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LAZELLE'S "ONE LAW IN NATURE"

One Law in Nature: A New Corpuscular Theory, comprehending Unity of Force, Identity of Matter, and its Multiple Atom Constitution, applied to the Physical Affections or Modes of Energy.

By Capt. H. M. Lazelle, U.S. Army. New York: D. Van Nostrand.

CSP, identification: Haskell, *Index to* The Nation. See also: Burks, *Bibliography*; *List of Articles*.

We cannot speak of Captain Lazelle's 'One Law in Nature' with much respect. Though it does not betray the dense ignorance which many pretentious theories of the universe do, we cannot say that it has any value as a contribution to natural philosophy. We may defend this judgment by two citations. On page 17 we read:

"Though tractive effort between masses of matter, without an intervening medium, cannot be understood, and though the mode of this invisible sympathy is as incomprehensible as is its nature, yet its existence is undeniable."

Now, in point of fact, there is nothing to determine whether gravitation acts through a medium or directly at a distance. All that we know is this: if it is propagated through a medium from one part to another adjacent to it, this process must, according to all analogy, occupy time. But, on the other hand, if there is no medium, the action cannot take time without violating the law of the conservation of energy—a law which, if it is not known positively to hold in such a case, may reasonably be supposed to do so. Now, Laplace has shown that, if the action is propagated through a medium, its velocity is, at least, many million times that of light and that there is no reason for abandoning the simpler supposition that gravitation acts instantaneously. But Captain Lazelle's notion that any simple and obvious facts disprove the existence of a medium has no foundation.

The second citation shall be from page 19:

"Though this force (gravitation) may extend through space independently of matter, yet it cannot be said to do so instantaneously; as successive positions must be occupied in successive increments of time."

These two opinions, that gravitation acts without a medium, and yet that it takes time to act, do not harmonize. But observe the reasoning: Gravitation cannot act instantaneously because successive positions must be occupied in successive times! But what if these positions are not successive? Cannot there be attraction at different points at once? Physicists are perfectly ready to examine general theories of the forces of nature, notwithstanding the fact that there is not a single instance of such a theory (imagined, and not derived by induction) which has finally taken a place among established truths. For example, the undulatory theory of light is proved up to a certain point, namely, that light consists of some sort of vibration transverse to its direction of propagation. This is a

result of induction. But no attempts to go further and imagine of what sort this vibration is, though the greatest mathematicians have made them, have met with such success as to be admitted to a place among established truths. Yet physicists always look upon such attempts to represent the mechanism of natural forces with favor; but they demand that they shall be developed with mathematical precision, and be shown to express known laws with mathematical accuracy. This Captain Lazelle has not done.

All physicists believe that everything in the outward world may be expressed in terms of mass, of space, and of time. The redness of a rose as it exists in the mind which sees it, is what it appears to be; but as it exists in the rose itself, it is only the fact that the particles vibrate in a certain time. This time may be expressed as a number. And in a similar way, no doubt, every property of any body might, if we only knew how to do it, be expressed numerically in terms of the pound, the yard, and the second. Of these physical constants (or numbers expressing properties) almost all are either peculiar to some particular thing (such as the dimensions of the earth) or to some kind of substance (such as the atomic weight of hydrogen). In the whole range of physics, we can expect to find no others and know of no others, except only two: first, the amount that one gramme attracts another gramme placed at a distance of a metre, which is 0.00000000000006 metre cubes per gram-(second)^2, and the velocity of light, which is 300000000 metres per second.

By choosing the appropriate relation between our units of mass, space, and time, we can give these constants any numerical values we please. For example, we might make them both unity. But if we had a third universal constant, we could not make all three unity, at least without determining the absolute value of our fundamental units. Now it may be considered reasonable to suppose that considerations relating to the general laws of nature should lead us to adopt a certain ratio between our units. We have an example of this in the measure of lengths in different directions. A length north and south, a length east and west, and a length up and down, are three quantities as incomparable with one another as a time and a weight. We may therefore take a mile north and south as our unit of length in that direction, and an inch east and west as our unit of length in that direction, and, since these units cannot be compared, they are unequal only in the sense in which a day and a pound are unequal. But now, it is a great law of nature (our familiarity with which must not be allowed to breed contempt) that bodies may be turned from one direction to another, and that when a body is so turned without being subjected to any strain, the numerical value of its length north and south bears a certain constant ratio to the numerical value of its length east and west. This ratio necessarily depends on the relative magnitude of the units of length in different directions, and this fact has naturally led us to assume these units, so as to reduce this ratio to unity. If there is only one law in nature, it is this law of the rotation of bodies, and if this is the only one there is, times and masses are in no way subject to law. A natural force is in fact nothing but a general relation connecting measures of different quantities. We must, therefore, suppose at least two forces to establish relations of mass and of time to space.

These are the two forces whose constants are the absolute modules of gravitation and the velocity of light. But our whole conception of the universe, and therefore our whole experience, are opposed to there being another general relation, for such a one could only exist by establishing absolute values of our units. Now, it is not to be believed that general considerations in regard to the nature of things could ever lead us to assign a particular numerical value to the measure of any particular thing, such as our standard measure. We have, therefore, reason to believe that while we doubtless are ignorant of the precise form of the fundamental principles of nature, we at least are not mistaken as to their number.

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Popular Astronomy.

By Simon Newcomb, LL D., Professor U.S. Naval Observatory. (New York: Harper & Bros.)

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Simon Newcomb (1835-1909) received his B.S. from Harvard in 1858, and assumed the position of professor of mathematics with the U.S. Navy. His first station was the Naval Observatory in Washington, D.C. He became the senior professor of mathematics in the Navy in 1877, and was appointed superintendent of the "American Ephemeris and Nautical Almanac." From 1884 until 1893 Newcomb was professor of mathematics at The Johns Hopkins University. He was not only a mathematician, but also an astronomer of international reputation, having been associated with several American observatories. While at Johns Hopkins, Newcomb was the editor of the *American Journal of Mathematics*. He was author of numerous books on astronomy and mathematics, member of the National Academy of Science (vice-president, 1883-1889), president of the American Academy for the Advancement of Science, 1877-1878, and president of the American Society for Psychical Research.

—The public naturally like to hear what a man who has recently distinguished himself has to tell them about his specialty; and astronomers will be glad to have a collection of Professor Newcomb's highly competent opinions in regard to various questions of astronomy. This book will not, however, fascinate the general reader. The style in which it is written suggests that it may have been first composed for a school text-book, and afterwards worked over for popular reading. In Part I. an attempt is made to teach the first elements of astronomy in their historical development; a very good idea, well worthy of a fuller working out. Part II. is entitled "Practical Astronomy," not certainly because it teaches anything practically, but because it supplies information concerning telescopes and the work which is done with them. Part III. describes the solar system, and Part IV. the stellar universe.