

Scientific American.

ESTABLISHED 1846.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 87 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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Subscriptions received and single copies of either paper sold by all the news agents.

VOLUME XXXV., No. 16. [NEW SERIES.] Thirty-first Year.

NEW YORK, SATURDAY, OCTOBER 14, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as African International exposition, Air pump, Alcohol, liquors, etc., and their corresponding page numbers.

THE SCIENTIFIC AMERICAN SUPPLEMENT.

Vol. II., No. 42.

For the Week ending October 14, 1876.

TABLE OF CONTENTS.

Table listing sections I through VI, including International Exhibition of 1876, Engineering and Mechanics, Technology, Electricity, Sound, etc., and their sub-topics.

The Scientific American Supplement

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WHAT IS MATERIALISM?

Those advanced scientists of the present day who have abandoned the old and easy way of explaining every obscure physical phenomenon by asserting a supernatural cause (such as vital force in the organic kingdom, or a separate creation for each species of plant or animal) are denominated "materialists" by the adherents of the supernatural or spiritual. Those who use this word so profusely confound, however, two very different things, which have nothing in common, namely, the scientific materialism and the immoral materialism. The scientific materialist maintains that all the phenomena we see on our earth take place by natural means, that every effect has its cause, and that every cause will produce its effect. In his view, law regulates the sum total of all physical phenomena, which depend on the necessary relations of cause and effect. He rejects, therefore, most emphatically, the belief in miraculous interferences, and every conception, of whatever form, based on a belief in the so-called supernatural. In his view, there do not exist, anywhere in the whole range of human cognition, real metaphysics, but everywhere only natural physics. For him, the inseparable connection of matter, form, and force is self-evident. This scientific materialism has long since been accepted in the realm of the inorganic natural sciences, physics, chemistry, mineralogy, geology; and no one, however poorly educated, has now the least doubt in regard to the correctness of basing these sciences on such materialism. Only savages believe now in the spirit of a cataract or of a storm, some supernatural power which presides over such phenomena; and this can arise but from utter ignorance of the whole system of natural laws, by which we are able to explain the existence of cataracts and storms: and not only this, but we can at present, thanks to our materialistic system of research, even predict the appearance of a storm, so as to guard against its disastrous effects.

This ignorance of the natural laws on which the development of the organic kingdom is based—which laws form the science called biology—is the cause that this department of Science has hitherto been generally looked upon as beyond all laws, and dependent upon supernatural agencies. Hence came the invention of the metaphysical spook "vital force," a mere theological dogma. If, however, we can now prove that all Nature, as far as subject to human cognition, is a unit, and that the same eternal, stern, and grand laws prevail in the life of animals and plants as in the growth of crystals or in the power of steam, we shall reach the same natural and mechanical standpoint in all the realms of biology, zoölogy, and botany, no matter whether we are suspected of materialism or not. In this sense, the whole realm of the positive natural sciences, and the fundamental laws of causes and effects, are pure "materialism."

A very different thing from this scientific materialism, however, is the immoral materialism, which, as we have stated, has nothing in common with the other, except its name. This materialism, in its influence on practical life, leads to nothing but material enjoyment and the indulgence of sensual passions. It lives under the sad illusion that indulgence to mere natural pleasures can give satisfaction to man; and under this illusion, it drives its votaries from one indulgence to another, while rest and peace are never reached. It is a grand and profound truth that the proper value of life does not reside in material enjoyment, but in moral acts, and that true happiness cannot be found in exterior appearance, but in virtuous conduct: this is, however, unknown to the votaries of the immoral materialism. For this reason, such a materialism cannot be found among the investigators of Nature; and philosophers, whose highest pleasure is the intellectual enjoyment of Nature's laws. This immoral materialism was found especially among the religious pretenders of the middle ages, who, under the mask of a pious exterior, aimed at nothing but an hierarchical tyranny and a material exploitation of the possessions earned by the labors of their fellow men. Blind to the supreme nobility of what they called, and what their successors still call, "common matter," and to the magnificent phenomena produced thereby, as well as to the inexhaustible charms of Nature, and without any knowledge of her laws, they treated the whole field of natural science and all the civilization derived therefrom as an heretical and sinful materialism: while they themselves practised immoral materialism in its most abhorrent forms. To avoid confounding such immoral materialism with the scientific materialism, Haeckel proposes to call the latter "monism," or (with Kant) "the principle of mechanism," without which, Kant declares, there can exist no science of Nature; and this principle lays at the base of the theory of evolution, and distinguishes it forcibly from the theologic belief in miracles, or in a series of separate and supernatural acts of creation.

INFUSORIAL EARTH AND ITS USES.

It is one of the paradoxes of Nature that the smallest creatures contribute most to the structure of the earth. The higher forms of life are barely traceable in the rocky strata; the lowest make up the bulk of vast formations, thousands of miles in area, thousands of feet in depth. The gigantic labors of the minute but multitudinous coral polyps are proverbial: but these are surpassed by the remains of still more microscopic creatures which swarm in all waters, arctic as well as tropical, fresh as well as salt, and whose cast-off shells fall like a ceaseless rain of solid matter on every part of the ocean's bed, on the beds of every inland sea and lake, every river, and marsh, and roadside pool. And minute though they be, the bulk of matter they contribute to the earth's strata every year is quite incalculable. The celebrated microscopist Ehrenberg, the first to realize their im-

portance, estimated that in the single harbor of Wismar, in the Baltic Sea, as much as eighteen thousand cubic feet of these silicious organisms accumulated annually. The deep sea explorers of the Challenger expedition found them everywhere above the depth of two thousand fathoms; and below that their insoluble remnants made up thousands of square units of "red clay" deposits, apparently the stuff from which the azoic bases of the continents were formed. The limestones and chalks derived from calcareous infusoria are still more abundant and important: and by no means insignificant are the unconsolidated silicious strata of modern origin, to which the name infusorial earth has been applied. The stratum at Bilin in Bohemia, in which Ehrenberg found the enormous number of forty thousand millions of individuals to the square inch, is eighteen feet thick, and extends over a large area. At Lünenberg is another deposit, nearly twenty-eight feet thick; and less important strata are found in other parts of Germany and throughout Europe. In Lapland and Sweden it constitutes the well known "mountain meal," used to swell the bulk of certain foods. Many deposits of considerable magnitude are known in England, and the Irish beds are celebrated, especially those of the county of Down. Africa for a long time monopolized the supply for use in the arts, and furnished the familiar name Tripoli. The material is now abundantly supplied by other parts of the African continent, by Asia, Australia, New Zealand, South America, our own country—indeed every part of the world. In South America, the natives count it in some parts an essential portion of their diet, using it as food mixed with fat. Along the Amazon, beds of this useful earth are numerous; and since the organisms which produce it are universally distributed, the deposits of it will doubtless be found more or less abundant everywhere when sought for. Such at any rate appears to be the case in this country. The extensive deposit at Drakeville, N. J., which so conveniently supplies a demand originally met by material imported from Germany, for the manufacture of dynamite, is a case in point. Perhaps the most extensive deposit in this country is the one underlying the city of Richmond, Va., a deposit which Professor Rogers traced from a point on Chesapeake Bay, in Maryland, to beyond Petersburg, Va., where it is thirty feet thick. Beds of similar character have been found in California, Oregon, and elsewhere on the Pacific Coast; and smaller deposits occur at West Point, at Wrentham and Andover, Mass., and in Connecticut and Rhode Island.

Infusorial earth, or tripoli, is best known as a polishing powder for gold, silver, etc., for which purpose it has no rival. Mention has already been made of its use in the manufacture of blasting powders, in which it serves the useful purpose of holding the explosive nitroglycerin. But these will ultimately be counted among the least of its uses. Already it plays an important part in the manufacture of cements and artificial stones, especially in Ransome's process. Combined with carbonate of magnesia, it forms the excellent cement known in Germany as albolite. With borate of lime, it forms a valuable glazing for furnaces, pottery, etc., and is found very useful as an enamel for iron and slate. Fused with borate of magnesia, it forms a beautiful and durable porcelain which can be cast and even blown like glass. A multitude of minor uses have been suggested, and many more will no doubt follow as our artisans become acquainted with its properties. Its lightness, indestructibility by fire, and slowness of heat conduction are qualities of very great value. Bricks of it, with a little clay, are nearly as strong as common bricks, yet so light as to float on water. At the same time they are infusible, and such poor conductors of heat that they may be held at one end while the other is heated to redness. As an experiment, an Italian engineer constructed the powder magazine of a wooden vessel with such bricks, and when set on fire the vessel burned till she sank, without exploding the powder. The lightness of such fireproof bricks makes them specially valuable for such uses. They have also been used to advantage in the construction of reverberatory furnaces, pyrometers, etc. The heat-resisting quality of infusorial earth makes it not less useful as a protection to ice bins, ale cellars, etc., and as a lining for fireproof safes and the like, for which purposes it is rivaled only by asbestos. Agriculture furnishes another promising field for the use of infusorial earth. Professor Wilson, who has the honor of discovering the use made of this form of silica by plants, pronounces the application of it to fertilizing purposes the most important adaptation of matter for the reproduction of vegetation that has ever been discovered. There can be no question of the importance of such assimilable silica to soils like those of Bermuda, where the silicious element is nearly if not entirely wanting.

THE HELL GATE BLAST.

The result of the great blast at Hell Gate, or Newton's Channel, as the locality is now termed in honor of the successful engineer, is in every way satisfactory. The rock has been shattered much more than was expected, and the work of dredging is consequently greatly lessened. Soundings are still in progress, and divers are at work surveying the bottom and locating the larger fragments of rock. Vessels drawing 18 feet of water and over cannot pass within 300 feet of the shore; at 180 feet, there is a clear depth of 8 feet of water. Of course, the results are merely preliminary, and the channel will be gradually improved as the stone is removed. The pilots say that navigation is bettered already. In some localities eddies have been replaced by true tides, and the current has materially decreased in swiftness, while about 200 feet more room is afforded for passing the strait.

The observations of the shock wave generated by the ex-