SCIENCE

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N Y.

TIME WASTED.

To what extent are men of science responsible for the credulity which everywhere prevails in reference to all matters relating to scientific discovery or accomplishment? This question is not to be lightly set aside, for the existing condition may well create alarm among all who seriously consider the welfare of science, of scientific men and of the people generally. Several causes have conspired to bring about this condition, two or three of which may be mentioned. To begin with, during the century which is now approaching its end scientific discoveries and their applications have been so numerous and so far reaching as to practically revolutionize conditions of material existence, and they have often been so wonderful in character that it ought not to excite surprise to find intelligent people ready to accept without question announcements of inventions and discoveries of the most improbable and absurd character. Along this line the evil influence of a sensational press is enormous. It was bad enough ten years ago, but it has been greatly magnified by the recent and, on the whole, unfortunate cheapening of processes of illustration to the seductions of which nearly every news-

paper in the land has yielded. To this has been added the newspaper 'syndicate,' by which men who know really nothing of science are employed to furnish sensational articles on scientific discovery, illustrated by sensational pictures, all of which is the more injurious because often founded upon a slender, microscopic tissue of fact. Unfortunately, some men who may be said to inhabit the fringe of genuine scientific activity lend themselves to this sort of thing and are made much of accordingly. Whole pages of this modern journalism are filled with accounts of discoveries that *are going to be made*, for writers of this class are shrewd in taking advantage of the fact that human interest and human memory are now practically restricted to about twenty-four hours in time. The publication of a broadside describing an alleged improvement of the telescope or microscope, in which there is absolutely nothing new that is true or true that is new, adorned with a series of cuts largely imaginary and many of which have no relation to the subject-matter, has served the purpose intended when its author has received his pay from the 'syndicate' and when the syndicate has scored a triumph in what in these days is called 'enterprise.' Even the most conservative among men of science are made to appear as willing purveyors of sensationalism by what ought to be looked upon as an unwarranted and illegitimate use of the results of carefully conducted investigations, often before such results have received final consideration and approval at their own hands.

If *all* impressions made by this false popularization of science were to disappear in twenty-four hours the evil would be greatly lessened, but unfortunately there are many very intelligent and thoughtful people, who ought to constitute the best support of scientific work, upon whom they are more lasting. To such the line separating the genuine accomplishments of honest scholarship from the output of sensationalism, which ought to be clear and sharp, is becoming very nebulous, and there is imminent danger of a revolt against the whole thing. The extent to which credulity has been carried was beautifully illustrated not long ago when a widely known scientific man amused himself and many friends by caricaturing, in the columns of one of our standard scientific journals, some of the phases of modern psycho-physics. So perfectly did the burlesque reflect the form and substance of some recent contributions to that science that it was immediately accepted as serious by the large majority of readers.

This suggestion leads us by easy descent, or ascent, to that large and growing region of pseudo-science, the cultivators of which are, for the most part, themselves honest. For the most part, I say, for it is difficult to believe that all of the persistent advocates of unadulterated nonsense are seriously in earnest. Honest or dishonest, they usually come upon us in much the same way and nearly always find converts in sufficient numbers to enable them to press their fallacious theories upon the public attention. Their appearance is generally sudden and unexpected, and although they have never been heard of in scientific circles before; although they have never done even a small bit of work which might entitle

them to a hearing, they generally begin with some, to them, trifling performance, such as upsetting the law of gravitation or disproving the rotundity of the earth. Such work ought to be harmless, but unfortunately it is not always so. A monthly journal published at the seat of one of our largest universities, not bearing the imprint of the university, however, devotes a large proportion of its space to the exploitation of the belief that the surface of the earth is concave and not convex, presenting in evidence experimental details and results which, if true, would be startling. Such publications as this demand and receive no further attention than the occasional filing away of a copy as a curiosity. Nevertheless, it calls itself a *Scientific Monthly* and 'the greatest scientific paper in America.'

Occasionally books, more dignified in character and appearance but equally unsound in doctrine, are issued, with the imprint of publishers of established reputation, and which seem, therefore, to require more serious consideration. Of this class, is a recent volume bearing the not inappropriate title 'Some Unrecognized Laws of Nature,' the authors being Ignatius Linger and Lewis H. Berens. It is a large, handsomely gotten-up octavo of over five hundred pages and its substitute is 'An Inquiry into the Causes of Physical Phenomena with Special Reference to Gravitation.' The largeness of the subject makes the reader a bit suspicious to start with, and this feeling is considerably enhanced by the first sentence in the preface, which is as follows: "At last, after years of patient plodding in dim regions, where the footprints are few and the pitfalls many, the time has arrived when we are enabled to place before the world of science the first fruits of our exploration." A book with such a beginning means either a great deal or nothing at all, and in the present instance a brief examination of its contents suffices to show that the only message which it brings is the too common one of well-meaning men attempting to explain what they do not themselves understand and to overturn well-established principles of a science of which they appear to be quite ignorant, by the use of arguments and data the soundness of which they are utterly incapable of judging. It is really a rather ostentatious attempt to explain the fundamentals of physical science by men who seem to lack all training in methods of physical research; who show gross ignorance of the latest results of physical investigation, and who are, therefore, totally unfit for the task which they have undertaken. A few citations and examples of their methods and conclusions will furnish sufficient defense for this statement.

They declare that the four great fundamental and universal laws of matter are '*persistence, resistance, reciprocity and equalization*, each one of which,' they say, 'can be seen at work in every single phenomenon within our reach.' Their attack upon the Newtonian law of gravitation consists of the assertion that attraction is not proportional to mass, and this side by side with the equally emphasized assertion that the term 'mass' conveys no distinct idea and that we have really no notion of what it means. This, of course, is mere play, and would be unworthy of comment if it were

not followed by the declaration that the *weight* of a body can be and is changed without changing its mass, some curious experimental evidence being furnished to prove this. The conservation and dissipation of energy are denied and the splendid researches of Kelvin and Joule are overhauled and denounced by critics who declare that "Pressure is 'work' and so is motion." It is declared that Joule could not have obtained the same result for the mechanical equivalent of heat had he used mercury instead of water, and still less had he used friction on copper, iron, glass or wood, even though the 'work' expended were the same. Here the authors seem to be troubled by some sort of a notion of specific heat, and throughout the whole discussion the reasonably well-informed reader cannot fail to be astonished at the unparalleled density of honest ignorance. Their own idea of heat is that it is 'merely a state or quality of bodies, which can be augmented or diminished, and which is due to the states of coercion, *i. e.*, when bodies are prevented from satisfying their natural tendencies.' Their right to speak authoritatively on this subject is further exemplified in the remark that in the case of a falling body "the amount of heat generated will vary as the bodies striking against each other are harder. A quantity of water or mercury falling from a certain height would not generate as much heat as would a like quantity of, say, steel falling from an equal height." Some notions about electricity are reflected in the statement that thin wires offer less resistance than thick wires of the same material, and the further statement, not altogether consistent with this, that the resistance of six pounds of copper would be the same, whether only a yard in length or a mile; also in the statement that the "air between two poles of an electro-magnet can be excited sufficiently to be felt as a viscous fluid when a piece of metal is passed to and fro between the poles."

The extension of some of these unrecognized laws into the domain of astronomy affords the authors ample opportunity for the display of their peculiar logic. In the case of the earth the whole thing is very simple. Its axial motion is due to relative states of excitation of its two hemispheres divided meridianally; the motion of the vanes of a radiometer and of plants turning to the sun is sufficient evidence of this. Its change of seasons is due to a reciprocating motion originating in the relative states of excitation of the two hemispheres, divided equatorially, and its varying distance from the sun is another reciprocating motion due to variations in the aggregate state of excitation of the whole mass. The revolution of the earth about the sun is a simple phenomenon, due to the rolling of one sphere upon the circumference of another, the necessary assumption that the real diameter of the whole earth must be over 500,000 miles being no obstacle to the acceptance of so beautiful a hypothesis.

It is, perhaps, in their review of the Newtonian law of gravitation that the authors reach a maximum in their phenomenal incapacity for an intelligent discussion of the subject. They assume to disprove that law by asserting that according to it the attraction at the equator ought to be greater than

at the poles ; they try to support this assertion by reference to what they call 'another phenomenon, namely, that bodies taken down mines weigh less than when on the surface,' which is not true, as they could have known by even a brief study of gravity before undertaking to upset its accepted principles. They positively declare that two pendulums of different material made to agree in period of vibration at one point on the surface of the earth would *not* agree if carried to others, and, what is more extraordinary, they even suggest this as an *experimentum crucis* by which their theory may be tested. They are blissfully ignorant of the fact that this experiment has been tried many times in many parts of the world and that it has always gone against them, as in the nature of things it must.

It may now well be asked, is time so plenty, is other occupation so scarce and are the columns of SCIENCE so little in demand as to justify so much attention as this book has already received? Perhaps time and space are wasted, but some justification may be found in a few facts, one of which has already been alluded to—the book bears the stamp of a publishing house of the highest character and it has received lengthy and, on the whole, complimentary notice in recognized scientific journals. There is about it something of an air of scholarship calculated to impress and in some degree impose upon those who may be unable to detect its fallacies. There is considerable internal evidence to show that its authors are much more at home with metaphysics than with physics, although this may not be admitted by our brethren of that ilk. Finally, it is perhaps well to make an opportunity for emphasizing the fact that no man has a right to undertake such a discussion as this book pretends to be until he has qualified himself by an exhaustive study of the principles which he proposes to attack. No man has a right to ask the ear of men of science or of an intelligent public on matters relating to science until he has demonstrated his own ability to understand and conduct a scientific investigation, by the presentation of actual, approved work. At first blush it would seem that these men are entitled to pity and sympathy rather than harsh criticism. They richly deserve both, and especially the latter, when their pages abound in the statement that men of science are so restrained by tradition and authority that they do not expect them to receive anything new with favor. This is an old, worn-out plea and utterly inapplicable at the present time. Students of science were never so willing as now to give attention to new theories, however revolutionary they may be, and they do not always insist that they should be immediately supported by facts, provided they emanate from one whose recognized accomplishments are such as to give reasonable assurance that he knows what he is talking about. If the authors of 'Some Unrecognized Laws of Nature' will now spend as much time as they have already spent in making the book in a serious attempt to study and understand some of the recognized elementary principles of physical science, the twentieth century may listen to them, if by that time they have anything to say.

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