Part First.

ORIGINAL COMMUNICATIONS.

ARTICLE I.—*On the Properties of the Ordeal-Bean of Old Calabar, Western Africa.* By ROBERT CHRISTISON, M.D., V.P.R.S.E., Professor of Materia Medica in the University of Edinburgh, etc.

(*Read before the Royal Society of Edinburgh, Feb.* 5, 1855.)

VARIOUS travellers, and other authors on the manners and customs of the negro tribes of Western Africa, make mention of the ordeal by poison as a mode of trial in that part of the African continent, when a suspicion arises of the commission of one of the more heinous offences. Of these none seems more frequent than the offence of effecting death or other injuries by means of witchcraft;—a crime so held in abhorrence, that the accused will often himself demand the ordeal, rather than lie under suspicion. We have no right, however, to express any astonishment at this folly of the benighted pagan African, when we reflect how short a time has gone by since witchcraft was generally believed in throughout civilised Christian Europe; and when the only way of meeting a charge, no less easy to make than difficult to repel, was by undergoing an ordeal of some kind quite as preposterous as that by swallowing a deadly poison.

The ordeal-poison of the native tribes on the River Gambia appears to be the bark of a leguminous tree, which has been described and figured under the name of *Fillœa suaveolens* by MM. Guillemin and Perottet, in their Flore de Sénégambie (1830–33, p. 242, tab. 55). This tree is considered by Dr Hooker and Mr Bentham in their Flora Nigritiana (1849, p. 424) to be synonymous with the *Erythrophleum Guineënse* of Mr George Don (Gard. Dict., ii. 424), the bark of which yields, by infusion, the Red-water, or ordeal-poison of our negro colonists around Sierra Leone. And this again has been thought identical, or nearly so, by Mr Brown, with the Casa, or Cassa, whose bark was found by Captain Tuckey to be used as an ordeal-poison by the natives on the banks of the Congo River (Tuckey's Narrative, Appendix v., p. 467). It is possible that more than one species of the same genus may be used for the same purpose; but, judging from the bark of the Gambia and Sierra Leone

plants in my possession, it is improbable that *Fillæa suaveolens* and *Erythrophleum Guineënse* are the same species.

I have not yet met with a good account of the effects of the red-water tree, or cassa tree; and they certainly have not been hitherto examined scientifically, although the subject cannot fail to repay inquiry. The red-water bark would seem, from the statements of Dr Winterbottom in his "Account of the Native Africans in the neighbourhood of Sierra Leone" (1803, p. 130), to possess the property of causing, in various circumstances, vomiting, purging, paralysis of the limbs, and death. Judging from the quantity which he says is required for the ordeal, it cannot be a very subtile poison. But the bark presented to me by Dr W. F. Daniell, of the Army Medical Service, as the bark of *Fillæa suaveolens* must be energetic; for when a grain or two is tasted, it causes slowly an intense numbness and tingling of the part of the tongue to which it is confined. That which I have received from him as the bark of *Erythrophleum Guineënse* has on the contrary a purely astringent taste, without bitterness or subsequent numbness or acrimony. Its texture is also full of a red concrete resiniform matter, probably a kind of kino; which is entirely wanting in the other. Hence, these barks cannot be produced by the same species; so that if there be no mistake about the barks, the two plants must be different species.

According to Dr Winterbottom, when a culprit is to undergo the red-water ordeal, proclamation is made, and the whole proceedings take place in public before a great concourse of people, among whom the women are conspicuous by their number and their finery. The bark is publicly pounded, and half a pint of powder is switched in water till it froths like soap. After certain ceremonial observances, the culprit drinks repeatedly, and as quickly as possible, a calabashful of the poison, amounting to eight ounces. Sometimes he dies after drinking the fourth calabashful; sometimes he will take twelve before any effect results. If he is seized with violent pains in the bowels, without vomiting or purging, he is declared guilty, and if he recovers he is sold for a slave. Should he vomit and sustain no other injury, he is pronounced innocent. But if the poison cause purging within twenty-four hours, or if he lose the use of his arms and legs, and so cannot run away when liberated, the red-water is said "to be spoiled;" and in that case, too, he is sold into slavery, or a relative for him, if he be himself too old.

I should have gladly examined a poison possessing such properties as these. But, unluckily, the quantity with which I have been hitherto supplied is too small for an adequate experimental inquiry.

Meanwhile I have fallen in with another African ordeal-poison, of much greater energy and interest, and not hitherto mentioned by any author on poisons I have consulted, although prevalently used in a district long accessible to Europeans. The only notice of any kind that I have seen of it, is a short allusion to it by Dr Daniell, in an ethnological paper in the Edinburgh New Philosophical Jour-

nal for 1846, p. 319. From such trials as I have made, it seems one of the most singular and intense poisons yet known, and well worthy of a more complete investigation than I have been hitherto able to accomplish.

A few years ago the Rev. Mr Waddell, missionary in Old Calabar, who lately left Scotland for the third time, to return to Africa in pursuit of his Christian calling, put into my hands two seeds, which he described as the ordeal-nut of the Negro tribes of Calabar, and of whose properties and uses he gave me so singular an account, that I felt great curiosity to investigate its action and chemical constitution. Subsequently, from him and from a mercantile friend in Liverpool, who annually sends a trading vessel to the Gold Coast, and who kindly interested its captain and its surgeon in the cause, I obtained successively three small parcels of the seeds. The natives, it seems, regard them with mystery, and reluctantly part with them. It is, therefore, necessary to guard against the chance of deception, and other sources of error. But I have no doubt that I have received the genuine article. For the four several specimens are the same seed; and it eminently possesses the only indispensable property for the trial by ordeal, inasmuch as it is an unerring and terrible poison.

I owe also to Mr Waddell a collection of documents illustrating the trial by the ordeal poison as repeatedly witnessed by himself and his brother missionaries. From these documents it appears, that when a man dies a little out of the ordinary course, it is no uncommon thing to ascribe his death either to poison or to *Ifod*, in negro English, *free-mason*, that is witchcraft. Thereupon one, or more, or many, of his relatives come under suspicion; and there is no other way for the poor creatures to clear themselves, than by swallowing, generally in the fetish-house, an emulsion of this dreadful seed. The native belief is, that the innocent vomit and are safe; but that the guilty retain the poison and die. And such is the confidence in the test, and the general detestation of the crime of practising witchcraft, that, when an individual is accused, he commonly demands the ordeal, and is with difficulty denied it. Many an innocent person thus pays the penalty of his rash reliance.

On one occasion, a young woman having been accused by the king's niece of "having freemason," she at once demanded of the king that she should "chop nut," that is, eat the ordeal seed. Eyo the king refused, however. But she went to an adjoining house, took the poison there, and died in three hours. On another occasion, when a native of rank died rather suddenly, his brother, a lad of eighteen, was accused of killing him by witchcraft. The lad indignantly demanded the ordeal, and swallowed an infusion of thirty seeds. Dr Taylor, a missionary, who rushed forward to save him, was at first repulsed by those around, but, reaching him at last, found him cold, flaccid, insensible, and unable to swallow the emetic which was offered him; so that he died in half-an-hour after

taking the deadly potion. A dose of this magnitude indeed, seems usually to prove fatal within an hour. A man, who was seen to pass the mission-house to the habitation of the priests, where he was compelled to take nineteen pounded seeds in a draught, was carried back, a stiffened corpse, in an hour afterwards. The only chance of life is an early attack of vomiting. In a courageous attempt by Mr Waddell to persuade king Eyo to abandon the trial of several people who were charged with slaying a man of family by witchcraft, a woman who had taken ten seeds was seized with vomiting while Mr Waddell was engaged in an altercation with the king; upon which she was immediately claimed by the missionary as innocent by their law, and was saved. Sometimes the horrible trial is undergone on the great scale, when a chief of rank is thought to have died suspiciously. In 1834, when a noted chief man called Duke Ephraim died, all his relatives and slaves, to the number of fifty, were condemned to undergo the ordeal, and no fewer than forty of them died. Among the documents put into my hands by Mr Waddell was a journal of this transaction, kept at the mission by a native convert in his broken English, of which the following extract is a graphic specimen :—

"*Old Calabar, October* 14, 1834.—Ephraim Duk died in five o'clock this evening, and put him for grown next morning.

"16 *October* 1834. This morning all country and Calabar come, and we go for Mr Young, and stop little, not long, after that we go for Duk Palaver House, with all country and our people, about the Duk Ephraim sick, and we go in for his yard ; so all our people chop nut. The name of them : Erim Cooffee Duk chop, dead. His son chop, no dead. Orrock Cooffee, and two his son, dead. Cooffee Copper, dead. Egbo Esham, dead. Egbo Young Egbo, dead. Bashie Archiebong Egbo Duk, dead. Erim Odoor, mother dead. Erim Egbo Duk Ephraim Otto, dead. Young Old Archiebong, dead. Otto Ercanam, dead. One Otto slave, dead, for street. Egbo Eshen, mother, dead to night.

"*Ditto* 17.—5 Duk wife chop nut this morning. All dead, etc."

Here other names follow; and so the entries go on day by day until forty of these cold-blooded murders are recorded.

I have received a few days ago some additional particulars respecting the uses of this poison from Dr Daniell, who resided for some time in Calabar, and, by his influence with Eyamba, the king of the country, was allowed to witness scenes which are usually forbidden to Europeans. This gentleman confirms the testimony of the missionaries as to the deadly nature of the poison, and says it is used not only as an ordeal-poison, but likewise often for despatching the numerous wives and slaves who are buried on the occasion of the funeral of men of consequence.

The ordeal-nut of Calabar, called Esére by the natives, is a leguminous seed or bean, about the size of our garden-bean, but thicker. According to one account I have received, it is not produced in the Calabar district, but is floated down the river from the upper coun-

try. This is possible, for it floats in water; but it is not very likely. According to information communicated to me by Dr Daniell, it was stated to him by the natives to grow in marshy places near Attarpah and Old-town in Calabar; and the Rev. Mr Waddell was informed that the plant is everywhere destroyed by order of the king, except where it is preserved for supplying the wants of justice; and that the only store of seeds is in the king's custody.

The seed is, I apprehend, quite unknown in Europe. Of several eminent botanists, including Mr R. Brown, to whom I have shown it, no one has been able to recognise it as a known species. In order to describe it, it has been cultivated at my request by my colleagues, Professor Syme and Dr Balfour, and both have succeeded. It proves to be a perennial creeper, of the natural family, *Leguminosæ*, and closely resembling a *Dolichos*. It has a large root-stock. The fresh plant has a heavy, strong smell, after being some time cut. Though two years old, it has not yet flowered; and, like other perennial creepers, it may require to form wood for several years longer before it bears flowers. I am therefore unable to describe it farther, or to name it.

It has a hard, brittle, ligneous tegument, rather rough, and of a brownish-crimson or pale chocolate-brown colour; but many specimens are ash-grey, apparently from slight mould. The kernels, which weigh from 36 to 50 grains, are always in good preservation, and never injured in the slightest degree by insects—a rare occurrence with tropical seeds. They are white and hard, but may be chewed; and they have the taste of the eatable leguminous seeds, without bitterness, acrimony, aroma, or any other impression on the organs of taste; in fact, they are scarcely, if at all, distinguishable in taste from a haricot-bean. This is a formidable peculiarity, were it possible for the seed to become a familiar poison in Europe. So far as I know, the property in question is peculiar to it, for all other poisonous seeds of the Leguminosæ, with which we are sufficiently acquainted, are bitter. The blandness of its taste is indeed so unusual a character that I was at first misled, and imagined that I had probably got a wrong and harmless seed; but I soon found that I was much mistaken.

I began a chemical examination of it, with the hope of separating an active proximate principle, which assuredly must exist in it, and will prove to be a poison of appalling subtilty. But with my limited materials success was unattainable; for leguminous seeds are difficult to analyse; and in this instance there is the additional obstruction, that at every stage the want of any marked sensible property makes it necessary to perform a physiological experiment on one of the lower animals, otherwise we may follow a wrong direction in the search. All I can say is, that the seed, like others of its natural order, contains much inert starch and legumin, and 1·3 per-cent of fixed oil, also probably inert; that its active properties may be concentrated in an alcoholic extract, which constitutes 2·7

per-cent of the seed; and that this extract does not yield a vegetable alkaloid by the more simple of the ordinary methods of analysis.

I shall now proceed to mention what I have observed of the effects of the ordeal-bean on the animal body. These are interesting, energetic, and in some respects peculiar, as it seems to affect directly and violently the functions of the heart, and the exercise of volition over the muscles.

When a poison impresses powerfully both the circulation and some function or functions of the nervous system, it is a matter of great nicety to eliminate the true phenomena, especially by observation upon the lower animals alone.

We know that some poisons, such as strychnia, and the various seeds and barks which contain it, cause, by direct irritation of the spinal chord, violent tetanic spasms of the voluntary and respiratory muscles, without impairing sensation, or enfeebling the heart, or clouding the mental faculties; and thus they occasion death by convulsive arrestment of respiration. Others, such as the urari poison, and conia, or hemlock from which it is derived, cause, by direct exhaustive action of the spinal chord, the opposite state of paralysis of the voluntary and respiratory muscles, but still without influencing the heart, or sensation, or the mental powers; and so death arises in their instance from arrestment of respiration, by simple paralysis of the muscles which maintain it. Others again, such as atropia, or belladonna, the plant which yields it, principally assail the functions of the brain, at first combining stimulus of some with exhaustion of others in the most singular and often grotesque concatenation, but inducing at last a state of profound coma, and as the result of this a universal muscular paralysis; and thus death ensues, equally as before, from arrestment of the breathing, not however by direct action on the origin of the nerves which govern the muscles of respiration, but indirectly, through an influence on the cerebral functions, exactly as in ordinary apoplexy. We can likewise conceive a poison to possess only a simple and direct action upon the heart, producing exhaustion of its irritability, paralysis, and consequently death, by arrestment of the circulation; but no such poison is yet known.

These are all instances of simple action on a single vital function. But many poisons exert a more composite action. Some, such as nicotina, and its source, tobacco, produce paralysis of the heart, and also a narcotic action on the brain. Others, such as foxglove, and in all probability its active proximate principle, digitaline, not only possess this double action on the heart and brain, but likewise powerfully irritate the kidnies. Others, such as hydrocyanic acid and picrotoxa, the active constituent of cocculus-indicus, exhaust the functions of the brain, so as to induce coma, and at the same time irritate the spinal chord, so as to excite convulsions; and thus, here again we have death produced by arrestment of the breathing, indirectly through the brain, but concurrently with direct spinal

irritation. In others, such as aconitina, and its source, monkshood, there is a singular combination of exhaustion of the heart's irritability, and of common sensation, but without any influence on the voluntary muscles, or on the mental faculties; and death arises by arrestment of the circulation.

It is easy to see,—on considering attentively what must be the manifestations of these various actions, both simple and compound, but especially the latter,—that extreme difficulty will often occur in seizing and rightly comprehending the facts, above all when the succession of phenomena is swift, and when the subject of observation is one of the lower animals, which cannot adequately express by external signs the varying influence of agents on sensation and the other cerebral functions.

Hence it arises that many erroneous conclusions have been come to regarding the action of our most potent and interesting poisons. Take for example hemlock. This formidable poison was long supposed to cause death by coma, that is, a narcotic action on the brain. But I have shown in a paper read before this Society in 1836, that the mode of death is really by paralysis of the muscles and arrestment of respiration, through an exhaustive influence on the spinal chord. And it is easy to see where the source of error lay. For, when the muscles are paralysed, sensation and the mental faculties will seem to a common observer to be paralysed also; because the animal mechanism for producing expression is at rest.—It appears that many persons think it an easy task to investigate experimentally the physiology of poisoning. But they are assuredly mistaken. A long apprenticeship must be passed before any one can observe with accuracy the phenomena of the action of poisons.

These cautions are prefatory to the remark, that it is a matter of great nicety to apprehend the deceptively simple manifestations of the action of the ordeal-bean on the lower animals. Scarcely do signs of uneasiness appear after a fatal dose has been given, when the animal becomes in quick succession languid, prostrate, flaccid, immovable; respiration, now faint, speedily ceases; and death is complete. It may thus appear to die insensible and comatose. But that is not the case. So long as the power of expression remains, amidst the swiftly advancing languor, signs of sensation may be elicited. Or we might infer from the phenomena that it dies of paralysis of the voluntary and respiratory muscles. But this too is in all probability not the fact. For, on dissection immediately after respiration ceases, the heart is found in a state of paralysis; and it is evident that a quickly increasing paralysis of the heart not only explains the mode of death, but might likewise account for the antecedent muscular weakness and flaccidity.

These effects were well exemplified in the first experiment I tried, when twenty-one grains of fine powder, made into an emulsion with two drachms of water, were secured in a cavity in the subcutaneous cellular tissue of the flank of a rabbit. For three minutes there was

no appreciable change. But the animal then evidently became weaker, especially in the hind legs. Its feebleness quickly increased, and was attended with slight irregular twitches of the muscles of the trunk and extremities, and occasional twitching of the head backwards. But sensation remained; for the animal struggled a little when held up by the ears, and resisted attempts to shove it from behind. In four minutes, when put upon the side, it lay in that position; which the rabbit always vehemently resists so long as it is able. The trunk and extremities immediately afterwards became quite flaccid. Respiration ceased in five minutes certainly; probably indeed sooner; but the precise time could not be fixed, owing to continuance of slight muscular twitches. The chest being immediately opened, the heart was seen pulsating slowly, feebly, and inefficiently for ten minutes; and when its cavities were then perforated, the left side gave out a much brighter blood than the right, showing that the circulation, owing to paralysis of the heart, had not been maintained after respiration had ceased. The muscles of voluntary motion contracted at this time vigorously under the stimulus of galvanism, and continued to do so twenty-five minutes after death.

The same remarkable properties are possessed by the alcoholic extract of the seeds. When two grains and a third of this extract, obtained from one hundred grains of powdered seeds, were introduced into the cellular tissue of a rabbit in the same way as before, at the end of two minutes, without any previous indication, the animal suddenly became weak, fell on its side, struggled a little with its feet, and ceased to breathe in one minute more. On the chest being immediately laid open, the same phenomena were observed as in the last experiment.

It is evident that this poison is one of great intensity of action upon the lower animals; but I have not endeavoured to ascertain exactly its degree of energy. I may mention, however, that on making trial of the exhausted powder from which the extract used in the preceding experiment was prepared, although no effect could be detected in the course of an hour, in ninety minutes the animal was observed to become suddenly weak, and it died in a few minutes more exactly like the others. This result, which appeared unintelligible at first, was afterwards satisfactorily traced to the residual farina not having been carefully enough washed clear of the second spirituous decoction; so that a little of the poisonous ingredient was inadvertently allowed to remain before the farina was dried. The quantity must have been very small.

The only other fact I have to mention relative to the action of the seed on the lower animals, is one observed incidentally by Mr Macnab. As the seed vegetates, the two fleshy cotyledons or sarcolobes rise partially above ground. In this state one of the seeds growing in the Botanic Garden stove-house was attacked by two slugs, one on each cotyledon. Mr Macnab observing that one

of them had begun to swell about the head, he removed it for further observation; and in twenty-four hours it was found dead.

Having ascertained the mode of death from the action of the ordeal-bean, I did not consider it advisable to study farther the details of its action by means of experiments on animals, because I had been fully informed as to this in a more precise manner by an experiment made with the bean in my own person. I shall conclude this notice with an account of what I experienced; and I trust the details will not appear needlessly minute, as they seem to me to establish an action of a very singular kind in the case of this poison, and one of which we might discover other instances among known poisons, had we equally precise opportunities of determining the true phenomena.

Having some doubts whether I had obtained the true ordeal-poison, as it tasted so like an eatable leguminous seed, I ate one evening the eighth part of a seed, or six grains, about an hour after a very scanty supper. During an hour that I passed in bed reading, I could observe no effect whatever, and next morning I could still observe none. I am now satisfied, however, that a certain pleasant feeling of slight numbness in the limbs, like that which precedes the sleep caused by opium or morphia, and which I remarked when awake for a minute twice or thrice during the night, must have been owing to the poison.

On getting up in the morning I carefully chewed and swallowed twice as much, viz., the fourth of a seed, which originally weighed forty-eight grains. A slight giddiness, which occurred in fifteen minutes, was ascribed to the force of the imagination; and I proceeded to take a warm shower bath; which process, with the subsequent scrubbing, might take up five or six minutes more. The giddiness was then very decided, and was attended with the peculiar indescribable torpidity over the whole frame which attends the action of opium and Indian hemp in medicinal doses. Being now quite satisfied that I had got hold of a very energetic poison, I took immediate means for getting quit of it, by swallowing the shaving water I had just been using, by which the stomach was effectually emptied. Nevertheless I presently became so giddy, weak, and faint, that I was glad to lie down supine in bed. The faintness continuing great, but without any uneasy feeling, I rung for my son, told him distinctly my state, the cause, and my remedy —that I had no feeling of alarm, but that for his satisfaction he had better send for a medical friend. Dr Simpson, who was the nearest, reached me in a few minutes, within forty minutes after I ate the seed, and found me very prostrate and pale, the heart and pulse extremely feeble and tumultuously irregular; my condition altogether very like that induced by profuse flooding after delivery; but my mental faculties quite entire, and my only sensation that of extreme faintness, not, however, unpleasant. Dr Simpson judged

it right to proceed at once for Dr Douglas Maclagan as a toxicological authority, and returned with him in a very few minutes.

In his absence, feeling sick, I tried to raise myself on my elbow to vomit, but failed. I made a second more vigorous effort, but scarcely moved. At once it struck me—"This is not debility, but volition is inoperative." In a third effort I was more nearly successful; and in the fourth, a resolute exercise of the will, I did succeed. But I could not vomit. The abdominal muscles acted too feebly; nor were they much aided by a voluntary effort to make them act. I then gave up the attempt, and fell back, comforting myself with the reflection that vomiting was unnecessary, as the stomach had been thoroughly cleared. At the same time the sickness ceased, and it never returned. There were now slight twitches across the pectoral muscles. I also felt a sluggishness of articulation, and, to avoid any show of this, made a strong effort of the will to speak slowly and firmly, through fear of alarming my son, who was alone with me.

Dr Maclagan, on his arrival, thought my state very like the effects of an over dose of aconite. Like Dr Simpson, he found the pulse and action of the heart very feeble, frequent, and most irregular, the countenance very pale, the prostration great, the mental faculties unimpaired, unless perhaps it might be that I felt no alarm where my friends saw some reason for it. I had, in fact, no uneasy feeling of any kind, no pain, no numbness, no prickling, not even any sense of suffering from the great faintness of the heart's action; and as for alarm, though conscious I had got more than I had counted on, I could also calculate, that, if six grains had no effect, twelve could not be deadly, when the stomach had been so well cleared out.

Presently my limbs became chill, with a vague feeling of discomfort. But warmth to the feet relieved this, and a sinapism over the whole abdomen was peculiarly grateful when it began to act. Soon afterwards the pulse improved in volume, but not in regularity. I was now able to turn in bed; and happening to get upon the left side, my attention was, for the first time, directed to the extremely tumultuous action of the heart, which compelled me to turn again on the back, to escape the strange sensation Two hours after the poison was swallowed, I became drowsy, and slept for two hours more; but the mind was so active all the while, that I was not conscious of having been asleep. On awaking, the tumultuous action of the heart continued. In an hour more, however, I took a cup of strong coffee; after which I speedily felt an undefinable change within me, and on examining the condition of the heart, I found it had become perfectly and permanently regular.

For the rest of the forenoon I felt too weak to care to leave my bed; and on getting up, after a tolerable dinner, I was so giddy as to be glad to betake myself to the sofa for the evening. Next morning, after a sound sleep, I was quite well.

On considering this narrative, as well as the experiments on the rabbit, it will appear evident that one principal action of this extraordinary poison, and the immediate cause of death in fatal cases, is depression, ending in paralysis, of the heart. I think it may be also safely inferred, that another action is paralysis of the voluntary muscles, attended with suspension of the influence of volition. It does not appear to me that mere faintness is adequate to account for the extreme muscular inability I experienced; neither do I conceive it possible for me to have been deceived by the strong conviction I felt of the will being inoperative in its influence over muscular motion. My failure reminded me forcibly at the moment of a phenomenon invariably remarked during the impaired acuteness of the mind which often attends the early stage of hemiplegia. When the patient is told to stretch out the palsied arm, he stretches out the other, however pointedly the physician turns his attention on the powerless limb, and even though the patient himself keeps his eye on it; thus clearly showing that the will orders, though the muscles cannot obey.

The integrity of the mental faculties, during the prostration of that cerebral function which conduces to the operation of the will or muscular action, was most remarkable. The minute details I have given are chiefly intended to illustrate this point; and I am persuaded that I have not overstrained any one article of evidence on that head.

The apparent efficiency of coffee, in removing what remained of the poisonous action after five hours' duration, is not unworthy of notice. Every physician knows that coffee is used for dispelling the after effects of various narcotic poisons; but its real utility has been doubted. In the instance of the present poison, the *post hoc* at least was both very prompt and most complete, so far as the main symptom, the irregular heart, was concerned; and I have myself no doubt of the reality of the curative action.

Whether the extraordinary power, which this poison possesses in depressing the action of the heart, may be susceptible of application in the exercise of the healing art, is a question which time and experiment will alone enable us to answer. Its mere potency is no objection, when it is considered that drugs so potent in poisonous energy as hydrocyanic acid, aconite, and digitaline, are now firmly established in medical practice as safe and efficacious remedies.

Let me advert lastly to a peculiarity in the action of the ordeal-bean which struck me forcibly while labouring under it. Philosophers have thought it not unworthy of inquiry, how in criminal executions death may be completed without physical suffering to the criminal. Governments have even consulted science on the subject. But science has not yet satisfactorily solved the question. Meanwhile, I suspect it has been accidentally solved by the negroes of Old Calabar. At least, so far as the effects of their state-poison on myself went, there was no bodily uneasiness except the single attack

of sickness—apparently the relics of the action of my peculiar emetic,—but simply a sense of sinking vitality, with clearness of mind, and without any sensation deserving in the slightest degree to be called physical distress. We know, indeed, that many forms of extreme fainting, of which this is evidently one, are attended with feelings, which, if not positively pleasurable, are certainly quite unallied to pain. Death by simple fainting, without any preparatory painful process, is evidently what a humane execution should aim at producing. And all this, I apprehend, will be effected by the Calabar Ordeal-bean.

ARTICLE II.—*Remarks on the Treatment of Disease.* By W. O. MARKHAM, M.D., Assistant Physician to St Mary's Hospital, London.—(*Continued from p.* 33.)

"THE nature of medical causation is such, that it takes as much time and trouble to rectify an error as to establish a truth. Thus it may require the experience of one man's life to arrive at some plausible theory, and the counter-experience of another man's life to show that it is false."—*Latham's Clinical Medicine.*

THE influence exercised over the human intellect by Bacon's master spirit is, amongst other illustrations, supposed to have been manifested, and in a striking manner, by advancements made in the art of medicine,—in a more rational application of it to the cure of disease; and at this present day, I imagine, that no body of scientific men makes greater claim for the credit of pursuing the inductive method, in their investigations, than do the practitioners of the medical art; and perhaps no body of scientific men possesses more just claims for such credit. The reason of this is plain enough. The direction in which the mind of the physician is turned by the physical and mathematical branches of study, whose cultivation is absolutely necessary, as stepping-stones to a knowledge of his profession, naturally gives to his ideas a positive and somewhat a material character; he demands to feel, to see, and to touch; and by the exercise of these faculties of the senses it is that he becomes, for the most part at least, possessed of a knowledge of his business.

He is thus, by the very nature of his previous education, by his study of chemistry, of natural philosophy, and of other kindred branches of the positive sciences, taught early to draw correct inferences respecting causes and their effects, and to trace out the proper connections in which sequences stand to antecedents; he is thereby continually warned against a fallacious acceptance of conclusions; he therein finds a safeguard against the great and very numerous temptations to the ready reception of fallacies besetting him in his investigation of those matters, which are the special objects of his professional pursuits. And such a safeguard he indeed requires, for these pursuits are constantly leading him into unknown regions of