NEO-DARWINISM AND NEO-LAMARKISM.

By LESTER F. WARD.

Annual address of the President of the Biological Society of Washington delivered Jan. 24, 1891. A historical and critical review of modern scientific and philosophical thought relative to heredity, and especially to the problem of the transmission of acquired characters. The following are the several heads involved in the presentation of the Problem, Discussion Status of Darwinism, Acquired Characters, Theories of Heredity, Views of Mr. Galton, Teachers of Professors Weissmann, A Critique of Weissmann, Neo-Darwinism, Neo-Lamarckism, the American "School" Application to the Human Race. In so far as views are expressed they are in the main in line with the general current of American thought, and opposed to the extreme views of the non-transmissibility of acquired characters.

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As the electrical energy involved manifests itself on the surface of conductors, the rod should be metallic; but it must be of considerable size, also. Without suppose that we make it comparatively small in size, so that the total amount of metal running from the top of the cap to the bottom of the foundation shall not exceed one pound. Suppose, again, that we introduce a number of insulating joints in this rod. The result of such a rod is that experience shows will be readily destroyed — will be readily dissipated — when a discharge takes place; and it will be evident, that, so far as the electrical energy is concerned in doing this, there will be the less to do other damage.

The only point that remains to be proved as to the utility of such a rod is to show that the dissipation of such a conductor does not tend to injure other bodies in its immediate vicinity. On this point I can only say that I have found no case where such a conductor (for instance, a bell wire) has been dissipated against a building, where there has been any material damage done to surrounding objects.

A Typical Case of the Action of a Small Conductor.

Franklin, in a letter to Collins read before the London Royal Society, Dec. 18, 1755, describing the partial destruction by lightning of a church-tower at Bowbury, Mass., writes, "Near the bell was fixed an iron hammer to strike the hours; and from the top of the hammer a wire went down through a small gimlet-hole in the floor of the bell stood upon, and through a second floor to a small plate, which hung by a wire to a clock, which stood about twenty feet below the bell. The wire was a small bell wire, and at the years was split off to pieces by the lightning, and the parts flung in all directions over the square in which the church stood, so that nothing remained above the bell. The lightning passed between the hammer and the clock in the above-mentioned wire, without hurting either of the doors, or doing any effect, much less than the lightning that took place just as the gunpowder burned when spread on a board. The objects against which the storm was directed at the time were not dissipated. I should therefore make clear this distinction between the action of electrical energy when dissipated, and the force of electricity, as manifest when acting by contact, as in the lightning that dissipated our bell, so as to be impressed on the surface of a comparatively small or equally dissipated conductor. Then the lightning, which dissipated on the surface of a comparatively small conductor, and only a small conductor, is to be understood as to resist the expulsive effect, — damage results to objects around. When dissipated on the surface of a small conductor, the conductor goes, but the other objects around are saved.

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What is the Problem?

In seeking a means of protection from lightning-discharges, we have in view to avoid the prevention of property, and the other prevention of injury to life. In order to destroy a building in whole or in part, the work would be done; that is, physicians express it, energy is required. Just before the lightning-discharge takes place, the energy is not dissipated very; but it is capable of being dissipated, for what we call electricity. We will therefore discuss the dissipation of electrical energy. What the electrical energy is, is not necessary for us to do, inasmuch as the subject is so large and difficult, as to make it impossible for us to discuss it in its proper place.

Why have the Old Rods Failed?

When lightning-rod were first proposed, the science of energetics was entirely undeveloped; that is to say, in the middle of the last century scientists had not come to recognize the fact that the different forms of energy — heat, electricity, mechanical power, etc. were convertible into each other, and that each could produce just so much of each of the other forms, and no more. The doctrine of the conservation and correlation of energy was first clearly worded in the early part of this century. There were, however, some facts known in regard to electricity a hundred and forty years ago; and among these were the attracting properties of points for electrical spark, and the conducting properties of metals. Lightning-rod were therefore introduced with the help of this knowledge, and by means of the lightning-rod the current was conveyed around the building which it was proposed to protect, and that the building would be saved.

The question as to the dissipation of the energy involved was entirely ignored, until we came to the time when the endeavors of those interested, lightning-rod constructed in accordance with Franklin's principle have not furnished satisfactory protection. The reason for this is apparent when it is considered that the electrical energy existing in the atmosphere before the discharge takes place is that amount of electric energy contained in the space from our earth to the earth, above referred to, reaches its maximum value on the surface of the conductors that chance to be within the column of electricity; that the greatest display of energy will be on the surface of the very lightning-rod, and that we are not, in so many ways, so well suited to do the work.

But it should be understood, of course, that this display of energy on the surface of the old lightning-rod is abated by their being more or less insulated from the earth, or by the earth's own properties of insulation, so that old lightning-rod can only tend to produce a dissipation of electrical energy upon its surface, "to draw the lightning," as it is so commonly put.

Is there a Better Means of Protection?

Having cleared our minds, therefore, of any idea of conducting electricity, and keeping clearly in view the fact that in providing against lightning we must furnish some means by which the electrical energy may be handled, we ask: "But, the question arises, is there, then, some improved form to be given to the rod, so that it shall all in this dissipation?"

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