

mean is 32.7 in. For a large area (about 3000 square miles) no records are available.

The annual report of the meteorological observatory of the Government-General of Korea for the year 1911 (Dr. Y. Wada, director) contains valuable observations taken three times daily at ten stations, with carefully prepared summaries. Weather conditions and special occurrences are denoted by international symbols, and the instruments and methods of observation are similar to those at meteorological stations in Japan, and, consequently, are all that can be desired. The absolute maxima of air temperature ranged between 88.3° F. at Fusan and 92.8° at Chemulpo, both in August, and the absolute minima between -16.1° at Ping-yang and 15.3° at Mokpo, both in January. The yearly rainfall varied from 33.3 in. at Song-chin to 76.8 in. at Fusan. The largest amount of sunshine was 2642 hours, at Ping-yang, being 60 per cent. of the possible quantity.

A report on the Mariout district, by Mr. A. L. P. Weedon, in Nos. 72 and 73 of *The Cairo Scientific Journal*, is of much interest, both from an agricultural and from a meteorological point of view. The district, which consists of a long strip of land west of Alexandria, was in ancient times famous for its fertility, but at present it is for the most part barren and waste, barley being practically the only crop grown, in some parts only, and this is dependent on the somewhat precarious winter rains. The rainfall seems to differ but slightly from that of Alexandria, which averages 220 mm. (8.7 in.) per annum. The climate depends on the temperature of the Mediterranean and the general atmospheric circulation, and from numerous quotations from ancient and modern writers it is concluded that there is no reason to believe that either of those factors, or the rainfall, has changed since Roman times. The author states that the land is capable of producing more profitable crops in the hands of more efficient cultivators, who by the employment of scientific methods could either give it a better or more regular water supply, or make a better use of the existing moisture of the soil, e.g. by a system of dry-farming (economising the rain-water by digging trenches before the rainy season), assisted by wells and cisterns, many of which already exist.

The Austrian Meteorological Institute has published part v. of its valuable "Klimatographie" of that country, referring to the mountainous province of Salzburg. Climatologically, Salzburg belongs to the Central European district, but owing to the Alps it is subject to many marked modifications. The portion on the northern side of the limestone Alps, being exposed to the north and north-west winds, has a decidedly damp and rainy character, with the peculiarities of the West European climate. But between the limestone and central alpine chain lies a zone of a continental, dry character, with stagnant masses of air (*Luftseen*) in the valleys, in winter excessively cold, and relatively warm in summer. In the Lungau district, Salzburg participates in the rough, inhospitable climate of the upper Mur valley. The author, Dr. A. Fessler, adopts in the main this general subdivision of the climatic conditions in his elaborate discussion, dealing with each district in great detail, and with full consideration of the effects of aspect and altitude on temperature, rainfall, and climate generally. The discussion is based on observations made at stations connected with the Central Institute, but the author is handicapped by the paucity of data in many points of climatological importance; from this point of view Salzburg compares unfavourably with other alpine districts; complete observations for, say, twenty years and upwards only exist for comparatively few stations.

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## GREAT ADVANCE IN CRYSTALLOGRAPHY.<sup>1</sup>

CRYSTALLOGRAPHY has made such remarkable progress during the last few months, and the position at the present moment is so interesting, that it was considered opportune to review it in a discourse from this historic lecture-table.

Overwhelming evidence has now been brought forward that a crystal is endowed with a definitely organised structure.<sup>2</sup> In the crystal of a pure substance we are dealing with a chemical element or compound, and if with the latter it may be of any grade of complexity, from a very simple binary compound to a most highly complicated one composed of a large number of atoms. If the crystal be that of an element the structure is obviously composed of the similar atoms of that element, while if it be a compound we have a structure composed of atoms of as many kinds as there are chemical elements present combined in the substance, and in the same relative proportion as is expressed by the chemical formula of the substance. In the case of a compound, moreover, the structure may also be considered to be that of the molecules of the substance, for they or a simple arrangement of a small number (group) of them form the grosser units of the structure, whilst the atoms are the ultimate units.

Suppose we now represent this molecular or poly-molecular grosser structural unit by a point, and that such point be analogously situated within each unit. The essence of crystal structure then is that these points are so arranged in space that if they are joined along the three directions of space by imaginary lines the latter form a "space-lattice" (German, "Raumgitter"), each unit cell of which may be conceived to be the "brick" already alluded to in the earlier part of the lecture, and the domicile of the chemical molecule or group of molecules (indeed, it is immaterial whether the points are considered as placed at the corners or in the centres of the cells) or, in the case of an elementary substance, of a group of similar atoms. We may, therefore, define a crystal as follows:—

"A crystal of any definite chemical substance consists of a homogeneous arrangement of grosser units of matter, each consisting of one chemical molecule or a small group of molecules of the substance, and the kind of arrangement is such that these grosser units are all identically (sameways, parallel-wise) orientated, and that their analogously chosen representative points, one from each such grosser unit, form a space-lattice (Raumgitter)."<sup>3</sup>

There are fourteen kinds of space-lattices, slides of several of which are exhibited on the screen. Three possess full cubic symmetry, two are tetragonal, four are endowed with rhombic symmetry, and two are monoclinic; while triclinic, trigonal, and hexagonal crystals have each one space-lattice corresponding to their type of symmetry. In every case it is the full (holohedral) symmetry of the system which is present, no space-lattice possessing merely the lower degree of symmetry corresponding to one of the so-called hemihedral or tetartohedral classes of the system in question.

Now in the solid crystal, not only are the grosser

<sup>1</sup> From a discourse delivered at the Royal Institution on Friday, March 14 by Dr. A. E. H. Tutton, F.R.S.

<sup>2</sup> This was very fully illustrated by numerous experiments during the first portion of the discourse.

<sup>3</sup> Since this lecture was delivered (March 14) and printed by the Royal Institution, a paper by Prof. Theodore W. Richards, of Harvard University, has appeared in the *Journal of the American Chemical Society* for April (vol. xxxv., p. 381), in which he shows that his theory of compressible atoms leads to "crystal units" of precisely the molecular or polymolecular character described in this lecture. He supposes such crystal units to be the entities necessary to relieve metastable supersaturation, and their centres to form the points of the crystal space-grating, assumptions with which the lecturer obviously fully concurs.

units arranged so that their representative points are repeated in space with extraordinary accuracy of position, with production of unit cells or "bricks" of absolutely identical dimensions throughout the crystal, but the shapes of the grosser units themselves are identically similar and identically similarly orientated in space. Suppose, however, that the force of crystallisation, the directive molecular force concerned in bringing the molecules together in this regular order of marshalling, is only adequate just to attain this marshalling of the grosser units into a space-lattice formation, without being able to fix the units about their own centres of gravity, a certain amount of wobbling about the latter being still permitted. We might, in such circumstances, expect that some of the properties of a crystal, dependent on the space-lattice formation on lines of definite symmetry, such as the optical properties of double refraction and polarisation of light, would be developed and exhibited, while the production of exterior plane faces would be either only partial, with rounded edges and the exhibition of plasticity and viscosity, or would

stable within a limited range of temperature, and the liquid crystals are usually the second phase observed on allowing the truly liquid heated substance to cool; the liquid crystal phase is produced at a definite temperature during the cooling, and persists throughout a definite interval of temperature during the continued cooling.<sup>4</sup> The view here put forth is apparently in agreement with that of Lehmann himself, as most recently expressed both in letters to the lecturer and in a memoir of July 27, 1912, to the Heidelberg Akademie der Wissenschaften, in which he says that in all probability: "Die Rundung der Formen hänge zusammen mit der Plastizität der Stoffe und habe ihren Grund in unzureichender molekularer Richtkraft, welche wohl genügt, ein Raumbgitter herzustellen, nicht aber regelmässige Treppenstufen, wie es nach Hauys Theorie zur Bildung ebener Krystallflächen nötig wäre." The formation of regular stepped faces (of invisibly minute steps, "Treppenstufen") the lecturer considers to occur only when the grosser units become fixed about their centres of gravity or representative points, with production of a truly solid crystal.

But now let us pass to the consideration of the internal structure of the grosser or space-lattice units themselves. Their symmetry may be, in simple cases, similar to that of the space-lattice, but in general this will not be so. Whatever the stereometric arrangement of the chemical atoms in the molecule may be, and, if more than one molecule goes to form the space-lattice unit, whatever their mutual arrangement, and therefore whatever be the outer configuration of the whole unit, when the crystal is a truly solid one, the force of crystallisation (now no longer denied) is adequate to fix each space-lattice unit, not only considered as a point with reference to its neighbours, but as regards its shape and its whole character, parallelwise and sameways orientated with respect to its adjacent fellows, and as close as possible to them. Also, if more than one molecule goes to each space-lattice unit, their mutual arrangement is achieved on a definite plan, and is the same for every space-lattice unit; these constituent molecules of the latter are also as closely packed as possible.

The final result is thus to produce an assemblage of chemical atoms in which not only the demarcation frontier between the space-lattice units disappears, but also that between the constituent molecules in the cases of polymolecular grosser units. We come, ultimately, in consequence, to a structure of atoms each of which we may represent by a point.

Now, just as the genius of Frankenheim and Bravais revealed to us the fourteen kinds of space-lattices, so Sohncke made us acquainted with sixty-five regular systems of points, including many of the thirty-two classes of symmetry, but not all, which von Lang had shown crystals to be capable of possessing. Later the number was brought up to 230 by simultaneous and wonderfully concordant geometrical researches by Schönflies in Germany, von Fedorow in St. Petersburg, and Barlow in England, and among these 230 all the thirty-two crystal classes are represented, and no others.

Hence, we come to the conclusion that the skeletal framework of crystal structure is the molecular or polymolecular space-lattice, and the detailed ultimate

<sup>4</sup> Ammonium oleate (Fig. 1), para-azoxyanisol, para-azoxyphenetol, and cholesteryl acetate were illustrated on the screen.

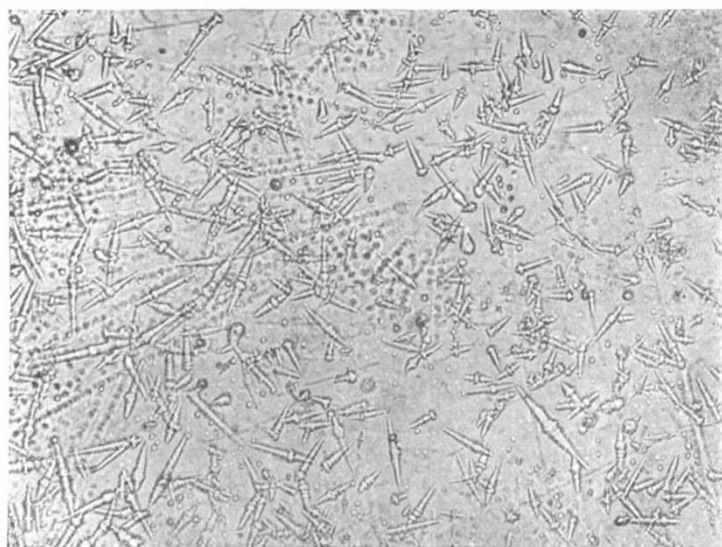


FIG. 1.—Liquid crystals of ammonium oleate.

not be achieved at all, the objects produced being still fluid. One cause of such a condition of partial success at crystallisation might well be that the substance was composed of a large number of atoms arranged in a long chain, such as the well-known "long chain compounds" of organic chemistry, which would offer considerable resistance to marshalling. The author believes that herein lies the explanation of the remarkable "liquid crystals" which Prof. Lehmann has made the subject of his particular study, many of which are of just such long-chain character.

By the kindness of Prof. Lehmann, who has sent over specimens of some of the most characteristic of his substances for the special purpose of this lecture, and of Mr. Poser, of Messrs. Zeiss, who construct an admirably convenient form of heating microscope and projection arrangement for demonstrating the formation of liquid crystals and their behaviour in polarised light, it is possible to exhibit some of the typical phenomena of these interesting objects on the screen. The substances in question are chiefly such as form two or more polymorphous forms, each

structure the atomic point-system. The latter determines the class of symmetry (which of the thirty-two classes is exhibited), and therefore governs any hemihedrism or tetartohedrism, as the development of less than full systematic symmetry used to be called. But it is the space-lattice which governs the crystal system, that is, which determines whether the symmetry is cubic, tetragonal, rhombic, monoclinic, triclinic, trigonal, or hexagonal, and also determines the crystal angles and the disposition of faces in accordance with the law of rational indices, the law which limits the number of possible faces to those which cut off small whole-number relative lengths from the crystal axes. Indeed, it is because only those planes

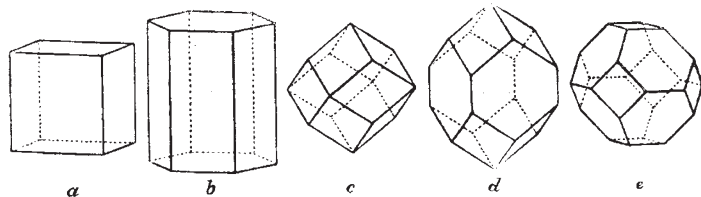


FIG. 2.—Fedorow's types of parallelehedra.

which contain the points of the space-lattice are possible as crystal faces that the law of rational indices obtains. For any three points of the space-lattice determine a plane in which similar points are analogously regularly repeated, and which is a possible crystal face obeying the law of rational indices. Moreover, those facial planes which are most densely strewn with points are of the greatest crystallographic importance, being what are known as the primary faces, either parallel to the crystal axes or cutting off unit lengths therefrom, as well as being usually the planes of cleavage.

As the space-lattice units are all sameways orientated, any one atom of the molecular or polymolecular grosser unit might be equally well chosen as the representative point of the lattice, so long as a similar choice were made in every space-lattice unit, and the resulting space-lattice would be the same whichever atom were so selected. Consequently, the space-lattice is afforded by the similarly (identically) situated atoms of the same chemical element throughout the crystal structure. The combined point-system (one of the 230 possible point-systems) may thus be considered to be built up of as many identical but interpenetrating space-lattices as there are atoms in the space-lattice grosser unit. These facts are concisely expressed in the definition of crystal structure which was stated as follows by Prof. von Groth at the Cambridge meeting of the British Association in 1904:—

"A crystal—considered as indefinitely extended—consists of  $n$  interpenetrating regular point-systems, each of which is formed from similar atoms; each of these point-systems is built up from  $n$  interpenetrating space-lattices, each of the latter being formed from atoms occupying parallel positions. All the space-lattices of the combined system are geometrically identical or are characterised by the same elementary parallelepipedon."

Having thus arrived at a comprehensive idea of crystal structure on the assumption of each atom and each grosser space-lattice unit being only a point, as far as which we are on safe and assured ground, we may proceed to the consideration of the various ideas advanced concerning the character of the units of structure thus represented by points; that is, concerning the mode in which the space around the point is more or less filled up.

The valency theory of Barlow and Pope considers

the atomic point to be expanded into the sphere of the atom's influence, the relative size of which in any one substance is supposed to be proportional to the fundamental valency of the chemical element of which the atom is composed. The spheres are further assumed to be pressed together on crystallisation until they fill space, becoming thereby deformed into polyhedra. The theory of von Fedorow, on the other hand, considers the grosser or space-lattice units to be parallelehedra; besides those corresponding to the fourteen space-lattices there are nine other parallelehedra (making twenty-three in all) composed of simple Sohnckian point-systems compounded of interpenetrating space-lattices. All the twenty-three parallelehedra are arranged parallelwise, and fill space without interstices. There are, however, only four types, namely the cube, the rhombic dodecahedron (which has a second vertically elongated variety), the cubo-octahedron, and the hexagonal prism, the first three being all of cubic symmetry, and the fourth of obviously hexagonal symmetry. They are shown, including the second variety of the dodecahedron, in the next screen picture (Fig. 2). He further considers that

all four may be homogeneously deformed into analogous parallelehedra of lower orders of symmetry, without ceasing to fill space when closely packed. Hence, von Fedorow concludes that all crystal structures are of either cubic or hexagonal type, including not only truly cubic and hexagonal crystals, but their deformed derivatives.

Unlike the atomic polyhedra of Pope and Barlow, these parallelehedra of von Fedorow are either molecular or polymolecular, in the latter event being made up of a small number of identically or symmetrically similar subpolyhedra, termed by him "stereohedra," which represent the chemical molecules, just as already explained, when the grosser space-lattice unit is polymolecular, the stereohedra being arranged to build up

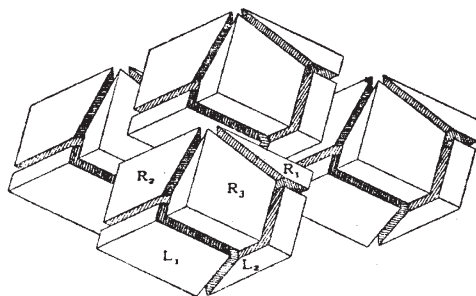


FIG. 3.—Fedorow's stereohedra.

the main parallelehedron (the space-lattice unit) on a definite plan, which may involve mirror-image juxtaposition. For example, a rhombohedral system of stereohedra is shown on the screen (Fig. 3), consisting of two kinds, R and L, one sort being the mirror-image of the other. Each rhombohedron representing the combined system is composed of six stereohedra, three of each kind, and a series of points, similarly situated one within each stereohedron R, would constitute a Sohncke point-system, while a "double-system" is obtained by adding a series similarly situated one within each stereohedron L. If a single point were taken to represent analogously each rhombohedral set of six stereohedra, we should have a rhombohedral space-lattice produced.

The valency theory of Barlow and Pope may or may not in the sequel prove to be correct, and some

facts have recently been brought forward by Barker which tend to show that it will not hold in many cases of inorganic substances. Barker, who has had the good fortune to have worked in St. Petersburg with von Fedorow for more than a year, shows that, as the lecturer has always held, the true unit of volume is the molecular or atomic volume, as determined for the particular substance itself. The molecular volume is determinable by dividing the molecular weight of the substance by the specific gravity of its crystals at a definite comparable temperature, such as 20° C., but the determination of the atomic volume offers peculiar difficulty, and so far only comparative and indirect methods have been employed, chiefly by Sollas. By taking the volumes of the spherical units to be proportional to the atomic volumes (not those of the element in the free state, as enormous compression occurs on combination), and also determining the amount of free interstitial space by comparative methods of calculation, Sollas has achieved some remarkable explanations of the crystallographic characters of the two polymorphous forms of silver iodide and of the three forms of titanium dioxide, rutile, anatase, and brookite. It would not be surprising if the valency volumes of Barlow and Pope, in the cases of those elements for which their theory appears to work in a satisfactory manner, turn out to be identical with the atomic volumes as determined by the method of Sollas. As regards the compounds of carbon and hydrogen, Barlow and Pope have been most successful in accounting for crystallographic and chemical relationships, and it is at least significant that both Le Bas, from experimental work on the molecular volumes of liquid hydrocarbons, and Traube from an entirely different point of view, concur in assigning the relative volumes 4 and 1 to carbon and hydrogen atoms in combination respectively. If Traube's results for carbon and hydrogen be accepted, so must also those for the relative volumes of the atoms of the halogens, sulphur, oxygen, and nitrogen, his values being: F=1; Cl, Br, and I=7 each; S=6; O=2; and N=3. As regards oxygen and nitrogen, he agrees with Barlow and Pope, but the latter take all the halogens as of unit valency volume, and sulphur as of valency volume 2. Barker shows that while in the binary sulphides, such as zinc sulphide ZnS, the sulphur is probably of volume 2, in the sulphates, such as K<sub>2</sub>SO<sub>4</sub> and BaSO<sub>4</sub>, it is probably 6, as Traube insists; this conclusion is also in agreement with other work of Barker on some extraordinary cases of isomorphism, including that of barium sulphate with potassium perchlorate KClO<sub>4</sub>, potassium permanganate KMnO<sub>4</sub>, and the extraordinary compound potassium borofluoride KBF<sub>4</sub>.

While it would thus appear that the atomic volume (in the substance itself, and including any interspace) is the true effective volume concerned in crystal structure, and that it may be only a coincidence that, in the cases of a few prominent elements, it happens to be approximately proportional to the valencies of those elements (as certainly appears to be true in the cases of hydrogen and carbon, and possibly oxygen and nitrogen), there is a very considerable amount of the joint work of Barlow and Pope which is of permanent value. Their explanations of the preponderating cubic and hexagonal crystalline forms of the elements themselves, and of binary compounds such as ZnS, are doubtless correct, and it will be of great interest, in view of the next development to which attention must be directed, to illustrate the case of zinc sulphide.

Barlow and Pope's idea of the structure of zinc blende, which merely assumes that the volumes of the atoms of zinc and sulphur are approximately equal, is

that sixteen molecules ZnS go to form the grosser unit of the crystal structure, the combined system or space-lattice unit—that is, sixteen atoms of zinc and sixteen of sulphur. Only one zinc or one sulphur atom in every sixteen is sameways orientated, and if we adopt von Groth's definition, we may give the structure of zinc blende as follows:—The crystals of zinc blende consist of two interpenetrating regular point-systems, one formed from zinc atoms, and the other from sulphur atoms; each of these two point-systems is built up from sixteen interpenetrating space-lattices, each of the latter being formed from zinc atoms or from sulphur atoms occupying parallel positions. All the thirty-two space-lattices of the combined system are geometrically identical.

Barlow and Pope have shown that the space-lattice in zinc blende is the third cubic one, in which a point is situated at each cube corner and also in the centre of each cube face. For this is the space-lattice corresponding to an assemblage of spheres of equal volume in closest packing.

The space-lattice in question is shown on the screen (Fig. 4), and a pair of models of the arrangement are illustrated in the next two pictures, in the first of which the points are expanded into spheres of considerable size, and in the second they appear still further expanded into actual contact. The third stage, in which the expansion proceeds until all interstices are filled up and the spheres are converted into polyhedra, is left to the imagination. In the second picture (reproduced in black and white in Fig. 5) the mutual arrangement

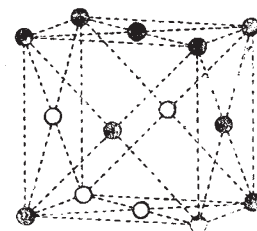


FIG. 4.—Space-lattice of centred-face cube.

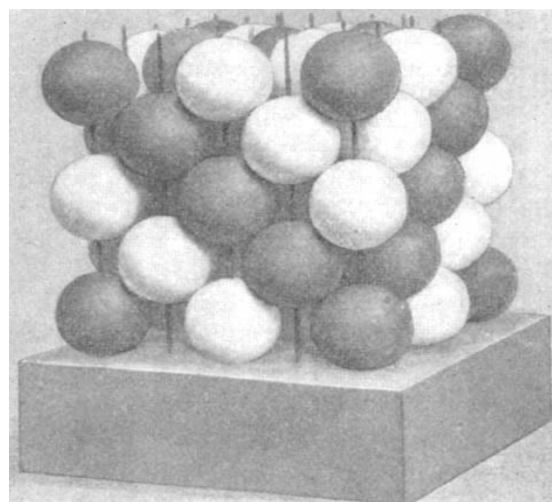


FIG. 5.—Model of arrangement of zinc atoms (shaded) and sulphur atoms (light) in zinc blende.

of the spheres of the two elements in zinc blende, zinc and sulphur, is indicated by the yellow colouring of the sulphur spheres and the grey tinting of those of zinc. The tetrahedral mode of derivation of the structure, accounting for the observed hemihedrism, is also shown in another slide (Fig. 6). The eight larger cubes which together form the grosser unit are each supposed to be occupied by four smaller cubes of the same element, arranged tetrahedrally, and of zinc and of sulphur alternately in different

larger cubes; on replacing the little cubes by spheres in contact the model represented in the second picture (Fig. 5) is produced.

Now this crystalline mineral, zinc blende, has been chosen advisedly as an example of crystal structure. For a remarkable series of experiments have recently been carried out by Laue, Friedrich, and Knipping at Munich, where the lecturer had the advantage of seeing some of the first photographic results last summer. In these experiments X-rays were passed through crystals of various substances, notably zinc blende, and, in more recent experiments by Laue at Zurich,

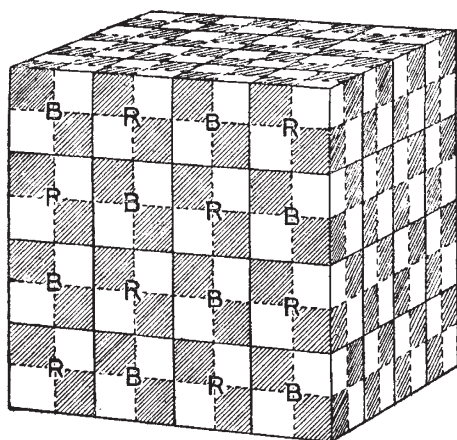


FIG. 6.—Scheme of tetrahedral arrangement of zinc (B) and sulphur (R) atoms in zinc blende. Unshaded cubes unoccupied.

quartz. The issuing rays were received on a photographic plate, on which they recorded a pattern of spots having the symmetry (full holohedral) of the space-lattice present as the foundation of the crystal structure. These interesting photographs thus afford the first experimental and visible proof of the truth of the structure assigned to crystals by geometers and crystallographers.

(To be continued.)

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

**BIRMINGHAM.**—At the annual Degree Congregation the degree of Doctor of Science was conferred on the following:—E. E. Fournier d'Albe, Hamilton McCombie, George William Todd, and Donald Levy. The occasion was also marked by the unveiling of a fine portrait of the Chancellor (the Right Hon. Joseph Chamberlain), the generous gift of Mrs. Chamberlain, "as a token of my own interest in all that concerns the University, and my earnest hope that future generations will see it develop into all that its founders dreamed of when it was established."

**EDINBURGH.**—The honorary degree of LL.D. was conferred on July 4 by the University on Mr. H. A. L. Fisher, Vice-Chancellor of the University of Sheffield; Emeritus Professor Greenfield; Sir James Guthrie; Lord Justice Hamilton; Mr. John Stewart, Nova Scotia; Prof. F. Strassmann, Berlin; Prof. J. Arthur Thomson; the Hon. James Wilson, Washington, U.S.A.; and (*in absentia*) Prof. Thomas Gilray, University of Otago, N.Z.

Prof. C. G. Barkla, F.R.S., professor of physics in the University of London (King's College), has been appointed to the vacant chair of Natural Philosophy, in succession to the late Prof. J. G. MacGregor.

PROF. J. W. JUDD, C.B., F.R.S., has been appointed emeritus professor of geology in the Imperial College of Science and Technology by the council of the college.

MR. ANDREW CARNEGIE has intimated to M. Liard, Vice-Rector of the University of Paris, that he will give 4000*l.* towards the construction of the new chemical institute which is being erected in the Rue Pierre-Curie, Paris.

DR. L. H. BAILEY, widely known as the chairman of President Roosevelt's commission on country life, has resigned the post of head of the New York State College of Agriculture, Cornell University, after a tenure of ten years. He has held the professorship of agriculture at Cornell since 1883. Dr. Bailey is resigning in order to secure more time for research.

AMONG recent Irish appointments we notice that Prof. Gregg Wilson, professor of zoology in Queen's University, Belfast, has been appointed a member of the first Senate of the University in succession to the late Prof. John Park. Mr. Edgar H. Harper has been appointed professor of mathematical physics in University College, Cork, and Mr. E. W. Hoare lecturer in veterinary hygiene in the same college.

RECENT changes at Johns Hopkins University include the promotion of Dr. J. E. Gilpin, now associate professor of chemistry, to be collegiate professor, and of Mr. E. W. Berry, now associate in palæobotany, to be associate professor of palæontology. Prof. D. S. Johnson is appointed to the directorship of the botanical laboratory and the botanical garden, and Prof. Burton E. Livingston to the directorship of the laboratory of plant physiology.

COLUMBIA UNIVERSITY and Rutgers College receive bequests which may amount to 200,000*l.* each as principal beneficiaries under the will of Mrs. Mary B. Pell, the widow of John H. Pell. *Science* states that each beneficiary received a direct bequest of 40,000*l.* and an interest in large trust funds amounting to more than 400,000*l.* The fund for Columbia is to erect Pell Hall, in memory of the late Mr. Pell, who was a student of Columbia. From the same source we learn that Princeton University has received 20,000*l.* from Mrs. Russell Sage toward the construction of a dining-hall; and that the College of Agriculture of Cornell University has received a State grant of 90,000*l.*, and a grant of 14,000*l.* for the veterinary college. A part of the additional grant this year is to be used for increasing salaries.

RECENT correspondence between the Maharaja of Darbhanga, who is at the head of the movement to create a Hindu University in India, and Sir Harcourt Butler, the education member of the Governor-General's Council, has, we learn from *The Times*, been published. The Maharaja points out that the subscriptions promised amount to more than 533,333*l.*, of which about 140,000*l.* has been received. Taking into account the capital value of certain grants of property and annual payments in perpetuity granted by three ruling chiefs, he estimates the amount in hand, or which may be safely taken as already in hand, to be not far short of 400,000*l.*, exclusive of the value of the Central Hindu College at Benares. He claims that a good case had been made out financially for the Government to take into consideration the legislation necessary for bringing the University into being. Sir Harcourt Butler has replied that the matter is still under consideration; but he thinks it will be of assistance to the promoters to know the conditions which the Government of India regards as precedent to the introduction of any scheme. These are the provision of a suitable site; the transfer of the Central Hindu College to the University; and the