

LETTERS TO THE EDITOR.

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Octopolarity and Valence.

Of the elements and their compounds there is a general property which is related to the peculiarities of their periodicity in a remarkable manner. This property is that of crystallisation, and in the isometric system is seen in its least complicated form. Among the conceivable causes which might act to produce the regular arrangement of particles evidenced in crystals, the view that considers the atom as having eight fields of polarity radiating from it, corresponding to the eight corners of a cube or the eight faces of an octahedron, agrees well with a wide range of facts. When an isometric crystal is heated and cooled under suitable conditions, polarity is developed in this manner. Four of the centres of polarity are positive and four are negative; the angle between the direction of like poles is $109^{\circ} 28'$.

Consider the bonds of chemical affinity or valence in the first two series of the elements. Helium, the first element of the periodic table proper, is devoid of affinity to combine; the valence of lithium, the first member of the first series, is one, of beryllium two, of boron three, and of carbon four. From stereochemical considerations it is believed that the four bonds of affinity in carbon are alike, and are disposed about the centre of the atom at angles of $109^{\circ} 28'$ apart, as are the four portions of the isometric crystal that have the same polarity. In the first four members of the series there is a regular increase of one bond of affinity to each succeeding element, and all are of the same character. In the next member, nitrogen, the valence is five, but one is of a different character, while four are alike in all respects as in compounds of the type NH_4Cl . Nitrogen forms compounds also on another type of valence, as in NH_3 , where it is trivalent. These three bonds of affinity are of the same character. Two bonds of opposite character, one positive and one negative, are rendered latent, a self-balanced pair. Oxygen, the next member, has only two active bonds and also latent pairs, but these are more difficult to render manifest than those of nitrogen. Fluorine has one active bond of affinity, and gives some evidence of possessing latent pairs also. The valence of neon, the last member of the series, is zero, being similar to helium. The next series of eight, Na, Mg, Al, Si, P, S, Cl, and A, corresponds perfectly in regard to the number of active bonds of affinity with the preceding series, while the latent pairs are more easily rendered manifest in combination, with the exception of argon, which has not been made to enter into chemical union. The series exhibits these valencies:—

Na_1	Mg_2	Al_3	Si_4	P_5	S_6	Cl_7	—
				P_3	S_4	Cl_5	—
					S_2	Cl_3	—
						Cl_1	—
						A_0	—

Thus the arrangement of the pyroelectric poles of an isometric crystal may serve to illustrate the changes of valence of the elements with increment of atomic weight. It would seem that when all eight polar faces have received the increment there is perfect balance, and the structure is no longer chemically active, as in helium, neon, and argon. Each of the first four members, Na, Mg, Al, and Si, has a definite valence which does not change, while P, S, and Cl have, beside the maximum valence, 1, 2, and 3 pairs respectively which can be rendered latent in pairs, as a positive field of force neutralising the effect of a negative field.

With this clue as to the nature of the increment of atomic weight, a conception of the structure of the atom can be formed which presents many remarkable and unexpected points of agreement with the system of the elements. If the increment of atomic weight or the principal factor of increment is due to addition of a ring, and no other structure

be found to adapt itself, the original atom form will consist of eight rings arranged like the eight circles inscribed on the faces of an octahedron. That rings will unite to form this as a structure of maximum stability will depend on their possessing the following properties. The material of the ring is a conductor of electric current, and a field of magnetic force permeates the space about the ring. The magnetic field on one side of the ring plane is of opposite polarity to that of the other side. The ring is elastic, and in vibrating would have a number of equidistant non-vibrating nodes about its circumference, separated by internodes of vibration. Briefly it is an elastic, current-bearing ring in rapid motion. After examining all conceivable combinations of this ring, it became apparent that the structure of maximum stability resulting from combination of these rings is that of eight rings arranged like the eight circles inscribed on the faces of an octahedron. The essential condition of stability is that contact of rings should be at non-vibrating nodes, otherwise the energy of vibration would drive them apart, also that the flow of electric current in contiguous rings should be in the same direction in each ring at the point of contact, otherwise there would be magnetic repulsion.

Rings may be added to the eight-ring structure in the order indicated above from study of the crystal and the change of valence in the series, and the stability of the structure retained or even increased. As the external arrangement remains the same, the first rings are forced inward, and as more are added the further in these first rings become, but they will not be strongly vibrating like the outer rings, and so can come in stable contact at any point of the circumference.

As there would very evidently be a limit to the number of series possible, a wire model was made of rings to determine this. When eighty rings were used, forming nine series of eight members each, after the original eight-ring form, no more rings could be added. The four innermost rings had come in contact and would go no further in, being arranged like the four circles inscribed on the faces of a tetrahedron. If a free ring was laid on the surface of the eighty-ring structure, it would be first attracted strongly by the magnetic field, and instead of being held in stable combination would be driven off by vibration of the internodes of the ring where it was laid. Such a structure would spontaneously lose rings, and these liberated rings, in accordance with their properties, would form the original eight-ring structure corresponding to helium.

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Botanical Nomenclature.

An event of considerable importance to botanists is the publication of a new code of botanical nomenclature, prepared by a commission appointed by the Botanical Club of the American Association for the Advancement of Science. This document, which has the approval of a large number of the leading botanists of America, appears in the *Bulletin* of the Torrey Botanical Club for May, being printed in three languages. The commission proposes to move in the Vienna Botanical Congress of 1905 that the code now offered be adopted bodily, and all other articles abandoned.

In these circumstances, it must be admitted that discussion is opportune. The authors state that they have found the Paris code of 1867 unsatisfactory, because "many important principles are either not recognised, or else given altogether too meagre consideration, and that there is a want of definite and exact statement, which leads to ambiguity." While there is very much in the new code to approve and admire, it seems to me that upon certain points these very words are exactly applicable to it. Without attempting to cover the whole ground, I desire to refer to a few special points.

(1) "Names published for primary subdivisions of species are treated as subspecific names, however designated by their authors." One example given is *Zizia aurea*, var. *Bebbii*, Coult. and Rose. No example is given of a plant designated a form, or of mutation; are these intended to be excluded? It seems evident that many plants designated varieties are not in any sense subspecies, and so to consider

them is improper. A nomenclatural technicality should not be allowed to obscure the facts.

(2) "A subspecies elevated to specific rank retains the same name, unless the resulting binomial has been previously published." However, *Juncus acuminatus robustus*, Engelm., 1868, though a valid species, does not become *Juncus robustus*, because of *Juncus robustus*, S. Wats., 1879. Further on, we read, "A specific or sub-specific name is a homonym when it has been published for another species under the same generic name. Two subspecies of the same genus shall not retain the same name." If two subspecies in a genus may not retain the same subspecific name, as I suppose is intended, though not clearly stated,¹ may a species and a subspecies do so? It appears logically to follow, though again it is not stated, that they may not. Hence in the above case of *Juncus*, the Watsonian *Juncus robustus* is invalid from the first, because of the Engelmanian subspecies, and there would result from the combination of these rules the dropping of the name "*robustus*" altogether, which seems absurd.

(3) "A generic or subgeneric name is a homonym when previously published, or proposed in print, for another genus." But we are not told whether the publication of a subgeneric name precludes its use in another sense for a genus, or whether when a subgenus is elevated to generic rank it is obligatory to use the subgeneric name, if it is not a homonym. These things are recognised by zoologists, and it does not seem proper for the botanists to ignore them in their code, and then do as they individually please.

(4) Names are considered identical when "mere variations in the spelling of the same word." This seems to me a dangerous rule, and illogical since it ignores the fact that names belong to the objects they designate, independent of derivation. By considering derivation, one can prove that crab and crayfish are "mere variations" of one word,² and most assuredly Theodore and Dorothy are one! The examples cited in the code expressly exclude differences of gender in generic names as valid distinctions, and while the specific names *Greenei* and *Greenii* (after Greene and Green) are admitted, we are not allowed *virginianus* and *virginiensis*. In this last case, I think a difference in the sense of the adjective may be detected, apart from its application to the plant. It is the same difference that is found between the statements that a man is English, and that he lives in England. One refers to quality, the other to place.

(5) Hybrids may be named like species, with the sign \times before, as \times *Salix caprea*. I should prefer to write *Salix* \times *caprea*. The naming of hybrids in this manner seems necessary, on account of the possible instability of the combination-names. Thus *Castilleja confusa* \times *acuminata*, Ckll., *Bot. Gazette*, April, 1900, p. 280, is better called *Castilleja* \times *Porterae* (a name I have long had in MS.), because the plant formerly known as *acuminata* is now called by a different name. T. D. A. COCKERELL.

Colorado Springs, Colorado, May 21.

The Formation of Coral Reefs.

SEEING (*NATURE*, April 21, p. 581) that this delicious bone of contention has once more been clawed from its resting place, I would beg editorial permission to join in discussing it.

That dead coral is soluble in warm seas is indisputable, but that solution in coral regions exceeds deposition is an issue to be tried not in a European laboratory, but on a coral reef. It is claimed that the lagoon of an atoll was excavated by solution, and that the matter removed was poured into the open sea through the reef channels. In opposition to this I reply that the central floor of a lagoon in process of excavation should present a bare surface of eroded rock like the basin excavated by a waterfall; but the middle of a lagoon floor has been shown by many observers, and especially by Mr. G. H. Halligan's boring, to consist of weed, mud, sand, and shingle. These are indications of an area of accumulation, not erosion. Let those who believe that the lagoon floor is dissolved away produce water from the seat of action heavily charged with solution!

Again, it is contended that the water flowing from the

¹ It is, however, clearly indicated by an example given.

² *Krebs*, *krebs*, *crab*; *krebis*, *ecrevisse*, *crayfish*, and *American*, *crawfish*!

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lagoon through the exit channels bears away in suspension and solution both matter excavated from the lagoon floor and matter washed by the waves into the lagoon. In denying that either is so drained away to any considerable extent, I would point out that water unarmed with sediment has no cutting power; but if the exit channels conveyed heavily charged water, the sand blast thus produced would cut to pieces every living thing in the passage. By my observations these passages are well carpeted with luxuriant life. To elucidate this important point the next biologist to report on coral fauna might be instructed to survey a main lagoon passage in detail.

If, as I maintain, the lagoon is an area of rapid accumulation from both growth and deposition, then, if no subsidence of the atoll occurs, the lagoon must in time be filled in. Every phase from a chain of islets to an atoll filled in solid is represented in the Pacific.

The destiny of every lake and pool on the earth's surface is to be obliterated by alluvium. It is here contended that the inevitable fate of a stationary atoll is the same, the only difference being that matter is poured from above into the terrestrial lake, whereas it is washed up from below into the atoll lagoon; but, as Darwin observed, while subsidence continues it will preserve to the atoll its lagoon.

CHARLES HEDLEY.

Australian Museum, Sydney, N.S.W., June 20.

The Traction of Carriages.

IN reference to a letter on the above subject in your issue of July 21, the draught of a vehicle depends largely, though not entirely, upon the ratio that exists between the distance from wheel to wheel and the height of the centre of gravity from the ground. If the wheels are far apart and the centre of gravity low, the carriage is hard to draw; if the wheels are closer or the load higher, the draught is lighter.

The reason for this fact may, I think, be readily seen by the following illustration:—Let us suppose a bicycle and rider, the centre of gravity four feet above the road, and vertically mid-way between the wheels. For the present purpose we will disregard the effect of springs and of speed. If the front wheel goes over a stone, say, two inches high, the centre of gravity, or load, is partly lifted vertically and partly thrown back over the hind wheel, describing, with relation to the machine, part of a circle having its centre at the point where the hind wheel touches the ground; and if the wheels are four feet apart, centre to centre, the load is raised about half an inch and moved backward to a much greater extent.

But we can imagine a bicycle of the same weight and having the same load with wheels, say, forty feet apart, and if this machine meets the same obstacle the load will be lifted nearly a full inch, the back-throw being scarcely perceptible; or, on the other hand, we may conceive of a bicycle with wheels four feet apart and the centre of gravity forty feet high, in which case the two-inch stone will scarcely lift the load at all, but only send it (dangerously, no doubt) back over the hind wheel.

Heavy draught depends upon, or is caused by, having to lift the centre of gravity rapidly, and may be lightened by easy springs, large wheels, putting the load high, or putting the wheels near together.

CECIL G. SAUNDERS.

Tower House, Canonbie Road, Forest Hill, S.E., July 25.

The Word Cingalese.

ON p. 131 of the current volume of *NATURE*, the expression "Cingalese fishes," and on p. 78 of the same volume the expression "Cingalese outlier" are found. The word Cingalese is also used in the "Cambridge Natural History" (Mollusca) to denote a subregion. In the first place the word should be spelt Sinhalese, the form above quoted being a quite incorrect transliteration. In the second place, the adjective corresponding to Ceylon is Ceylonese, the word Sinhalese meaning "of or belonging to the Sinhalese race."

Ceylon, July 6.

A. K. COOMARASWAMY.

Residual Affinity.

IF Mr. Pickering has imagined that fractions of a charge are necessary, and has not discriminated between fractions of a charge and fractions of a bond, it is not surprising that his contribution of thirteen years ago failed in impressive

OLIVER LODGE.