eugène Penard** and **G. H. Wailes**: The fresh-water rhizopoda obtained during the Clare Island Survey. The first collections of the fresh-water rhizopoda of Clare Island and the neighbouring districts of the mainland of Ireland were made by **Dr. E. Penard**, the work being continued later by **Mr. G. H. Wailes**. The present report has been drawn up under the joint authorship of these two investigators. The total number of species and varieties recorded is 140, of which *Cryptodifflugia eboracensis*, *Euglypha cirrata*, *E. rotunda*, and *E. armata*, as well as several varieties, are new to science. Seven other species are new to the British Islands.—**D. J. Scourfield**: Fresh-water entomostraca. In a preliminary report Mr. Scourfield states that 41 species of Cladocera, 23 species of Copepoda, and 13 species of Ostracoda have been observed on Clare Island and the neighbouring parts of the mainland. No new species have as yet been definitely identified, but a couple may eventually prove to be new to science. The great majority of the species recorded are common types in the British Islands; only a few are to be con-

sidered as rarities.—Miss A. Lorrain **Smith**: Lichens (Clare Island Survey). The lichen flora of the Clare Island district is extremely abundant, especially as regards rock and ground species. The rarity of trees renders bark species less widely distributed than usual. The present report deals with some 280 species and 40 subspecies, &c. Of these, between thirty and forty are hitherto unrecorded from Ireland, and several are new to the British Isles or only once previously found therein. A summary of previous work in the district shows that while the neighbouring county of Galway has been well explored by Larbalestier, Mayo was practically unworked until the present investigation.

## PARIS.

**Academy of Sciences, June 26.**—**M. Armand Gautier** in the chair.—**E. Guyou**: Solution of problems of altitude. New tables of navigation.—**J. Boussinesq**: Calculation of the absorption in translucent crystals for plane waves, laterally undefined.—**P. Villard** and **H. Abraham**: A large electrostatic machine. A description of a specially constructed Wimshurst machine of twenty plates, capable of yielding 1 milliampere at 250,000 volts.—**A. Müntz** and **E. Lainé**: Considerations on the employment of sewage in agriculture. Analyses of the Paris sewage are given, showing its value when applied directly to various crops. It is deficient in phosphates, and to use it to the best advantage these should be added.—**L. Maquenne**: Concerning a recent communication by **M. L. Cailletet** (on the origin of the carbon assimilated by plants).—**E. L. Bouvier**: New observations on evolutionary mutations.—**Édouard Heckel**: The action of cold, of chloroform, and of ether on *Eupatorium triplinerve*. No odoriferous substance exists preformed in this plant, but such a substance is formed after desiccation for several hours, and much more rapidly after exposure to cold or to the action of anaesthetics.—**J. Ph. Lagrula**: A triple meteor observed at Nice.—**Luigi Giuganino**: Effect of the movement of the earth on light phenomena.—**M. Chanoz**: Images physically developed after fixing exposed gelatine-silver bromide plates.—**J. Gardner**: Apparatus for the telephonic reception of submarine signals. This consists of a microphone connected with a metal ring of carefully specified proportions, and attached to the armour of the ship. The signals can be perceived at increased distances, and their directions ascertained.—**G. Sagnac**: Movement of the earth and the optical phenomena in an entirely terrestrial system.—**H. Buisson** and **Ch. Fabry**: Measure of the intensities of the different radiations in a complex ray. The radiations from a quartz mercury vapour lamp were allowed to fall upon a thermopile after passing through various absorbing media, such as water, solution of potassium chromate, solution of quinine sulphate, solutions of oxalic acid, glass, &c., thus obtaining the amounts of energy carried by radiations of different groups of frequencies.—**Georges Meslin**: Circular polarisation.—**L. Bloch**: Some general theorems in mechanics and thermodynamics.—**L. Houllévigie**: Kathode rays produced in electric incandescent lamps. Conditions are described under which it is possible to obtain pencils of rays, easily deviable by a magnet, in the interior of incandescent lamps.—**M. Dussaud**: Economical incandescent lighting. Description of the great efficiency of a coiled filament of tungsten as compared with a carbon filament.—**A. Besson**: Action of the silent discharge on dry and damp ammonia. Small quantities of a substance which reduces copper salts are formed. This is probably hydroxylamine, produced according to the equation



—**Paul Pascal**: A method of optical control of magneto-chemical analyses.—**J. B. Senderens** and **J. Aboulenc**: Catalytic esterification of aromatic acids in the wet way. The yield of ethyl benzoate produced in presence of sulphuric acid was found to depend upon the amount of the latter added. Acids such as the toluic acids, and salicylic acid, resemble benzoic acid in this respect, and in having the carboxyl group attached directly to the benzene nucleus; whereas such acids as phenylacetic and phenylpropionic, in which this group is not directly attached to

the nucleus, do not yield increasing amounts of ester with increase in the quantity of sulphuric acid used as catalyst. The effects of potassium bisulphate and of aluminium sulphate as catalysts were also examined.—**G. André**: The diffusion of saline substances through certain organs of plants.—**H. Astruc**, **A. Couvergne**, and **J. Mahoux**: The adherence of insecticides of arsenate of lead.—**V. Balthazard**: Identification by finger-prints.—**Léon Pigeon**: Measure of the degree of strabismus.—**M. Odier**: The part played by mercury and some of its salts in certain cancers.—**M. Foveau de Courmelles**: A cause of X-ray dermatitis.—**MM. Sollaud** and **Tiiho**: The presence in Lake Chad of *Palaemon niloticus*.—**E. Kayser**: The influence of humous substances on micro-organisms.—**M. Lemoigne**: Denitrifying bacteria of filter-beds.—**Jean Bielecki**: The part played by mineral matters in the formation of the protease of anthrax.—**Stanislas Meunier**: Influence of the structure of certain fossil shells on the production of a new variety of fibrous silica.—**M. Lantenois**: The advance of geological knowledge concerning Indo-China.—**Henry Hubert**: The mechanism of rains and storms in the Soudan.

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