

There appears to be reason to believe that the color of the hair is due to an oily pigment, and that this is increased under the influence of Jaborandi.

Shaving the scalp usually has the effect of making the hair thicker and darker, on the contrary, as age advances and the processes of nutrition are enfeebled, the hair becomes thin and dry and whitens.

THE CONSTITUTION OF THE "ATOM" OF SCIENCE.*

By MRS. A. B. BLACKWELL, SOMERVILLE, N. J.

[Abstract.]

This paper developed the hypothesis that in each atom of matter a given quantity of force and extension are conditioned by each other to act in special modes, rigidly adjusted in time and space. All atoms react against many opposed and unlike forces simultaneously, hence each atom must be a highly complex (not compound), elastic structure, which, by its changes in space, gives the direction, extent, rate of vibration, and all modes and transformations of the atomic force.

We can explain this variety and change of action, if we suppose every atom to alternately expand and contract unlike filaments or poles that act and react in vibrations towards and from a common axis, which is at rest. No point outside this axis can be at rest, except when held in equilibrium by other atoms. Reaction is equal and opposite between every part of the atom, and between it and all other atoms. Chemical combination is the interlocking, the literal intertwisting of certain poles of the combining atoms. Such combination brings to rest, makes latent, the opposed combining poles, wholly or in part; the more completely this is done the greater the transformed motion called heat, and the more stable the compound.

In combining, the uniting poles are massed or knotted, as any intertwisting cords would be, and many-atomed molecules require no extra room for their vibrations; but all gases contain equal numbers of molecules to the volume. But the atomic axes are shifted to a common centre; and thus the vibrations of all the free poles are more or less modified, according to the number and kind of the combining factors; they are always so far modified that the molecules of any compound vapor cannot repel those of either of its constituents, nor those of any unlike vapor—the explanation being that the periods of greatest expansion, the stretch outwards in their free poles are not synchronous. In like molecules they are synchronous, and the free poles, striking at any point short of greatest expansion, drive the atoms asunder. We call them mutually repellant. The action of all repulsive forces will admit of similar explanation. Push or strain in one direction compels counter-push or strain in another direction; hence opposed electricities, magnetisms, and polarization in general.

Gravitation may be considered the concurrent result of brief intertwisting of the physical poles; cohesion and crystallogenic energy represent more permanent interlocking. But chemical and physical combination are supposed to be alike in kind—the result of opposed, adapted mechanical energy. Chemical action in general produces more radical changes in the sensible properties of substances, because, taking the initiative, it sifts the atomic axes, and subsequent combinations are but in accommodation to these previous changes.

The hypothesis attempts to give a fairly adequate explanation of material changes; of the *how* and *why* of such changes.

The unlike elements of matter are supposed to be conditioned in special groups, but are essentially of the same type, and their changes are all in time and space only. There is held to be a higher type of atoms in the living

sentient, or "mind matter" group, which we know only through their active organisms. In these atoms, force is conditioned both by extension and by intensiveness, and not in time and space alone—as with simple matter, but in time and space and sentience.

Possible changes in sentience, emotion, may be nascent in these atoms just as complex motion is nascent in all uncombined or but little combined atoms. Complexity of action in molecule and larger mass against which any atom must react in equal measure and opposite directions, compels complexity in the atomic reactions, and in the higher type of atoms one phase of all these reactions represents changes in sentience-sensations, thoughts, volitions.

Molecular complexity sufficient to excite a pleasurable degree of feeling would tend instinctively to repeat itself; hence the rise of organisms. The organism is the sentient atoms everchanging active molecule; and organic growth is adapted to the more and more complex sentient states. Decadence means failure in such adjustments. Sentient changes vary all the way between the low sentient state of profound sleep and the most alert phase of self-consciousness, but they are all individual or atomic changes. This hypothesis claims to offer an explanation of the joint facts both of matter and of mind.

BACTERIA AND THEIR RELATIONS TO PLANT CULTURE.

By THOMAS TAYLOR, MICROSCOPIST, OF THE DEPARTMENT OF AGRICULTURE.

If we examine, under a high power of the microscope a small portion of the scum of a fermenting infusion of vegetable matter, numerous particles of a globular shape will be observed, measuring about one twenty-thousandth of an inch in diameter, uniform in size and shape, highly refractive and frequently found in gelatinous masses. These are known as micrococci, or spherical bacteria. Associated with them is generally found another description of germs of the same diameter, but of a rod-like shape, jointed and of various lengths. In common vegetable fermenting infusions they are seldom observed over .003 of an inch in length, and are frequently under .001 of an inch. They have generally an active motion, as seen under a high power (as have also the micrococci), and are known as rod-bacteria (from bacterion, a staff). Botanists of the present day assign both of these organisms to the division algæ.

Many investigators believe that certain species of these organisms produce contagious fevers, but there certainly are other species which perform a most useful part in the economy of nature, and in many of our valued industries their active co-operation is absolutely necessary. It is well-known that they are the chief agents of fermentation and putrefaction, and it is to the decomposing power they thus exert, in conjunction with the action of the elements, that all organic bodies decay and restore to the earth soluble fertilizing salts, instead of the insoluble and therefore unavailable material of which, in their unchanged state, they are made up. There is high authority for stating that organic substances are not inherently unstable. Under suitable conditions they may remain for an indefinite period wholly unaltered. It is well-known that in some portions of the earth the carcasses of dead animals tend to dry up and become mummified. In the arctic region the remains of animals imbedded in ice are kept in perfect preservation for centuries. It is only under conditions more or less favorable to the existence and multiplication of the small organisms which produce fermentation and putrefaction that rapid decay takes place.

Without bacterian fermentation the compost heap of

* From the A. A. A. S., Cincinnati, 1881.