groupings more complex than those which give us the yellow and green lines. The visibility of the green lines, *which are short*, in the flame, taken in connection with the fact that they have been seen alone in a vacuum tube, is enough for my present purpose.

With regard to the second point, the passage from the heat-level of the flame to that of the spark after volatilization is complete, produces no visible effect, indicating that in all probability the effects heretofore ascribed to *quantity* have been due to the presence of the molecular groupings of greater complexity. *The more there is to dissociate, the more time is required to run through the series, and the better the first stages are seen.—Nature.* J. NORMAN LOCKYER.

THE RICHMOND DIATOMACEOUS EARTH.

The stratum of fossiliferous earth underlying the cities of Richmond and Petersburg, in Virginia, when first discovered by Prof. Wm. B. Rogers, in 1842, was supposed to be peculiar to those localities; the further investigations of geologists have shown it to be a material constituent in various parts of the great Tertiary formation which bounds the continents of North and South America, and, perhaps, those of the Eastern Hemisphere also. To Mr. Charles Stodder we are indebted for the interesting and suggestive fact, that a stratum of infusorial earth, apparently the same as the Richmond deposit, has been struck at a depth of five hundred feet at Fortress Monroe, in boring an Artesian well.

The deposit at Richmond has long been famous with microgeologists for the great variety of beautiful forms it contains; the illustrious Ehrenberg having assigned to it one hundred and twelve species—nearly double the number to be found at any other place on the Atlantic coast; and the subsequent researches of microscopists have shown it to be perhaps the richest deposit of the kind in the world, every new preparation of the earth revealing some forms not before noticed, many of the most interesting remaining unnamed or described to the present day. The stratum varies in thickness from twenty to forty feet, and Major Bolton, engineer of the Church Hill tunnel, at Richmond (which runs through the deposit for three-fourths of a mile), informed me that at certain points of that excavation it reached a maximum thickness of eighty feet. In addition to an inexhaustible supply of the Diatomaceous earth, that work brought to light thousands of fossil remains of the gigantic marine monsters that, long ages ago, swam in the deep ocean over the spot where the city now stands.

An observation of the sections made by the various water courses which cut through the plateau on which Richmond is built, shows the deposit to be nearly level—its upper surface about fifteen or twenty feet below the top of the ground, and perhaps one hundred feet above tide-water. The Petersburg deposit was regarded by Prof. Tuomey as belonging to a different geologic era from that at Richmond, as evinced by the fact of his finding the casts of Pectens and other Meiocene fossils below that deposit, while at Richmond they are found above. The great difference in the character of the two deposits would also indicate this, the Petersburg Diatoms being generally much more transparent than the Richmond forms, and differing also materially in species. Upon exposure for some time to the weather, this earth assumes an almost snowy whiteness, and crumbles to a fine powder, but as first dug from the depths of the earth it resembles bituminous coal in color and solidity—so tough and hard is it, that in removing it from the tunnel it was blasted with gunpowder just as any other rock. Its composition, as nearly as can be estimated in a general way, is—10 per cent. unbroken forms of the Diatomacæ, 25 per cent. fine white sand, and the balance fine clay, formed, perhaps, mostly of the decomposed and broken Diatoms, the whole mass interspersed with many sponge spicules and a few Polycistena, and so strongly impregnated with alum that many of the wells and springs in Richmond are injured by it. To the microscopist this deposit is a source of unfailing interest, whilst the most inexperienced in such matters, upon being shown the wonderful forms found in it, are struck with surprise and delight. Had the pre-historic man possessed a microscope it might have been supposed that the forms seen in this deposit may have suggested the forms of many of his appliances, as in it may be found models of almost all the implements used by savages, whether for war, the chase, or in domestic life; witness, for instance, his stone hatchets, arrow and spear heads, knotted clubs, boomerangs, &c.; a catalogue of such matters used by civilized people would embrace plates, dishes, cups, saucers, knives, forks, scissors, balls, tops, spectacles, watches, anchors, dumb-bells, cannon, coin, musical notes and many other articles; the investigator being constantly startled by the strange resemblance which hundreds of these ancient natural forms bear to things in every day use. Certain varieties, however, predominate, and their distribution varies with level and locality, the upper portion of the stratum being comparatively poor in forms, while they increase in number and variety as we descend to the lower levels. The genus Coscinodiscus seems to characterize this earth, and of it there are dozens of varieties varying from the (microscopically) enormous C. gigas to the minute and elegant C. stelliges which resembles closely a finely polished opal, requiring a lens of wide aperture and considerable power to show its areolations. Orthosira marina is everywhere abundant, whilst many beautiful forms of Navicula are found in every gathering. Amongst these we may specially note two kinds of Pleurosigma, one of which, P. angulatum, is a favorite test Diatom, and the other, which it is proposed to call P. Virginica, (as it is the most common form of Pleurosigma in the Virginia earths), is remarkable for the beauty of its contour, which exactly copies a willow leaf, and the want of uniformity in its striæ, which are much coarser in the middle than at the ends of the valves. It can be easily resolved with a good ¼ in. Objective, without the aid of oblique light. The genus Triceratium, is also well represented by many beautiful varieties, the handsomest of which is, perhaps, T. Maylandica, which can be resolved with almost the same ease as P. Virginica, Isthmia enervis, Biddulphia Tuomeyii, Terpsinæ musica, Anlacodiscus crux, Navicula lyra, Gonphonema, Heliopelta, Asterolampra Concinna, Asteromphalus, Brookeii, and Synedra, are more rarely met with.

From the great variety in the markings on these valves, a slide of the earth, properly prepared, becomes one of the best and most interesting tests for the performance of objectives, from the lowest to the highest powers in general use. On some of them, for instance, the areolations may be seen with a simple triplet, whilst on others a first-class objective of wide angular aperture, aided by all the modern refinements of illumination, is needed to show them.

Mr. C. L. Peticolas, of 635 Eighth street, Richmond, Va., has sent us for inspection a few of his recently mounted slides of the Richmond earth, prepared by a new process for separating the Diatoms from the extraneous matter. We have pleasure in stating that these slides show the leading characteristics of this deposit very clearly and beautifully. To those who are studying these forms of fossil diatomaceæ, the slides of Mr. Peticolas will be very acceptable, and they should be added to the cabinet of all who possess a good microscope.

A USEFUL list of the Longicorn beetles, or wood borers, constituting the vast number of insects injurious to our forest, shade, and fruit trees, may be found in the October number of *The American Entomologist*, briefly arranged in the order of their most recent classification.

THERE are two beetles in the United States, both commonly called "*Fire-flies*," which are now known to be luminous in their larval as well as in their perfect state; the one *Photurus Pensylvanica*, De Geer, the other species *Photurus pyralis*, Linn. Both the males and females of these species have wings, and therein they differ from the true Glow Worm of England (*Lampyris noctiluca*), the female of which is wingless and emits a much more brilliant light than does her winged mate.—C. V. Riley.