Natural phenomena form but links in endless chains of cause and effect. An evolution or expenditure of energy, such, for example, as that following a sun spot, produces a number of allied phenomena which are themselves the causes of subsequent phenomena, and these in turn the causes of still other phenomena, the chain extending in most instances far beyond our ken.

There has been unusual solar activity during 1892, as has been evidenced by an unusual number of sun spots. The great spot observed in Philadelphia and elsewhere in the early part of the year was one of the largest ever studied, and since that time numerous other abnormally large spots have appeared.

It would seem that these rather unusual outbursts of solar energy have produced the following terrestrial phenomena, viz.:—

(1.) The recent brilliant auroral displays.

(2.) Magnetic storms, or marked disturbances in the values of the magnetic intensity, in inclination and declination.

(3.) Unusually severe electric storms, as evidenced by the existence of abnormal earth currents. These electric storms are in reality connected with the magnetic storms.

(4.) Marked disturbances in the earth's meteorological phenomena. These have been evidenced by the long spells of unseasonable weather that have occurred so frequently in the United States during 1892, one of which was the recent unusally hot weather before alluded to, the unusual severity of which accords well with the unusual solar activity.

So, too, does the severity of the allied phenomena. Take, for example, the auroral displays, which have seldom been equalled in these latitudes for brilliancy. So also the electric-storms and magnetic-storms, which have been unusually severe during 1892. According to the observations of Mr. Finn and others, as many as eleven such storms were recorded during this time. Their dates were as follows: February 13, March 6, March 12, April 24, April 25, April 26, May 16, May 17, May 18, July 12, and July 16.

The storm of July 16 was unusually severe, and caused great disturbances on the various telegraph lines. The earth-currents were so strong that the lines could be operated entirely by means of earth-currents. This was done, for example, in the case of one of the lines between New York and Boston. On the same day, July 16, an enormous spot appeared on the sun.

And now for possible extra-terrestrial influences and phenomena. The recent opposition of Mars has brought that planet nearer the earth than she has been at any time since 1877, and nearer than she will ever be again until 1909. The opportunity has therefore been particularly good for studying those peculiarities of the surface that have always been of such interest to astronomers.

Some observations recently made on Mount Hamilton appear to show a marked decrease in the mass of snow within the polar caps, as is inferred from certain characteristic markings at these points of the planet. This disappearance is unusual, and would seem to indicate unusually hot weather in our sister planet. The Martian thermometer has probably been way up, and the weather has, to form a phrase from the fiery color of the planet, been at a red-heat.

We may add, therefore, another effect produced by the unusual sun-spot, viz., 5. The extra-terrestrial effects.

Of course the influence may be mutual. It may be that the unusual proximity of Mars may be the cause of the great number of spots, in which case we may thank Mars for the recent terrific heat.

"FLATHEAD" DEER.

IN the *American Naturalist* for August, 1887, were given some instances of the occurrence among deer of hornless specimens. Here we shall summarize these, preparatory to giving in full some original particulars furnished us by a German correspondent.

Lord Lovat is quoted as having seen *humle* (hornless) stags. They are able to thrash stags of their own or greater than their own weight. Several of them were undisputed masters of large herds.

Mr. Horatio Ross has also shot them. They are more frequent than generally supposed. They are no whit inferior to their horned brethren. A full-grown *humle* is very formidable in fight. During the rutting season Mr. Ross has seen one in possession of a large herd of hinds, who drove off all rivals.

Both these gentlemen's experience refers to Scotland. The following mentioned special cases refer to Germany. H. von Nathusius of Altaldensleben, Saxony, and Ludwig Beckman have supplied very interesting information which is well worth reading to those interested in venery.

These hornless deer occur wild, they write, and are very fertile and impressive. In the *Illustrirte Zeitung*, published in Leipzig (Oct. 2, 1886), there is a picture of a fight between a horned and a hornless stag, in which the hornless stag displays the mastery. Hornless stags have been mentioned in German sporting literature since the seventeenth century.

These are cases of what is regarded as variation, but which really appear to be referable to atavism, as will be immediately seen.

There are two species of deer that are normally destitute of horns as a characteristic. The first of these is the musk-deer; these have peculiarly long canine teeth. These (*Moschus moschiferous*) are natives of Thibet and Nepaul. The second is the water-deer, *Hydropetes inermis*. It is found in the marshes of the Yangtze, above Chin-kiang, China. The Chinese are strongly averse to the flesh, which Europeans, for want of better, pronounce tolerable.

Passing from living to extinct forms of deer, we find that, tracing them backwards, they become more and more simple as to horns, till reaching the lower miocene no member of the family is possessed of antlers. It will thus be admitted that the claim that instances of hornless deer of the present time are only cases of atavism, or reversion to the early condition of the head of the species, is simply the truth. Further, the above facts prove that horns are of the nature of acquired characters — a rather interesting fact just now to bring out in connection with the Wiesmannia that is raging.

The following is a translation of the communication we received from our German correspondent:—

"The hunter of the deer species has for long designated the deer which are destitute of antlers by the name of 'flat-heads,' or *mœnche*. On the skull of such deer appears a so-called *hornbase*, usually the real bearers of the antlers, remarkably stunted and entirely overgrown with the elongated hair of the forehead. The cause of such striking appearance is often held to be the long-continued inbreeding occurring in certain districts, or the lack of new blood obtained by bringing in deer not related.

"If we notice how the deer and roebucks which have been confined for domestication and freely fed with oats, rye, peas, corn, acorns, chestnuts, and beechnuts, often develop uncommonly large and branching antlers, it seems just to conclude that a lack of these and other means of nourishment hinders the growing of horns. In fact the so-called

'flatheads' are more particularly found in the pine-wood regions, where game is obliged to subsist solely upon heather forage (sweet broom), and where food is to be found only in occasional places.

"As transitory forms, there are also in such districts, in addition to the few flatheads found at all times, deer having one 'scurr' or stunted horn, while the other horn is well developed, bearing perhaps ten to twelve branches, and the majority of the rest of the deer have only small, smooth antlers of light color, some curiously bent or spirally twisted. Deer which instead of antlers bear a long, straight, spear-like horn on one side were formerly called 'provincial murderers,' as they were considered a very dangerous enemy of other deer during the rutting season, and on which account their destruction was sought.

"In the main, these so-called deformities, and even the total absence of antlers on the flatheads, can in no way be considered an indication of the lack of procreative power, nor can they be classed with the abnormal forms or the total loss of antlers, which results from injuries, and which reappear in their young. The flathead deer are seldom unequal in strength or weight to the others of the same age and the same district, but occasionally excel the latter in these respects. They also early enter the rutting season, and show themselves equally ready for the conflict. Their art and manner of fighting are singular enough; like the female, they rise up high on their hind feet, and with their fore-feet they, from above, mercilessly strike their antagonist. It is remarkable how the antler-bearing antagonist intuitively enters such conflict by rising on his hind feet, making no use of his terrible weapons. On such occasions the flathead, having developed superior skill in his movements, almost always puts to flight in a few rounds much larger deer with immense forked horns. Also at other seasons the contests may be observed in regions where the flatheads are found, and where at times a troop of such game is run together into a narrow space, as is the case occasionally during the preparations of a suspended hunt; yet those encounters are less fierce and soon ended, as they are brought on by the momentary invitations and accidental meeting of the deer in the press."

Have there been any cases of deer, bisons, etc., with 'flat' or hornless heads noticed in America? A.

SOME ANALOGIES BETWEEN MOLECULES AND CRYSTALS.

BY JOHN W. CALDWELL.

CHEMISTRY and crystallography are closely related branches; they are, indeed, but parts of one great whole. The special design of chemical laws is to present the methods and conditions of the re-arrangement of atoms, which re-arrangements we generally denominate chemical reactions. The laws of crystallography, on the other hand, primarily relate to the element of form. While the first series of laws concerns the arrangements of atoms, the second takes cognizance of the arrangements of molecules: while the one considers the influence of the chemical force of affinity, the other is concerned with the physical force of crystallization.

A consideration and comparison of the most important laws of the two series will develop, I think, a most interesting parallelism and correspondence. Thus, the first great law of chemistry is that of definite proportions, in which is stated the principle of the fixed and unchanging composition of every compound. It finds its satisfactory analogue in the crystallographic law of the constancy of the interfacial angles, first propounded by Steno in 1669, and re-enunciated by Romé de l'Isle in 1783. It affirms that for a certain crystal species, under conditions of absolute identity of chemical constitution and equality of temperature, the corresponding interfacial angles in different individuals will be found always to be equal and constant; and this holds in imperfect as well as perfect crystals. It is evident then, that what the law of definite proportions is, in regard to chemical constitution, the law of constancy of the interfacial angles is, in respect to crystalline form.

Another equally perfect and beautiful correspondency obtains between the law of multiple proportions and that of the rationality of the indices. The former emphasizes the simple multiple ratio of one element as it unites with some other element to form two or more compounds; whereas the latter, an important crystallographic law, attributed to Haüy, articulates the remarkable fact that the modifications of specific crystalline form always take place by a multiplication of one or more of the index values (or the reciprocals of these, the parameter values), by small and simple numbers or fractions, by rational and not by irrational quantities. The analogy here existing is easily appreciated: in the one case we have presented the method (namely, by simple multiple ratio) of the formation by weight of chemical compounds containing the same elements; in the other, the method, also by simple multiple ratio, by which is determined the modification of fundamental form of a crystalline species.

A third analogy is found in the comparison of the law of valency or equivalence in the chemical domain, and the law of replacement or substitution in the crystallographic. The first of these, of course, refers to the relation by weight in which the various elements react; potassium being exchanged for sodium in the proportion of 39 of the former to 23 of the latter; and, in like manner, chlorine (35.5) for bromine (80). The chemical type or idea is continued in such reactions, although one of the original constituents may have been substituted by another element. Correspondingly, the law of replacement allows the crystallographic type or idea to be continued, though by altered agents. Thus, the recognized substitution-power of magnesium and calcium allows, in compounds of the latter, a greater or less substitution of the former, without change of crystalline form; calcite and dolomite are both rhombohedral in crystallization, the angles of the two differing slightly.

A fourth analogy is expressed in the allotropisms and isomerisms of chemistry, and the dimorphisms and polymorphisms of crystallography. The allotropism of elements is probably to be explained upon the basis of different atomicities of the elemental molecule; but, however explained, like atoms are able in many cases to build up structures sometimes as variant in physical characters as are the diamond and ordinary charcoal, having chemical dispositions as different as common phosphorus and red phosphorus. Similar suggestions apply to the subject of isomerism. Now, to this, crystallography presents an analogue in the dimorphism so often to be seen in minerals; one and the same substance showing itself in nature in two (sometimes more) crystalline forms, i.e., belonging to distinct crystalline systems; take, as illustration, calcite (rhombohedral) and arragonite (orthorhombic). Here again diversity of form is set over against diversity of physical and chemical characters.

A fifth analogy (the last that I shall venture) bases upon