traction of the muscles indicates its passage. This, too, affords a convincing proof that the mental and physical agents are the same. Here mental emotion produces physical disturbance; in that physical disturbance we recognise electricity, and therefore we conclude that this agent is productive alike of our mental and corporeal faculties; that the human mind is mysteriously connected with it; in short, that electricity is the vital principle. That electricity is the vital agent is an idea by no means new or original; but the causes which have prevented a more clear demonstration of the fact have been the limited views which philosophers have taken of this mighty agent. The snap and the spark have been too much regarded as the sole test of its presence, and therefore while they have recognised it in the rolling thunder and withering lightning of the tempest, they have failed to discern it in the secret power that governs the reins of the whirlwind, or in its milder character, as the instrumental means of tempering and regulating climate, and as producing, by its varied action, all that is delightful, mournful, or terrible in Nature. They have traced it as the silent agent, which, deep in the bowels of the earth, is productive of mineral formation; but they have forgotten to follow its workings through the various grades of vegetable and animal life, till they should arrive at the crowning feature of creative skill—man.

"Connexion exquisite of distant worlds!
Distinguish'd link in being's endless chain!
Midway from nothing to the Deity."—YOUNG.

To study man aright, he must be considered, not as a machine, complete and perfect in itself, but as a being connected with external objects, and influenced by external causes; as a part, in short, of that creation, of which it is happily said, that

"One common soul
Inspires, and feeds, and animates the whole."—DRYDEN.

This is the view which a philosopher must take of creation before he can comprehend its mysteries; this is the only means by which he will be enabled to penetrate into the secret recesses of Nature; and although the possession of the Promethean fire must ever be ranked with the impossibilities of the elixir vitæ and philosopher's stone, yet Nature, viewed in this light, will open up to us new themes for our admiration, new wonders for our amazement, and as the great scheme of creation becomes more unfolded to our view, we shall exclaim, in the impassioned language of Byron,

"Are not the mountains, waves, and skies, a part
Of me, and of my soul, as I of them?"

Holbeach, Oct. 1846.

ON ELEPHANTIASIS,

ITS HISTORY AND TREATMENT.

By HENRY G. DALTON, Esq., M.R.C.S. Eng., Georgetown, Demerara.

THE term elephantiasis (elephant leg) has been applied to the designation of one of the most formidable and inveterate diseases that mankind has experienced—formidable as regards its revolting aspect, and inveterate as concerning the difficulty hitherto met with in its alleviation, much less cure.

Of its antiquity there can be no doubt, as will be demonstrated by the remarks of some of the oldest writers on medicine. From the earliest period up to the present time, it has been considered as an "opprobrium artis medicæ," since it has baffled the skill of the most scientific, and wearied the patience of the most industrious inquirers, who have sought to investigate its nature. But, as has often been remarked in the history of medicine, in reference to other diseases, the gradual accumulation of facts concerning it has eventually done much towards facilitating our present knowledge of the disease; and the various hints and suggestions thrown out regarding the possibility of a cure having been tested by experience, now render almost certain the means of effectually relieving the disease. It must not be overlooked, that in almost every age native remedies have been started in every quarter where this disease is prevalent, each warranting a cure; and it is not to be doubted that solitary cases of recovery have been now and then met with.

In making use of the term elephantiasis, as applicable to the disease under consideration, we must take care not to confound it (as has been frequently done) with another disease totally different, known by the same appellation; and for this purpose we will give its synonymes.

Two diseases have been designated by the term elephantiasis,—one, "elephantiasis Græcorum," a special disease of the skin, usually attacking the face and ears, called also,

"tubercular elephantiasis," "leontiasis," (and "juzam" by the Arabian writers,) this being essentially a contagious disease. The other, "elephantiasis Arabica," is the distinctive name of the subject of the present essay; but it has received various appellations from almost every writer on the subject. Dr. Mason Good has termed it, "Bucnemia Tropica," and classes it under "Phlegmasia," taking a view of its inflammatory nature. By the Arabian physicians it was termed "dal til," which signifies elephant leg. Dr. Hillary calls it "Barbadoes leg;" Dr. Hendy, the glandular disease of Barbadoes. By some it has been called "yam leg," from its resemblance to the vegetable of that name, and the term, as a popular one, is correct enough. In Ceylon it is termed "galle leg." In the Polynesian isles it has received the name of "yava skin," from its supposed origin from a drink so called. In Malabar it is called "kaal," which also signifies elephant leg. By French writers it has been termed "andrum," "sarcocele d'Egypte," "æolica Japonica," "lepra elephantiasis," "lepra tuberculeuse elephantina;" by Alibert, "elephantiasis tubereux;" by Kämpfer it was styled "pedarthrocace." On the peninsula of India it is known as "Cochin leg."

The disease thus variously denominated is not contagious; but it is endemic, and seems to depend upon certain conditions of the system and of climate, which must be hereafter considered.

The first description of the disease was given by Rhages, the Arabian physician, who lived in the year 850 A.D. From him it received the name, "elephas Arabus," or "dal til," and it is remarkable that his description accurately represents it as at present met with, and, moreover, that one of the chief elements in its cure should have also been suggested at that time. From this period numerous writers have given descriptions of the disorder, amongst others, Dionis, Cheselden, Walther, Morgagni, Chopart, and Larrey. It has been generally remarked by all these writers, that the disease, though endemic, chiefly attacks persons either born or long resident in certain places, as Barbadoes, Malabar, Egypt, Ceylon, &c.

It chiefly attacks the lower classes of these inhabitants, and the dark races of mankind are more liable to it than the fair. Thus, in Barbadoes it was confined to the black population until 1700, from which period, however, to the present time, numerous instances of its attacking white people have been encountered. Persons liable to it in one locality have been known to remain free from its invidious ravages on quitting for other countries. It has rarely been known to attack soldiers, and others who migrate.

Individuals coming to live in a country where this disease is prevalent do not become attacked at an early period of their residence; it seems to require a certain amount of "seasoning," in order to render the constitution liable to its influence. It equally affects both sexes; but the young seem more subject to its contamination than those more advanced in life. It rarely breaks out in an old person who had not previously had some premonitory symptoms in early life. Instances of infants being attacked by elephantiasis Arabica have been met with, although rarely. It would seem that the brute creation is not free from its baneful influence, since it has been asserted that horses, dogs, poultry, and other animals, have been subjects of it.

In Polynesia, this frightful affection is regarded, like the gout in Europe, in rather an honourable light, inasmuch as it is considered an indication of high living, and to be chiefly induced by the use of a certain intoxicating beverage, called "yava." It is not, however, confined to the higher classes in this region. The disease has been chiefly, if not altogether, confined to warm latitudes. Dr. Titley, who wrote on the genito-urinary organs, has remarked, that in the Orkney Isles cases have appeared; still its remote and exciting causes are, for the most part, found in warm latitudes, and where malaria is prevalent. In some countries, as British Guiana, the aboriginal inhabitants are not subject to it; but this may, in some measure, be accounted for by the fact that the climate of the interior of this country, where the aborigines chiefly reside, is of a very different character to that inhabited by the other settlers, the former region being generally high land; the latter marshy, low, and bordering on mouths of rivers and the sea. It has, in this respect, much analogy with intermittent fever, with which it is frequently associated.

Having thus briefly sketched some prominent facts connected with the disease, it will be now necessary to give some description of its appearance, and the parts of the body that are liable, or have been known, to be attacked by it.

Elephantiasis Arabica consists of a marked enlargement of the limb, (or parts affected,) with thickening of the integument and the subjacent cellular tissue, varying degrees

deformity existing, according to the seat or stage of the disease. When the disorder is advanced, the limb (if this be the part attacked) presents a huge misshapen mass, in figure and dimension like to the foot of the elephant.* The skin is rough, indurated, and uneven. There are noticed irregularities of its surface, with warty-looking excrescences, and a scaly condition of the cuticle, which is marked by cracks and fissures, giving rise frequently to raw ulcerated surfaces. Masses of horny-looking integument form in many places folds and protuberances. There is no longer any resemblance to the usual contour of the limb. The foot is transformed into a square mass, the sole being perfectly flat; the shape of the toes is obliterated, and they are so compressed together and swollen as to be no longer recognisable save by lines indicating their divisions; the dorsum of the foot and the ankles are enormously swollen, and marked by creases and folds of leathery-looking integument, with occasional patches of sharp-pointed, elevated, and hardened cuticle; the nails of the toes, when present, are absolute horn; the calf and knee are blended in one common deformity, of gigantic dimensions; the movements of the joints are imperceptible; the whole limb is raised with considerable effort, so as to affect the gait of the unfortunate sufferer, who moves about precisely in the same manner as a man with a wooden leg: to run is impossible.

The usual transpiration of the skin is interfered with, and in its place, a foetid serous discharge oozes in drops from the limb, giving, at times, a greasy unctuous appearance to the surface; but when absent, which is sometimes the case, the skin feels harsh, rough, and dry. Sensation of the part is much impaired, and punctures or blows of the outer integument cause no marked pain. There is generally a scantiness of hair upon the limb, but not a total absence; the hairs appear sparse and long, from the distention of the cuticle. Projections or spurs of cartilaginous hardness sprout forth in some places, usually the heel or foot. These may be pared off gradually, nearly to their base, without marked bleeding, or inducing much inconvenience; but they soon grow again. The texture of the skin throughout is not the same; in some places it is smooth, hard, and glossy; in others, rough, scaly, corrugated, and warty-looking, occasionally presenting a mouldy appearance, especially about the toes. The interstices between the horny edges of skin are always smooth, and are the frequent seat of troublesome ulcers, especially noticed when the toes are forcibly separated. From their weight, the lower folds of skin often form flaps, which trail around the foot, and sometimes on the ground. The disease rarely extends throughout the whole length of a limb, and it is less often met with in more than one limb of the same individual, and rarely to a severe extent in both limbs. When a member thus affected has been removed by amputation, the disease often seizes upon another part, usually the corresponding limb. The most common seat of the disease is the leg; and it is in this member that the most frightful deformities have been met with. Next in order of frequency is the scrotum, which has been known to attain an almost incredible size. Instances are on record, where the swelling of this organ has descended to the knees—nay, even to the ground. Tumours of this nature have been removed by amputation, which have weighed forty, sixty, and seventy pounds. One mentioned by Dr. Titley is reported to have weighed a hundred and sixty-five pounds; but many of the patients operated upon have recovered. It is rare to find the scrotum and legs both affected in a severe degree in the same individual. In women, the vulva and breasts are frequently met with enormously enlarged from this disease. The clitoris is also liable to be attacked; and I once assisted at an amputation of that organ, which, on removal, weighed about six ounces. The arms, scalp, ears, neck, penis, &c., have been the seat of similar disease; also the tongue.

The internal organs have been described as liable to be attacked. Dr. Scott considers that many forms of enlarged liver, ovary, and uteri, may be ascribed to such disease. But elephantiasis Arabica is liable to metastasis, and death has been attributed to its attacking the stomach, intestines, and brain. Dr. Musgrave considered that this form of the disease may be termed the "migratory inflammation of the lymphatic system;" and asserts, that the patient is never secure from a liability to attack of the internal organs, whether of the head, chest, or abdomen, so long as any constitutional disturbance exists; for that wherever may be the local seat of the disease, retrocession to some vital part may result and prove fatal.

Prognosis.—Practitioners should give a cautious prognosis as to the duration and result of any case of elephantiasis. When called to a case of elephantiasis Arabica in its early stage, where the patient is young, and otherwise healthy, where the swelling is not very great, and where those peculiar alterations in the condition of the integument and cellular tissue have not yet arisen, it may with safety be stated, that the symptoms can be promptly relieved, and a further increase of the disease checked, by certain precautionary measures rigidly adhered to. It too often happens, however, that patients in the early stage, indifferent to the insidious advance of so frightful a complaint, neglect such means as skilful treatment affords, and allow that period to pass over unprofitably, when the best chance of recovery exists, until at last, the system being thoroughly invaded, the disease spreads with obstinate inveteracy, and assumes a deformity which embitters the whole remainder of their lives, or requires them to go through such an ordeal for their amelioration as few have the means or patience to endure.

Symptoms.—To a person unacquainted with the progress of the disease, it would be difficult to anticipate, from its early symptoms, the extent which this malady will attain; and for this reason it will be necessary to trace it gradually, from its early or primary stage, to that state where frightful deformity results. The monstrous swelling and deformity that constitute this terrible malady, however, are not the produce of a few weeks. From its first insidious and often neglected commencement, it requires many years to arrive at anything like serious inconvenience. Elephantiasis Arabica is first ushered in by febrile disturbance of the constitution. There is heat of skin, headach, nausea, sometimes vomiting, lassitude, and often rigors, attended with pain in the limb about to be affected, especially in the course of the absorbents, (in white persons, redness of the same;) with glandular swelling and marked tenderness generally in the groin of the limb. The leg (if this be the part affected) becomes stiff, painful, and swollen—the skin tense, smooth, and shining. The attack may last for several days, yielding to ordinary treatment, and often without any interference. The local symptoms also disappear; frequently the cuticle desquamates; and the patient returns to his usual state of health. After a time, varying in different cases, the attack returns, with similar symptoms; the limb again becomes swollen and painful; the bowels are active, the tongue is furred white, and the pulse accelerated. These symptoms, again, soon subside, leaving the patient weak. Where a predisposition prevails, after several such attacks occurring in no regular period, an habitual swelling obtains about the ankle-dorsum of foot and toes, and an occasional enlargement of the glands of the groin: the swelling subsides during repose or confinement, but is increased by standing or walking. As yet, no visible alteration is noticed in the integument; the swelling is soft, doughy, and pits on pressure. But the patient now becomes more than ever subject to attacks of fever and ague, and the swelling gradually increases; this stage may last from one to more years. Very often the disease never proceeds beyond this; for numerous instances are met with where persons up to the age of fifty are so affected, without any very marked enlargement of the limb. It is to this condition—an incipient stage—that the term "rose" is commonly applied.

After a time, the swelling increases, but without any accompanying fever; as this latter becomes less marked, the glandular swellings and pain along the absorbents are not so distinct. The limb, up to this time, has swollen uniformly, commencing from below upwards; but as the swelling advances, anatomical causes interfere with this equal enlargement; the swelling becomes visibly constricted about the flexure of the ankle, so that ridges of elevated skin are formed, with intervening fissures, the cuticle becoming gradually harder and more rough. The circulation of the capillaries is interfered with, and the skin forms folds, becoming tubercular, rugose, warty, and fungous-looking, according to circumstances. In aggravated cases, spurs or projections shoot forth. Sometimes, however, the swelling arrives at a great extent without any marked alteration in the condition of the skin, which pits on pressure, and slowly recovers its original puffiness. The shape of the leg gradually becomes altered; the toes are obliterated in appearance; the foot assumes a square form; and the whole limb, as far as the knee, is a shapeless mass where the disease extends; the shape of the knee is also obliterated, and the motion of the limb much impaired. To appearance it seems lengthened, and actually it is so a little, from the weight of the depending mass; the patient lifts it with an effort in walking, and advances it by a slight circular jerk. As the disease progresses, the skin will be found to have undergone great changes: it feels very rough and scaly, and irregularities of surface occur. The

* Some faithful engravings of its appearance will be found in the last volume of THE LANCET, pp. 435-6.

usual transpiration is absent, the hairs become sparse, and, from the enormous distention, the skin cracks in various places, through which beads of serous-looking fluid escape, and yield a peculiar, sickening odour, which is very remarkable, and serves to distinguish the presence of the disease, even were the eye prevented from noticing it. The languid capillary circulation, together with the cracking of the skin, gives rise to unhealthy, indolent ulcers, with small, pale granulations, and elevated, hardened edges; and through these ulcers a drain from the system is kept up, which leads to differing results. The sore never ceases discharging, unless interrupted by some constitutional derangement, and the factor of the discharge is remarkable.

Some of the results of the discharge may be noticed.—1. It tends to keep down, in some instances, the further increase of swelling; for it is rare, that in the worst forms of elephantiasis, as regards size, that such large ulcers are noticed, although small ulcers about the toes are almost constant.

2nd. It is generally noticed, that where such ulceration obtains, the patient becomes almost entirely free from febrile attacks, although prior to the formation of such sores he had been much disturbed by pyrexia.

3. The pain constantly complained of in a leg affected with elephantiasis, is in some measure diminished by the presence of such ulcers, although these of themselves give rise to a new annoyance, and that not a trifling one.

4. These ulcers, when extensive, often lead to debility of the system, with loss of appetite, sleeplessness, irritation of mind, a pale, anxious expression of countenance, and emaciation, although this latter symptom is a general consequence of the disease in any shape.

5. Sometimes, on the contrary, such ulceration tends to keep the patient in very fair health, rendering him less subject to febrile attacks and other diseases.

Georgetown, Demerara, 1846.

REVIEWS.

Animal Chemistry; or, Chemistry in its application to Physiology and Pathology. By BARON LIEBIG, Professor of Chemistry in the University of Giessen. Edited, from the author's manuscript, by WM. GREGORY, M.D., F.R.S.E., M.R.I.A., Professor of Chemistry in the University of Edinburgh. Third edition, revised and greatly enlarged.—Part I. The Chemical Process of Respiration and Nutrition; Part II. The Metamorphoses of Animal Tissues. Section 1. Method to be pursued in the Investigation. Taylor and Walton. London: 1846. 8vo, pp. 258.

THIS new edition of Professor Liebig's *Animal Chemistry* is eminently calculated to add lustre to the fame of its highly and justly distinguished author. Whilst every page bears testimony to the rapid advance of the application of chemistry to the elucidation of the phenomena of living beings, every new investigation,—whatever be the precise department of the subject, the properties of whatever organic substance, or function of whatever organ may have been the object of research,—tends to bring into greater prominence, and to support, the beautiful generalizations, the great theories, which have placed the name of Liebig in the first rank of discoverers in science. "During the four years which have elapsed since the publication of the first edition of this work," says the preface, "several philosophers have subjected some of the processes of the animal organism to a thorough investigation," (chiefly, we must in justice observe, through the instrumentality of the author,) "and if, in consequence of these researches, our views have received an expression more definite, and more nearly approaching the truth, this must be regarded as a proof, not that we were in error, but that we have made some progress."

In re-writing his work, the author has not only incorporated all that is valuable in these chemico-physiological inquiries into his text, but he has given to every part more precision, and has placed every subordinate topic in closer relation to his great theory of the cause of all chemical combination and decompositions. The exposition of the theory itself, in a logical form, and its application to the elucidation of miasmatic and contagious diseases, or, rather, the indication of its fitness and

use in explanation of those diseases, form the subject of a new chapter, occupying 104 out of the 258 pages of which this first part of his work consists. This, which is intended as an introduction to his treatise on the Metamorphoses of the Animal Tissues, Liebig has, with excellent judgment, given to the periodical press, and we are availing ourselves of the opportunity to present it entire to the readers of *THE LANCET*. The paper published in *THE LANCET*, No. 10, vol. ii. 1846, Sept. 5th, on the Chemistry of Respiration, forms another section of the work. The readers of the former edition will remember that the author's theory of animal heat is purely chemical. He then alleged that the amount of heat evolved by the slow combination of oxygen with carbon and hydrogen in the body, must be precisely the same as that produced by the combustion of those bodies, and that the products in both cases would be equal. At the same time it was admitted, that, in the case of hydrogen, the information then possessed did not allow of any quantitative statement; and, with respect to the amount of heat evolved by the combustion of carbon, the quantity deducible from extant experiments could only be considered an approximation. The more accurate experiments since made by Dulong, Favre, Siebermann, Despretz, and others, have given an exact quantitative expression to the phenomena.

The following is an outline of the general results. The herbivora return to the atmosphere, in the form of carbonic acid, nine out of ten volumes of oxygen introduced into their bodies in the blood; the carnivora return, in the same form, from five to six volumes only. The formation of the carbonic acid is dependent upon the formation of water. The circulation of the oxygen, through the system, in the minute vessels, presents an enormous amount of surface to its action, so that all the oxidizable substances throughout the organism combine with that element.

In consequence of the permeability of all animal membranes by fluids, all these products enter the circulation, and flow towards the heart. Some of them are separated from the blood, in the liver, forming bile, which is destined to a further use in the economy; others, totally effete and useless, are eliminated by the kidneys. The constant restoration of all the tissues, and the simultaneous maintenance of the temperature necessary to the processes, are effected by the supply of material in the food, which embraces two classes of substances, one containing sulphur and nitrogen, serving to build up the organism, and maintain its integrity; the other class containing the radical (C O) carbonic oxide, and the elements of water, destined to undergo a slow combustion, to maintain animal heat, and to supply a store of fat to the system, which, in its turn, is destined to be burned, but in the meanwhile subserves other purposes in the economy.

The sulphuretted and nitrogenous elements of the food, fibrine, albumen, and caseine, are found originally in vegetables; they are appropriated and stored up in the bodies of herbivorous animals; they are elements of animal blood, requiring only solution to enter the circulation; and as they are brought into contact with the various tissues and organs, they are appropriated to the need, and yield the substance, of such organs, being modified for this assimilation by virtue of a law which operates throughout all nature. The so-called inorganic constituents of these nutritive matters—iron, phosphorus, (as phosphoric acid?) sulphur, and lime—are absolutely indispensable to their nature and functions.

The other class of substances entering the animal organism, as food, composed of the radical C O, with hydrogen and oxygen, part with a portion of their hydrogen, which, combining with the free oxygen of the atmosphere, forms water, and evolves heat; and, under some influence in the economy, analogous to the presence of caseine in a fermenting solution of sugar, or simply from a deficient supply of oxygen, part of the hydrogen combines with the carbon, and forms fat.

The uses of fat in the economy are well known. Liebig suggests that "in some diseases the starch, sugar, &c., of