

When a large mass of sand was moved downward, I heard the sound at a distance of 105 feet from the base, a light wind blowing at right angles to the direction. On one occasion horses standing close to the base were disturbed by the rumbling sound. When the sand is clapped between the hands, a slight hoot like sound is heard; but a louder sound is produced by confining it in a bag, dividing the contents into two parts and bringing them together violently. This I had found to be the best way of testing seashore sand as to its sonorousness. The sand on the top of the dune is wind-furrowed, and generally coarser than that of the slope of 31° ; but this also yielded a sound of unmistakable character when so tested. A bag full of sand will preserve its power for some time, especially if not too frequently manipulated. A creeping vine with a blue or purple blossom (*kolokolo*) thrives on these dunes, and interrupts the sounding slope. I found the main slope 120 feet long at its base; but the places not covered by this vine gave sounds at intervals 160 paces westward. At 94 paces further the sand was non-sonorous.

The native Hawaiians call this place *Nohili*, a word of no specific meaning, and attribute the sound caused by the sand to the spirits of the dead (*uhane*), who grumble at being disturbed; sand-dunes being commonly used for burial-places, especially in early times, as bleached skeletons and well-preserved skulls at several places abundantly show.

Sand of similar properties is reported to occur at *Haula*, about three miles east of Koloa, Kauai. This I did not visit, but, prompted by information communicated by the Hon. Vladimir Knudsen of Waiawa, I crossed the channel to the little-visited island of Niihau. On the western coast of this islet, at a place called *Kaluakahua*, sonorous sand occurs on the land side of a dune about 100 feet high, and at several points for 600 to 800 feet along the coast. On the chief slope, 36 feet high, the sand has the same mobility, lies at the same angle, and gives when disturbed the same note as the sand of Kauai, but less strong, the slope being so much lower. This locality has been known to the residents of the island for many years, but has never before been announced in print. This range of dunes, driven before the high winds, is advancing southward, and has already covered the road formerly skirting the coast.

The observations made at these places are of especial interest, because they confirm views already advanced by Dr. Julien and myself with regard to the identity of the phenomena on sea-beaches and on hill-sides in arid regions (*Jebel Nagous*, *Rigi-Rawan*, etc.). The sand of the Hawaiian Islands possesses the acoustic properties of both classes of places; it gives out the same note as that of *Jebel Nagous* when rolling down the slope, and it yields a peculiar hoot-like sound when struck together in a bag, like the sands of Eigg, of Manchester (Mass.), and other sea-beaches,—a property that the sand of *Jebel Nagous* does not possess. These Hawaiian sands also show how completely independent of material is the acoustic quality, for they are wholly carbonate of lime, whereas sonorous sands of all other localities known to us (now over one hundred in number) are silicious, being either pure silex or a mixture of the same with silicates, as felspar.

The theory proposed by Dr. Julien and myself to explain the sonorousness has been editorially noticed in *Nature*, but may properly be briefly stated in this connection. We believe the sonorousness in sands of sea-beaches and of deserts to be connected with thin pellicles or films of air, or of gases thence derived, deposited and condensed upon the surface of the sand-grains during gradual evaporation after wetting by the seas, lakes, or rains. By virtue of these films the sand-grains become separated by elastic cushions of condensed gases, capable of considerable vibration, and whose thickness we have approximately determined. The extent of the vibrations, and the volume and pitch of the sounds thereby produced after any quick disturbance of the sand, we also find to be largely dependent upon the forms, structures, and surfaces of the sand-grains, and especially upon their purity, or freedom from fine silt or dust ("Proceedings American Association for the Advancement of Science," 38, 1889).

I should be lacking in courtesy if I closed this letter without expressing my great obligations to Mr. H. P. Faye of Mana, and

to Mr. George S. Gay of Niihau, for both a generous hospitality and a sympathetic assistance in carrying out my investigations.

H. CARRINGTON BOLTON.

Honolulu, H.I., May 26.

BOOK-REVIEWS.

Civil Government in the United States considered with Some Reference to its Origins. By JOHN FISKE. New York, Houghton, Mifflin, & Co. 12°. \$1.

THIS is not such a work as we expected from Mr. Fiske. We thought when we took it up that we should find it a philosophical treatise on the nature and functions of government, but that is just what it is not. The author does, indeed, ask what government is, but dismisses the question in a single sentence; there is nothing in the book about the nature and uses of law; and the ethical principles that lie at the basis of civil society are never once alluded to. The work is purely descriptive and historical, and treats, not of government, but of governmental machinery only. Moreover, one-half the book is devoted to municipal government,—to the town, the city, and the county,—the city alone receiving as much attention as the State. But such a mode of treatment magnifies the work of the municipalities out of all proportion to its importance. The essential element in our political system is the State, and the municipalities are merely agencies of the State for certain administrative purposes.

But though we cannot agree with Mr. Fiske's conception of his subject, yet the work he has actually done is well done. He has given a description of the various agencies of government in the United States which is both accurate and clear, and in a smaller space than we should have thought possible. The book also conveys a good deal of interesting historical information, especially in the part devoted to the town and the county. Questions for pupils, and suggestions for teachers, adapt the work for use in schools; and its value is increased by an appendix containing the Articles of Confederation, the National Constitution, a translation of the Great Charter of King John, and other interesting documents.

Die Furcht. Von A. MOSSO. Aus dem Italienischen übersetzt von W. Finger. Deutsche Original-Ausgabe, mit 7 Holzschnitten und 2 Lichtdruck-Tafeln. Leipzig, Verlag von S. Hirzel. 1889.

THERE are two classes of scientific men. To the one class belong the enthusiastic, absorbed searchers after truth, who are driven by an inborn impulse to grapple with Nature, and who find their highest happiness in wresting her secrets from her. They are unfortunately in the minority, for they are the pioneers of science. The other class are many, and range in culture from learned men down to those who read for the sake of a subject to talk about. The purpose of the work and study of the latter is social influence. Both classes are useful, the second acting as the interpreter of the truths which the former have extorted from nature.

It is seldom that the scientific investigator has personally the time and the necessary contact with the masses of the people to enable him to popularize his own observations and experiments. Mosso, however, has undertaken the task with Italian geniality. The charm of his book is that he is himself so enthusiastic in and enraptured by his scientific work that he must seek to interest others also. He says of it, "It is a work full of patience. The only difficulty consists in gradually learning to understand Nature's speech; to find ways and means of questioning her, and compelling her to answer us. In this struggle in which we, modest pygmies, are continually striving to grasp the secret of life, there are delightful moments, lights and shadows, which excite the imagination of scientist and artist."

His enthusiasm does not cause him to forget that he is writing for the people as well as for his colleagues in science. Though his language is as free of technical terms as possible, the work is pregnant with scientific observations and experiments, chiefly the result of his own study, some of them as yet unpublished. The chapters in which he describes the pulsations of the blood in the

brain are fascinating.¹ Three patients came to him whose skulls had been so disturbed by disease or accident that he was able to see and register the pulsations of their brains through the window-like opening thus formed. The observations were made in sleeping and in waking moments. The registered curves proved that every emotion, every thought, is accompanied by an increase in the volume of blood in the brain. The severer the mental work, the more violent the emotion, the stormier were the pulsations of the brain. Another interesting series of experiments which the author describes are those made with an originally constructed balance, by means of which he was able to register the respiratory movements and the flow of the blood from the feet to the head. The table of the balance was large and wide enough for a man to lie at full length upon it. It was upon this table that Mosso observed that a sudden noise caused the blood of a man asleep upon the table to leave the lower extremities and flow to the head; further, that the head end of the balance sank deeper during the solution of a difficult mathematical problem than when the mind was less severely occupied. By these two methods, as well as by means of the more common methods of registering the beat of the heart and the respiratory movements of the lungs, he found that any sensation exciting fear sends the blood to the brain, increases the strength and frequency of the heart-beat, and alters the regularity of the breathing. He describes the effect upon our system thus: "We men, who constantly carry the fragile machinery of our body about with us, must remember that every jolt that exceeds the ordinary limit can be fatal to us; that a slight shove accelerates the motion of the wheels, a stronger one arrests the motion, a gentle push drives us forward, a violent jerk throws us to the ground. For this reason the phenomena of fear, which in a small degree might be useful to us, become unhealthy and fatal to the organism as soon as they exceed certain limits: hence one must look upon fear as an illness."

He denies that the phenomena of fear, as trembling, scowling, the raising of hair and feathers, are essential to the survival of the fittest, and claims that the strong and healthy animals are those who do not fear, but concentrate all their powers to escape or defy the enemy. To the weak man a sudden danger brings fear; to the strong it is an incentive to action.

Fear, however, does not act upon the distribution of the blood and upon the respiration alone; but, since our body is a unit, it acts also upon the muscles,—those of the eye, the skin, the face, the digestive and secretory organs, as well as upon the larger muscles of motion. All this is of special interest (1) to the educator, the physician, and parent; (2) to the artist, the novelist, and poet. To the former Mosso's words are, "The first purpose of an education must be to increase man's strength, and to favor every thing that sustains life." Further, "One moment of violent fear causes far more dreadful effects and significantly severer injuries in woman than in man; but the fault is ours, who have always considered woman's weakness as a charm and an attraction; it is the fault of our educational system, that seeks to develop the emotional nature in woman, and, on the other hand, neglects that which would be more effectual,—to give her character. We imagine sometimes that the most important part of culture is that which education and study have given us; that the progress of mankind is accomplished entirely through the science, the literature, the works of art, which the generations have handed down to one another; but we carry a no less important part of the progress of culture with us in our blood. Civilization has reconstructed our nervous system; there is a culture that is transferred to the brains of the children by inheritance; the superiority of the present generation depends upon its greater ability to think and act. The future of a nation does not exist in its trade, its science, its army alone; but it exists in the bodies of its citizens, in the lap of its mothers, in the courageous or cowardly disposition of its sons."

To the latter he says, "When art extends its territory over all visible nature, it will find an incomparably greater number of

powerful effects in the reproduction of pain than art possessed in classical times. The difficulties are certainly far greater here than in the dignified production of ideal beauty. And the painters and sculptors who undertake the great problem of reproducing pain will be obliged to equip themselves with a study of nature, and with anatomical and physiological knowledge to an extent for which, up to the Hellenic period, we have no example in art."

It is to illustrate the expressions of the face in suffering and fear in their wonderful variety, that the author reproduces, in two lithographic plates, a series of sixteen photographs taken of a boy while enduring an oft-repeated painful operation. They are worthy the study of psychologist and artist. The width of the horizon which art is to possess when incited by this new physiological knowledge is best indicated by his own words, which shall at the same time be the final ones of this article.

"I believe that with the progress in scientific criticism, together with an exact knowledge of physiology and the functions of the muscles, we shall come to the point where we can claim that the Greeks were not adequately prepared to represent the violent emotions effectively."

Economic and Social History of New England, 1620-1789. By WILLIAM B. WEEDEN. New York, Houghton, Mifflin, & Co. 2 vols. 8°. \$4.50.

THIS is an elaborate and painstaking work, dealing with the whole subject of New England industry from the first settlements to the foundation of the present Federal Government. Beginning with the landing of the Colonists in the wilderness, the opening chapters are largely devoted to the subjects of agriculture, the distribution of land, and trade with the Indians. Ocean commerce and manufactures claim attention a little later, and soon become the most prominent parts of the subject. The social life of the Colonists is described with less fullness than the economic, but yet is never neglected. The whole subject of the book is treated by periods,—a method that has some advantages, and is to a certain extent necessary, but which has led to some repetition and diffuseness. The work is also encumbered with too much detail; the commercial and manufacturing operations, and even such matters as dress and equipage, being treated with a minute particularity which is wholly unnecessary, and wearisome to the reader. Facts in history are chiefly valuable as illustrating natural and moral laws, and in enabling us to mentally reconstruct the life of the past, and all details that are not needed for these purposes may better be dispensed with. Nor can we think Mr. Weeden altogether happy in his pictures of social life, his attention being too much fastened on the trifling matters of dress, manners, amusements, etc., and too little on the more important themes of morals and education. He gives a good deal of space to the sumptuary laws and other restrictive measures of the Puritans, but is not equally satisfactory in delineating the nobler elements of the Puritan character.

But though the book has in our eyes these defects, it is nevertheless a valuable work, and an addition to our historical and economical literature. It is written in a clear and simple style, which makes it at once more interesting and more easily understood than works of this kind often are. The author seems also to have taken great care in collecting his facts; town records, personal diaries, and merchants' accounts having been ransacked for the purpose, and often with good results. One of the strong points of the book is its treatment of political subjects in relation to economic life. The account of the settlement of the country and the beginnings of industry and commerce is one of the best parts of the work, and shows the working of both political and economical agencies in the formation of the new community. Again, in dealing with the navigation acts and other oppressive measures of the British Government, the author shows with much felicity their effect in injuring trade as well as in rousing the spirit of rebellion among the Colonists. Yet, though he has clearly grasped the economic bearings of political agencies, he has not allowed himself to be drawn off into political history itself, but has confined himself to his own proper theme. Mr. Weeden shows that the fisheries, in which the Massachusetts people always excelled, were the main foundation of New England commerce, agriculture being only a

¹ Ueber den Kreislauf des Blutes im Menschlichen Gehirn (Leipzig, Veit u. Co., 1881); "La temperatura del cervello studiata in rapporto colla temperatura di altre parti del corpo," in the pamphlets of the R. Accademia dei Lincei (Rome, 1889); Sui movimenti idraulici dell' veide (K. medic. Akademie in Turin, 1875); Mosso et Pellacani, Sulle funzioni della vescica (R. Accademia dei Lincei, Bd. XII., 1881; Archives italiennes de Bologne, 1882).