Venomous animals / by Sir J. Fayrer.

VENOMOUS ANIMALS.

BY

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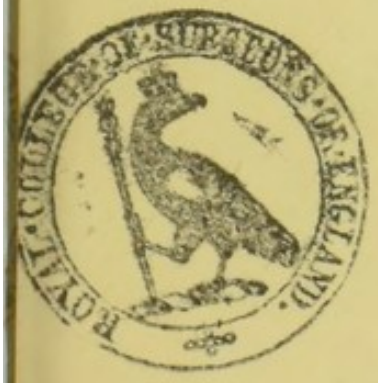

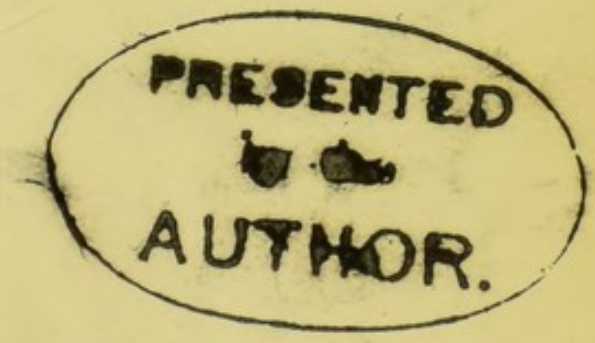

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MDCCCLXXVII.

VENOMOUS ANIMALS.

ANIMALS that possess the power of secreting and ejecting a poison, the effects produced by inoculating this secretion in man or other animals, and the appropriate treatment, will be briefly described in this paper. Poisons generated in diseased, enraged, or otherwise disordered animals, or such as may be formed after death by decomposition, or those by which teeth, claws, spurs, or other weapons of carnivora, predaceous birds, and fish or invertebrata, may be accidentally contaminated, are not included: for these refer to descriptions of rabies—hydrophobia, animal poisons, septicæmia. Nor are the effects produced by eating the flesh or drinking milk diseased or disordered by any cause included. It is known that the use of certain articles of food—certain states of health—changes during breeding, and in decomposition, may render the flesh or secretions of living creatures unwholesome, or even poisonous, but for descriptions of these refer elsewhere.

VERTEBRATA.

Mammalia.—The higher orders of vertebrata apparently have no venomous representatives, though the male monotremes, Echidna, and Ornithorhynchus paradoxus, are armed with a perforated tarsal spur, communicating with a crural or popliteal gland, which seems analogous to the poison apparatus in other creatures; no authenticated case of poisoning by this weapon, however, is on record, and its true use seems not to have been yet determined. Evil result following a puncture from this weapon, or from teeth, claws, or spurs of this or other mammal, may rather be attributed to the puncture than to an inoculated venom.

Aves have no known poisonous representative. Ill effects from wounds inflicted by their claws, beaks, or spurs may be referred to the lacerated or punctured nature of the wound, or to accidental contamination by extraneous septic matter.

Reptilia furnish the most numerous and important examples of venomous animals, and these are limited almost entirely to the

order Ophidia, which has three subdivisions: O. colubriformes, innocuous, O. colubriformes venenosi, and O. viperiformes, venomous. These are distributed widely over the globe, land and sea. The most venomous are generally denizens of warm climates.

The poison apparatus of a snake consists of a composite racemose gland, situated in the temporal region, which secretes a clear, slightly viscid fluid, that is poured through a duct into a grooved fang situated on a movable maxillary bone, capable of erection and reclination, to a greater extent in viperine than in colubriform snakes, by the action of muscles which push forward the ectopterygoid and maxillary bones, raise the fang, at the same time compress the gland and eject the poison through the duct into the groove in the fang; it is thus hypodermically injected into the bitten part.

The fangs are longer, more curved, more movable, and more formidable in viperine than in colubrine snakes—they are deciduous, and when lost by accident or by the process of shedding, are quickly replaced by reserve fangs that lie loose in a fold of mucous membrane. On the loss of a fang the most advanced of the reserves quickly takes its place, becoming anchylosed to, and moving with the maxillary bone.

The groove is on the convex aspect of the fang, and opens near the point for emission of the venom. There is an opening at the base of the fang, into which the poison is shed from the papillary orifice of the poison duct. This at the time of emission becomes closed in by a fold of mucous membrane, so that the poison is directed into the groove in the tooth.

Viperine snakes can recline or erect each fang independently of the other. This power is limited in colubrine snakes. The difference may be well seen in Naja tripudians—cobra; and Crotalus-horridus—rattlesnake. The poison is secreted in considerable quantities; half a drachm may be collected from a fresh and vigorous cobra. It is a clear, slightly viscid fluid, and very deadly in its action, probably more active in some snakes, quantity for quantity, than in others, and varying in activity in the same species or individual, according to season, temperature, state of health, etc. It acts most rapidly when injected into the blood; but it can be absorbed through mucous and serous membranes, as seen by its poisonous effects when applied to the conjunctiva, the stomach, the peritoneum. It may neither be applied to the lips nor taken into the stomach with impunity, and sucking a snake bite is by no means free from danger, though if the saliva be quickly ejected and the mouth washed, the danger is probably small. It contains an active principle, which has been described as echidnine, viperine, crotaline. Analysis has shown the poison to be very nearly like albumen in composition. It is most active in its action on warm-blooded creatures, but it takes effect in all. It appears, however, that poisonous snakes are very insensible to

the venom of other species of poisonous snakes. A cobra is not poisoned by another cobra's venom, but is probably affected by that of other species; and so with the others. But innocuous snakes, other reptiles, amphibia, birds, mollusca—indeed all life—succumb to it. Further analysis of the poison is needed. Though differing in activity and slightly in mode of action, the *modus lædendi* is essentially the same in all snakes.

The action of the poison is local and general.

Local.—Pain, partial paralysis of the bitten part, ecchymosis, swelling, and if death does not rapidly follow, infiltration of other and distant parts, cellulitis, sloughing.

General. — Depression, fainting, nausea, hurried respiration, vomiting, exhaustion, lethargy, loss of co-ordinating power, paralysis, loss of consciousness, hæmorrhagic discharges, relaxation of sphincters, coma, convulsions, death. If the quantity of poison injected be small or its nature feeble, the earlier symptoms may give way and recovery take place. Snake poison acts by paralyzing the nerve centres—sometimes the peripheral distribution of the nerves, and by altering the constitution of the blood. It takes effect through the circulation, and if inserted into a large vessel, such as the jugular, humeral, or axillary veins, it will cause almost instant death—the heart's action stopping, systolic spasm.

The respiratory centres, the spinal cord, the peripheral nerve distribution may all be affected; in ordinary cases death seems to take place by arrest of the respiration, the heart's action continuing for some time after apparent death. The convulsion or coma that precedes death is due to the circulation of venous blood. The muscular fibre itself would appear in some cases to have its contractility impaired or destroyed. The poison also acts septically, producing at a later period sloughing and hæmorrhage. There are certain points of difference in the action of viperine and colubrine venom. In the former there is greater tendency to hæmorrhage than in the latter. Experiments on animals showed, that generally after death from cobra poisoning the blood coagulated firmly, whilst after death from viperine poisoning the blood remained permanently fluid. In most cases of death in man the blood has been found fluid even after cobra poisoning. Snake poison is also to a certain extent a poison to protoplasm, at all events it arrested the action of infusoria, and was not without effect on ciliary action. The results of its influence on amœboid movements of blood-corpuscles was not definite.

There is reason to believe that the numerous agents that have been recommended from the earliest times as antidotes are useless, and have no such properties as those ascribed to them.

The rational treatment of snake poisoning is that of endeavouring to prevent the entry of the virus into the circulation, to support the failing nervous force if it have entered, and to aid in its elimination by all possible means.

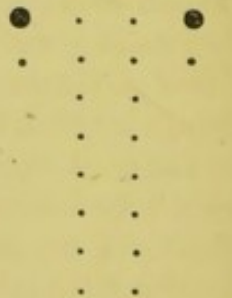
The application of a ligature applied tightly between the bite and the heart, the immediate excision or destruction by cautery or caustic of the bitten spot is essential, and such other local measures subsequently as appear necessary.

The constitutional treatment requires that the strength should be supported. Stimulants, such as alcohol and ammonia, have always been in repute, and probably with justice, though not in the sense to which the term antidote is frequently applied. Next—and if the respiration be failing, the use of artificial respiration should be resorted to. Elimination by the skin and kidneys should be encouraged and promoted by stimulating diuretics. The patient should be kept warm. It is not reasonable to make him exert himself by walking about; he is already sinking from nervous prostration, and forcing him to exhaust himself more is not likely to do good. Ammonia has always held a high place among remedies in snake poisoning, and its injection into the veins has been warmly advocated in Australia, and seems to have met with success there that it had not in India. In cases of moderate severity, and happily many are so, remedies with careful nursing and tending may prove successful, but where the bite has been thoroughly effected by the cobra, daboia, rattlesnake, craspedocephalus, cerastes, and others, the prognosis is very unfavourable; in no case, however, should efforts be relaxed until the last.

There is often uncertainty as to the kind of snake, its condition, and the extent to which its fangs were used. The great shock or depression which follows a snake bite may be in a measure due to fright, and will, on reassurance, pass away. The marks of two well-defined punctures attest the insertion of two fangs, and if the snake has not been seen, may enable one to form an opinion as to its character. Many of the innocuous snakes are fierce, and bite vigorously, but their numerous teeth leave different marks to those of the poison fangs.

There are exceptions to this rule; a few innocent snakes have the anterior maxillary teeth developed like poison fangs, but bites from them are not very likely to occur.

In a brief notice of this kind it is not possible to enter into much detail, but it may be well to note some of the characters that distinguish the venomous snakes. The form and arrangement of their teeth, and an examination of the mouth, will always reveal the true character. On opening the mouth of a venomous colubrine snake, such as naja or bungarus, two well-developed fangs will be observed, one on either side, and close behind it there may be seen one or two smaller teeth; there is no row of teeth along the outer side of the mouth, but a double row will be found on the palatine surface.



In the viperine and crotaline snakes, a large fang will be found

on either side, and a double palatine row. There are no small fixed teeth behind the fangs as in colubrines, but in a fold of mucous membrane at the base of the fangs, both in vipers and colubrines, a set of loose reserve fangs will be found.

In Hydrophidæ the fangs are arranged like those of the cobra, but are very minute, and no reliance can be placed on any mark made by them. The circumstances under which a bite is inflicted will generally help to indicate the kind of snake.

Harmless snakes have a double row of equal or nearly equal-sized teeth in the maxillary and palatine bones. There are certain innocent colubrine snakes that have long anterior maxillary teeth that might cause doubt as to the nature of the bite, but such are very exceptional.

There is nothing (except the hood in Najadæ) in colubrine snakes peculiarly characteristic, in their general aspect, of their venomous character; at first sight for ordinary observers it is difficult to say whether they are poisonous or not. Indeed, several of the innocent have a more repulsive aspect than poisonous species.

The viperine and crotaline snakes are remarkable for their broad arrow-shaped heads, often without shields, their thick bodies and short tails. They have thick, swollen looking lips, from the large fangs underneath them; and the nasal pits in Crotalidæ are very conspicuous. The Hydrophidæ are recognised by their compressed bodies and tails. Their peculiar heads, which in some species is very small, the valvular nostrils, and the absence, except in one genus, Platurus, of ventral scales. They are obviously aquatic, and are always found in the sea or on the shore. Space will not admit of more than a general indication of the genera, and of the geographical distribution of the venomous snakes.

These belong to the families Elapidæ, Hydrophidæ, Viperidæ, Crotalidæ. Elapidæ is a large group, widely spread over the Indian and Australian regions, and in America. It contains the truly venomous snakes, such as ophiophagus, naja, bungarus, hoplocephalus, pseudechis. The genera naja, ophiophagus, bungarus, pseudonaja, xenurelaps, doliophis, magrophis, and calophis are Oriental, and in Japanese An ophiophagus has been found in New Guinea. Cyrtophis, elapsoidea, and poccilophis in Africa. Elaps in America, but not in the West Indian Islands. Diemenia, acanthophis, hoplocephalus, brachiurophis, tropidechis, pseudechis, cacophis, pseudonaja. Denisonia and vermicella are Australian. The two first in the Moluccas and New Guinea. Ogmodon in the Fiji Islands (Wallace). There are 100 species.

Family Hydrophidæ.—These are sea snakes, and probably all very poisonous. They have a wide range of distribution in the Indian and Australian seas, from Madagascar west to Panama east.

Genera.—*Hydrophis* has numerous species, and probably many yet undescribed. They are found in the Indian seas about Formosa, and in Australia. *Platurus:* 2 species; Bay of Bengal, New Guinea, New Zealand. *Aipysurus:* 3 species; Java, New Guinea, Australia. *Disteira:* 1 species. *Acalyphis:* 1 species; S.W. Pacific. *Enhydrina:* 1 species; Bay of Bengal, New Guinea. *Pelamis:* 1 species; Indian and all Eastern Seas. *Emydocephalus:* 1 species; Australia.

Family VIPERIDÆ.—In India, Ceylon, Africa, Europe. The common viper Pelius berus has a very wide range, from Portugal to the Island of Saghalien (Wallace); it is poisonous, but not deadly. The daboia of India and Ceylon, echis of India, puff-adder, cerastes of Africa, are deadly vipers.

Genera.—*Vipera* has 2 species, extending (Wallace) over Palæarctic and Ethiopian regions, but not in Madagascar. *Echis:* 2 species in India, Persia, North Africa. *Atheris:* 3 species; confined to West Africa.

Family CROTALIDÆ.—The pit vipers, a numerous group, containing some very deadly snakes. The craspedocephalus of the West Indies and the rattlesnakes of America. They are unknown in the Australian and Ethiopian regions.

The genera are:—Craspedocephalus, of which there are seven species, in tropical America and the West Indies; some are very poisonous. Cenchrus, crotalophorus, uropsophorus, crotalus, in North America, from Canada and British Columbia to Texas; one species, Crotalus horridus, extending to South America. Trimeresurus, 16 species, all in India, Ceylon, Africa, Formosa, Philippines, Celebes. They are poisonous, but not nearly so much so as are the rattlesnakes. Peltopelor and hypnale in India. Calloselasma, Siam, atropos, Java. Halys, 3 species; Tartary, Himalayas. These are not very poisonous; though they may cause severe symptoms, are hardly able to destroy life.

Amphibia.—None are known to possess a poison apparatus like that of ophidia, but toads and salamanders secrete a fluid in glands along the back, connected with the integument, which yields an actively venomous principle capable of causing local irritation, and when injected into the blood, death, preceded by symptoms indicating action on the cerebro-spinal nerve-centres. Dogs seizing the toad, Bufo vulgaris, have been observed to suffer from swelling of the lips and salivation; and a case of death is related in a French journal, 29th March 1865, of a child in whom an abrasion of the hand came in contact with the secretion of a toad; death was preceded by vertigo, vomiting, fainting.

Injected into guinea-pigs, small birds, and other animals, violent symptoms and death soon follow. It is a viscid, milky fluid, with a slight yellow tint and peculiar odour; it is exuded, or may be pressed out from glands behind the orbits. Zalesky has shown that the land and water salamanders, S. maculatus and Triton cristatus,

and probably others, have also the power of secreting venom, and his experiments prove that it contains a very active principle—salamandrine, and that its action on the cerebro-spinal nerve centres is energetic.

It appears that these poisons, like those of ophidia, though effective on others, have no action on their own species. It is probable that all species of these families have the same active principle in their glandular secretions, though in different degrees of intensity.

I am indebted to Dr Leibrich of Berlin and Dr T. Lauder Brunton, F.R.S., for the accompanying abstract of what is known on the subject of poisonous amphibia.

Abstract of Paper by Zalesky on Poison of Toad, Triton, and Salamander.

"Poison of fishes depends upon their food, and is not always present, *vide* Signatera on 'Fish Poison Disease,' *Social Science Review*, July 19, 1862.

"Bombinatur igneus is poisonous, its poison is probably the same as in salamander. Three poisonous salamanders: Salamandra maculata = land salamander, Triton cristatus = water salamander, Salamandra venenosa (Barton) Daudin, *Histoire Naturelle des Reptiles*, vol. viii. p. 229.

"Land salamander has different names: Lacerta salamandra, Salamandra maculosa, S. terrestris.

"'Researches on Toads,'" John Davy, *Phil. Trans.* 1826, p. 127; Gratiolet and Cloëz, *Compt. Rend.*, April 21, 1851, t. xxxii. p. 592. Secretion of salamander in birds caused convulsions, opisthotonos, and death. In animals, laboured respiration, weak convulsions, recovery. They say secretion has a strong odour and marked acid reaction. Secretion of Rana buffo killed birds in five to six minutes without convulsion.

"There was also stupor from poison of toads and of earth salamanders. Injected under skin of foot of tortoise it caused paralysis of the limb after some days, which did not disappear in eight months. The poison when dried preserves its qualities indefinitely. It contains an alkaloidal substance which causes excitement, then irritability, then paralysis, death. In all birds killed by it the semicircular canals were found filled with blood.

"Vulpian, *Mem. de la Soc. de Biolog.*, 1856, p. 122, found in dogs and guinea-pigs triton poison caused progressive weakness without convulsions, although twitchings of individual muscles, and weak respiration and heart's action. Membranes of brain congested. No vomiting. Not poisonous for tritons. Intense local irritant to the eye.

"Land salamander causes convulsions. Appears to act on spinal cord. Much weaker action on the heart than the poison of triton.

"Poison of toads, Bufo fuscus and B. viridis.—In dogs—violent

vomiting, staggering gait, convulsions, death. In guinea-pigs—efforts to vomit, convulsions more violent than in dog, but were intermittent, and only became constant shortly before death ; then opisthotonos, grinding of teeth ; death in ½ to 1½ hour. Symptoms in warm-blooded animals may be divided into four stages: 1, excitement ; 2, relaxation ; 3, nausea or vomiting ; 4, convulsions. Given internally to a dog it only causes vomiting, and animal recovers.

"Poison does not affect irritability of nerves or muscles. *Post-mortem* examination in dogs showed heart motionless, filled with blood, lungs pale, heart contracted when galvanized. In frogs, toad poison causes convulsions, emprosthotonos, paralysis, contraction of pupil. Death in one hour. The poison paralyzes the movements of heart in frogs. It does not affect toads. The poison of toads kills tritons. The poison of tritons kills toads. The poison of land salamander kills toads and tritons. It is not known whether the poison of toads and tritons kills land salamanders.

"*Zalesky's experiments.*—Milk-like secretion of salamander obtained by scraping back with spoon. It only comes out under pressure, and easily spirts into eye, but animal cannot eject it. It is white, thick, strongly alkaline, acrid and bitter, slight smell not unpleasant, microscopically it is like milk. The granules disappear on addition of alcohol, ether, and acetic acid ; when fresh secretion is put in water the greatest part remains undissolved in cheesy flakes. The water, however, becomes milky and turbid, and acquires an alkaline reaction and peculiar smell. The substance which causes the turbidity is not precipitated by acids or alkalies, but is by ether. The precipitate is soluble in hydrochloric acid, and is again precipitated by water.

"The watery solution coagulates at 59°, and gives white cheesy precipitate. On filtration the filtrate is clear, colourless, with pleasant smell, and *intensely poisonous.* It contains much phosphoric acid and nitrogenous substances. Dried over sulphuric acid in vacuo, it leaves amorphous brittle residue, which redissolves sparingly in water or alcohol. When completely dried it *loses* its *poisonous* power. When the concentrated solution is acidulated with hydrochloric acid, it gives on drying fine needle-shaped crystals, which are *not* poisonous.

"The watery extract may be boiled for a long time without losing its poisonous power. Phosphomolybdic acid (phosphormolybdausaüre) precipitates copious yellowish white cheesy flakes from the hot watery extract. The precipitate is intensely poisonous. It was washed, dissolved in baryta water, excess of baryta removed by CO_2, boiled, filtered, filtrate distilled in tubulated retort over naked flame, then completely dried over water bath in a current of hydrogen. Before the residue is completely dry numerous long needle-shaped crystals form, which disappear when the drying is complete, leaving a brittle, colourless, amorphous mass. This is

almost entirely soluble in water. The solution is strongly alkaline, is precipitated by chloride of platinum, and also by phosphomolybdic acid. It is exceedingly poisonous. It produces all the symptoms caused by the entire secretion.

"Even by drying in the stream of hydrogen a part of the base was so altered that a resinous body was produced, insoluble in water, soluble in alcohol, solution fluorescent, fluorescence disappeared after some time. The aqueous or alcoholic solution of this body when saturated with HCl, and dried on a water bath in a stream of H, leaves before it is dry long crystalline needles, which disappear when the drying is complete. The substance when fully dried contains hydrochloric acid. The free base when once dried retains its poisonous power for months.

"*Results.*—Samandrin is an organic base, not volatile without decomposition, easily soluble in water and alcohol, crystallizes with water of crystallization. Solutions are strongly alkaline, forms neutral salts with acids, precipitated from solution by phosphomolybdic acid, also by chloride of platinum which decomposes it. It is not decomposed by boiling its solutions, but is by gradual drying in air; when dry it is permanent.

"*Test.*—Precipitate by phosphomolybdic acid, dissolve, evaporate to dryness with $PtCl_4$ on water bath, a transparent amorphous blue mass insoluble in water forms during the drying.

"*Symptoms produced by it.*—After a few minutes (three to twenty-nine) the poisoned animal trembles, is restless, epileptiform convulsions occur, at first weak and confined to single limbs. The animal moves, but goes backwards, instead of forwards; there are violent convulsions of the muscles of mastication (especially in rabbits), and marked salivation, most when the fresh secretion has been used. The convulsions increase; there is opisthotonos, the animal can no longer sit, but falls in convulsions to the ground with head bent back. The eyes are open, the pupils much dilated and insensible. The animal seems insensible to all irritation, the respiration is weak, the pulse irregular, but strong, the muscles relaxed. During the convulsions the activity of the heart is unaltered, but respiration completely suspended. They last only one to two minutes at most, then there is rest, and then another often stronger than before, so that the animal is thrown clean into the air. Death occurs from exhaustion, with symptoms of paralysis. Rigor mortis comes on quickly, blood very dark, often bleedings in lungs, heart and veins full, heart pulsates after respiration has ceased. Brain normal, only great congestion of it and liver.

"In fish it produced rigidity of body (quiet respiration) and death.

"In dogs, given by mouth, salivation, restlessness, vomiting, convulsions limited to posterior part of back and feet, intermittent, sudden like an electric shock. Vomiting and convulsions increased, *pari passu*, and convulsion affected whole body. During

intervals between the vomiting the convulsions were less violent; but with nausea or vomiting they increased, and there was opisthotonos or pleurosthotonos.

"In frogs—in two minutes respiration quickened; in eight to ten, irregular, laboured, and with long intervals. Muscles of belly, neck, and chin take part in the respiratory movements. After fifteen to twenty minutes more, convulsive movements of single muscles, especially in back and extremities. These come and go instantaneously like electric shocks.

"Emprosthotonos and rest alternately; sensibility gone. After four to six attacks, complete paralysis, with twitchings in single muscles. This condition may continue two to three days before the frog dies. The nerves and muscles retain their irritability. The symptoms are not altered by ligature of the aorta in belly of frog. Poison does not seem to affect the heart very much."

Pisces.—Several fishes are provided with an apparatus consisting of a cavity at the base of, or a sac and duct leading to a channelled spine, through which a more or less irritating secretion is ejected. No true poison gland, however, has as yet been certainly made out. This secretion is apparently connected with the secreting mucous system, and it is well known that in certain species it produces marked symptoms of poisoning, though never to the same extent as in the case of the poison of venomous snakes.[1] Fish armed with sharp or serrated opercular or fin spines can inflict severe and painful injuries liable to cause great pain, and to be followed by the grave symptoms attributable to the lacerated or punctured nature of the wounds, and these may be aggravated by the irritating nature of the mucus with which they are contaminated. In several, however, in addition to the spine there is a distinct receptacle in connexion with it, either in the form of a sac or duct, such as in thalassophryne, in a cavity in the spine itself, as in trachinus.—*Weever.*

In the case of others, such as the sting rays, which may produce severe wounds by their pointed and serrated spines, there is no distinct receptacle for the poisons in connection with them. The ill effects of such wounds are so well known to fishermen and others, that the spines are generally broken off as soon as the fish is caught; and in France and Spain fishermen are obliged by police regulations to do this before the fish are exposed for sale! Whilst it is well known that many spiny fish are capable of inflicting wounds that are dangerous from their lacerated and punctured character, it is recognised, also, that others increase the danger by the inoculation of an irritating fluid; and the following are the most remarkable among them (*Day*):—

[1] Experiments on the action of this poison are needed; it is probable that in its action and composition of its active principle it would be found to resemble that of the salamanders.

I. Sub-Class.—TELEOSTEI.

a. Order—**Acanthopterygii.**

A. Family—TRACHINIDÆ.

Genus—*Trachinus.*

1. Trachinus draco, } Great Britain.
2. T. vipera, }
3. T. araneus, Mediterranean.

B. Family—SCORPŒNIDÆ.

Genus—*Synanceia.*

1. Synanceia verucosa, East Coast of Africa, Red Sea, Indian Seas.

All the individual members of this family are reported poisonous. Synanceia, says Sir J. Richardson, is more dreaded by the people of the Isle of France than snakes or scorpions. The dorsal spines are the weapons, and they have a receptacle for poison at the base of each.

C. Family—LABYRINTHICA.

Genus—*Polycanthus.*

1. Polycanthus cuparus, found in ditches and paddy fields along the Malabar and Coromandel coasts in India generally, within or not far removed from tidal influences. It hides under stones and among weeds; about 3½ inches long.

b. Order—**Phyostomis.**

Family SILURIDÆ.

Genus—*Thalassophryne.*

1. Thalassophryne reticulata, } Coast of Panama. Grows to ten inches in length. In these the poison seems most highly developed.
2. T. maculosa, }
3. Saccobanchus fossilis, Malabar. Is much dreaded by the natives, who call it the scorpion-fish, for the irritating wounds it inflicts with pectoral spines; ~~and~~ Wounds from the siluroid genus Clarus are much dreaded.

II. Sub-Class.—CHONDROPTERYGII.

Order—**Plageostomata.**

Sub-Order—*Batoidei.*

Family—RAIEDÆ.

Family—NYGONIDÆ.

Rays.

The latter sub-class are capable of inflicting severe wounds, but it is doubtful if there be any poison inserted into the wound. Probably there are others that are capable of inflicting severe envenomed, others merely lacerated or punctured, wounds. It is sufficient to indicate the certain danger of some, and the probable danger of other spiny fish. There is no ground for supposing that there is any poison apparatus connected with the teeth of fish. The effect of the poison is to produce severe burning pain at and beyond the injured part, with fever, and the intensity would,

no doubt, depend on the quantity of poison injected, and the state of health and constitution of the person at the time. The wound alone, without any poison, is likely to be painful and severe from its punctured character; and may require means to relieve tension, evacuate pus, or give exit to sloughs.

Ipecacuanha, alkalis, alum, ammonia, have all been recommended as useful internal applications to allay the irritating action of such poisons. Poultices of onions, or warm applications of opium or other sedative fomentations, are likely to be useful; and prompt surgical relief, if suppuration or cellulitis occur, is necessary.

The constitutional treatment needs no special description; it is such as would be indicated by the condition and progress of any other inflamed punctured wound. In case of depression of the heart's action, alcohol or ammonia would be indicated. Rest, quiet, and due attention to the state of the bowels and of elimination by the skin and kidneys, with careful regulation of the diet, should be observed.

Invertebrata.

Mollusca.—*Aphysia punctata*, the sea-hare, a gasteropod, is said by some to produce an irritating secretion capable of causing urtication and even severe inflammation, and of causing the hair to fall off. It was used by Locusta in Nero's time as an ingredient in poisonous draughts, but it is doubtful if it be even an irritant.

Arthropoda, Myriapoda, family *Scolopendridæ*, or centipedes.—Body long, even to 12 inches, divided into horny segments; legs short, strong; feet numerous; antennæ 17 to 20 joints. They have mandibles or nippers, formed by a pair of dilated feet, joined at their origin, with perforated, hook-like points with an aperture near the apex, through which a poisonous fluid, secreted in a poison gland, sac, and duct, is ejected when they bite, which they can severely. This, in the case of the larger tropical species, is sometimes very painful, and causes considerable local irritation and even constitutional disturbance, and fever and delirium. Dr Linceicum says that he saw a case of a child terminate fatally in six hours; nausea, vomiting, and convulsions preceded death; body swollen and covered with livid blotches. That of the smaller kind generally causes only local and transient irritation. Centipedes are found all over the world nearly, in Europe and Africa, America, the East and West Indies and Islands, and in the tropics generally. Those of warm climates are the largest and most dangerous.

The following are characteristic genera and species:—

Scolopendridæ—Pallipes.

S Crassa.
" Ceylonicus, Ceylon.
" Morsitans, West Indies.

Scolopendridæ—Platypoides, Brazil.
" Placeæ, Brazil.
" Variegata, Brazil.
" Angusticollis, Old Calabar.
" Tuberculidens, East Indies.
" Leachii, Cape de Verd Islands.
" Cœruleo viridis, New Holland.
Cryptops—Hortensis, British.
Lithobius—Fortificatus, British.
Cermatia, distinguished by its long spider-like legs.
C. Capensis, Cape of Good Hope.
C. Smithii, New Holland.

These are venomous, but it is not very likely that they should injure men. There are others, but it is unnecessary to detail them here.

ARACHNOIDEA.—*Scorpionidæ* or *Pedipalps.*

Scorpiones (true scorpions).—Have the abdomen segmented, the last six joints narrowed into a tail, terminated by a curved perforated spine or hook, with which they strike and wound. At its extremity are two small orifices, through which venom is injected from a gland receptacle and duct at its base.

The palpi are large, and formed like the claws of a lobster. Scorpions run about very quickly, carrying the tail curved over the body. They live in holes in the ground, under stones, logs of wood, in dark places. The tail is used as an offensive and defensive weapon. They seize small creatures, insects, with the palpi, and then pierce them with the sting. The venom is so active that it quickly destroys life.

Those of tropical climates are most active and poisonous. They attain to the length of from two to three, four, and six inches. The European genera are smaller and less active.

They exist in all tropical countries, but extend also into the warmer regions beyond the tropics. They are found in the East and West Indies, Ceylon, and other islands, Australia, Africa, Egypt, south of Europe, America. There are several genera, such as Androctonus, Bothus, Brotheas, Ischurius, Væjovis, Opisth-ophthalmus, and the following species—Bathus ater, Androctonus, Bothus Cæsar are good examples of the active kinds. Europæus and Occitanus are also venomous, but those of Europe are less active than the tropical forms.

Solpugidæ, Galeodes—has some individuals reputed to be venomous, but proof is wanting. They are like large spiders. Galeodes araneoides is said, but has not been proved, to be poisonous to man.

The effects of the scorpion's sting and centipede's bite have no doubt been exaggerated, but they may produce very painful, and in the case of the larger species, severe and serious symptoms in their character, not unlike, or even more severe than those of the wasp

sting: pain, swelling, in some cases numbness, vertigo, nausea, vomiting, temporary loss of vision it is said, swelling of the tongue, fever and death in delicate and feeble or sickly subjects. The local and constitutional symptoms may be severe in persons of irritable constitution, or otherwise out of health, but generally in the case of bites of ordinary scorpions or centipedes inflicted on healthy subjects, the suffering is local and soon passes away. A variety of remedies have been recommended. Probably the application of a ligature above the bitten part, or a cupping-glass, or suction of the wound, as in snake bite, might be useful. Some authorities recommend that the wound should be scarified, volatile ointment rubbed in, and an emollient poultice applied. Suction of the wound, the application of salt water, vinegar, ammonia, alum, ipecacuanha, spirits of camphor, eau de Cologne, tobacco water, turpentine, tincture of iodine, alcohol, the leaves of cruciferous plants made into poultices, solutions of opium and lead, or other sedatives, all seem to lessen pain and irritation. For the constitutional symptoms, the use of diffusible stimulants, opiates, or other sedatives may be necessary, and such surgical interference as inflammatory action inducing suppuration or cellulitis may render necessary.

It is a popular notion that the scorpion loses its venomous power after being at sea for a short time. This is probably not the case.

ARACHNIDÆ.—*Spiders.*—Some spiders are venomous, and certain of the larger tropical forms are capable of inflicting painful bites. The poison apparatus of spiders consist of falces or modified mandibles or jaws, the last joint of which is a hard curved fang, with a fissure near the point; there is an elongated poison sac and duct in which the venom is elaborated, and thence transmitted to the fang, by which it is inoculated into the flesh of its prey. The venom is a very active principle, and apparently capable of destroying the life of the small creatures on which the spider feeds rapidly. It also causes symptoms of poisoning in man and other animals. Probably all the species have some venomous secretion, but it is only the larger kinds that are obnoxious to man. It may be noted that whilst the fangs of one section of spiders move laterally, those of the Mygalidæ move vertically.

The Mygalidæ, or mouse spiders, grow to a large size. They are covered with a felt of hair, have vertical fangs, are very fierce, and are said to kill and eat small birds.

There are several species. Those reputed venomous are tropical.

Mygale Klieglii, Western Pampas.
M. versicolor, Brazil.
M. californica, America,
and others.

Therididæ.—Lactrodectus malmignatus, a black spider, with ten blood-red spots, South Europe, Spain; is said to be very poisonous and even dangerous to man. It is probably identical with the Tendaraman of the cork woods of Morocco, which also has an evil reputation. There is an allied species in Corsica, Malmignatte (Theridiidæ tredecim guttatum), also said to be very poisonous. This spider kills its insect prey, such as locusts, instantaneously. It has thirteen red spots. Others with similar powers are said to be found in Southern Russia and in New Zealand.

Lycosidæ, or Wolf Spiders.—Lycosa tarantula is reputed to cause extraordinary symptoms, and has given rise to the stories about dancing; hence the Tarantula of Naples. It is poisonous, no doubt, but there is no reason to believe that its effects exceed a certain amount of local irritation.

There are numerous families, genera, and species of spiders; in all, probably, evidences of the possession of an irritating fluid may exist, but it is only in the larger kinds that they do so to any extent, and there is no very positive proof that even in tropical climates they can inflict the grievous injuries ascribed to them, though there can be no doubt that the venom is very fatal to the creatures on which they prey.

The treatment of spider bites would be similar to that for centipedes and scorpions.

The popular notions that the spider is very poisonous when swallowed, and that its web possesses valuable medicinal properties, are probably equally exaggerated, if not altogether untrue. It is to be noted, however, according to Kirby and Spence, that Ulloa mentions a species of red spider, perhaps mite, called coya, in Popayan, that is very poisonous, the juices of its body when crushed, and coming in contact with the punctured skin, cause tumours and even death. This is no doubt an exaggeration, but it is probable that the juices of not only those, but some others are acrid and irritating, and it is therefore better not to crush them when they are detected on the person, but to brush or blow them away.

In India and the tropics, a streak of almost erysipelatous redness of the skin coming on rapidly, is attributed to a spider. No one has yet defined the species; it is possible that it may be due to an analogous species to that just referred to.

Acarina or Mites.—Some families of the acarina have individuals that have the power of causing considerable irritation by some secretion ejected on the surface, or injected into the wounds they make, in their burrowing operations with claws or mouth.

Tetranychus autumnalis or the Harvest Bug (Le Rouget), Leptus autumnalis.—Is brick red in colour, and very minute. It is bred on plants, but leaves them to fasten on animals, especially the human species. They fasten on the skin and adhere firmly, they

cause swelling and great irritation, severe itching when they are numerous, as they are apt to be. The intense irritation causes fever. The symptoms are not unlike the sting of a nettle. Erythema or even blistering is caused. They burrow under the skin rapidly. They are covered with hairs, and effect entrance into the skin with their claws or palpi, and thus give rise to the great irritation, which is probably aggravated by some acrid excretion. They are found in Britain, France, and other parts of Europe. There are varieties of them found in the tropics. One is mentioned as occurring in Brazil that causes intense irritation, also in Honduras and on the Mosquito Coast, and in the West Indies.

The *Tetranychus Tlalsahuate* is the name given to another form known in Mexico, which gives rise in the same way to great irritation, which continues for days. The mode of treatment is to extract the insect with a needle or point of knife, and then apply some soothing lotions.

T. irritans is the jigger of the Mississippi valleys; it causes great irritation in the same way.

Argas persicus.—A gamosid of this name, known also as the Teigne de Miana, venomous bug of Miana, well known in Persia. It is found in the houses, and it is said that its puncture produces serious symptoms—convulsions, delirium, gangrene, and even death. This is an exaggeration, though probably it is true that local irritation, and perhaps some constitutional disturbance, may be caused. It is blood-red in colour, spotted on the back, with white; feet yellow. Argas moubata, a native of Angola, is said to have much the same properties.

Argas talaje.—In Guatemala produces great irritation. It bites like an ordinary bug, and the punctures are followed by great irritation, swelling, and pain. It lives in holes in the bamboo walls, or such like crevices, and issues at night to attack the sleepers. They are called by the people talajes.

The *Ixodidæ* or ticks are also the source of annoyance and irritation, by attaching themselves to the bodies of most animals; but there is no proof that they have any poisonous properties, so it is not necessary to allude to them further here.

Several others, *Anoplura* or lice, and *Sarcoptidæ* or itch mites, as is well known, cause great irritation and disease, but this is due to the mechanical, rather than the poisonous nature of the wound; the whole subject will be found detailed under the head of Parasites.

Hemiptera or Bugs.—Geocorysæ and Hydrocorysæ, land and water bugs.—Some of these have irritating properties, and also offensive odour; they have a suctorial mouth armed with a grooved instrument or rostrum for piercing the skin.

Cimex lectularius the bed bug, causes much irritation, and in some persons inflammatory action in the bitten part. The effects are transient.

Notonecta, the water boatman, and *Nepa*, the water scorpion, common in pools of water in our islands, are also capable of inflicting a painful puncture.

Kirby and Spence speak of the *Cimex Nemorum* as causing nearly as much pain by its puncture as the sting of a wasp.

The wheel bug, *Reduvius serratus*, of the West Indies, gives an electric shock to the person it touches. St Pierre mentions a species of bug in the Mauritius whose bite is as venomous as the sting of a scorpion.

The *Benchucha*, or great black bug, of the pampas of South America, is more obnoxious, it is said, than the common bed bug.

Aphaniptera.—Pulicidæ, or Fleas.—There are several families of this order. It is only necessary to refer to Pulex irritans,—the universal common flea. It varies much in size and colour; some are almost black and very large, and are found on the sandy shores of the Mediterranean. There are many species, such as P. canis, P. musculus, P. vespertitinus, and others. Pulex penetrans of West Indies and South America, known also as the jigger or chigoe. It penetrates into the skin, and beneath the nails generally of the feet, causing great irritation. It will, if not extracted, deposit its ova, and thus give rise to severe irritation. The effects of the ordinary flea-bite are well known. No special treatment need be described. Prevention is better than cure. Though the irritation of flea-bites is chiefly due to the wound, there is reason to believe that this is aggravated by the presence of some irritating secretion.

Orthoptera are probably all free from venomous properties.

Diptera.—To this order belong the gnats. Mosquitoes, pipsas, sand-flies, gad-flies, are more or less dreaded for their bites. They have a proboscis composed of a grooved and flexible sheath, through which long, slender, sharp darts are protruded that pierce the skin, and no doubt inoculate some venomous secretion, though its nature is not known. They draw blood, raise white lumps or swellings; some, such as the pipsa of the Cossiah Hills, India, leave a livid spot of effused blood, that gives the person the appearance of a purpureal rash. They swarm in many countries, especially the tropics, generally near water. But they are not by any means confined to the tropics. Lapland swarms with them. The principal forms are the Culex pipiens, C. reptans, (common gnats,) C. mosquito, Culex laniger, (the mosquito,) the flies, C. tabanus. Some of these are formidable insects, and are insatiable blood suckers. The tsetze or timb, Glossina Morsitans of Africa, is one of the most remarkable. The bite of this poisonous insect is almost certain death to the horse, ox, or dog; though it appears not to trouble man more than to cause slight irritation, which has no further effect on him, though in a few days the animal sickens and dies.

Oestrus, or the gad-fly, is troublesome to animals; but it does not, as a rule, molest man. Poisonous properties doubtful.

The *Tipulidæ*[1] are for the most part harmless, though one of them, the Hessian fly, Cecidomyia, is dreaded for its destruction of grain and wheat.

The *Simulium*, or Sand-fly.—The females only are irritating to man, the bite often giving rise to painful swellings. These insects, especially mosquitoes, are the pest of many countries, not only tropical, but even in Europe, and render it necessary that, to procure sleep, the person should be protected by a curtain.

The Pipsa is probably a simulium. It appears from the great irritation and the white hard swelling that follows the puncture of most of these insects, that some acrid secretion is injected into the wound.

In young full-blooded persons, especially recent arrivals in India or the tropics, the irritation caused by mosquito bites is often so severe as to give rise to violent inflammatory symptoms, resulting in suppuration or ulceration, and even gangrene, risking loss of limb, perchance of life. The application of common salt, solution of ammonia, soda, potash, lead, oil, ipecacuanha, alum combined with opium, allay irritation in the first stage. The more violent inflammatory symptoms are amenable to ordinary surgical treatment. Camphor, pulegium, lime-juice, applied to the skin are all regarded as preventatives. The term mosquito is rather vaguely applied to a great number of species of culex and simulium. In South America they are called Zancudos, long-legs, moustiques, maringouins, temporaneos, black flies, mucha in India. These names are given to different varieties, all very similar in their effects on man in different parts of the world. The brulot, or burning fly, of West Indies and America, is one of this family, and it is so called because its bite is said to resemble the puncture of a red hot needle. The stomoxys calcitans, which is not unlike a common house fly in this country, is said also sometimes to cause local irritation. The gnats and mosquitos not only torment by their envenomed bites, but also by the buzzing and humming noise they make as they hover about their victims.

Hymenoptera.—A number of species that secrete poison are found among the different families of hymenoptera, the bees, wasps, ants.

They are distinguished from other insects by the presence of an ovipositor at the extremity of the abdomen in the female, which not only is used for depositing the eggs, but is in many species as a weapon for injecting venom. It consists of five pieces, two valves as a sheath, and three bristles which form a grooved sting. Through this groove formed by these three pieces the egg is

[1] A small species of Ceratopogon, one of the midges, is of this family, and is often annoying in our islands.

passed, and the poison flows, or is injected into the wound. Those that use it for that double purpose are known as the aculeate hymenoptera. In these the ovipositor becomes a sting by being connected with a poison gland at its base.

Formicidæ, the Ants.—Formica smaragdina and many others.—The sting of the ant causes considerable irritation, especially if the persons have been attacked by many. It has been suggested that formic acid is the irritating principle. There are several venomous varieties and species of ants, black and red, and they are of various sizes. Some of the larger forms in the tropics are capable of inflicting a very painful injury. Some ants have no sting, but eject a fluid which irritates the skin with which it comes in contact. They are sociable insects, and are apt to attack in numbers.

Vespidæ.—The Wasps, Hornets.—The females and workers of vespa are provided with a poison sac and sting.

Vespa vulgaris, a type of the tribe Crabro. It lives in communities, which are very numerous. Its sting produces much irritation, pain, and swelling, especially when inflicted on the face, or where the cellular tissue is loose. When they attack in numbers the consequences may be severe.

The *Apidæ*, or true bees, and the *Bombidæ* or humble bees, have similar properties, and their sting has very much the same effect as that of the wasp.

The stingless honey bee, found both in the old and new world, is, as its name implies, harmless. Some of the parasitic Hymenopteræ also inject a poison into the wound made by their ovipositor. The best known instance is that of the genus Ophion. The genus Paripla also injects a poison in the same way, and probably others of the Ichneumonidæ do the same.

Many remedies of a simple nature have been recommended to allay the pain and irritation caused by wasp and bee stings. Vinegar, eau de Luce, ammonia, solution of soda or potash, oil, indigo, eau de Cologne, alum, and all those recommended in scorpion stings, have been vaunted as useful. In case of venomous stings, where constitutional disturbance is induced, stimulants or sedatives may be necessary, and as the sting is liable to be left in the wound it ought to be picked out. In cases of wasp or bee stings in the mouth or throat, which may happen when children bite a peach or other fruit that conceals a wasp, severe consequences may arise from the œdema that supervenes, and extends to the glottis. An emetic is useful. With the ordinary treatment of œdema, laryngotomy may become necessary. In other cases, should violent symptoms supervene, surgical aid may be required to relieve tension, or give exit to matter. Such untoward results, however, are happily rare.

Brink says that Mutilla coccinea, a native of the warmer parts of North America, is said to produce loss of sense within five

minutes after the infliction of its sting, and that life is in danger for some days afterwards.

Lepidoptera.—Burmeister says that the majority of insects furnished with a sting, as a means of defence, belong to the Hymenoptera. It is but recently that a stinging Lepidopterous insect has been found. The species is not mentioned.—(*F. Smith.*) The bee moth of the Cape of Good Hope is said to defend itself with a sting.—(*Kirby, Spence.*) Though the majority of the perfect insects of this tribe are harmless, some of the caterpillars appear to be possessed of very irritating properties, residing in the fine hairs with which they are cased, and which being sharp and brittle, break off and remain on the skin with which they come in contact, certainly causing irritation mechanically; but also probably by the presence of some acrid substance concealed within the hairs. For instance, in Ceylon, a greenish hairy caterpillar, longitudinally striped, frequenting the leaves of *Hibiscus populneus*, probably of the genus Bombyx, which, alighting on the skin, causes as much irritation as the sting of a nettle. The larvæ of Neæra lepida, which feeds on the jasmine flowering Carissa, have similar properties. It is short and broad, of a pale green, with fleshy spines on the upper surface, each of which is charged with venom that occasions acute suffering. The larvæ of the genus Adolia are also armed with venomous hairs. There are probably many others. One, not uncommon in certain trees in the terai of the Himalaya, is a dark-coloured hairy caterpillar, that is apt to fall on people below and cause intense irritation. It is known as the Komlah, but the moth that produces it is not known.

Neuroptera, apparently, are free from venomous properties.

Coleoptera.—None are known to be injectors of venom, but there are several that have acrid secretions capable of exciting great irritation and inflammation, raising blisters, and if absorbed causing painful strangury and great urinary irritation. Such are Mylabris Cichorii of India, Cantharis or Lytta, or Meloe vesicatoria, Lytta gigas of Senegal, Lytta vitata of America, and Lytta ruficeps in Chili.

The *Brachinus*, or bombardier beetle, seems also to be provided with an acrid secretion, which it ejects against its prey; it is not, however, obnoxious to man. The nature of the action of the Cantharis is so well known that it is needless to describe it here.

Crustacea have no poisonous representative.

Vermes has no venomous species. The Leeches: Hirudo. Many species inflict a wound which in hot, damp climates may give rise to inflammation, causing a troublesome sore, but there is no reason to believe that they possess any venomous properties.

Echinodermata.—The long sharp pointed spine of some of

the Echinidæ are capable of inflicting painful punctured wounds, but they convey no true venom into the wound. Whether, as in the case of some spiny fishes, there may be an irritating mucous secretion inoculated is uncertain.

Cœlenterata.—Some of the Medusæ—jelly fish—have the power of stinging. The poison apparatus is placed in certain tubercles on the surface. These contain a collection of granules, amongst which are small vesicles. Within these corpuscles or nematocysts a spiral thread is found, which bursts out on pressure. These corpuscles are found in the mucus exuded by the creature, and to these is attributed the urticating power it possesses. There are several stinging species, some are found on our own coasts, others in other seas. It is the larger forms generally that are venomous, the small ones, if they are so at all, having no effect on man. Cyanea capillata of our seas, says Professor Forbes, is a most formidable creature, and the terror of bathers. It has a broad tawny disk, and a long train of ribbon-like streamers floating after it; it flaps its way through the waters, and whatever comes in contact with these trailing trains soon writhes in torture, the effect produced being not unlike that of the nettle.

Physalea pelagica, Portuguese man-of-war, has similar properties. It causes severe and stinging pain, extending up the limb, with feverishness, which has been known to continue for some hours, white wheals forming on the skin, like urticaria. The application of vinegar or olive oil is said to remove the unpleasant symptoms. Several of the medusæ possess these properties, and hence they have received the name of Acalephæ, or sea nettles.

There has been difference of opinion as to the functions of the thread cells. Some think that they are the agents by which the poisoning is produced, by penetrating the tissues. The threads being armed with a sharp barbed spine inflict the puncture into which the poisonous secretion is injected. Others reject this explanation. Allman thinks that there is penetration; the sudden ejection of a barbed sac against the soft tissues of the prey, which if these be soft enough allow the point of the sac to penetrate as far as the roots of the barbs, the act is followed by the ejection of the filament, for which the barbed sac has opened a passage.

He thinks it is impossible that the effects which follow can be produced simply by mechanical irritation, but that some virus is injected. That the creature can sting there can be nodoubt, though the exact process by which it is effected may be uncertain.

The *Actiniæ*, or sea anemones, and the hydroid polyps, appear to possess a similar power, and are provided also with thread cells. They appear to be able to paralyze the small marine creatures that come within their grasp, or to cause urtication of the human skin when brought in contact with their tentacles.

The *Sagartiadæ* furnish examples of sea anemones with this property. The effects, however, of any of them are transient. In some parts of Europe or Norway the Acalephæ have been used therapeutically as counter-irritants, and being brought in contact with the patient by immersing him in a salt-water bath filled with these creatures.

It is by no means pretended that in the preceding description the subject of venomous animals has been exhaustively treated, or that all the forms of animal life so endowed have been described. The object has been to point out the principal forms, and to indicate generally the mode of dealing therapeutically with the effects of the venom.

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