LETTERS TO THE EDITOR.

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THE FOURTH FORM OF MATTER.

To the Editor of SCIENCE:

Science to-day recognizes but three forms of matter, viz.: the solid, the liquid, and the gaseous; though the existence of another form still more tenuous than the gaseous has been suspected by some distinguished men, and among them FARADAY, prince of scientists.

FARADAY, in 1819, delivered a series of lectures before the Royal Institution, on the general properties of matter, in one of which, entitled, "On Radiant Matter," he thus expressed himself: "If we conceive a change as far beyond vaporization as that is above fluidity, and then take into account also the proportioned increased extent of alteration as the changes rise, we shall, perhaps, if we can form any conception at all, fall not far short of *radiant matter*." Later he pointed out that matter may be classed under four states, viz.: solid, liquid, gaseous and radiant, and demonstrated the *probability* of the existence of the last. So far went FARADAY, and no one who has ever attempted it has gone any farther.

This "fourth" form can be accepted only upon a demonstration that is beyond question or doubt. It must be as positively distinct from the gaseous as that is from the liquid, or as the liquid is from the solid, and its existence must be more than inferential or imaginary. Its effects on a sufficiently large scale must be seen or felt. Then will men recognize it as the "border-land" of matter, beyond which only spirit can be.

That such a form of matter exists can to-day be confidently asserted, for modern science is demonstrating it in many ways. Around and about us, and known to all men, is an element that apparently satisfies every requirement; an element more efficient than steam, vapor, or gas; having numerous and varying forms, and with as many names; an element that is generically called electricity. It is the chief study of scientific men at present. It is matter; subtle, swift, powerful, manifold in operations, invisible, and with the strange power of multifold transformations. It passes as a *substantial* thunderbolt at one moment, and at the next is diffused into almost infinite tenuity. In the electrical fireball it moves at times slowly; in the telegraph with inconceivable velocity; in the cyclone with utmost power and regularity; and in such incalculable phenomena as that of the Minnesota flouring mills disaster, with marvelous explosiveness. As radiant matter it is everywhere present, as far as we can discover. Some idea of the ever-present and ever-ready state of this element is conveyed in the fact that not only every body and substance, but almost every method of dealing with substance manifests its presence. Earth in every part, and air, are pervaded by this mighty universal power, strong as gravity itself.

PROF. WILLIAM E. CROOKES, of the *Royal Society, London*, has sought for this kind of matter "in the shadowy realm between the known and unknown," which for him, he says, "has always had peculiar temptations." The shadowy realm of imagination cannot be fruitful in furnishing the substantial and reliable data required in scientific investigation. He has, however, inadvertently contributed to the resources of science by exhibiting some striking experiments that show the peculiar action of electricity *in vacuo*. In claiming to have discovered his "fourth form," in the imagined play of imaginary molecules or atoms, while at the same time having in use an electric battery, competent to all the phenomena, he appears to rather speculate than reason. As well claim that the spirits are at work in his tubes. Electricity in this case appears too subtle for its master.

It is, therefore, to the radiant, all-pervasive electrical or magnetic matter, that we must look for a candidate for the high honor. FARADAY'S classification may henceforth stand as legitimate, viz.: solid, liquid, gaseous, radiant. The latter may be considered as dominating and interpenetrating all the rest. It is the form in which life and motion reside, or through which they are communicated. Electricity now appears to be the underlying form, or substratum, out of which come light, heat, magnetism, gravity, etc., and recent experiments of EDISON, BELL, COULON, and others show the fact that most wonderful transmutations belong to this matter of the "radiant form."

It may be said that scientists are not altogether agreed as to the materiality of electricity, yet it *is* material to the consciousness of every thoughtful man. But, if matter, to which of the forms does it belong, solid, liquid, or gas? or do we find it in all? Plainly it transcends in qualities and powers each and all the recognized forms and is beyond their definition. No one would declare it to be solid, nor would it be called gaseous, and though it may pass under the definition, "A *power* in nature styled the electric *fluid*," yet it is not scientific to call a fluid one of *the powers of nature*. It were more satisfactory to relegate it to the realm of spirit-force at once; but what scientist would do that? We shall yet find in a fourth or radiant form, the true interpretation of all the most mysterious phenomena of matter.

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Dunkirk, N. Y., Oct. 11, 1880.

COMPARATIVE ZOOLOGY.

That the extinct fish-like reptiles known as Ichthyosauri, in some cases, at least, produced living young, is the conclusion of a Report upon the subject to the recent meeting of the British Association by Prof. Seeley, a brief abstract of which is given in *Nature* for September 16. In several specimens, notably those at Tubingen, the perfectly preserved young are enclosed within the ribs of the parent. In estimating the zoological significance of viviparity it should be borne in mind that while it is constant among the mammals, some sharks are oviparous and others viviparous, and that among serpents not only does this diversity of function exist, but even some species seem to be variable in this respect. B. G. W.

NOTES AND QUERIES.

[2.] WHO first used the phrase "Foramen of Monro"? In a paper entitled "The Foramina of Monro: Some Questions of Anatomical History," in the Boston *Medical and Surgical Journal* for August 12, Prof. B. G. Wilder demonstrates, upon various lines of argument, that the foramina were named in honor of Alexander Monro, *secundus*, and not *primus*, as stated by some writers. It is now desirable to ascertain by whom the name was introduced into the anatomical vocabulary. Monro's "Observations upon the Nervous System" was published in 1783, hence the phrase must have originated at some later date. MEDICUS.

A REMARKABLE solar protuberance was observed by M. Thollon, on August 30, at the Paris Observatory. About 11 A.M. he saw it rise from the eastern limb, as a vertical, thin, and very brilliant, luminous jet. The displacement of the line in C in the spectroscope corresponded to a velocity of 35 kilometres per second, and the protuberance rose to a height equal to half the solar radius, or about 343,000 km. After rising, it enlarged to prodigious dimensions, its brightness sensibly diminishing especially near the base. By about 1 P.M. it had become hardly visible. A curious fact is, that while the lower and middle part of this protuberance gave a deviation of the line C towards the violet, the top presented a nearly equal deviation towards the red.