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I.

On the Poison of Fish. By C. CHISHOLM, M. D.

THE many instances of the poison of fish, and the frequency of death in consequence of receiving it into the human stomach, do not seem to have roused, to any useful degree, the attention of medical men. When we consider, that, on the shores of some of the West India Islands, almost all the fish partake in a greater or less degree of this pernicious quality; that on the coast of others, this evil is partially experienced; and that generally there are kinds of fish whose exemption from it cannot be depended on, although, when wholesome, they are delicious food, and constitute the principal means of support of the inhabitants; when we consider this, we cannot suppress our surprise that so little has been done towards obtaining a more perfect knowledge of the subject. Our neighbours, the French, have not, however, been so inattentive. The Society of Medicine of Paris, in a memoir of instructions for the scientific men accompanying M. de la Perouse, very properly direct their inquiry into the investigation of the poison of fish. "Take notice, say they, of the animals, and especially serpents and *venomous fish*, and endeavour to find out the cause on which this dangerous property depends in the latter, and if there be any means by which it may be prevented." (De la Perouse's voyage, by Mellet Moreau, v. i. p. 264.)

I know not any of our voyagers, unless Forster may be considered an exception, who have made any useful observations on this singular property of fish; nor am I certain whether this proceeds from its being an evil chiefly, or exclusively confined to the Caribbæan Seas. These considerations have induced me to resort to and examine my tropical notes, and endeavour, from them, to throw some light on the subject.

It has been well and elegantly said, by a celebrated writer on natural history, that "Nature seems to have fitted fish with appetites and powers of an inferior kind, and formed them for a sort of passive existence in the obscure and heavy element to which they are consigned. To preserve their own existence, and to continue it to their posterity, fill up the whole circle of their pursuits and enjoyments; to these they are impelled rather by necessity than choice, and seem mechanically excited to every fruition. Their senses are incapable of making any distinctions; but they drive forward in pursuit of whatever they can swallow, conquer, or enjoy." (Goldsmith's Hist. of the Earth and Animated Nature, v. vi. p. 160, 2d. ed.) This well drawn general character will explain what might otherwise be considered as inconsistent with the laws of natural instinct. Such a conformation of body, such imperfection in the organs of sense, such rapacity, such want of discrimination, became suitable and necessary to the circumstances of the lot assigned them by Providence. We perceive from it, too, the existence of a law, by which substances inimical to life in another element, and under different circumstances, are not only harmless to fish, but become assimilable to their peculiar nature.

It was in the early part of my residence in the island of Grenada I first had occasion to observe and to attend to the poisonous property of fish. There the fish possessed of this property are the barracuda (*perca major subargentea maculata, pinnis migrantibus* of Browne, N. Hist. of Jamaica—the *esox barracuda* of Sloane, and *becune* of the French)—a species of snapper (*coracinus fuscus major*) gray snapper—the porgee (*sparus chrysops*)—the dolphin (*coryphæna cæruleo varie splendens, caudâ bifurca*)—the king-fish, tassard of the French, (*scomber maximus, pinnulis utrinque novem, tuberculo rigido acuminato utrinque ad caudam*)—the conger-eel (*muræna major subolivacea*)—a variety of the sprat, distinguished by the trivial name "yellow-bill'd," not mentioned by Browne, (*clupea thryssa*, Osbeck's Fauna Sinensis). These, however, differ greatly in the degree of poison; and all of them, except the last, are generally wholesome. The *clupea thryssa* possesses this virus to an extent almost passing belief. The first instance of its fatal effect I met with,

with, was in a negroe of the estate of Grand-mal, near St George's. The poor fellow had scarcely swallowed the fish, when the most dreadful convulsions were produced, and in about half an hour he was dead. The œsophagus and stomach were in a highly inflamed state, and exhibited the appearances produced by the most active metallic poisons. When the progress of the action of the poison of this fish is less rapid, the course of symptoms is an itching all over the body, violent colicky pains, a contraction and pungent heat of the œsophagus, nausea, heat of skin, and great acceleration of pulse, giddiness, loss of sight, cold sweats, insensibility and death. The distinguishing symptoms are the contraction and pungent heat of the œsophagus. The rapidity of the action of this poison is such, that at St Eustatius, and other of the Leeward Islands, whites and negroes have been known to expire with the sprats in their mouths still unswallowed. And yet I am informed, that at Porto Rico, the yellow-bill'd sprat is by no means poisonous, but eat with impunity--a curious circumstance, and not to be accounted for, without supposing the local existence of a marine poison of some peculiar kind.

The poison of each fish seems to possess a peculiar action on the human body. The poisonous gray snapper affects the bowels chiefly, occasioning a cholera, with pains so excruciating as scarcely to be borne: it also produces an itching of the surface, and sometimes, but very rarely, a denudation of the cutis, the cuticle peeling off as in some species of lepra. The effects of the poison of this fish are of very long continuance, and frequently give rise to chronic complaints of a very distressing nature, such as weakness and paralysis of the lower extremities, a dimness of sight, dulness of hearing, &c. In the year 1786, a carpenter of the name of M'Arthur, his two brothers, three or four white journeymen, and some negroe carpenters belonging to him, suffered severely by eating of a poisonous gray snapper. The general symptoms were such as I have described; but its mode of acting on one of the negroes is very singular, and affords perhaps an useful hint in the treatment of old ulcers. This man had had an ulcer on one of his legs, which had resisted a variety of means of cure, for more than two years; and at the time I am speaking of, it was so ill-conditioned, that amputation had been proposed as the only means of saving his life. He had eat a larger portion of the fish than his mess-mates, but at first the symptoms were similar. At the end of two days, the discharge from the ulcer became thicker, more abundant, and better coloured; but at the same time, the whole surface of his body became scored, or divided into regular squares, each score deepening into a fossula, out of which was discharged, in astonishing quantities, a substance

substance of a thick curdly texture, and whitish colour. During six weeks, this singular discharge continued: about that period, it gradually ceased, the ulcerated surface healed, and the ulcer on his leg, in a few weeks more, no other means having been used, healed in a most perfect manner. This was literally impressing a new habit on the system, by the introduction of a more powerful and active stimulus. Instances of this do not often occur, and it may be considered as a kind of reproach to physicians, that they are almost always accidental.

The *porgée*, a species of *sparus*, and which seems to be the *sparus pargos* of Forster, produces effects somewhat similar, but, in the West Indies at least, in a very inferior degree of violence.

I do not recollect more than two instances of the poisonous effect of the dolphin. One of these occurred in Grenada. In this, besides violent headach and nausea, there was the eruption of large blotches of a very florid colour, intolerably itchy, but very distinguishable from the prickly heat, and the eruption occasioned by the *clupea thryssa*, in as much as this was in clusters of the breadth of the palm of the hand, had no distinct pustules, but was of an uniform redness and surface. These were accompanied by a tightness in the breast; but readily yielded to a very simple treatment.

The *muræna conger* sometimes possesses a most active poison. This fish is very common off the coast of Grenada, and often of a great size. In the month of April, 1791, a conger of the largest size was caught off the plantation of Mess. Prudhomme and Molinier, on which two overseers, three stout negroe men, and a negroe child of three years old, fed heartily; but the negroes ate a much larger proportion than the white men. In the course of the following night, they were all seized with violent griping and cholera, together with a peculiar sensation in the lower extremities, attended with violent convulsive twitchings, and, particularly the child, faintings. The white men suffered less than the negroes. They all perceived a brassy taste in their mouths, as they expressed it, and a rawness of the *œsophagus*, as if it had been excoriated. These symptoms continued to afflict the negroes for a fortnight, and then terminated in paralysis of the lower extremities. One, indeed, was not only thus affected, but had superadded a paralytic affection of the whole of one side. The child had, conjoined with this, an achorous eruption over the whole of the hairy scalp, emitting a most offensive smell, and discharging an ill-looking ichor. After suffering for several months, they recovered with difficulty.

The king-fish (*scomber maximus*) frequently, when of an uncommon size, gives rise to very unpleasant symptoms, such as cholera

cholera and florid eruptions. It is a variety of this which is most poisonous, distinguished by the trivial name bastard king-fish.

The large white and the small red land crabs, varieties of the cancer ruricola, are also frequently poisonous, exciting violent cholera.

During five months of the years 1796-7, I resided at St Croix, and made excursions to the adjoining groupe of the Virgin Islands. Here I received much interesting information relative to the poison of fish. The poisonous fish of the sea around these islands are the barracuda (*perca major*); the yellow-billed sprat (*clupea thryssa*); the poisoned grooper (*perca venenosa* of Catesby, or *trigla subfusca nebulata* of Browne); the horse-eye and green-backed cavalloe (varieties, I believe, of the scomber *macula nigra ad basin utriusque branchiostegæ et in utraque pinnâ pectorali*); Spanish mackarel (*scomber cæruleo argenteus nudus*, B.); king-fish; the old wife (*balistes monoceros*); the hyne (*coracinus minor*); and some varieties of the cancer ruricola. Of these the most dangerous are the barracuda and sprat.

The accounts given by the fishermen, particularly those settled at the east-end of St Croix, were uniform. The questions generally put, were, During what season are the fish most poisonous? What kinds of fish are known to be poisonous about St Croix? What part of the coast do the poisonous fish chiefly resort to? And what is supposed to be the cause of the poison? The answers amounted to this; that the fish, more especially those resorting to the eastern coast of the island, about the end of February, or beginning of March, frequent the bank situated to windward of Buck-Island, in order to deposit their spawn; that they remain there occupied in the important work of propagating their kind, during March and April; that when this is completed, they return to the shallower water near the coast; that during the time they are on the bank, they feed on what the fishermen call sea-moss (*corallina opuntia*), which, they say, possessing a most active poisonous principle, renders their bodies poisonous to those who eat of them, immediately after their return towards the coast, or if caught on the bank itself; that during the months of May, June, and July, the kinds of fish I have named are poisonous; but during the remainder of the year, until the spawning season returns, they are wholesome. To the question which relates to the nature of the poison, the fishermen could give no satisfactory answer: they all agreed, however, in assigning it to an impregnation of copper, somehow brought about. Imperfect as this information is, with respect to the nature of the poison more especially, it appears, with some explanation and allowance for the obscurity of the subject itself, rational enough; and accounts satisfactorily for the varying experience of the inhabitants of the
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effect of the same kinds of fish, used as food, at different periods. Mr Semple, of Butler's Bay, on the north side of the island, assured me, that when sprats were caught by his fishermen, his servants, to please him, separated the yellow-billed from the black-billed, and served up to his table the latter only; but the former, being found perfectly wholesome, they constantly ate. On the Golden Rock estate, a negroe-fisherman having busied himself in preparing sprats for drying and smoking, a dog, during the operation, greedily devoured the offals, among which were those of a yellow-billed sprat. The dog became immediately convulsed, and died in less than fifteen minutes. Instances were related to me of negroes dying in the very act of swallowing this fish. Dr Claxton, a physician of eminence, of Christianstaedt, favoured me with a surprising proof of the singular activity of this poison. A person had taken one of the yellow-billed sprats into his mouth, but had swallowed no part, when informed of his danger; he instantly spat out what he had masticated. Assistance was immediately procured; vomits and alkalis were given, and the danger was considered as obviated. The consequence, however, was fatal, and in a manner the most painful and lingering. Blotches appeared on various parts of his body, corroding ulcers succeeded, which penetrated to the bone, and ending in marasmus, put a period to the existence of the unhappy sufferer. Thus various is the event; a result, in all probability, confirming the accuracy of the observation of the fishermen, that, at certain periods, the same fish is wholesome or poisonous, according to the nature of its food,

The result of my inquiry, and of my own observations, relative to the cause and the nature of the poison of fish, has not been satisfactory. I shall, however, relate them, and leave the reader to decide for himself.

The inhabitants of the West India Islands, in their opinion respecting this poison, may be divided into those, 1. Who believe copper to be the basis of it; 2. Those who attribute all its pernicious qualities to the galere or gally-fish (*medusæ* and *holothurizæ*), which are supposed to constitute the food of those fish which possess it; and 3. The few who assign the poison to the manchineel apple, and probably as it relates to the varieties of land crab, found poisonous, they are right.

1. That copper constitutes the basis of the poison of fish, is by far the most prevalent opinion; but I know of no facts which decidedly prove this. In the month of February 1798, I had occasion to travel across the island of Antigua, from St John's to English Harbour. About four miles from St John's, the surface became considerably divided, and offered to my observation a

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singular appearance. The rock is universally schistus, and almost every where naked; but the colour of this rock, as well as that of the scanty argillaceous soil, is a beautiful pea-green,—in some places much stronger than in others. For about five miles it continued in deeper or lighter shades, without interruption, and, at Monk's Hill, is suddenly terminated in a high abrupt huge mass of green stratified schistus, intermixed with large blocks of quartz, the whole about 600 feet in perpendicular height. On inquiry, I found that this vein of mountain-green (*cuprum acido aëris mineralizatum*, Berg. Scrag. 192.) extends across the whole island, in a line nearly N. and S., and in a continuous breadth of five miles; that it is not confined to Antigua, but passing under the sea, between that island and Montserrat, forming a coppery bank or ledge of the same breadth, and reappearing on the opposite coast of the latter, it crosses it also. I am assured that this oxidation of copper continues its course from Montserrat to St Christopher's, and, passing close along the shore of that island at Sandy-point, is again discovered ranging along St Eustatius. It is again recognised among the Virgin Islands, and among the coralline reefs of the eastern shores of St Croix. In this tract, at Virgin Gorda, copper mines were successfully worked about sixty years ago; and when I visited that island, I examined the neglected shafts of many, and collected some good specimens of copper ore (the *cuprum nativum* of Bergman and Cronstedt) in a quartz matrix. An ingenious gentleman, Mr Myttleberry, surgeon to the 59th regiment, at that time stationed in Antigua, informed me that, some time after he had observed and examined the coppery tract across the island, happening to be returning with another gentleman from St Christopher's, the master of the vessel they were on board of, on passing over the bank in the channel, between Antigua and Montserrat, I have mentioned, caught some fine looking barracudas, which he immediately threw away, but having reached the deep water beyond the bank, those he caught he made use of. On being asked the reason for his doing so, he said that the copper bank rendered the fish which fed on it always poisonous. A gentleman of Montserrat to whom Mr Myttleberry related this circumstance, confirmed the accuracy of the master's observation. On my return to St John's, I had ample testimony to the same effect. A further confirmation of this is the well established fact, that almost all the fish, but particularly the kinds I have named, caught at Sandy-point, St Eustatius, and St Croix more especially, possess a most virulent poison, insomuch that very few venture to eat of them. I shall add only one more singular fact relative to the supposed coppery basis of this poison. It was communicat-

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ed to me at St Croix by the late Mr William Newton of that island. Some time after the Santa Monica, British frigate, was cast away on the coast of the island of St John, one of the Virgin Islands, oysters grew on her bottom, which was coppered. Many people ate of these oysters, and although the consequence was in no instance fatal, it was such as was dangerous and unpleasant in a very great degree, producing cholera and excruciating tormina. The submarine ridge or bank, extending from Grenada to Tobago, called by the fishermen of the former island "Copper Bank," is, I suspect, a vein of the mountain-green, and may be, there are good grounds for believing, an extension of that demonstrated in the leeward Caribbean Sea. Nor is it at all improbable that it might be discovered among the Bahama Islands, were a careful investigation made. The poisonous quality of the fish of the Bahama Seas has been noted and experienced from the days of Catesby to the present. In tracing the tract marked by the presence of poisonous fish, it will be considered a circumstance of at least curious importance, that at Saba, Sombnero, Dog, and Pear, &c. forming a kind of sweeping line nearly N. W., the fish are as poisonous as at St Eustatius and Sandy-point; whilst, to the westward of this line, at St Thomas, St John, Tortola, Virgin Gorda, Crab and Passage Islands, and Porto Rico, and to the eastward at St Martin's, Anguilla, Anegada, they are always perfectly wholesome. St Bartholomew is however an exception, although closely adjoining St Martin's. On comparing this observation, the result of actual experience, with the map of the Caribbean Islands, it will be remarked, that the bank placed between Tobago and Grenada, that from the Rock of Aves to Saba, and that from Saba, indistinctly traced towards the southern islets of the Great Bahama group, are all exactly in the north-westerly line, distinguished by the peculiar poison which renders the fish caught in it so pernicious and fatal. It is probable that this principal bank branches off in a few places, as towards Montserrat and Antigua, in one direction, and towards Dominica in another. At Dominica, in Prince Rupert's Bay more especially, the Barracuda and sprat are poisonous; and here an unanswerable argument against the opinion, that the manchineel furnishes the cause of the poison, exists, for, at Prince Rupert's, this tree has never been found. Now this very curious fact can be accounted for, probably, only in one of two ways, by a coppery oxidation of the tract thus distinguished, or by the lithophyte inhabitants of the coralline, of which the greater part certainly, perhaps the whole of this tract is formed, being poisonous, and being the food of the fish, as has been observed at St Croix.

Let these facts be compared with the character of copper given by the most enlightened chemists. Geoffrey, the celebrated French chemist, thus speaks of it, "*Æs inter venena recensetur præsertim ærugo. Edulia enim, vel etiam aqua, aliquamdiu in cupreis vasis servata, admodum noxia evadunt. Ventriculi et intestinorum dolores et tormina, vomitiones enormes, frequentes et inanes dejiciendi conatus, intestinorum exulcerationes, interdum anhelitus difficultatem et spasmodicas membrorum contractiones, ac triste lethum pro majori vel minori hujus veneni quantitate, producunt.*" (Alston's Mat. Med. v. i. 127.) The testimony of most chemists since Geoffrey's time serves to strengthen his opinion; and the cases stated by Dr Percival of Manchester, in an excellent paper on this poisonous mineral (3d vol. Med. Trans.), may perhaps be considered as illustrative of the nature of the poison of fish. The account given by Dr Blane, in his observations on the diseases of seamen, of the fate of an officer and two seamen of the Cyclops frigate, is so similar to the many instances of the effect of the poison of fish, as almost to remove a doubt of the identity of cause. (Obs. p. 298.) M. Fourcroy observes, that the oxides of copper are the most virulent poisons of the mineral kind; that muriatic acid (the basis of sea-water) dissolves metals most readily, and retains them in a state of solution most tenaciously; that the solutions are generally more permanent than those effected by the nitric or sulphuric acids, and usually more difficult to decompose by heat; that the solution of copper in the muriatic acid forms a magma which dissolves readily enough in water; that the oxygenated muriatic acid converts metals into oxides, and dissolves them without occasioning effervescence; and that this effect arises from the excess of oxygen. (Elements of Chem.) If heat, as this eminent chemist observes, is a necessary condition in the solution of copper by the muriatic acid, we can the more readily perceive the cause of the natural solution of this metal in the West Indian or tropical seas, 1. In the temperature of the sea-water being much greater than in cold or temperate climates. 2. In the innumerable submarine volcanoes, and pyritous beds, the existence of which is proved by the many hot springs found under the sea, and the insupportable heat of the sand in many places; and, 3. In the probability at least of the oxygenation of the muriatic acid being a frequent natural chemical combination in the seas of the torrid zone, where the proportion of oxygen in the atmosphere is so much greater than in other regions. This may find illustration in the fact, that the fish inhabiting the sea around Virgin Gorda, distinguished by its copper mines, are perfectly wholesome; but here there is not a single vestige of volcanic fire, nor a single instance of

of hot springs. The following circumstance may also merit consideration. Although I believe it is a fact pretty well established, subject, perhaps, to a few exceptions, that the poison of fish is confined to the limits of the tropics, yet I also have reason to believe that, within that region, the West India Islands, particularly the smaller Antilles, are almost exclusively subject to it. The seas which wash the north and south American continents within the tropics, are generally blessed with excellent fish; those which bound the opposite continent of Africa are equally so; for M. Bosman, who lived on the coast of Guinea more than fourteen years as chief factor to the Dutch African Company, informs us, that "the want of flesh and other necessary provisions in this country (the Gold Coast), renders the sea considerable, as the principal support of human life, without which it were impossible to subsist here," &c. (Description of the Coast of Guinea, Lond. 1705. p. 261.) This is further evinced by later voyagers. An observation of Mr J. R. Forster is deserving of our attention before we quit this part of our subject. Although Mr Forster (p. 648) attributes the poison of fish to their feeding on the blubbers or medusæ, yet, in other places, he ranks these among the articles of food of the natives of the islands of the Pacific Ocean, particularly Otaheite (p. 215), or, he says, "in regard to the mollusca, what little discoveries we made are confined to the Atlantic Ocean." (197.) Now, it is to be observed, that the only two instances of poisonous fish Mr Forster mentions, occurred within the tropics, in the islands of the Pacific, viz. Malicolla and New Caledonia. It is a curious circumstance, and, I imagine, illustrative of the present observation, that the poisoned sparus pargos was caught at Malicolla, which Forster describes as a volcanic island itself, and in the vicinity of an active volcano (23.). New Caledonia, where the tetrodon sceleratus was caught, is not described as distinguished by volcanic vestiges, but, like the rest, owing its origin to submarine volcanos. In these, particularly the latter, the existence of copper was proved (28.). It is curious, too, that the sparus and other fish taken in the seas around other islands, also volcanic, but without the vestigia of copper, were wholesome. It is further remarkable, that the morbid effects of the tetrodon sceleratus and sparus pargos were precisely similar, although very different kinds of fish, and similar, too, to the effects produced by the poisonous fish of the Caribbean Sea. (See Obs. on a Voyage round the World.)

2. I shall now proceed to offer what I have to say on the holothurix, and medusæ, and manchineel apple, as causes of the poison of fish. Du Tertre, the oldest writer on this subject I am acquainted with, says, "on dit dans les isles que cela vient de ce que

que ce poisson (becune or barracuda) mange de la mancinille que tombe des arbres dans la mer ; et je crois ainsi, car moy-mesme ay pensé mourir pour avoir mangé quelques soldats (the small red land-crab) qui s'en estoient repeus." (Hist. Naturelle des Antilles, tom 2. p. 204.) M. Desportes mentions this as a supposed cause, but is inclined to assign others, perhaps equally improbable. (Malad. de St Domingue, tom. 1. 108.) M. Valmont de Bomare, taking his information from Du Tertre, attributes this poison to two causes, the manchineel apple and the galere (medusa veilla Lin.). Diction. Raison. tom. iii. 12. The Pere la Bat is also of this opinion, as is the inaccurate Rochefort. Whether the apple of the manchineel really produces this effect on fish, or whether fish make it their food, except some of the testaceous tribe, is extremely uncertain. My own observations certainly contradict the opinion, and they are strengthened by the universal suffrage of the inhabitants. The celebrated naturalist Jacquin has given observations which in some measure correspond with mine (See N. Jos. Jacquin Select. Stirp. Americ. Hist. Hippomane (Mançinella). The solution of the following question may lead to interesting results. If fish are so susceptible of certain vegetable poisons, as to be instantly thrown into a state of stupor by an almost inconceivably small quantity, and when the application is continued, or the quantity of the poison increased, death immediately ensues, why does not the same effect result from the natural application of the poison, I mean the poison which is the subject of our present inquiry? In Guiana the roots of the hiarree are employed for this purpose (See Dr Bancroft's Essay on the Natural History of Guiana, p. 106.). Two other plants are used by the Indians of the same country to produce the same effect, the kunamee and the yaouraconalee; the leaves of the first are pounded and made into balls, the root of the latter is used as that of hiarree. The seeds of the menispermum cocculus, formed into a paste, are used by the fishermen of the Levant for the same purpose. (Ency. Brit.) In Georgia and South Carolina, the root of a very beautiful plant, the trivial name of which is buck's eye or poison root (*Rhus Carolinianum* of Catesby I believe), is constantly employed with the same intention. None of these, although they intoxicate and kill fish, renders these fish in the smallest degree injurious to human life. If, therefore, vegetable poisons were operative, within the tropics, in communicating a poisonous quality to certain fish, we should expect a similar result, that is, that these poisons, although destructive of the life of these fish, should not render their bodies noxious to the life of other animals, particularly man, when used as food. How different, however, is the result, when the poison, whatever

whatever it may be, is received into the bodies of tropical fish,—their life is not destroyed, but their bodies are rendered capable of destroying, by it, the life of man. Nor does “a culinary fire” (see Bancroft) correct its noxious particles. Are we to infer from this, that vegetable poisons are not the cause of the poison of tropical fish? It seems at least a reasonable inference.

The opinion which chiefly prevails among the French voyagers and naturalists is, that the galere or medusa is the cause of the poison of fish. Bomare is very pointed, “cet animal galere (I believe it is indiscriminately applied to the medusæ and holothuriæ) porte un poison si subtil, si caustique, si violent que s’il touche la chair de quelque autre animal, il y cause une chaleur extraordinaire, avec une inflammation et une odeur aussi pénétrante, que si cette partie avoit été arrosé d’huile bouillante.” “Ce qu’il y a de surprenant, c’est qu’il corrompt et empoisonne la chair des poissons, qui en ont avalé, sans cependant les faire mourir.” (Tom ii. mot Galere.) The short remarks of our countryman Sir Hans Sloane are founded on the same opinion. They are confined to the barracuda, which, with Mr Ray, he calls umbra minor marina maxillis longioribus. “According to its feeding on venomous or not venomous food, ’tis wholesome or poisonous to those who eat it; ’tis noxious in some seasons of the year, and in some places, and innocent in others, I suppose, according to its nourishment, by which, now and then, it acquires so much poison, as to kill immediately.” (N. H. of Jam. fol. ed. v. ii. 285.) The medusæ and holothuriæ are, I believe, generally considered poisonous, although their possession of that quality is at least doubtful, to the degree Bomare assigns to them. But, be this as it may, if they constitute the agent in communicating a poisonous quality to fish, we should expect to find the fish of those seas, in which these animals are most abundant, should be the most poisonous. This, however, is by no means the case. On many parts of the coast of Great Britain holothuriæ and medusæ are found in great plenty, but the fish are perfectly wholesome. Nay, within the tropics, and near the equator, these singular animals produce no such effect; the fish of the seas of Guiana (Demerary more especially) are excellent, and yet they abound in these supposed agents of poison*.

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* In some countries the inhabitants avail themselves of this pernicious quality in committing the most atrocious acts. At Carthage, in Spanish America, Mr Van Rohr, the famous but unfortunate Danish botanist, who resided there some time, and communicated the fact to my learned and respected friend Mr John Ryan, of St Croix, ascertained that the Spaniards make use of the galere (holothuria

In the Leeward Islands, St Croix, &c. this opinion has also been received, but in some instances with an explanation of the action of the poison on the fish themselves, different from that which we have seen promulgated by the French naturalists. We are informed, by very judicious and well-informed naturalists of St Croix, and other of the Leeward Islands, that fish, immediately after feeding on holothuriæ and medusæ, and becoming the food of the human race, actually prove poisonous, but not without being themselves poisoned; that the action is less sudden on them,

thuria physalis) as a poison. The animal is dried and reduced to a fine powder, of which a small portion is mixed in the chocolate intended for the devoted victim, and proves certain death. It is the custom in this part of South America to drink a dish of chocolate every morning; hence, when a person is poisoned, or dies under strong suspicion of being so, he is said to have had his galera that morning. It is highly probable this infamous practice originated among the Spaniards of the old Continent themselves. In Shakespeare's "Life of Henry V." act iii. s. 6. on Fluellen's rejection of Pistol's application for his intercession for the life of Bardolph, the former, in a rage, calls out—"Die and be damn'd; a figo for the friendship—the fig of Spain." On this passage Mr Steevens makes the following observation:—"This is an allusion to the custom of giving poisoned figs to those who were the objects of either Spanish or Italian revenge;" and illustrates it by several quotations from old poets, particularly Shirley, ann. 1652.—"I must poison him; one fig sends him to Erebus." Also B. Johnson's Every Man in his Humour—"The lie to a man of my coat is as ominous a fruit as the fico," &c. Kæmpfer mentions a fish of Japan called Furube, (Foster ranks it among the cartilaginous, and calls it tetrodon ocellatus), which is said unavoidably to occasion death. "People," says he, "that, by some long and tedious sickness, are grown weary of their lives, or are otherwise under miserable circumstances, frequently chuse this poisonous fish, instead of a knife or halter, to make away with themselves. A neighbour of my servant, at Nagasaki, being so strongly infected with the pox that his nose was ready to drop off, resolved to take this meal, in order to get rid at once both of his life and distemper. Accordingly he bought a good quantity of this poisonous fish, cut it in pieces, and boiled it, and, in order, as he thought, to make the poison still stronger, he took soot from the thatch and roof of his house, and mixed it with the rest. After dinner he laid himself down to die, and soon falling mortally sick, he brought up not only the poison he had taken, but a large quantity of viscid matter, probably not the least cause of his distemper, and by this means found life and health in what he sought for death, for he recovered and was well afterwards." Kæmpfer mentions three species of the furube or tetrodon, viz. Susumebuka, the mabuku, and the kitamakura. Of these, the poison of the last is absolutely mortal, it is therefore never asked for but by those who intend to make away with themselves.—History of Japan—Scheuchzer's Trans. v. i. 134. Kæmpfer, in his Amæn. Exoticæ, p. 880-1, says, a branch of the *Illicium anisatum*, boiled with the decoction of the furube, makes it still more poisonous, although the tree itself is not poisonous, and is even held in the highest esteem for its good qualities. Osbeck, in his Voyage to China, confirms this account. By the Chinese the tetrodon ocellatus is called Kay-po-y; it is caught in the river of Canton, and kills in two hours. He gives a very full description of the fish. v. i. 364, and, in his Faunula Sinensis, classes it among the Reptilia Nantes. The Dutch distinguish it by the name De op Blaser. Dr Kæmpfer's observation may be compared with that on the negroe carpenter in Grenada, who was cured of an inveterate (probably syphilitic too) ulcer, by the poison of the grey snapper.

them, probably from their structure and cold temperament, although not less certain; but that when they afterwards prove poisonous to those persons who make them their food, they are then actually in a diseased state; that they consider the apparently morbid state of the teeth and gums and fauces of the more rapacious fish, as proofs of this; that thus the poisonous barracuda, for instance, is observed to have dark coloured teeth, and swelled and bloody gums, as well as bloody and corroded chops; and that these fish seem also to be in a languid state at the time, and are observed to emit a peculiar smell. A gentleman of Montserrat, where poisonous fish are remarkably prevalent, endeavoured, by frequent observation, to ascertain wherein the poison was seated; and the marks or symptoms which indicated its existence in the fish. After a long series of observations, he at length concluded, that the more rapacious fish, barracuda, rock-fish (*perca venenata*), snappers, and the variety of king-fish called molatoc king-fish, are those only which are poisonous; that their rapacity often precluded that discrimination in the choice of their food which secures safety; that they thus devour holothuriæ, medusæ, or polypes, but soon after suffer for their rapacity; and that it is only during the action of this poison on their own bodies they become deleterious to others. These observations led this gentleman to an inquiry into the seat of the poison, the general result of which was this—that if the peritonæum, or membrane lining the abdominal cavity, could be so completely separated from the body of the fish, as to prevent the diffusion of its contents, then the body of the fish might be considered a safe and wholesome food. The gall-bladder has been considered by others as the seat of this poison, particularly of the *clupea thryssa*. A gentleman of Antigua, was in the frequent habit of eating this fish, and explained the cause of the impunity he experienced in the following manner: He maintained that, the poison being contained in the gall of the fish, if the gall-bladder could be extracted without diffusing its contents over the abdomen, the fish would be rendered innocent. He always gave the preference to this kind of sprat thus treated; but if the smallest particle of the bile touched the body of the fish, he threw it away as a certain poison; and, therefore, to have this done properly, he constantly employed a fisherman who was particularly dexterous in performing the extraction of the gall-bladder. It must not be concealed, indeed, that du Tertre and M. Desportes have pointed out symptoms of apparent disease in poisoned fish, which seem to arise, as has been above observed, from their becoming victims themselves to the poison. The former, speaking of the barracuda, remarks, “*c'est pourquoy celui qui en voudra manger*

manger en toute assurance, doit luy regarder aux dents, et gouter de son foye ; s'il a les dents bien blanches, et le foy doux, il en peut manger en toute surété ; mais s'il les a tant soit peu noircies, et le foy amer ou acré, on n'en doit non plus gouter que si c'étoit de l'arsenic : en effet c'est un poison qui n'est pas moins dangereux."—Hist. Naturelle, tom. ii. p. 204. Desportes only remarks, that, of several persons who ate of the "sardine dorée" (*clupea thryssa*), "ceux qui ne mangerent point des entrailles en furent-moins incommodés." Hist. des Malad. de S. Domingue, tom. 1. p. 108*.

These opinions lead to the conclusion, that fish are incapable of assimilating their bodies to the nature of the poisonous substance, accidentally or by selection, constituting their food, and becoming thereby destructive to others, without receiving injury themselves, an inference by no means necessary, I imagine, since there are many instances on record, of certain animals selecting as food, substances which prove certain death, or extremely pernicious to others. Indeed, I am strongly inclined to give full admission to that law of irritability laid down by the ingenious Girtanner, by which the effect produced upon the irritable fibre, by any stimulus, will be always in the inverse ratio of the repetition of its application, so that at last the effect will be nothing †. In truth, we have daily experience that this law is founded on just and established principles : it is the source of habit, and exists throughout creation. Nay, there is reason to believe that such habits may be impressed, as render men proof against the most subtle poisons, whilst they acquire, at the same time, a capacity of poisoning others. To illustrate this proposition, the consideration of the following facts may be useful.

Mr

* The use to which the heart, liver and gall of fish were applied by Tobias, by the command of the conducting angel, is remarkable: When the evil spirit, who had hitherto destroyed seven husbands married to Sara, before consummation, "had smelled the smell, he fled into the utmost parts of Egypt, and the angel bound him."—Tobit, c. vi. and 8. The gall applied to the eyes of Tobit was the means of renovated vision.—C. xi. See also Dr Gray's Key to the Old Testament on this passage in the history of Tobit. The application of the gall of fish in diseases of the eyes is mentioned by Galen as a remedy highly extolled by physicians—*επιων δε ζων εξαίρετως επηνηται χολη παρα τοις ιατροις, ως οξυδιερως τε αμα και υποχυματων αρχηος διαφοροσυνα, καδα περι ητιτε ιχθυος ενωμασσαι δ'αυτο καλλιωσιμον, &c.*—De Simp. Medic. Facult. l. 10. c. 18.

† It is well expressed by the following equation: If the stimulus be as a , the irritability as b , and the repetition of the application of the former to the latter as c ; then will the effect produced on the fibre x be $x = \frac{ab}{c}$. See Med. Rev. v. iii. p. 46.

Mr Barrow, in his Travels into Southern Africa, (p. 268), informs us, that serpents are instantaneously killed by the oil of tobacco. A Hottentot applied "a small quantity of a thick black matter, from the short stem of his wooden tobacco-pipe, which he called tobacco-oil, to the mouth of a snake, while darting out his tongue. The effect was instantaneous, as an electric shock. With a convulsed motion that was momentary, the snake half untwisted itself, and never stirred more; and the muscles were so contracted, that the whole animal felt hard and rigid as if dried in the sun." The Hottentot himself, although inhaling its fumes, felt refreshed and delighted. M. Pallas mentions a singular kind of honey, which, from its effects on men, has been called "maddening," which the bees collect from the blossoms of the rhododendron (dwarf rose bay), and the azalea pontica (upright honeysuckle), in the country of the Abassines, in the line of the Caucasus.—Travels in S. Prov. of Russia, v. i. p. 386. Dr Barton, of Philadelphia, describes the morbid effects of the wild honey of N. America, sometimes even fatal, which the bees extract from three species of the kalmia; some species of the andromeda, the datura stramonium, and the plants mentioned by M. Pallas.—Trans. of Am. Ph. Society, vol. v. The white darnel, (*lolium temulentum*), during a scarcity, occasioned by the blockade of Genoa, in the year 1800, was fraudulently mixed with wheat, or substituted for it. The effects on those who ate bread made of it, were dimness of sight, confusion of ideas, prostration of strength, trembling, &c. whilst chickens fed with greediness on this grain, and throve on it.—Med. and Surg. Journ. of Edin. v. i. p. 106. M. Vaillant describes a caterpillar which acquires an active poison from feeding on a small poisonous plant, the name of which is not mentioned; and of this animal, when about to change into the chrysalis state, the Mimiquas prepare a deadly poison, in which they dip the points of their arrows; and yet this caterpillar, before it feeds on this plant, is not poisonous. Travels into the Interior of Africa, v. ii. p. 359. Peter Kalm, describing the effects of the swamp sumach, (*rhus vernix*), on different persons, says "this tree is not known for its good qualities, but greatly so for the effect of its poison, which though it is noxious to some people, yet does not in the least affect others." He instances this in himself, and in his botanical assistant Yungstrom.—Travels into N. America, Forster's Transl. v. i. p. 77. He mentions similar effects produced by the *apocynum androsaemifolium* in Canada, v. iii. 26. In v. ii. p. 157, he relates a curious fact of the *meloë proscarabæus*. "Numbers of oil beetles sat on the leaves of the white hellebore (*veratrum album*), and feasted on them. I considered them a great while, and they devoured

voured a leaf in a few minutes. Thus this plant, which is almost certain death to other animals, is their dainty food." But the most remarkable proof of this diversity of action of the poison of the same plant, the same learned naturalist exhibits in the *kalmia latifolia* (foliis ovatis, corymbis terminalibus), the spoon tree or dwarf laurel. "These trees are known for this remarkable quality; their leaves are poison to some animals, and food for others. Experience has taught the people, that when sheep eat of these leaves, they either die immediately, or fall very sick, and recover with great difficulty; on the other hand, the leaves of the *kalmia* are the food of stags, when the snow covers the ground, and hides all other provision from them. Therefore, if they be shot in winter, their bowels are found filled with these leaves; and it is very extraordinary, that if these bowels are given to dogs they become quite stupid, and as it were drunk, and often fall so sick, that they seem to be at the point of death; but the people who have eaten the venison have not felt the least indisposition." This fact, it will be remarked, corresponds with what has been said of the poisonous substance being confined to the stomach of fish. "The leaves of the *kalmia* are likewise the winter food of those birds which the Swedes of N. America call hazel-hens, the partridge of New England (*tetrao cupido*), and which stay here all winter; for when they are killed, their crop is found quite filled with them." v. i. p. 335. But the flesh of these birds is so impregnated by the poison of the *kalmia*, as to produce on those who eat of it the most alarming symptoms, and even death. See an excellent paper on the poison of this species of the *tetrao* (pheasant or partridge of N. America), by Dr James Mease of Philadelphia—*Med. Repository*, v. i. p. 161. It is well known, in almost all the West India Islands, that hogs eat greedily of the bitter cassada (*Jatropha foliis palmatis pentadactylis, radice conica oblonga, carne sublactea* of Brown); and it is, perhaps more generally, known that it is, in the raw state, a most deadly poison to other animals, and more especially to the human race. Mr Long, in his history of Jamaica, says, "the expressed juice of this plant soon putrefies, and breeds worms, which undoubtedly draw their nourishment from those particles which are so baneful to mankind; and when dried and pulverized, they have formerly been applied to the most mischievous purposes by the Indians and Negroes; who, having conveyed some of the powder under the thumb nail, presented a cup of drink to the person they intended destroying, contriving, at the same time, to suspend the tip of their thumb in the liquor, in order to impregnate it." 4th ed. v. iii. p. 781. To accumulate instances of this law of the animal oeconomy, whereby the bodies of animals may

be assimilated to the nature of substances constituting their food, and acquire a capacity of communicating the baneful influence of that nature to other bodies, would seem unnecessary. I shall, therefore, confine myself to two or three classic instances, the authenticity of which has indeed been impugned on the score of credulity; but I imagine, in all probability, unjustly. The antidotal story of Mithridates the 7th, called the Great, King of Pontus, is known to every classic reader. Justin says his enemies "veneno eum appetivere. Quod metuens, antidota sæpius bibit, et ita se adversus insidias exquisitoribus remediis stagnavit, ut ne volens quidem senex veneno mori potuerit." l. 37. c. 2. However inclined many may be to question the truth of this singular anecdote, it is certain the modern compilers of the history of Pontus, give full admission to it. Galen has given full credit to it, and founds his belief not only on the authenticity of the fact itself, but on his own knowledge of a similar habit impressed on the Emperor Aurelius. *Εἰ δὲ τις ἦτοι κατ' ἑκάστην τῶν ἡμέρων, ὡς ὁ κατ' ἡμᾶς γενόμενος ἀντοκράτωρ Ἀυρήλιος Ἀντωνίνος ἢ ὡς αὐτὸς ὁ Μιθριδάτης λαμβάνει τὴν φαρμάκην, πανταπασι ἀσφαλῆς ὑπὸ τῶν θανασίμων ἔσται, &c. ** Galeni de Antidotis, l. 1. c. 1. Paris ed. 1639. The consideration of this curious subject, throws a shade of probability on the strange relations of some travellers. Were we to believe, what indeed appears in the highest degree probable, that the bodies of certain fish possess an idiosyncrasy, which capacitates them to the innocuous reception of poison, whilst they thereby become so assimilated to its nature, as to become, when used as food, pernicious to men, then might we admit, as sufficiently consistent, the story related by Grynæus, on the authority of Vertoman, of a Sultan of Cambaia:—He gravely assures us, that that monarch was so accustomed to take poison from his infancy, that a certain quantity, every day, was necessary to his existence; and, when any of his courtiers offended him, he would chew some of a very malignant nature for a considerable time, and by spitting it on the culprit's naked body, would deprive him of life within the space of half an hour. He adds, "huic sunt circiter quaternascentorum millia; nam ubi semel concubuerit cum quavis meretricum, proxima luce vitam exiit." (See *Novus Orbis Region. ac Insular. veteribus incognitarum.* Bazil 1555, of Simon Grynæus,

* Verum si quis vel singulis diebus quemadmodum nostra tempestate factus Imperator Aurelius Antoninus, vel ut ipse Mithridates, medicamentum capiat, omnino a lethalibus et deleteriis appellatis medicamentis erit securus et immunis; sicuti aiunt et Mithridatem ipsum, quum lethali medicamento interire potius quam Romanorum subijci imperio maluit nihil invenisse quod ipsum interire potuerit.

as quoted by the ingenious and learned Mr Hole, in his Remarks on the Arabian Nights Entertainments, p. 224 and 197.) Galen lays down as an axiom in physiology, that the most poisonous substances, as hemlock, if introduced gradually into the body, will not injure, and gives the following instance of this: "Id quod anus Atheniensis experimento docuit, cujus apud omnes percelebris memoria est. Etenim ea a minima cicuta portione auspicata, nullo detrimento ad permagnam progressa est copia; principio enim paucum exiguitate ipsa devictum est, at consuetudo naturale reddidit *." (Galen de Simp. Medic. Facultat. l. 3. c. 18. Paris ed.). The aphorism of Hippocrates is in confirmation of this; for, in truth, it is the result of daily experience, that "quæ longo tempore assueta sunt, etiam si deteriora sunt, minus iis quæ insueta sunt molestare consueverunt." (2. Aph. 50). Nor

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* και τὸτο και η Αττική γραις εδειξεν, ης απαντες, μημνονοισιν, απ' ελαχιστη, μεν αρχαιμεν η κωνια, προ ελθουσα δε αλυτως επι πληθος ικανοι, εαρχης μιν γαρ ενικηθη το βραχυ δι, αιτητην ολιγοτητα, τω δε εδισμω ενμφυτον εγενετο. This singular effect of habit, or rather this wonderful law of the animal economy, he calls Φυσεις επικτητοις. adscititia natura sive altera natura. And again πλειστον δυνασθαι τα εδη, και Φυσεις επικτητοις. plurimum possit consuetudo velut altera ac adscititia natura.—Ibid. And c. 6. he mentions a faculty possessed by storks similar to that of the American pheasants, observed by Kalm. επι το γε κωνιον, ε μόνον ε καταψυξει τοις ψαράς, εδ αναγει καθα περ ημας, αλλα και τρεφει, και θερμαινει δηλοδοτι. Siquidem cicuta sturnos non modo non refrigerat et enecat uti nos, sed et alit quoque, et nimirum etiam calefacit.

I know not whether the following history be authentic or fabulous. I met with it in a newspaper of Bristol, and traced it to the Monthly Magazine for March 1807, where it will be found p. 167, under the head "Literary and Philosophical Intelligence." I wished much to ascertain its authenticity, but the Editor of this periodical work refused to gratify me; certainly a suspicious circumstance. "The following singular consequences of the bite of a rattlesnake are mentioned in a late American publication.—In the summer of 1801, Mrs Beeman, of Luzerne county, Pennsylvania, was bitten by a rattlesnake at the time she was in the fourth or fifth month of her pregnancy. She, however, recovered from the alarming symptoms attending the bite of that animal, and was delivered. The child, which seemed healthy, no sooner began to suck, than it turned quite black, swelled considerably, and soon died. A puppy was then procured to draw the breast, but it died in two days, with the same symptoms; a lamb was next tried, then a dog, and afterwards three other lambs, all of which died. A third dog was then procured, which was attacked with slight symptoms, but survived. The mother continued in good health, and two years afterwards produced another child; but the medical men who were consulted advised her to suckle it, in consequence of the time which had elapsed since the bite. She did so, and no ill consequence ensued." Catesby denies pointedly that the manchineel apple is the cause of the poison of the barracuda, and gives a decisive reason; "there being very few of these trees in those of the Bahama islands I was at, and none growing on the sea-shore, nor within many miles of those parts of the Bahama seas, where these infectious fish are known to abound." Vol. ii. p. 95. fol. ed.

is the impression of such extraordinary habits, or the existence of such peculiar temperaments, among animals, inconsistent with the arrangements of Providence, either for the supply of food, or as a check to exuberant population *. (See Dr Paley's Nat. Theology.)

After all, however, admitting that, in conformity with the opinions I have stated, (p. 8), holothuriæ, medusæ, and polypes or zoophytes (corallina opuntia), are poisonous, and the immediate cause of certain fishes becoming so, the question will be still undecided, what is the basis of this poison; why should these animals be, almost the only inhabitants of the sea, possessed of this property; and why should they, thus constituted, be made the food of fish, which, without them, would, we have reason to believe, be wholesome. In vain would ingenuity be exerted in the investigation; fruitless would be the research for its solution. We must listen to the awful expostulation of the Almighty, and humbly acknowledge our incapacity. "Hast thou entered into the springs of the sea; or, hast thou walked in the search of the depth. Knowest thou the ordinances of Heaven? canst thou set the dominion thereof in the earth?" Our answer must be, "We darkeneth counsel by words without knowledge;" for, "Thy way is in the sea, O God, and thy path in the great waters, and thy footsteps are not known." (Job. c. 38.—Ps. 77.)

Let us now proceed to a more important part of the subject, the means of detecting the poison. Here it is with regret I acknowledge the uncertainty of any experiments which have as yet been made; and that we must, in a great measure, trust to the

* Is this power of habit, this *φύσις ἐκίτητη*, more extraordinary than the power of reproduction possessed by certain animals, as the lizard, which has been found by Spallanzani to be capable of regenerating its tail and feet when cut off; or the power which other animals possess of becoming distinct animals according to the number of pieces into which they are cut, as the polypi. Surely these are more wonderful operations than the body of an animal becoming so accustomed to poisonous food, as to be rendered at last capable of poisoning, without injury to itself. Is it more extraordinary than the capacity which certain fishes and insects possess, to exist, as in a native element, in water of the temperature of 210°, mentioned by the ingenious and learned Mr J. Mason Good, on the authority of Messrs Humboldt and Bonpland, and the late Lord Bute? Or, is it more wonderful than this other fact, mentioned by the same gentleman: "The eggs of the musca vomitoria, or common flesh or blow-fly, are often deposited, in the heat of summer, upon putrescent meat, and broiled with such meat, over a gridiron in the form of steaks, in a heat, not merely of 212°, but of three or four times 212°, and yet, instead of being thereby destroyed, we sometimes find them quickened, by this very exposure, into their larva or grub state." See his Anniversary Oration before the Med. Society of London, 1808, p. 30.

the observations of persons unacquainted with science, and which have been the result of mere experience, unaided by any chemical proof. This experience is, however, very general, although not absolutely, "vocis ratæ tentamina."

When any suspicion is entertained of the wholesomeness of fish, the most usual method practised in all the islands, is to boil a piece of silver, or, very often, when silver is not at hand, an onion, in the same vessel with it. If the fish is wholesome, the colour of the silver, or onion, remains unchanged; if poisonous, they become black. This is generally considered a most certain test of the quality of the fish, and its simplicity would render it the most useful. Experience has been the guide in the choice, and learned men have given their suffrage in favour of it. (Kalm's Travels in N. America, v. i. 386.) But how far we can depend on its infallibility, I shall not pretend to say, although an instance of its fallacy was related to me, by my friend Mr Stevenson, of St Eustatius. A Negroe, of that island, purchased a barracuda, which his friends, believing to be poisonous, endeavoured to persuade him from eating. He, however, had it boiled, and to ascertain its quality, put a piece of silver into the vessel. The silver became perfectly black; but, not being disposed to lose his money, he still determined to eat the fish; he did so, and found it perfectly wholesome. Another method of detecting the poison, is to throw the heart, or the entrails, to a dog, cat, or duck, before the fish is boiled. If, these prove harmless, the fish is of course considered wholesome; on the contrary, if they prove fatal, a test of the most decided certainty is furnished of the existence of poison. But there are tests existing in the fish itself, not unfrequently, by which the poison may be detected. It is a general observation of fishermen and navigators of the channels and narrow seas among the keys or smaller islands, where fish are most abundant, that when fish of any kind, but particularly king-fish (the varieties called bastard and molatoo), Spanish mackerel (*scomber cæruleo-argenteus rudus*), &c. are destitute of a certain smell peculiar to them, that smell distinguished by the name "fishy smell," they ought to be considered as unwholesome. It is also remarked, by the same class of men, that when these fish are of an uncommon magnitude, they should be rejected as hurtful, or, at least, as less certainly wholesome than those of a more moderate size. The last observation is more particularly applicable to the overgrown king-fish, the barracuda, and bay and gray snapper (species of the *coracinus* *.) In the barracuda, nature

* The monks of Salernum seem to have been aware of this.

Si pisces molles sunt, magno corpore tolles,

Si pisces duri, parvi sunt plus valeturi.—Scol. Salern. c. 30.

ture seems to be particularly careful to discover its poison by a singular distinction. When this fish is observed to have black or dark-coloured teeth, not a doubt, we are told, should remain of its poisonous property; and it is generally received as a fact, that when any of this kind of fish have proved poisonous, they have been found with black or dark-coloured teeth; and, on the other hand, that there has seldom been an instance of the white-teethed barracuda being unwholesome. Du Tertre, we have seen, has, with a different view, carefully pointed out these marks of poison.

The next object of our attention, is the destruction of the poison before the fish is used as food. Salt is justly considered as a powerful agent in counteracting this poison. This is employed for this purpose in the West Indies, in the form of pickle, in a dry state, or through the medium of smoke; and the most virulently poisonous fish, the clupea thryssa, is rendered perfectly innocent by means of it. The late Mr William Newton of St Croix, assured me that the negroes of his estates ate constantly both of this and the poisoned barracuda, after they had undergone the action of salt. Innumerable proofs have been furnished by persons totally unconnected with each other, of the salutary effects of salt, in whatever manner applied, on poisonous fish. A barracuda, the poisonous quality of which was proved by its entrails killing a cat that had ate of them, being cut into slices or *junks*, and slightly salted or corned, was rendered perfectly wholesome, and, as usual, delicious to the taste*. Salt water is a provision furnished by nature against this poison; for if a large draught of it is drank as soon as the poison of the fish eaten has ascertained itself, it either altogether prevents the effects, or renders them infinitely milder. And it is a common practice among the fishermen of the Leeward Islands, when they have taken a poisonous fish, immediately to open it and take out the entrails, wash the body in the sea, and throw a little salt over it; all which renders it perfectly wholesome. Instances have occurred, however, in which salt has not exhibited its counteracting power. The following is singular: A Mr P. Heyliger of St Croix, trusting to the efficacy of this antidote, was in the habit of eating fish supposed to be poisonous, after being sliced and corned. For a considerable time he perceived an uniform beneficial result; at length, however, a poisonous barracuda treated

* "That salt is *σύμβολον φιλίας και ειρήνης*, a symbol significative of friendship and peace, is ordinarily said." See Hammond on the New Test. Mark, c. ix. n. f. Why it should be so, the facts here related may be received as proofs.

treated in this manner, was eat with the usual confidence, but all the usual symptoms soon after took place—his life was even despaired of, and several months elapsed, and a change of climate recurred to, before his former health could be restored. The juice of the lime (a variety of the citrus lima) has been used with good effect by the negroes with this intention. I have had no experience myself of its beneficial effects this way, but it certainly possesses qualities which may render it an useful counter-actor of this poison. The ancients seem to have held this opinion of it, or at least of the citron, which possesses the same properties (superoxygination) *. To the same principle of action we may, I imagine, attribute the astonishing efficacy which the ripe juice of the sugar-cane, employed for the same purpose, is said to possess. The decomposing or counteracting power of this juice is so little known, and so wonderful, as to render it necessary to be more particular, in detailing the account I have received of it from Mr William Stevenson, a gentleman of great respectability and probity, and many years a resident in St Kitts and the Virgin Islands. During those months in which fish are most dangerous from their poison, viz. the spring and summer months, then are the sugar-canes at their full growth, and consequently their juice mature. At the same period of the year are the sweet potatoes (*convolvulus battatas*) ripe; and there are not more effectual antidotes against the poison of fish, than the raw juice of these two plants. The fishermen are so perfectly aware of this, that they never hesitate to eat of suspected fish, providing they can procure the juice of the sugar-cane more especially. They bruise the cane between two stones, and express the juice, which they immediately drink without further preparation. When the cane cannot be procured, they drink the sweet potatoe, prepared in the same manner. Thus provident has the Almighty Creator of all things been to furnish the sure means of preventing the fatal effects of a, no doubt, necessary evil! thus within the tropics, where the poison of fish, for wise reasons, is most prevalent, perhaps exclusively so, are there abundant indigenous decomposers of it! The lime, the sugar-cane, the sweet potatoe, are in perfection, when fish are most baneful;

‡ *Media fert tristes succos tardumque saporem
 Felicis mali; quo non præsentius ullum
 (Pocula si quando sævæ infecere novercæ,
 Miscuerunt herbas, et non innoxia verba)
 Auxilium venit, ac membris agit atra venena.*—Virg. Georg. 2.

baneful; and at all times, when these are wanting, the sea itself furnishes a remedy, by no means devoid of efficacy*.

I may here notice two curious circumstances attending the poison of fish. The first is, that the person who has been once affected by the poison of any particular kind of fish, is ever after subject

* The astonishing goodness of Providence is wonderfully manifested here.—The nature of the tropic climate requiring a larger proportion of oxygen in the composition of its atmosphere than is found in other climates, it is perhaps followed by a chemical impregnation of copper in the food of fish, whose rapacity prevents them from avoiding the use of it, but whose constitution and habits fit their bodies for the harmless reception of it. These, however, on becoming the food of man, act on his body as a poison—but, to compensate this, there is, in the vicinity of the poison, nay, in the very element in which it exists, abundant means of relief, abundance of agents calculated for its decomposition. It is certainly one of the most instructive, one of the most beneficial exercises of the mind, to discover and contemplate this compensative distribution of good and evil in the divine economy of the world, for it terminates in this important truth, “that all things work together for good to them that love God.”—Rom. viii. 28.

As a proof of the efficacy of the sugar cane juice as an antidote against poison, my respected friend, Mr Stevenson, related the following very extraordinary fact, which nothing indeed but the known veracity and honour of my informant could have induced me to give it a place here, which I do chiefly with a view that the fact may be confirmed or disproved by the ingenious experiments of those whose situation enables them effectually to pursue the inquiry: It was long after my return to England Mr S. communicated it to me. During a temporary absence at St Eustatius, from St Christophers, where his mother-in-law, Mrs Newton, resided, a favourite little dog of Mrs Stevenson's had been, one night, inadvertently locked up in a pantry, in which, the house-keeper, a very intelligent mulatto woman, had, the preceding evening, set powdered arsenic mixed up with potatoe and butter for the rats. In the course of the night, the dog discovered this baneful preparation, and ate up the whole of it. On the following morning, when the housekeeper came to see the effects of the poison, she found the dog in the agonies of death; desirous of saving the little animal's life, and recollecting that raw cane-juice was used to counteract the poison of fish, and it being then crop time, she instantly ran to the boiling-house, which was fortunately near at hand, and procured a small bason-full of the expressed raw cane-juice, which she presented to the dog, who, agonized as he was, leaned his head towards it, and eagerly lapped up the contents. The effect was almost immediate—he perfectly recovered, and lived several years after. This fact acquires additional weight from a paper in the Asiatic Researches, where an antidote to the poison of arsenic is mentioned with confidence, and which has, nevertheless, we should conceive, less pretension to secure belief than that I have stated.—“The best antidote against its (arsenic's) effects are the scrapings of leather reduced to ashes. If the quantity of arsenic taken be accurately known, four times as much of those ashes, mixed with water, and drank by the patient, will sheath and counteract the poison.” (Asiatic Researches, v. ii. as quoted in Med. Journ. of Edin. v. iii. p. 20.) A curious observation of Dr Kæmpfer's is also to the point.—The Chinese, who are remarkably fond of fat unctuous food, and particularly of pork, would, by the constant use of it, de-

subject to a return of the symptoms on eating even a wholesome fish of that kind. A remarkable instance of this was related to me by the late Mr William Newton of St Croix. This gentleman assured me, that dining once in company with his brother Mr Samuel Newton, and a Captain Hyet, they all eat of a fine barracuda. Mr Newton and his brother sustained no injury whatever, but Hyet had all the symptoms of the poison of this kind of fish in a milder degree. This fact was rendered interesting by Hyet's information, that at St Eustatius he had nearly lost his life by eating of a poisoned barracuda; and that he was assured at the time, that if he should ever again eat of this fish, whether poisonous or wholesome, similar symptoms would be the certain result, but not in a degree to endanger life. The second circumstance is, that some men escape the poison at one time, but are affected by it at another. Mr Stevenson already mentioned was a remarkable instance of this: he twice escaped the poison of fish, whilst several others who had eaten of the same fish at the same time, suffered severely from it. At another time he was not equally fortunate. This however is not more singular than what has been frequently observed in the plague, and other pestilential diseases; and, as in these, the poison may require a predisposition of body, to have its action manifested.

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stroy the principle of life, were it not for the equally constant use of a strong infusion of the leaves of the tea-tree. If these two contraries be put together, he adds, on the authority of a grave elderly Chinese physician, they will, far from being prejudicial, rather contribute to health and long life. For the truth of this assertion, they vouch the case of a lascivious woman, who, following the advice of a physician, in order to get rid of her impotent husband, gave him for his daily food swine's flesh, and all manner of fat things, which, she was assured, would kill him in one year. This, however, was too slow a process, and in order to dispatch him at once, she was advised by another physician to swell him with a strong infusion of tea-leaves. She wisely concluded that if each of these separately should be so powerful, combined they must be infinitely more so. She accordingly gave her husband both, but found, to her great grief, that far from declining, he quickly recovered his strength, and was at length restored to a perfect state of health. He adds a similar story from Ausonius, of a lascivious wife, who was disappointed in the same manner, of putting a jealous husband out of the way, which is equally applicable.

Quam pia cura divum! Prodest crudelior uxor;

Et cum fata volunt, bina venena juvant!

(See *Amœnitat. Exoticæ*, Art. Tea). In the leeward Caribbee islands, the poison of land-crabs (*cancer ruficola*) is most virulent during the month of March, but as they are considered as a great delicacy when divested of this pernicious quality; they are kept several days and even weeks in pens before they are used for food, and to render them wholesome, for the first few days, the leaves of the physic nut (*jatropha curcas*) are given to them; these they greedily eat, and they act on them as cleansers and decomposers of the poison, thus literally "*bina venena juvant.*"

The next important object of this inquiry, is the ascertaining the best means of preventing the fatal effects of this poison, after it has been received into the stomach. This, where it has been practicable, I have effected by evacuation, and by the judicious use of ardent spirits, or the stronger wines. If, instantly after receiving the poisonous fish into the stomach, a vomiting is excited to such a degree as to discharge the offensive body, no further inconvenience can arise from it. This, however, and all other remedies are inapplicable to accidents from the poison of the clupea thryssa: to those from other kinds of poisonous fish, less rapid in their operation, they certainly are, if the application is made in sufficient time. But as the person who unhappily becomes the subject of this poison, is seldom aware of his danger, till too late to prevent it, vomiting as a means of prevention is seldom resorted to. The moderate use of brandy, or any other ardent spirit, or of Maderia or sherry wine, after eating the fish, is attended with the most desirable consequences. The poison is either prevented from acting altogether, or the symptoms of its action are infinitely less violent than when nothing of this kind has been taken. Instances of the correctness of this observation are innumerable. A fact evinces the utility of this simple preventive: it is drawn from a comparison of the consequences of eating poisonous fish, as they are seen in slaves and the more indigent white people, who cannot afford, or are not allowed this indulgence; and in the more opulent who make use of it. The former are afflicted with the whole train of symptoms of the poison, whilst the latter remain, with a few exceptions, exempt from its pernicious action. It is to be observed too, that this exemption is in proportion to the quality of the liquor drank: thus, if any good ardent spirit is used, the exemption is almost always complete; if Madeira, or any other strong bodied wine, it is less so; but if claret of the usual body sold in the West Indies before the French Revolution, is used, there is either no exemption, or a very imperfect one. It must be obvious, however, that this preventive can be beneficial only before the poison is received into the circulating mass; after that it will be not only without efficacy, but productive of dangerous consequences. It is hence that some well informed gentlemen in the West Indies have denied the efficacy of it altogether, and in some instances treated it even with ridicule; but that they have done so unjustly or injudiciously, is manifested not by my experience alone, but by that of many intelligent and eminent physicians in the different islands*.

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* The wisest of men hath set down as a maxim, "Give strong drink unto him that is ready to perish, and wine unto those that be of heavy hearts." Prov. xxxi.

The last part of my subject is the cure, after the poison has entered into the system, and commenced its baneful influence on the vital powers. Towards establishing a successful, at least a rational indication, it is necessary to ascertain the nature of the cause; or, in the present case, of the basis of the poison, and of the morbid changes it produces on the body. The obscurity of the subject, renders the former, in all cases of the poison of fish, uncertain; the latter is demonstrated, in fatal cases, by dissection. It is indeed more by the morbid changes produced by this poison, and by the train of symptoms it gives rise to, than by any direct experiments on the poison itself, that a judgment can be formed on the nature of its basis. This certainly holds true in the West Indies, where chemical experiments can seldom be recurred to with a successful result. I have been induced by the data I have stated in the preceding part of this paper, imperfect and doubtful as they are, and by analogical reasoning, to consider the poison as metallic; and my plan of cure has been generally founded on that opinion. I admit the opinion is subject to weighty objections; but in a choice of difficulties, it is the business of the physician to rest on that which certain facts and analogy point out as the least irrational. My object, therefore, has been first to evacuate abundantly. I have excited brisk vomiting by tartarized antimony and white vitriol, after which I have cleansed the intestines by a large dose of castor oil. The early administration of these in practicable cases, has often been sufficient. If not, the next object was to decompose the poison; and to effect this, I almost entirely depended on alkalies in simple solution with water. I never had recourse to the volatile alkalies, although, from the authority of Dr Mead, who proved them in-

fallible

xxx. 6. The son of Sirach hath also said, "Wine is as good as life to a man, if it be drank moderately: What life is then to a man that is without wine? for it was made to make him glad." Eccles. xxx. 27. Galen speaks in high commendation of wine in counteracting the action of "ψυχρα τη φύσει φαρμακα." De Simp. Med. facult. l. iii. c. 20. "οίνος ἔν ἐν τῷ τέρματι πινεμένος ἀριστὰ ἴαμα, καὶ ἡμεῖς ἤδη τινὰ κατεψυγμένον ἰσχυρατὸς ἀνασάσαμεν οἶνον Λεσβίου. (Caldidum itaque id temporis vinum ebibitum præstantissimum est remedium; nosque etiam quendam extremè jam refrigeratum vini Lesbii* potione servavimus.) Paris ed. I may here remark, that the coincidence of the efficacy of ardent spirits in the prevention of the action of the poison of fish, with what Dr Wolf has recorded in one case of hydrophobia, is too remarkable to be passed over in silence. I have not Dr Wolf's cases by me, but the fact may be referred to in the 11th volume of the Encyclop. Britan. Edin. 3d ed. p. 278 and 281.—Does the efficacy of this preventive depend on any chemical principle?

* Hic innoctis pocula Lesbii

Duces sub umbrâ———Hor. Od. l. 17.

fallible against the poison of laurel water, there can be little doubt, we should imagine, of their efficacy in counteracting the effects of the poison of fish, whatever the basis of it may be. The probability at least of this is strengthened by the experiment made on a dog, to ascertain the efficacy of the volatile alkali after life had been almost extinguished by a variety of poisons, and chiefly that of the viper. See Phil. Trans. as quoted in the Encycl. Brit. Edin. v. xv. p. 269*.

Some of the symptoms demanded particular attention. Thus the excessive violence of the spasm rendered laudanum absolutely necessary in considerable quantity; but I endeavoured to avoid its use, before ample evacuation was procured. The following history is particularly illustrative of the proper application of this remedy. It was communicated to me by a much respected and learned friend, Mr John Ryan of St Croix. Soon after Mr Ryan's return from Europe, where he had received a complete medical education, to his native island Montserrat, a remarkable and melancholy instance of the effect of the poison of the barracuda occurred to him. A large barracuda had been caught, of which thirty persons (negroes) ate, all of whom were poisoned, and eleven, who were more improperly treated than the rest, died. A particular friend of Mr Ryan's was the owner of three of the nineteen survivors; but as the proper treatment had not been employed at an early period, time was given to the poison to act so powerfully, as to reduce them to the most deplorable state imaginable. They were convulsed in the most shocking manner, every fibre was contracted, every joint distorted, and every joint deeply excoriated. The pain they felt was so intolerable that they gnawed the flesh from the bones; but no delirium, nothing like tetanus took place. It was difficult to determine on any plan of treatment; for as the poison had been long since intimately mixed with the general mass of fluids, evacuations seemed unnecessary or hurtful. To allay, therefore, the violence of the nervous excitement, was the indication

* How far are we warranted to consider the chemical affinity of ammonia or the volatile alkali to metallic oxides, particularly the oxide of copper, as an applicable hint in the treatment of the poison of fish? There is a curious observation made by Mr Spalding, the celebrated diver, the consideration of which may be useful here. He says, "that when a person has breathed in copper pipes a few minutes, he feels in his mouth a very disagreeable brassy taste, which continues all the time he remains in the vessel; so that, on this account, copper seems by no means an eligible material. This taste most probably arises from the action of the alkalescent effluvia of the body upon the copper; for volatile alkali is a strong dissolvent of this metal," &c. Encyclop. Britan. Edin. vol. vi. p. 71. art. Diving.

cation which naturally presented itself, and fulfil it, opium was employed. Mr Ryan began by giving each 100 drops of laudanum, and repeated that quantity at the expiration of a few hours. In this manner he proceeded, as he would have done in a case of true tetanus. A change very soon took place; and the continued liberal use of the medicine completely recovered them. Two of them, long after all symptoms of the disease had been removed, but when as yet in the debilitated state of convalescence, were imprudently exposed to the night-dew, which proved fatal to them. I have been more particular in this statement, because it clearly points out the only useful practice in such deplorable spasmodic affections proceeding from this active poison.

Sometimes a singular and very disagreeable sensation remains for months in the soles of the feet, as if boiling oil was running on their surface; at others a pricking, like that communicated to the skin by West India pepper, or like the creeping of ants. In these cases, soaking the feet in strong high wines or alcohol, has the best effect. It has also happened, but by no means frequently, that the skin of the soles of the feet separates by the formation of a peculiar kind of pus beneath it. In this case I have had recourse to bark, and bathing the feet with vegetable-mineral water (ag. lytharg. acetat. comp.) and wrapping them in cloths soaked in it. When, however, the action of the poison perseveres, and these remedies produce no permanent good effect; when the surface of the body becomes an almost continued ulcer, and the limbs are affected with paralysis; then the only remedy to be depended on is mercury, combined with bark (the cold infusion prepared with magnesia more especially), and wine. The use of mercury is gradually to be pushed to salivation, so as to excite the action of the absorbents, whilst the bark and wine strengthen and give tone to the whole habit. External applications, such as camphorated oil, beef-pickle, a mixture of spirit of turpentine and rum, mustard, pickled-herrings, &c. and electricity, have no doubt been of use; but their use has been secondary; as principal remedies I have employed them ineffectually*.

The foregoing are chiefly observations made by myself during a long residence in the West Indies; or they are those of professional men or men in civil life, whose accuracy, judgment and probity, may

* The coincidence of my practice in the chronic disease produced by the poison of fish, will be remarked, with the singular case related by Dr Heberden from Dr Monsey, in which very extraordinary symptoms, proceeding from the long-continued use of bullock's liver, as diet, were removed by the use of mercury.

may be depended on. They furnish data on which the speculative philosopher may found a curious physiological disquisition; which may induce the enlightened chemist to institute a series of interesting experiments, for the purpose of establishing an accurate discrimination of the basis of the poison of fish, and of the principle on which the attributed efficacy of some of the preventive remedies, particularly the raw juice of the sugar-cane and sweet potatoe, depends; and which may, I trust, be useful to all classes of men, who, visiting the torrid zone, may be exposed to suffer by this most active, pernicious, and obscure principle.

Clifton, July 20. 1808.

II.

Medical Report for Nottingham, from March 1807 to March 1808.

By JAMES CLARKE, M. D. Physician to the "General Hospital and Vaccine Institution."

"In every science in which we would wish to arrive at perfection, we should propose for the object of our pursuit some certain station, even beyond our abilities—some imaginary excellence, which may amuse, and serve to animate our inquiry."—GOLDSMITH.

THE science of medicine is yet to be considered only in its dawn, and requires the greatest exertion in its votaries to bring it to perfection. The ability and industry of individuals may do much to attain this imaginary excellence, but it is highly necessary that every one who values his professional acquirements should possess himself of the improvements of the day, and, by nicely combining theory with practice, assist in the formation of a rational system of medicine; for he who resigns himself to the pleasing, but fallacious reflection, that he has surmounted the difficulties of his profession, loses, from that moment, all anxiety for the promotion of scientific inquiry; to him the field of discovery is involved in a mist, he no longer views with complacency the discoveries of the age, but lapses into a state of perfect indifference to the advancement of science.

The profession of medicine is particularly calculated to call forth the energy and resources of an active mind; but it requires attentive observation, nice discrimination, with coolness and fortitude,