OUR DOGS
AND THEIR DISEASES

POINTERS.

OUR DOGS

AND THEIR DISEASES

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PART I.

INTRODUCTION.

THERE is no animal that appreciates our attention more, or is more worthy of our attachment, than the Dog. It appeals by instinct (or reason—which?) to our care, our affection, and protection. It possesses the capability of placing the utmost reliance and good faith upon those who use it considerately and kindly, and will fearlessly expose its life to imminent danger in order to guard and protect its friend from harm. Its courage, faithfulness, sagacity, endurance, honesty, gentleness, submission, including many other attributes, are unquestionably without a parallel in other domestic animals. When you are deserted by those in whom you have confided, when the world forsakes or ignores your existence, turn to your dog if you possess one, and there you will find a trustworthy friend, one on whom you can with confidence depend. Yet how often is this affectionate, brave creature despised! the valuable services that it has already rendered are surely sufficient to entitle it to some little consideration; but alas! how often are those services forgotten when advancing age proclaims the fact that he can no longer masticate his food, when teeth are no longer visible, when the eyes grow dim, and the limbs stiffened; he is either remorselessly hanged, shot, drowned, or poisoned, or maybe

wilfully lost. Such is too often the fate of one of our best friends.

Passing then to the consideration of the distinct breeds of the British Dog, let us notice in the first place,

The Colley, or Shepherd's Dog (*Canis familiaris*)—

the most useful variety of the canine species, for owing in a great measure to its sagacity, talent, and energy, depends the chief safety of the flock.

It is considered that this animal seems to be, as far as can be judged from appearances, the original ancestor of the true British dogs, and preserves its peculiar aspect in almost every country in Europe. It is rather a large dog, as is necessary in order to enable the animal to undergo incessant labour which it is called on to perform, and is possessed of limbs sufficiently large and powerful to enable it to outrun the truant members of the flock, who, if bred on the mountain-side, are so swift and agile that they would readily baffle the efforts of any dog less admirably fitted by nature for the task of collecting and keeping them together.

Now, as the Sheep-dog is constantly exposed to all weathers, it requires the protection of very thick and closely-set fur, which, as a rule, is woolly in its character, and is especially heavy about the neck and breast. The tail is naturally long and bushy, the muzzle is sharp, the head of moderate size, eyes bright and very intelligent, as might be expected in an animal of so much sagacity and ready resource in time of absolute need. Its legs are strongly made, and sufficiently well protected to endure severe work among the harsh stems of the heather on the hills, or the sharp cutting stones of a turnpike road. And no doubt owing to its constant exercise in the open air, and the hardy manner in which it is brought up, the Sheep-dog is perhaps the most untiring of our domesticated animals.

There are many breeds of this animal, differing from each

THE COLLEY, OR SHEPHERD'S DOG.

other in colour and aspect, and deriving their varied forms from the dog with which the family have been crossed. Nearly all the sporting dogs are used for this purpose, so that some Sheep-dogs have traces of the Pointer nature in them, others of the Foxhound, and others of the Setter; this last cross being the most common. Together with the outward form the creature inherits much of the sporting predilection of its ancestry, and is capable of being trained into a capital sporting dog.

We frequently find, however, that many of these animals possess (like a number of creatures) two distinct characters; they are often very respectable and worthy Sheep-dogs, but at night are most disreputable poachers. This characteristic becomes the more apparent when there is an element of the Setter blended with the Colley; in such a case they can with great success silently discover and mark their game by night, as well as the more useful occupation of managing the flocks by day. To some natures this double qualification would be of inestimable value, and would add materially to the larder of his master, provided his sporting proclivities tended in that direction, while the animal is further and more efficiently fitted for midnight manœuvres by the training to which he is subject. Therefore it so happens that he spends the whole time at his disposal in the society of his master, and learns from companionship the least gesture of hand or tone of voice. Consequently he is far better adapted for a nocturnal visit to the happy hunting-grounds than the more legitimate Setter or Retriever, and will cause far more deadly havoc among ground game than either of these last mentioned. It is also worthy of consideration that, owing to his avocation, he frequently escapes suspicion, for witness his quiet and impressive demeanour during the day; he assiduously adheres to his arduous task of guarding the fold, and reclaiming its wandering members, therefore it appears incredulous that such an honourable-looking animal would be guilty of beating for game at night. But let us not be hasty

in our condemnation, for, after all, to use the old proverb, as the sapling is bent so shall the tree be inclined.

Again, sometimes there is an infusion of the Bull-dog into the Colley, but this mixture is now thought to be unadvisable, as such animals become too ferocious and apt to bite their charge, and as a result alienate from themselves the confidence of the helpless sheep whom they are intended to protect, and not to harm.

A good Sheep-dog bestows no attention upon a stranger, neither will he court to be caressed, but respectfully keeps his distance; even with other dogs he seldom makes companionship, contenting himself with absolute confidence with the society of his master only.

The Scotch Colley

resembles the English type in character, although it differs from that animal in form. It possesses a sharp nose, bright and mild eye, and a most sagacious aspect. Its body is abundantly supplied or covered with long woolly hair, which forms a most effectual screen against heat, or the cold piercing sleety blasts of the northern wintry winds. The tail is exceedingly bushy, and curves upwards towards the end. The colour of the fur is generally dark, but is sometimes variegated with a very little white. These distinctive marks are greatly admired by some fanciers, while others give their decided preference for the tint that is black and tan. However, it sometimes happens that the coat is a peculiar mixture of these colours, or it may be one uniform colour, in which case the dog is not so highly valued.

The "dew claws" are as a rule generally double, and are not attached to the bone, as is the case with the other claws. It used to be the practice to remove these appendages, on the ground that they are apt to be torn off by the various obstacles through which the animal is often obliged to force its way, or by the many accidents to which it is liable in its

laborious and somewhat thankless vocation. Now, however, it is almost obsolete.

This dog, again, perhaps enjoys a special claim upon our attention, for has not Caledonia's bard, the immortal Robert Burns, poured forth the praises of this noble animal in such language that it may be truly said

"His twa dogs preach to every land?"

Yes, the more we know of this wonderful animal the greater reason have we to thank that beneficent Being who gave the dog to man as his companion and friend, and ill may betide the wretch who abuses the devotion of this most affectionate and docile creature.

Burns with his characteristic enthusiasm says, "Man is the god of the dog. He knows no other, he can understand no other, and see how he worships him; with what reverence he crouches at his feet, with what love he fawns upon him, with what dependence he looks up to him, and with what cheerful alacrity he obeys him. His whole soul is wrapt up in his god; all the powers and faculties of his nature are devoted to his service, and these powers and faculties are ennobled by the intercourse. Divines tell us that it ought just to be so with the Christian, but the dog puts the Christian to shame."

The tale of "The Twa Dogs" was composed by Burns after some evil-disposed person had wantonly killed his favourite Colley, called Luath. The following lines are fraught with keen penetration, and describe the characters and physical appearance of "The Twa Dogs" that no other poet has been able to imitate. They run thus:—

"Upon a bonnie day in June,
When wearing through the afternoon,
Twa dogs that were na thrang at hame,
Forgathered ance upon a time.
The first I'll name, they ca'd him Cæsar,
Was keepit for his honour's pleasure;

His hair, his size, his mouth, his lugs,
Showed he was nane o' Scotland's dogs,
But whalpit some place far abroad,
Where sailors gang to fish for cod.
His locked, lettered, braw brass collar,
Showed him the gentleman and scholar;
But though he was o' high degree,
The fient o' pride—nae pride had he;
But wad hae spent an hour caressin',
E'en wi' a tinkler-gipsy's messan.
At kirk or market, mill or smiddie,
Nae tawted tyke, though e'er sae duddie,
But he wad stan't, as gled to see him,
And stroan't on stanes and hillocks wi' him.
The tither was a ploughman's colley,
A rhyming, ranting, roving billie,
Wha for his friend and comrade had him,
And in his freaks had Luath ca'd him,
After some dog in Highland sang,
Was made lang syne—Lord knows how lang!
He was a gash and faithfu' tyke
As ever lap a sheugh or dike.
His honest, sonsie, bawsent face
Aye gat him friends in ilka place.
His breast was white, his towzie back
Weel clad wi' coat o' glossy black,
His gaucie tail, wi' upward curl,
Hung o'er his hurdies wi' a swirl.
Nae doubt but they were fain o' ither,
And unco pack and thick thegither;
Wi' social nose whyles snuffed and snowkit,
Whyles mice and moudieworts they howkit,
Whyles scoured awa in lang excursion,
An' worried ither in diversion;
Until wi' daffin' weary grown,
Upon a knowe they sat them down,
And there began a lang digression
About the lords o' the creation."

The poet then proceeds to criticise numerous faults and follies of the human race and concludes as follows:—

"By this, the sun was out o' sight,
And darker gloaming brought the night;

The bum-clock hummed wi' lazy drone,
The kye stood rowtin' i' the loan,
When up they gat, and shook their lugs,
Rejoiced they were nae men, but dogs;
And each took aff his several way,
Resolved to meet some ither day."

Now it is scarcely possible to overrate the marvellous intelligence of a well-taught Colley, for if the shepherd were deprived of the help of his dog, his office would be impracticable, especially in the Highlands of Scotland. It has also been asserted that if the work of the dog had to be performed by men, their maintenance would more than swallow up the entire profits of the flock. The dog is the direct medium through which the instructions of the man are communicated to the flock, and being in intelligence the superior of his charge and the inferior of his master, he is equally capable of communicating with either extreme.

The memory of the Colley is singularly tenacious; in fact, he forgets nothing, while some assert that he can distinguish the seventh day from the ordinary working days of the week. Hogg, the "Ettrick Shepherd," says that he has known one of these dogs to mount guard night and day over a dairy full of milk and cream, and never so much as break the cream with the tip of its tongue, nor permit a cat, or rat, or any other creature to touch the milk-pans. Many incidents could be related concerning this faithful animal, but we trust sufficient has been said to ensure the sympathy of all those that have in any way to do with his comfort through life.

We pass on now to consider the merits of a much-maligned animal, recognised in ordinary language as

The Lurcher.—(*Canis familiaris.*)

This animal possesses many of the elements of the Collie, but is employed for far different purposes; in fact it is very seldom the companion of persons other than those of doubt-

THE LURCHER.

ful respectability. It is a cross between the Greyhound and Sheep-Dog, and is supposed to be most valuable when the parents are the rough Scotch Greyhound and the pure-bred Colley.

It is certainly to be regretted that this dog should bear such a bad reputation, as it is in reality a very handsome animal, combining the best attributes of both parents, and being equally eminent in speed, scent, and general intelligence. As, however, it is usually the companion of poachers and other disreputable characters, the gamekeepers exercise a wholesome hatred and dislike towards it, and will shoot it without the slightest remorse at the earliest opportunity. For such conduct there is at least some pretext, as the creature is so admirably adapted for the pursuit and capture of game, and because one single poacher is enabled by the aid of this four-legged assistant to capture and secure at least twice as much game as could be taken by any two men.

Now it is a notorious fact that punishment frequently falls upon the wrong shoulders, and in this instance it is not difficult to illustrate. For be it remembered that the poor dog is only doing his duty when he is engaged in capturing game—it is his special avocation, for which he is peculiarly fitted; therefore I hold that he ought not to be subjected to the penalty of wounds, suffering, and death for obeying the order which he has received, and which is perfectly natural to his disposition; he, poor brute, is only acting under orders, and faithfully carrying out his instructor's intentions. No one has any sympathy with the master of such an animal, therefore the penalty ought in justice to fall upon the poacher, and not on the dog.

Now regarding the sagacity of this dog, it is really extraordinary and wonderful, for it not only comprehends the unspoken commands of its master, but it appreciates quite as fully as himself the absolute necessity for lying concealed when enemies are near, and in every case of moving as stealthily as a thief. It is even trained to guide the way for

THE OTTERHOUND.

its owner, and to give timely warning of hidden foes. It is destructive to all classes of game, and more especially where rabbits and hares abound. Its delicate sense of smell enables it to diagnose its prey at a considerable distance, and its superior speed qualifies it to pounce upon the hare or rabbit before it actually has time for shelter or flight. As soon as it secures its prey it brings it to its master, deposits it in his hands, and silently yet expeditiously renews its search after another victim; even pheasants and partridges are often captured by this singularly crafty and agile animal.

It can also be entrusted with guardianship of the house, and will watch faithfully the property committed to its charge with vigilance and fidelity; or it can watch a flock of sheep, or conduct them from one place to another nearly if not quite so well as the true Colley from which it sprang.

The Otterhound.—(*Canis familiaris.*)

This animal is exclusively employed for the chase of the otter.

It is a bold, hardy, active dog, which is in every sense requisite, as it has to encounter a fierce and hard-biting creature. Being forced to take the water in search or in chase of its prey, it is necessarily endowed with great swimming powers, otherwise it could never match the most amphibious of quadrupeds. Those who have witnessed an otter disporting itself in its congenial element must have been struck with the exceeding rapidity and consummate ease of its movements, and can therefore appreciate the great aquatic powers that must be possessed by any dog which endeavours to compete with so lithe and active an antagonist.

Another special requisite is great courage on the part of the dog, because when the otter is irritated it is a peculiarly fierce animal, and can inflict the most painful wounds by its long sharp teeth. It can also twist itself about like a snake, and if grasped heedlessly, can writhe itself about quickly,

and is as slippery as an eel, and will unexpectedly plant its teeth in its antagonist's nose. Now it must be borne in mind that the nose is rather a sensitive organ of the animal economy, and a bite in that region causes such exceeding pain that none but a well-bred dog can endure the torture without flinching. Such needful courage, then, is found in this dog, but it is apt to degenerate into needless ferocity; in short, there are few animals, with the exception of the Bull-Dog, which will fight as savagely as the Otterhound, or bite as fiercely, and with as terrible results. The attack of the Otterhound is even more dangerous than that of the Bull-Dog, and its bite more to be dreaded; for when this animal bites, it instantly tears its teeth away without relaxing its jaws, and immediately seizes its prey with a second grip. It will be seen, then, that the wounds which it inflicts by this ferocious mode of action are of the most terrible description, lacerating all the tissues, and tearing asunder the largest and most important vessels. The reason for this savage mode of attack is quite apparent; the otter is so quick and agile, that if the dog were to retain its hold, the otter would twist round and inflict a severe, if not fatal wound.

These dogs are obliged to endure the most turbulent weather and the coldest streams; they are furnished for protection with a very strong, wiry, rough coat, which is capable of resisting the combined effects of cold and storm. The face and muzzle are guarded with a profusion of long and very rough whiskers. The Otterhound is a tolerably large dog, measuring nearly two feet in height at the shoulder.

The Bull-Dog (*Canis familiaris*)

is classified by all who have had the opportunity of judging of its capabilities to be the most courageous animal in the world, the game-cock excepted.

This dog's extraordinary courage has passed into a proverb, and has so excited the admiration of the British people that

we have been pleased to symbolise our peculiar tenacity of purpose under the emblem of this small but most determined animal. In height the animal is but insignificant, but in strength and courage there is no other dog can match him. In fact, there is hardly any breed of sporting dog which does not owe its courage to an infusion of the Bull-Dog blood.

THE BULL DOG.

When those cruel and cowardly combats between the bull and the dog were a disgrace to this country, "bull rings" were a frequent resort. In these contests the dog was trained to fly at the head of the bull, and to seize him by the muzzle when he stooped his head for the purpose of tossing his antagonist into the air. But when the dog had

made good his hold it was impossible for the bull to shake him off; he clung pertinaciously to his foe, and suffered himself to be swung about as the bull might choose.

There seems to be no animal which the Bull-Dog will not attack without the least hesitation. The instinct for fighting is strong within him, and manifests itself in every feature of this ferocious-looking creature.

Now it is as a rule generally assumed that this animal must be of a very dull and brutish disposition, because every specimen indicates this conclusion; however, there can be no doubt that its sagacity and affections are greatly underrated. It is not naturally a quarrelsome creature, and it would certainly bear a more favourable character, providing it were better taught. It is, however, not a desirable or safe companion, for it will with very little provocation attack its master as soon as a stranger, should there be any accidental cause to aggrieve it. Thus a tread on the toes or a kick is quite sufficient to afford it a pretext for attack, and when it does fix its teeth, they cannot be removed unless a barbarous method be resorted to. It may be said, however, in favour of its temper, that the life which the poor dog leads is liable to aggravate its morose nature, being continually tied up for the greater part of its existence. Any animal would become savage, sullen, and revengeful under such treatment, which is insufferable to the poor dog. According to "Stonehenge," a well-bred Bull-Dog ought to present the following characteristics. "The head should be round, the skull high, the eye of moderate size, and the forehead well sunk between the eyes; the ears semi-erect and small, well placed on the top of the head, and rather close together than otherwise; the muzzle short, truncate, and well furnished with chop; the back should be short, well arched towards the stern, which should be fine and of moderate length; the coat should be fine, the chest should be deep and broad, the legs strong and muscular, and the foot narrow and well split up like a hare's."

THE MASTIFF.

The Mastiff (*Canis familiaris*)

is the largest and most powerful of the indigenous English dogs. It possesses a singularly mild and placid temper, and seems to delight in employing its great powers in affording protection to the weak, whether they be human beings or dogs. It is positively adverse to inflicting an injury upon a smaller animal (what a contrast to some animals endowed with speech!), even when it has been sorely provoked, and either looks down upon its puny tormentor with sovereign disdain and contempt, or it inflicts just sufficient punishment to indicate the vast and superior strength it could employ, but which it would not condescend to throw away upon so insignificant a foe. Yet notwithstanding all this nobility of its gentle nature, it is a most determined and courageous animal in fight, and when defending its master or his property, becomes a foe which few opponents would dare to face. Now these qualifications of mingled courage and gentleness adapt it especially for the service of watch-dog, a task in which the animal is as likely to fail by overweening zeal as by neglect of its duty. It sometimes happens that a watch-dog is too hasty in its judgment, and attacks a harmless stranger on the supposition that it is resisting the approach of an enemy.

The Greyhound.—(*Canis familiaris.*)

It is scarcely within the region of imagination to conceive an animal which is more entirely formed for speed and endurance than a well-bred greyhound. Its long slender legs, with their whip-cord-like muscles, indicate extreme length of stride and rapidity of movement; its deep, broad chest, affording plenty of breathing room for the large lungs,—all certify that it is capable of long-continued exertion, while its sharply pointed nose, snake-like neck, and slender tapering tail, are so formed as to afford the least possible resistance to

THE GREYHOUND.

the air through which the creature passes with such express-like speed. The principal avocation of this animal is in coursing the hare, and exhibiting in this chase its marvellous swiftness and thorough endurance to fatigue.

In actual speed the dog far surpasses the hare, so that if the latter animal were to run in a straight line she would soon be snapped up by the swifter hound. But the hare is compelled to practise duplicity, as she knows her success of escape depends upon it; she will therefore turn an angle to her course with such suddenness, that the heavier and longer-limbed Greyhound is carried far beyond his prey by his own impetus, before he can alter his course and again make after the hare.

This, then, is the principle upon which the whole system of coursing depends, the hare making short quick turns; and some are so crafty that they frequently baffle the best hounds and get away fairly into cover, and in such cases the chase is over, because the greyhound works only by sight.

The Scotch Greyhound (*Canis familiaris*)

is a good deal rougher in its coat than the English prototype. The Glengarry breed measures twenty-eight inches, and thirty-four inches in girth. Sometimes these animals are designated Deerhounds. Each, however, from being constantly employed in the chase of either deer or hare, becomes gradually fitted for the pursuit of its special quarry, and contracts habits which render it comparatively useless when set to chase the wrong animal. The Scotch Deerhound is possessed of better powers of scent than the English dog, and in pursuing its game depends as much on its nose as on its eyes. It is also curious to note that although it makes use of its powers of scent when running, it holds its head higher from the ground than the greyhound, which only uses its eyes.

We will proceed now to the consideration of another valuable and important dog. Although it cannot be classed as a

THE SCOTCH GREYHOUND.

British one, nevertheless its true nobility of character is worthy of passing reference and commendation; it is the Newfoundland Dog.

The Newfoundland Dog.—(*Canis familiaris.*)

This large and handsome animal derives its name from its native land. It is possessed of extraordinary mental powers, and is capable of instruction to a degree that is rarely seen in any domestic animal.

In its native home this noble dog is often shamefully treated, as we are informed that it is frequently converted into a beast of burden, and forced to suffer even greater hardships than those which generally fall to the lot of animals which are used for the carriage of goods or the traction of vehicles. This poor animal's life is often one of continued privation, and its useful life rendered thoroughly miserable. In winter the chief employment of the inhabitants is to cut fuel, and the occupation of this dog is to draw the carts.

They are frequently urged beyond their strength, and are moreover indifferently and meagrely fed with putrid salt fish, the produce of some preceding season. Very many of these noble dogs sink under the double effects of fatigue and starvation; such are the usages to which it is exposed in its own land.

Here, however, the Newfoundland Dog has found a home; it is raised to the proper position which nature intended it to occupy, and is the faithful friend and companion of man, not his abject, miserable, wretched slave. Many and many a time has it doubly repaid its master for considerate kindness by rescuing him, or some of the fallen creatures of humanity, from mortal peril. Innumerable are the instances upon record of human beings being rescued from drowning by the timely assistance of this dog; and not only does it recognise at a glance the dire necessity of immediate help, but it seems to comprehend thoroughly the entire situation of the

THE NEWFOUNDLAND DOG.

drowning, by selecting the head and holding it above the water, as though it had studied the subject with accurate reason. Not only has this wonderful animal saved hundreds of individual lives, but it has even been the means of saving an entire ship's crew by swimming ashore with a rope in its mouth, when the vessel was being remorselessly dashed to fragments against the rocks.

I might dwell for a considerable time upon the heroic deeds of this animal, and might multiply anecdote upon anecdote describing the wondrous powers it possesses, but I must proceed and leave room for others.

THE POMERANIAN DOG.

The Pomeranian Dog.—(*Canis familiaris.*)

This little animal has sprung into notoriety almost suddenly, it is affectionately treated as a household pet and companion. It has undoubtedly become a great favourite, and is really intelligent in character and handsome in aspect. Its long white fur and bushy tail give it quite a distinguished appearance, while it seems to be perfectly aware of its superiority and good looks.

It is a lively little creature, and an excellent companion.

The St. Bernard's Dog.—(*Canis familiaris.*)

This splendid specimen of a dog is the largest of the canine race. It derives its title from the celebrated monastery of that name. They are taught to exercise the wondrous powers with which they are endowed, and which have gained for them and their instructors world-wide celebrity.

The humane works of these animals are so well known that it is only necessary to allude to them in passing.

Bred among the coldest regions of the Alps, and accustomed from its birth to the deep snows which cover the mountain-top, the St. Bernard's Dog is a most valuable animal in discovering any unfortunate traveller who has been overtaken by a sudden storm and lost, or who has fallen upon the cold ground, worn out by fatigue and hardship, and fallen into a death-like sleep.

Therefore, whenever a snow-storm occurs, the monks of St. Bernard send forth their dogs on their mission of mercy. Taught by the wonderful instinct or reason with which they are endowed, they traverse the dangerous paths, and seldom fail to discover the frozen traveller, even though he be buried under a deep snowdrift. When the dog has made such a discovery it gives notice, by a deep, powerful, and prolonged bay, of the perilous position of the sufferer, and endeavours to clear away the snow that often covers the lifeless form. As soon, however, as the monks hear the

THE ST. BERNARD'S DOG.

THE RETRIEVER DOG.

signal they immediately set off to aid the perishing, and in many cases lives must have been lost without their timely assistance. It is also worthy of note that before these dogs are dispatched on their life-saving errand, a small flask of spirits is tied to the dog's neck in order to afford every possible help to the sufferer.

The Retriever Dog.—(*Canis familiaris.*)

These animals derive their name from their occupation, that is, in retrieving or recovering game that has fallen out of the reach of the sportsman, or on which he does not choose to expend the labour of fetching for himself.

This engraving represents the effect of a mixture with a Newfoundland and Setter, and is the breed most generally known. There is, however, another cross between the Water Spaniel and the Terrier. It is necessary that this animal should have a powerful frame, strong limbs, and a good nose, in order that the dog may trace the devious and manifold windings of the wounded birds. The fur is curly, of moderate length, and is almost invariably black.

The English Setter.—(*Canis familiaris.*)

This dog has earned its title from its customary habit of crouching or "setting" when it perceives its game. There are several breeds of these animals, and each breed possesses its own particular excellences, which are combined in experienced and skilful hands by careful admixtures of one breed with another.

While at work the Setter has a strange predilection for water, and this fancy is carried so far in some dogs that they will not go on with their duties unless they can wet the whole of their coats once at least in every half-hour. If deprived of this luxury they pant and puff with heat and exertion, and are perfectly useless for the time being.

Pointers.—(*Canis familiaris.*)

Here we have a representation of two breeds of the Pointer, the two foremost dogs being examples of the English Pointer, the third representing the Spanish Pointer; this latter animal is seldom used for field-sports, as it is too slow and heavy.

The nose of the Pointer is peculiarly sensitive, while its limbs are so light and wiry that it can match almost any dog in speed.

When it scents a bird it stops suddenly, arresting even its foot as it is raised in the air, its head is thrust forward, its body and its limbs fixed, and its tail straight out behind. This position, then, is termed a "point," and on account of this peculiar mode of indicating the presence of game the animal is designated a "Pointer."

It is a matter of considerable difficulty to teach them carefully, because they are quite as liable to err through over anxiety to please their master as through sluggishness and carelessness.

This engraving shows

The Modern English Pointer.—(*Canis familiaris.*)

The Bloodhound.—(*Canis familiaris.*)

Here we have a magnificent illustration of the animal termed the Bloodhound. In olden times this animal was largely resorted to for tracking and securing robbers, sheep-stealers, murderers, &c. In fact, many an offender has been brought to capital punishment through the instrumentality of this dog.

The colour of a good Bloodhound ought to be nearly uniform, no white being permitted. The prevailing tints are a blackish tan, or a deep fawn. The tail is long and sweeping, and by certain expressive wavings indicates its success or failure.

THE ENGLISH SETTER.

THE MODERN ENGLISH POINTER.

THE STAGHOUND.

The Staghound.—(*Canis familiaris.*)

Intimately blended with the Bloodhound is this now rare Staghound. It is supposed to have derived its origin from the Bloodhound and Greyhound, this latter animal being employed on account of its superior speed. These Staghounds are very powerful, are possessed of great capabilities

THE BEAGLE.

of scent, and able like the Bloodhound to hold to the trail on which it is laid, and to distinguish it even among a crowd. These dogs have been known to run a distance of fifty miles in pursuit of a stag.

Now it is necessary that the Staghound should be a courageous as well as a powerful animal, for when the stag is brought to bay it becomes a formidable antagonist, dashing

boldly at the nearest foe, whether man or dog, and often inflicting by the stroke of its sharp antlers a mortal wound upon any dog within its reach.

The Beagle.—(*Canis familiaris*).

There are several breeds of this animal, which are distinguished from each other by their size and general aspect.

The ordinary Beagle is not unlike the Harrier, but is heavier about the throat than that animal, and has stouter limbs and a larger body; the height of the dog is from twelve to fifteen inches. These little dogs are chiefly employed by those who hunt on foot, as they are not sufficiently swift to drive the hare from her doubles, but by patiently tracking her through all her intricate movements, win by delay.

The Foxhound.—(*Canis familiaris*).

Few animals have received more attention and judicious care than the Foxhound, and few have so absolutely fulfilled and warranted the expectations that were entertained concerning him; while few have enjoyed the same privileges, or have had such an enormous amount of money spent upon them. Efforts have been successfully made by enterprising sportsmen to render this animal as perfect as possible, therefore the modern Foxhound is one of the most wonderful animals in the universe.

At this present moment, when there is echoed in every paper the bitter cry of Outcast London, what a sad comparison those hovels or dwellings of the poor present to many of the palatial residences that constitute the home or kennels of the Foxhound! Thousands of pounds are annually thrown away upon the luxury of an animal that can only be supported for pleasure, while all the time thousands are perishing in this moving, seething mass of humanity. However, my object is not to moralise upon the sad condition of affairs at present, but to describe the object of our illustration.

There are many breeds of this favourite dog, each being remarkable for the peculiar development of some faculty,

THE SKYE TERRIER.

PART II.

HYDROPHOBIA OR RABIES.

THE special characteristic, and what is considered an important diagnostic sign, is the absolute horror or dread of water. This being, for the most part, a very striking symptom of the fatal indisposition which results from the bite of a mad dog, and some other animals affected in the same way, the disease itself has been termed *hydrophobia.*

The oldest writers, as we learn from Cælius Aurelianus, used to employ the terms *acrophobia*, or a dread of air, and *pantephobia*, or a fear of all things, since the impression of cold air sometimes excites terror, and the disorder is certainly marked by a singular degree of general timidity and distrust.

Others, again, christened it *phobodipson*, signifying thirst, because the patient is thirsty, yet, notwithstanding, fears to drink. Several modern authors, however, objecting to any appellation expressive only of one symptom, denominate the disease *rabies*, and *rabies canina*, or canine madness. The French call it *la rage.*

With respect to hydrophobia, or the dreadful indisposition produced by the bite of a dog or other animal affected with rabies, or by the application of some of the secretions of such animal to a part of the body, the first clear mention of it is generally considered to be that made by Aristotle; but he must have had very erroneous notions upon the subject, since

he sets down man as incapable of receiving the distemper from the bite of a rabid dog. Now concerning the antiquity of hydrophobia, I may mention that Dr. Hecker thought that the fact was conclusively proved that the disease existed at least four hundred years before Christ; aye, even in the most remote periods. But with respect to a name for the disorder, as the patient does not commonly betray any tendency to fury at the outset, while the dread of water is in reality a customary attendant on the complaint, the terms *la rage* and *rabies* appear, strictly speaking, even more exceptionable than the word *hydrophobia*.

At the same time, in order not to imbibe confused notions for whatever name be thought most appropriate for the illness, when it arises in the human subject from the bite of a mad dog, or some other animal similarly affected, it is therefore necessary to understand well (and this to a certain extent may tranquillise an individual possessing a nervous temperament) that hydrophobia, in the sense of a horror of water or other liquids, is an occasional symptom of many diseases, and neither exclusively confined to the indisposition caused by the bite of a rabid dog or certain other animals, nor even constantly attendant upon it. And therefore, with the view of avoiding perplexity, all hydrophobic complaints may be arranged in two general divisions :—

1. The first comprising all cases not ascribable to the bite of a rabid animal, or the application of some of its secretions to an injured part of the body.

2. The second comprehending the examples preceded by one of those occurrences.

The cases included in the first of these divisions are again subdivided into the *symptomatic hydrophobia* and the *spontaneous* or *idiopathic hydrophobia*.

By the symptomatic form we understand that there is an aversion or dread of liquids, presenting itself as an occasional symptom of various diseases, as certain inflammatory, febrile, and nervous disorders ; for example, epilepsy, injuries to the

brain, &c., or the operation of particular poisons, &c.; and, again, in many of the instances of symptomatic hydrophobia the aversion or dread of fluids occurs on the same day as the cause on which it depends, or a few days afterwards, and, for the most part, may be cured with the disease which has given rise to it, or even independently of it. But, on the contrary, the hydrophobia from the bite or infection of a rabid animal does not develop until a considerable time has elapsed after the occurrence of the cause, and, when once formed, has hitherto defied the best efforts made in order to effect a cure.

Whatever analogy, therefore, may be imagined to exist between symptomatic hydrophobia and rabies, they differ essentially in their causes, progress, degree of curability, and also in the treatment required.

Spontaneous or *idiopathic hydrophobia* denotes the questionable form of the complaint, sometimes supposed to be induced by violent mental commotion, anger, fright, &c., unpreceded by any other primary disease to which it can be referred as a symptom.

Numerous facts upon record leave no doubt whatever concerning the reality of symptomatic hydrophobia, but perhaps none of the cases adduced in proof of the possibility of a spontaneous idiopathic form of the disease in the human subject are sufficiently unequivocal to remove all suspicion either that the complaint had been preceded by another primary disease, or had been the result of an unobserved or forgotten occasion, on which the infection was received from handling a dog or cat never suspected at the time to be affected with rabies.

Animals of the dog kind, including the wolf and the fox, are most frequently the subjects of rabies; and certain writers have maintained, that although it may be received and propagated by other animals, yet it always originates in some of the canine race. However, it is asserted that the disease sometimes arises spontaneously in cats, that is to say, without their having been previously bitten by another rabid animal.

But the moderns do not incline to the belief that it ever has been known to commence in this manner in other animals, though such an assertion is made not only with respect to man, but horses, asses, camels, pigs, bullocks, bears, monkeys, and even poultry.

Now it is certainly very interesting to inquire what animals are capable of communicating rabies, and what animals of receiving it. So far as our knowledge extends yet, it appears that animals of the canine species, with perhaps those of the feline race, are the only ones in which this disorder ever arises spontaneously, and they are capable of transmitting it to animals of their own kind, to other quadrupeds, and to man; while experiments tend to prove also that birds, at least the common domesticated fowl, may have the fatal malady communicated to them.

But though it be well known that animals of the dog and cat kinds can propagate the disorder, it is not definitely settled whether it can be communicated by other animals. Some authorities declare that inoculation with the saliva of a rabid sheep fails to produce it in others of the flock, while others maintain that the disease can be communicated through inoculation. But as for some extraordinary cases, in which the disease is alleged to have been imparted to the human subject by the bites of birds or injuries done with the claws of animals, they are generally dismissed by modern writers with the inference that the complaint thus transmitted was not true hydrophobia or rabies. There is, however, a case on record where a young man was scratched on the big toe by a cat, and some months afterwards he was attacked with hydrophobia and died; but if the patient really succumbed to this disease, the only conceivable idea is this, that the cat's claw with which the scratch was made must have been wet with the animal's saliva.

Again, another question of considerable importance is whether hydrophobia, that is to say, rabies, can be communicated from one human being to another, or whether

in man the disease is infectious or contagious. Now many attempts have been made in vain to communicate the distemper to several kinds of animals by inoculating them with the saliva of patients who had perished of the disease, but no infection was the consequence. Several dogs were inoculated with the saliva of a man in the convulsed stage of hydrophobia, but none of them afterwards took the distemper. Another experiment was tried by a very prominent medical man, who collected some of the frothy saliva the instant it was discharged from a patient's mouth who was labouring under the disorder. He then inserted some of this fluid into eight punctures made on the inside of a dog's four legs, yet six months after this inoculation the animal had not suffered the slightest inconvenience. A similar experiment was made on three dogs by another authority, and six months afterwards they also were unaffected.

Dr. Bezard published the following experiments:—Pieces of the flesh of a person who had died of hydrophobia were smeared with his saliva and given to a dog; another dog was suffered to eat the salivary glands, and a third the sides of a wound. In three other dogs incisions were made; the cut parts were then inoculated and sewed up. And not one of these six animals became affected with rabies.

It will therefore be seen from the preceding experiments that they only furnish negative results, but one to which I shall now advert tends to establish a contrary opinion. On the 19th of June 1813, in the Hotel-Dieu at Paris, Magendie and Breschet took some of the saliva of a man who died a few minutes afterwards of hydrophobia, and by means of a bit of rag they conveyed this saliva the short distance of twenty paces from the patient's bed and inoculated with it two healthy dogs. One of the dogs became rabid on the 27th July, and bit two others, one of which was attacked with complete rabies on the 26th of the following month. It is also remarked in the work from which I have collected these particulars that the foregoing is one of the

best-authenticated experiments on record; for in addition to consideration of the talents and characters of the gentlemen who made the experiments, the facts were witnessed by numerous medical students; and notwithstanding the objections which have been urged against the account, the main points are declared to be entitled to credit.

Now with these relations it is proper to notice certain cases, as it is astonishing to note and observe the longevity of superstition even in our day; for there still exists a class of credulous beings who believe in the possibility of the disease being communicated from one person to another. It has been asserted that a maid-servant died merely from seeing her mistress vomit while labouring under hydrophobia; or the case of the labouring man's children who all died on the seventh day, as is alleged, from embracing their dying father; or the example of a woman contracting hydrophobia from her husband; nor other cases of a similar nature, as they are not now regarded as proving nothing more than that the patients supposed to have caught the disease by contagion fell victims either to violent affections of the mind and nervous system, or illness accidentally taking place soon after the death of a near relation. It is clear enough, also, that some of the causes were, at most, only instances of symptomatic hydrophobia.

Again, with regard to another opinion, that the bite of a man or other animal when merely enraged may bring on hydrophobia, it is now entirely discarded as erroneous; therefore wrong notions of a dangerous tendency have been generally entertained in regard to the disease as it appears in the canine race. The peculiar symptom which often attends the complaint in the human subject has been applied to the disease in the dog, and has occasioned it to be called by the same name, hydrophobia. But this is decidedly a mistake, for in no instance does there exist any dread of water; on the contrary, dogs are, as a rule, greedy of it. Neither have sheep any dread of water, but frequently take it with great freedom.

Now such unfounded suppositions have often conduced to a very fatal error; for it being the recognised opinion that no dog is mad who can lap water, many persons have been lulled into a dangerous security.

Another equally false and fatal idea has prevailed that every mad dog must be wild and furious; but this is so far from being true, that in the greater number of instances there is very little of that wild savage fury that is expected by the generality of individuals. Hence it is evident that the term *hydrophobia* characterising this disease in the dog is a misnomer; so it is evident the term *madness* is equally so, because in very few cases have the mental faculties been disturbed. The disposition to do mischief is rather an increased irritability than absence of sense; for, in most instances, even those that are furious acknowledge the master's voice and are obedient.

The symptom which is most frequently first observed in a rabid dog is a certain peculiarity in its manner, that is to say, you will notice some strange departure from its usual habits. In a very great number of instances, the peculiarity consists in a disposition to pick up straws, bits of paper, rags, threads, or the smallest objects which may happen to be on the floor. More especially is this trait said to be particularly common in small dogs. Others, again, evince an early predisposition to lick the parts of another dog; also an attachment to the sensation of cold appears in many cases, it being very common for dogs to lick cold iron, cold stones, &c., while others early in the disease will devour their own excrement and lap their own urine. An early antipathy to strange dogs and cats is very commonly observed, but especially to cats. As the disease progresses, the affected dogs bite those with which they are domesticated, and, lastly, the persons around. But, except in a moment of irritability, they seldom attack the human subject. The irritability that induces them to bite is very powerful, but is devoid of wildness. It is, in fact, more like peevishness than fury. A stick held up at them always

excites their anger in a violent degree, and throughout the disease there is generally a wonderful impatience of control, while they are with difficulty frightened. In sheep, as well as in dogs, there is a peculiar change of the voice, which is a noticeable and valuable symptom, as it is undoubtedly an unequivocal sign of the malady.

Dr. John Hunter calculated that out of every dozen of rabid dogs about one evinces no particular tendency to bite. That these animals, and wolves also, have no special dread of water is proved by facts. Thus, a rabid wolf at Fréjus swam across several rivers, while mad dogs can drink without difficulty. Another painful illustration is recorded by Dr. Gillman, who speaks of a dog which was not deemed rabid because it ate and drank well; but as it seemed indisposed, it was killed, though not before it had bit a man, who fell a victim to hydrophobia.

Now when a dog bites a person, it is in my opinion mistaken policy to have it destroyed immediately; it rather ought to be chained up, because, by destroying it at once, the possibility of ascertaining whether it was rabid is prevented, and constant alarm is thus kept up in the minds of the wounded person and his friends. If the animal be affected with rabies, in all likelihood the disease will be manifested in the course of, say, six weeks or two months. However, by this statement I do not lay down a positive rule, for the time that the poison may rest latent in the system seems indefinite.

I hope, therefore, that I have said enough to make the reader aware that mad dogs are not particularly characterised by an inability to lap water, nor by any degree of fury. These animals, when actually affected with rabies, from their quiet manner have even not been suspected of having the disorder, and have been allowed to wander *ad lib.*, been fondly caressed, and even slept with.

Now the causes of this peculiar distemper in dogs are at the present time in a very unsatisfactory state of explanation, and little more than conjecture prevails upon the subject.

It is not positively known whether rabies sometimes originates spontaneously in these animals, although I admit that this opinion is gaining ground; or whether, like small-pox in the human species, it is propagated by contagion. That the disease is frequently imparted in consequence of one dog biting another, every one well knows; yet there are many instances in which this mode of propagation cannot be even suspected. Several facts render it probable that among dogs the disease is often communicated by contagion. It is also observed that in insular situations dogs are seldom affected; and this circumstance is ascribed to such animals being in a kind of quarantine. The celebrated sportsman Mr. Meynell secured his dogs from the malady by compelling every new hound to perform a quarantine before he was suffered to join the pack. Great heat was also supposed to be an exciting cause of the disease in dogs, but without much foundation. A very hot climate, or one exposed to the extremes of heat and cold, a very hot and dry season, feeding upon putrid, stinking, and maggoty flesh, want of water, worms inhabiting the kidneys, intestines, brain, or cavities of the nose, are declared by some authorities as causes of the disease. But we have the clearly demonstrated reliable information from the unimpeachable lips of Dr. John Hunter, that in the hot island of Jamaica, where dogs are exceedingly numerous, not one was known to go mad during forty years. Cold weather has also been set down as conducive to rabies amongst the canine race, because, as is suggested, from the ponds being frozen, they cannot quench their thirst. That neither of these sentiments about heat and cold being the cause of the origin of the disease in dogs is correct will be manifest to anybody who calmly and patiently investigates this important subject. Indeed, one French authority asserts that January, the coldest month in the year, and August, the hottest, are those which furnish the fewest instances of hydrophobia; on the contrary, the greatest number of rabid wolves is in March and April.

Again, according to Savary, dogs never go mad in the island of Cyprus, nor in that part of Syria which is near the sea; while Volney assures us that these animals enjoy the same fortunate exemption both in the latter country and in Egypt. The traveller Brown also declares that in Egypt they are never, or very rarely, attacked with rabies; and Baron Larrey observes, "Although hydrophobia is more frequent in warm than temperate climates, it is not observed in Egypt; and the natives assured him that they knew of no instance in which this disease had manifested itself either in man or animals. This was attributed to the species and character of the dogs, and their manner of living."

Now it is remarked by travellers that the Egyptian dogs are almost in a state of inaction during the day; they lie down in the shade near vessels full of fresh water, prepared by the natives. They only run about in the night-time; they evince the signs and effects of their love but once a year, and only for a few moments. They are seldom seen together or coupled. They do not go into the houses in the daytime; they remain at the sides of the streets, and wander into the country at night, in order to find any dead animals which happen to be unburied. Their disposition is meek and peaceable, and they rarely fight with each other. Possibly all these causes may exempt them from rabies.

Now this observation about the exemption of the Egyptian dogs from rabies is very ancient, having been made by Prosper Alpinus; and according to Barrow, the dogs in the vicinity of the Cape of Good Hope and in Caffraria very rarely go mad; while several writers assert that rabies never occurs in South America. Again, Valentin declares that it is exceedingly rare in the warm regions of America, but common in the northern part of that continent. Dr. Thomas, who resided a good while in the West Indies, never saw or heard of a case of rabies there; and Dr. B. Moseley states that the disorder was not known in those islands down to 1783. On the other hand, the disease sometimes happens

in the East Indies, though not with such frequency as at all to justify the doctrine about heat being the cause of its production. The silence of Hippocrates proves that in his days hydrophobia must have been very rare in Greece. And as the disorder is not mentioned in the Scriptures, an inference may be made that it could not be common in the hot tracts of the globe inhabited by the Hebrews, as in the temperate climates of Europe and America.

Neither can the sentiment be received as correct that rabies is more frequent in the north than in the temperate parts of Europe, for De la Fontaine particularly notices how extremely rare it is in Poland. Again, the disease is reported to be very common in Prussian Lithuania; but mad dogs are seldom or never heard of at Archangel, Tobolsk, or in the country north of St. Petersburg.

In Mr. Meynell's account, which was communicated to him by a physician, it is asserted that the complaint never arises from hot weather or putrid provisions, nor from any cause except the bite; for however dogs have been confined, however fed, or whatever may have been the heat of the season, the disorder never commences without a possibility of tracing it to the preceding cause; nor was it ever introduced into the kennel except by the bite of a mad dog.

Dr. Gillman endeavours to prove that the disease in dogs is probably excited independently of particular climates, of putrid aliment, of deficiency of water, of want of perspiration, &c., and he expresses his belief that it originates somewhat like typhus in the human subject, and is not always produced by inoculation or by means of a bite. He thinks that it may be occasionally brought on by the close confinement of dogs, want of exercise, or close, filthy kennels, and that the success of Mr. Trevalyan, as related by Dr. Bardsley, in clearing his kennel of the disease by changing even the pavement, after other means of purification had failed, affords presumptive evidence in favour of the opinion; and, consequently, this author thinks that the method of quarantine adopted

by Mr. Meynell and recommended by Dr. Bardsley, on the supposition that the disease originates exclusively from contagion, will not be a sufficient prevention alone; and he infers from some facts reported by Mr. Daniel that the poison sometimes lies dormant in dogs four, five, and six months, and, consequently, that the period of two months is not a sufficient quarantine. Now, in opposition, however, to some of the sentiments contained in the foregoing passage, it should be known also that Dupuytren, Magendie, and Breschet have purposely kept many dogs for a long time in the most disgusting state of uncleanliness. Aye, they have even allowed them to die in this condition for want of food and water, or even devour each other; yet, notwithstanding all this, they failed to excite rabies. And yet Professor Rossi of Turin is said to have produced this or some similar disease in cats by keeping them shut up in a room.

Therefore, on the whole, I consider it well proved that neither long thirst, hunger, eating putrid flesh, nor filth, will occasion the disease in the canine race.

At Aleppo, where these animals perish in great numbers from want of food and water and the heat of the climate, the distemper is said to be unknown. Nor is rabies found to attack dogs and cats with particular frequency during the copulating season, and therefore the *œstrus veneris* cannot be admitted to have any share in its production, as some writers have been disposed to believe. Although most writers believe in the reality of a poison or specific infectious principle in cases of rabies, the fact has been questioned or absolutely rejected by others. In fact, Bosquillon considered the disease always as the effect of fear, or an impression upon the imagination. This view of the matter is far from being new, and has been ably refuted, because it will be difficult for us to imagine now that one could impress a terror of hydrophobia into a horse's, ass's, or mule's head; yet they die from rabies.

Another notion has partially prevailed, that rabies does not depend upon any virus, but upon the continuance of an irrita-

tion in the bitten parts affecting the whole nervous system. But this doctrine confounds rabies and locked-jaw together, and can only apply to the symptomatic non-infectious hydrophobia from an ordinary wound or laceration.

Now the facts in proof of the reality of a peculiar infectious principle in cases of rabies are too numerous to leave any doubt upon the subject. Twenty-three individuals were bit one morning by a female wolf, of whom thirteen died in the course of a few months, besides several cows which had been injured by the same animal. How could all these unfortunate persons have had similar symptoms, and especially a horror of fluids, had they not been all under the influence of some cause besides the bites? The patients who died were bit on the naked skin, while in the others who escaped infection the bites happened through their clothes, which no doubt intercepted the saliva, the vehicle of the virus.

On the 27th January 1780, fifteen individuals were bit by a mad dog, and attended at Senlis by the Commissioners of the French Royal Society of Physic. Ten had received the bites on the naked flesh, and five through their clothes. Of the first ten, only five lost their lives, three of them dying of decided rabies between the 27th February and the 3d April, and the other two between the 29th February and the 18th March. Therefore, unless the opinion be adopted that the disease is caused by an infectious principle, a sort of inoculation, it would be impossible rationally to explain the cause of so many deaths from the bites of rabid animals. If, on the other hand, the idea that rabies originates from fear or nervous irritation were true, how could we account for there being such a difference between the usual consequences of the bite of a healthy dog and those of the bite of one affected with rabies? Healthy dogs are incessantly quarrelling and biting each other in the streets, yet their wounds are not followed by rabies; and if hydrophobia were referrible to nervous irritation derived from the wounded part, how does it happen that, amongst the thousands of wounded after a

great battle in time of war, hydrophobia is not seen instead of tetanus or locked-jaw? But if it were yet possible to entertain a doubt of an infectious principle in hydrophobia, this possibility would be removed by the reflection that the disease may be accompanied by tetanic symptoms, and that it can be communicated to healthy animals by inoculating them with the saliva of certain other rabid animals. In short, as I have already stated, the bites of such animals are in every point of view only an inoculation, and the same remark may be extended to the numerous instances on record in which the disease arose in the human subject as a consequence of a rabid dog or cat (not suspected to be in this state at the time) having been played with, fondled, or suffered to lick the hands or naked skin, in which there was at the moment some slight scratch, entirely forgotten or overlooked.

Indeed, many of the ancient writers not only believed in the hydrophobic virus or infectious principle, but even in its diffusion through the blood, flesh, and secretions in general. This hypothesis was professed by Boerhaave, Swieten, and others; but in proportion as the humeral pathology lost ground, the foregoing idea was abandoned, and the opinion adopted that the infection is confined to the saliva and wounded part in which it has been inserted.

Again, the tales of some old writers would lead one to think that hydrophobia may be communicated by eating the flesh of a rabid animal. But these accounts are not entitled to much confidence, for it is certain that rabies never begins, as is stated with regard to some of the cases in question, a few hours after the application of its cause, and its early stage is never characterised by any fury or disposition to bite. And, besides, how can such relations be reconciled with the practice of the ancients, who, according to Pliny, employed the liver of a mad dog or wolf as a remedy? Palmarius also fed his patients for three days with the dried blood of the rabid animals without exciting the disease. The

flesh of a bullock which had been bit by a mad dog and afterwards died rabid was sold to the inhabitants of Medola near Mantua, yet none of them were affected or attacked by hydrophobia. In fact, we have the following statement from Dr. Le Camus, that he had eaten the flesh of animals which died rabid, but he suffered no inconvenience from the experiment. And it is stated in a letter from Dr. Valentin that certain negroes in the United States of America had no illness from eating the flesh of pigs which had died of rabies.

As for the question whether the blood is affected or infected, it is considered generally to be settled in the negative, notwithstanding the account given by Lémery of a dog which was attacked by rabies, as is said, from lapping the blood of a hydrophobic patient who had been bled. At the same time, Dupuytren, Breschet, and Magendie were never able to communicate rabies by rubbing wounds with blood taken from mad dogs; and they even on several successive occasion injected such blood into the veins of other healthy dogs, yet none of these latter animals were attacked with rabies, though they were kept for a sufficient length of time to leave no doubt upon the subject.

Now I think a point of greater practical interest than the former is whether the drinking of the milk of an animal labouring under rabies is attended with any risk of communicating the disease.

It is asserted that a peasant, his wife, children, and several other persons, were seized with hydrophobia in consequence of drinking the milk of a rabid cow, and that the husband and eldest child were saved by medical treatment, but that the wife and four of the children died. It is further stated that three or four months afterwards the maid and a neighbour, who had partaken of the milk of the same cow, also died of hydrophobia. But, in opposition to this account, we have several facts recorded by writers of great credit, and they maintain that hydrophobia cannot be com-

municated by the milk of a rabid animal. My own impression tends in this direction likewise; for it must be borne in mind that long before an animal becomes rabid the secretion of milk would necessarily be arrested.

Neither can hydrophobia be imparted by the breath, notwithstanding the statements of some old writers. A nurse, mentioned by Dr. Vaughan, repeatedly kissed a hydrophobic infant, which she had suckled, and exposed herself incessantly to its breath, but without the least ill effects. The fear which has also been entertained of the disorder being receivable from the application of the patient's perspiration to the skin is not founded upon any authentic facts.

Now the question that we have to determine is, does the infectious principle of rabies reside in the salivary secretion or in the mucus of the trachea and bronchi? The common belief is, that, in hydrophobia, the salivary glands are considerably affected. But it has been remarked by a modern writer, that if these glands exhibit no morbid alteration during the whole course of the disorder; if they are found healthy after death; if the air-passages are the seat of inflammation; if the saliva does not constitute the frothy slaver about the lips, and if such slaver, wherewith the disease may be communicated by inoculation, is derived from the windpipe, which is inflamed, and the bronchi as well; and if it consists of a kind of mucus converted into a foam by the convulsive manner in which the patient breathes,—there is some reason for questioning whether the saliva, strictly so called, undergoes the alteration generally supposed. However, this writer is not exactly correct when he describes the frothy secretion about the mouth as being altogether composed of mucus from the windpipe, since a very great part of it is unquestionably true saliva and mucus secreted in the fauces and mouth.

In the stomachs of dogs which died rabid Dr. Gillman constantly observed traces of inflammation, and he tried to communicate the disease to rabbits by inoculating them with

matter taken from pustules found in the stomach of a rabid dog, but no infection took place.

According to Professor Rossi, the nerves, "before they grow cold, participated with the saliva in the property of communicating rabies." He asserts that he once imparted the disease by inserting in a wound a bit of the sciatic nerve immediately after it had been taken from a living rabid cat.

Now, after all that has been stated concerning the hypothesis of the infectious principle of hydrophobia being more or less diffused through the solids and fluids of a rabid animal, and not being restricted to the saliva, perhaps the safest conclusion is not to reject the opinion altogether, but to consider it as at present requiring further proof.

Although many cases are to be met with in the records of medicine and surgery tending to convey the idea that the mere application of the saliva of a rabid animal to the sound entire skin of the human subject may give rise to hydrophobia, the assertion is contrary to general experience, and liable to a reflection which must overturn the hypothesis, namely, the slightest prick, scratch, abrasion, or broken pimple on the surface of the body, such as would not be likely in many instances to excite notice, may render the application of the saliva to the part a positive inoculation.

Instances are also reported, the tenor of which is to prove that the hydrophobic virus may take effect through a sound mucous membrane. But that this does not happen in the human subject is tolerably well proved by the consideration that formerly a class of men made it their business to suck the wounds caused by the bites of rabid animals, yet none of them contracted hydrophobia from this bold employment. The example of the nurse who repeatedly kissed the child without the least ill effect while it was dying of rabies has been already noticed in these pages. And if hydrophobia were apparently to arise in any rare instance from the application of the slaver of a rabid animal to the inside of the lips, no positive inference could be drawn from the fact,

unless the means were also possessed of ascertaining that there were no slight abrasions about the gums or within the mouth previously to such application. Therefore, for the hydrophobic virus to take effect, it is generally if not always necessary that the infectious saliva be either applied to an abraded wounded or ulcerated surface. In the case of a bite, the teeth are the envenomed weapons which at once cause the solution of continuity and deposit the infection in the part. But the mere abrasion of the skin and the application of the infectious saliva to the denuded cutis will often suffice for the future production of the disease. As the mode of communication, then, is a true inoculation, it follows that the danger must depend very much upon the quantity of infectious matter conveyed into or applied to the part, the effectual manner in which the saliva is lodged in the flesh, the extent and number of the wounds, and particularly the circumstance of the teeth of the rabid animals having passed through no clothes, by which the saliva might possibly be effectually prevented from entering the wound at all. Hence bites on the hands and face are well known to be of the most dangerous description, especially those on the face, the hands being sometimes protected with gloves.

From what has been observed, however, it is not to be concluded that the disease always follows, even when the animal which inflicts the bite is decidedly rabid, and some of its saliva is actually applied to the wounded or abraded parts. On the contrary, experience fully demonstrates that out of the great number of individuals often bit by the same mad dog, and to whom no effectual prophylactic measure is extended, only a greater or lesser number are afterwards attacked with hydrophobia. When this difference in the fate of the individuals cannot be explained by the intervention of their clothes, the thickness of the cuticle at the injured part, the small size and superficial nature of the bite, the ablution of the part, or some other mode, in which any actual inoculation may have been rendered ineffectual, it can only

be referred to some unknown peculiarities or differences in the constitution of the several individuals. The latter conjecture seems more probable when the fact is recollected that some animals are more susceptible of rabies than others, and some appear to resist the infection altogether.

Dogs, for example, are more susceptible to the infection than the human species. Four men and twelve dogs were bitten by the same mad dog, and every one of the dogs died of the disease, while all the four men escaped, though, strange to say, these men used no other means of prevention but such as we see every day fail. There is also another instance of twenty persons being bit by the same mad dog, of whom only one succumbed to the disease.

Dr. Heysham has defined hydrophobia to be an "aversion and horror at liquids, exciting a painful convulsion of the pharynx, and occurring at an indeterminate period after the canine virus has been received into the system."

Dr. Cullen places it in the class *Neuroses* and order *Spasmi*, and defines it as "a loathing and great dread of drinking any liquids, from their creating a painful convulsion of the pharynx, occasioned most commonly by the bite of a mad animal."

Others have suggested the following definition, as more complete: "Melancholy, dread of cold air, of anything shining, and particularly of water," often arising from the bite of a mad animal. However the latter definition is perhaps equally objectionable, because there is not invariably a dread of shining bodies. While some writers represent it as a nervous disorder, others, amongst whom is Boerhaave, consider it as one of an inflammatory nature. In many systems of surgery hydrophobia is treated off with poisoned wounds, of one species of which it is strictly the effect.

Symptoms.—With regard to the symptoms of hydrophobia, they are generally tardy in making their appearance, a considerable but a very variable space of time usually elapsing between their commencement and the receipt of the bite. Out

of a table of a hundred and thirty-one cases, none of the patients became ill before the eleventh day after the bite, and only three before the eighteenth. It is pretended by Pouteau that one patient was bitten by a dog in the morning, and was attacked with hydrophobia at three o'clock in the afternoon. But as this account was communicated to that writer a long time after the occurrence, and not by a medical man, it deserves very little confidence. Another case, adverted to by Mead, is deprived of all its importance by the same consideration. These examples, as well as another reported by Astruc, in which the patient is said to have had hydrophobia in less than three days after being wounded on the temples, can at most be regarded only as specimens of symptomatic hydrophobia.

There appears, therefore, to be no determinate or exact period at which the disorder makes its attack after the bite, but it is calculated that the symptoms most frequently commence between the thirtieth and fortieth day, and that after this time the chances of escape daily increase. "Of fifteen patients whose cases Trolliet was acquainted with, seven were attacked between the fourteenth and thirtieth days, five between the thirtieth and fortieth, two a little beyond the latter period, and one after fourteen weeks." In May 1784, seventeen persons were bit by a rabid wolf near Brive, of whom ten were afterwards attacked with hydrophobia, as follows: one on the fifteenth day after the bite, one on the eighteenth, one on the nineteenth, one on the twenty-eighth, one on the thirtieth, one on the thirty-third, one on the thirty-fifth, one on the forty-fourth, one on the fifty-second, and the last on the sixty-eighth day. Fothergili and Mosely mention cases in which the disease began four months after the bite, and Matthey details an instance in which the interval was a hundred and seventeen days. Haguenot knew of a case in which the interval between the bite and the commencement of the illness was five months. Dr. J. Vaughan mentions an interval of nine months; Mead, of eleven; Galen,

Bauhin, and Boissière, of a year; Nourse, of nineteen months; and Lentilius, of three years.

Dr. Bardsley has recorded a case in which the most careful inquiries tended to prove that the patient had never suffered the least injury from any animal except the bite inflicted by a dog twelve years previous, yet the patient died from hydrophobia. Another instance may be quoted, namely, that of a merchant of Montpelier, who was attacked with hydrophobia ten years after the bite of a rabid dog, which also bit the patient's brother, he dying on the fortieth day after the accident. There are also other instances recorded in which the interval is alleged to have been eighteen, twenty, and even thirty years; but it is certainly difficult to attach any credit to these very late periods of attack.

Dr. Hunter considers seventeen months, and Dr. Hamilton nineteen, the longest interval deserving belief.

Exposure to the heat of the sun, violent emotions of the mind, and fear, are believed to have considerable influence in accelerating the commencement of the symptoms. That mental alarm is also of itself sometimes capable of bringing on simple hydrophobia totally unconnected with infection is incontestable. A most convincing case is recorded illustrating the positive effects of fear. A young man was bit by a dog which he fancied was mad, and on the fifth day after the occurrence he evinced the usual symptoms of hydrophobia; indeed, he was thought to be dying, when the dog which had bit him was shown to him perfectly well, and the agreeable intelligence tranquillised him so effectually that he was quite well four days afterwards. Dr. J. Hunter mentions a similar case, in which he says, "Most certainly the patient would have died had not the dog been found and shown to him to be in perfect health."

Now it is to the effects of terror that several modern writers are disposed to refer the instances of very late attacks of hydrophobia after the period when the patients were bitten, though, unless the intellect be changed in the meantime

by other causes, it is difficult to conceive why the alarm should not have the greatest effect earlier, while the impression of the danger is undiminished by time.

The idea that the symptoms begin sooner after the bite of a wolf than a dog is not adopted by a writer who has given careful notice to this branch of the present interesting disorder.

Cullen has divided the disease into two stages, "the *hydrophobia simplex* and *rabiosa*," or the melancholy and raving stages of some other writers. But as the early stage is frequently unattended with anything like melancholy, it is best merely to adopt the distinction of the first and second stages, one comprehending the effects of the disorder previous to the occurrence of a dread or a decided aversion of liquids, the other the subsequent changes.

The wound, if treated by common and ordinary methods, usually heals up at first in a favourable manner. But at some indefinite period, and occasionally long after the bitten part seems quite well, a slight pain begins to be felt in it or the neighbouring parts, now and then attended with itching, but generally resembling a rheumatic pain. If the bite took on the finger, the pain successively extends from the hand to the forearm, arm, and shoulder, without any redness or swelling in these parts, or any increase of suffering from pressure or motion of the limb. In a great many instances the muscles of the neck on the same side as the bite are the points to which the pain principally shoots.

The place where the wound was inflicted meantime begins to swell, inflames, and often festers, and discharges an ichorous matter. These uneasy painful sensations recur from time to time, and usually precede any dread of water several days, and they are a just reason for very serious apprehension. Sometimes pains of a more flying, convulsive kind are felt in various parts of the body. As the disease advances, the patient complains of the pain shooting from the situation of the bite towards the region of the heart. Some-

times instead of pain there is rather a feeling of heat, a kind of tingling, or even a sensation of cold, extending up to the chest and throat, while it is sometimes observed that no local symptoms take place. Thus Sabatier, in giving an account of several cases, remarks, it is worthy of notice "that the bitten parts did not become painful previously to the accession of the fatal symptoms, nor did any swelling or festering occur." Again, "Dr. Marcot particularly observed that the pain follows the course of the nerves rather than that of the absorbents." In the case which he has related, as well as in one of the cases detailed by Dr. Babington, "there was pain in the arm and shoulder, but without any affection of the axillary glands;" and in another case the pain occasioned by a bite in the leg was referred to the hips and loins without any affection in the inguinal absorbents.

Now, regarding the accuracy of the foregoing statement by Dr. Marcot, there is no doubt the observation, however, in regard to the irritation not affecting the absorbents, was long ago anticipated by several authors, who urged the freedom of the lymphatic glands from disease as an argument that the disorder did not depend upon the absorption of any virus. It is also noticed by others, who inclined to the belief in the absorption of the infectious principle.

Pain and heaviness are felt in the head: sometimes the headache is at first very severe, sometimes slight; but in the latter case it often becomes afterwards intense, general, and accompanied with a sense of pressure upon the temples. In certain instances the patient's sleep lasts a good while, though disturbed by dreams, while in other more frequent examples he is continually restless. The intellectual functions generally seem increased, the memory stronger, the conception more ready, the imagination more fertile, and the conversation more animated. On the other hand, some patients are silent and dejected, and when questions are put to them, the answers are short and peevish. But the greater number are active, lively, and talkative; at the same time the organs of sense

betray signs of increased sensibility, and the eyes, which are very open and bright, avoid a strong light; sometimes the pupil is found to be considerably dilated. Extraordinary pains are felt about the neck, trunk, and limbs; it is not uncommon, also, for the patient to evince great anxiety, or to fall into a state of dull despair and melancholy. These last symptoms, of which great notice is taken by writers, are particularly ascribable to the effect of fear. The disorder of the organs of digestion is sometimes manifested in various ways, though it is far from being so frequent and striking as the affections of the head which precede it.

The disorder referred to consists at first in loss of appetite, nausea, vomiting, and afterwards constipation, and sometimes colic. In the first stage of the disease the pulse is generally somewhat more frequent and stronger than in health, and the countenance appears more animated. These symptoms then precede the second stage, or that of decided rabies, only by a few days, usually four or six, though sometimes but two or three.

The second stage of hydrophobia commences with the first manifestation of the dread or aversion of liquids. The ungovernable agitation and distressing sense of suffocation excited by the sight of liquids, the attempt to drink, or even the mere idea of drinking, is unquestionably the most remarkable symptom of the disorder. The patient is also frequently attacked with the same kind of commotion and suffering from other causes, such as the least agitation of the air or exposure to a strong light. Indeed, some patients are so much affected by a blast of wind, that they have been known to endeavour to elude it by walking with their backs towards it, while others scream out whenever the window or door of their room is opened.

Dr. Marcot, in relating the case of a patient affected with hydrophobia, observes that "on our proposing to him to drink, he started up, and recovered his breath by a deep convulsive inspiration; yet he expressed deep regret that he

could not drink, as he conceived it would give him great relief, his mouth being extremely parched and clammy. On being urged to try, however, he took up a cup of water in one hand and a tea-spoon in the other. The thought of drinking out of the cup appeared intolerable, but he seemed determined to drink with the spoon. With an expression of terror, yet with great resolution, he filled the spoon and proceeded to carry it to his lips, but before it reached his mouth his courage forsook him, and he was forced to desist. He repeatedly renewed the attempt, but with no more success. His arm became rigid and immovable whenever he tried to raise it to his mouth, and he struggled in vain against this spasmodic resistance. At last, shutting his eyes, and with a kind of convulsive effort, he suddenly threw into his mouth a few drops of the fluid, which he actually swallowed; but at the same instant he sprang from the chair and flew to the end of the room, panting for breath and in a state of indescribable terror." What an agonising picture for any one to witness!

It is now affirmed that the splashing or running of any liquid causes a great deal of inconvenience. As the system becomes more and more affected, the patient loses his sleep entirely, and has frequent and violent fits of anxiety and loud screaming from slight causes. "A woman whom Dr. Powell attended was often attacked in this way, in consequence of so trivial a circumstance as a fly settling on her face; the noise of tea-cups or the mention of any sort of drink greatly disturbed her, though she was not at all agitated by the sound of her urine. The currents of air entering her room whenever the door opened became very distressing to her, and this more and more so. The pain in her neck became so great that she could scarcely bear it to be touched, but she made use of a looking-glass without the inconvenience which hydrophobic patients usually suffer from the sight of shining bodies. Dr. Powell states that the paroxysms which the poor woman suffered resembled those

of hysteria, and increased in duration as the disorder lasted. She described their commencement to be in the stomach, with a working and fulness there, and that a pricking substance passed up into her throat and choked her. She screamed suddenly, and grasped firmly hold of her attendants, as if voluntary and muscular convulsions came on, which were sometimes more, sometimes less, general and violent. The causes from which these paroxysms arose were extremely slight—the passage of a fly near her face, the attempt to swallow a pill, a stream of air, the sight of oil or wine, or any other liquid; even the sound of water and other such circumstances were sufficient. She now also complained of inconvenience from light, which was accordingly moderated. The effect of sounds was peculiar, for though in the subsequent stages their influence became more general, at this period the effect was rather proportionate to the ideas they excited in her mind than to their violence. Bells and other strong noises did not agitate her, but the clatter of earthenware, the noise of a distant pump, or anything connected with fluids, produced the paroxysms in all their violence.

"She could swallow fresh currants with less resistance than anything else, taking care that they were perfectly dry. Her mind had till now been quite calm and composed, and her conversation and behaviour proper during the intervals of the convulsive attacks. Fifteen grains of urgentum nitratum had been given without any sensible effect. The fits and the irritability to external objects increased; the pain shot from the back of the neck round the angles of the jaw, the chin, and throat. At length the paroxysms became more frequent, and, indeed, might be said to come on spontaneously; seven occurred in one hour. She looked pale and exhausted, and a tremor and blueness of the lips and fingers were observable; her pulse became weaker and more rapid, and her scalp so tender that touching it brought on the convulsions. She had latterly eructations of wind and spat up some thick, viscid fluid; her urine now came away involuntarily,

and she became more irritable and uncontrollable. Indeed, she passed two hours in almost constant convulsions; became extremely irritable and impatient of everything about her; complained of failure of sight; wished to be bled to death; her words were fewer and interrupted; she struck and threat ened to bite her attendants. She had copious eructations of air; discharged an increased quantity of saliva with much convulsive effort; said the affection of her throat and stomach had quite left her, and continued in a general perspiration with a weak pulse from 140 to 150. She afterwards bit some of the attendants, and was therefore confined in a waistcoat. From this period she lost all control over her mind, and continued for almost four hours in a paroxysm of furious insanity. She now swallowed with an effort near half a pint of water, but this was in a few seconds vomited up, with some mucus and a greenish fluid. In this violent raving state she continued till within two hours of her death, which took place forty-seven hours after the first marked occurrence of hydrophobia. In the course of the case she swallowed once or twice a little porter, and also some cinnamon-water with tincture of opium, but they were always vomited up."

Now it is by no means uncommon for a period to occur when the horror of liquids undergoes a considerable diminution, or even entirely ceases, the patient quenching his thirst, and this sometimes as well as if he were in perfect health, and so as to raise doubts of the existence of rabies. But after a few hours the dread of fluids is renewed again, and with it the convulsive paroxysms, which now become general, violent, and incessant.

Dr. Cayol attended a girl labouring under rabies who was never affected with any very great dread of liquids, nor an absolute inability to swallow them, although she certainly disliked them, and swallowed them with difficulty. In fact, patients are sometimes seen who can swallow wine or broth, although their aversion to water is beyond all control, while other patients can often look at a liquid in a black pot with-

out inconvenience, though any fluid offered to them in a glass will bring on a violent paroxysm of spasm and sense of suffocation. The sight of tears has even been enough to excite and bring on the attack.

Another aspect of the question has sometimes been entertained, namely, whether rabies can ever exist quite unattended throughout its course with a dread of liquids? The possibility of such a case was believed by Mead and others, and an instance is recorded by Mignot in which the patient died without having manifested any sign of hydrophobia. However, it is asserted that a careful perusal of this case must produce a conviction that the disorder was not rabies, and it is added that when the histories of this disease on record are critically investigated, none will be found complete which do not make mention of a more or less decided aversion to fluids. It also appears from facts referred to that the dread of liquids does not depend upon the pain which the patient has already suffered from his attempts to drink, as it sometimes occurs before any such attempt has been actually made.

The reader will recollect that an inclination to bite was evinced in the case described by Dr. Powell. Yet this disposition is far from being usual; in fact, it never presented itself among any of the cases that were studied by Drs. Vaughan, Desault, and others. And even when the patient's imagination is so disordered that he cannot help biting, he commonly warns the bystanders to avoid the danger.

Again, the frothy slaver, which is voided with considerable and repeated efforts, is a symptom which is said not to commence before the respiration begins to be convulsive. As the disease advances there is no remission of the sputation necessary to clear the throat of this viscous secretion, and at the approach of death, when it cannot be expelled, it collects in the mouth and covers the patient's lips.

The symptoms of what is termed cerebral excitement become stronger and more marked in the second stage of the disease. The eyes, the brightness of which is still further

increased, appear as it were inflamed; the patient never shuts them again, and as the daylight and brilliant colours are offensive, he prefers darkness.

The hearing becomes very acute, and, as well as the sight, is troubled with hallucinations. The touch is extremely fine, the speech abrupt and rapid, and the conversation energetic, and often expressive of the most touching sentiments.

Dr. Marshall made a very just distinction between the real convulsions which come on towards the termination of the case in death, and the strong, sudden action of the muscles excited in the course of the disorder by light, the sight of liquids, and the feel of the air. Convulsions and hiccough, in fact, are the symptoms of dissolution.

Delirium is far from being a constant symptom, and only happens the last day of the disorder; neither is it always with out remissions, for the patients affected with it sometimes give rational replies. Therefore every case on record where delirium is described as being one of the first symptoms, or as coming on with the dread of liquids, is set down on good authority not as true rabies, but as symptomatic hydrophobia attended with mania.

Again, the dread of swallowing liquids, though the most singular symptom of the disease, constitutes but a small part of it. It is true that none, or at least very few, recover who have this symptom; yet they certainly do not die in consequence of the difficulty of swallowing liquids, for the human body could easily exist double the time at the end of which the disease usually proves fatal without food or drink. Besides, the sick can often swallow substances that are nourishing in a pulpy state without their lives being thereby at all prolonged. It is not, therefore, the difficulty or impossibility of swallowing liquids, but the effects of the poison upon the constitution at large which occasions death.

The extreme sensibility of the sick to all impressions appears in the displeasure which they express at even the air blowing upon them, in their dislike to a strong light, in

their aversion to new faces, or even the sight of their friends and relations, and in the terror they express at being touched, which throws them into convulsions. In a case related by Magendie, the slightest noise, and even merely touching the patient's hair, excited convulsions of incredible violence. As the disease advances the mind is more and more filled with dreadful fears and apprehensions.

In the second stage, the region of the abdomen as well as the chest is the seat of considerable pain; the patient is constipated, but the urine is plentiful and high coloured. Before a certain period the pulse is generally strong, regular, and a little accelerated, but towards the end of the case it becomes small, irregular, feeble, and rapid.

The duration of life, from the appearance of hydrophobia till death, varies from thirty-six hours to four or five days; the most common period is from two to three days. The event is said to be directly caused by asphyxia, or the cessation of respiration. Of ten persons who were bitten by the same animal, nine died on the second and third day from the commencement of the horror of fluids, and the other on the fifth day. There is an account of a child who lived nine days, but the description of the case and the circumstance of fourteen worms being found in the intestines may raise doubts about the nature of the disease.

Now, whatever may be the resemblance found between tetanus or locked-jaw and hydrophobia with regard to the rapidity of their course, their causes, and some of their symptoms, the following considerations will always serve for the discrimination of one disorder from the other. Tetanus attacks the muscles of the jaw, which remains motionless, while in rabies the jaw is not only movable, but incessantly moving in consequence of the efforts unremittingly made by the patient to free his mouth from the thick saliva with which it is obstructed. In hydrophobia the muscles are alternately contracted and relaxed, but in tetanus they always continue rigid. In addition to these differences, it is

to be remembered that the latter disease is induced after the receipt of a local injury, and may occur as a complication of any wound, even that made during a surgical operation.

On the subject of prognosis, with respect to the bite inflicted by a rabid animal and its effects, as evinced in the decided form of rabies, there are several things worthy of attention. According to some writers, small wounds are not less dangerous than large ones, and an attempt is made to account for the fact by the more copious hemorrhage from larger wounds and the frequent neglect of lesser injuries. Perhaps another reason is that the virus is more likely to be confined in a wound with a small orifice than in one which is ample and admits of being effectually washed out. But the more numerous the wounds are the greater the risk. If it then be inquired what is the average number of persons attacked with rabies out of a given number who have received bites, the question can only be answered by referring to the extremes. For example, Dr. Vaughan speaks of between "twenty and thirty individuals bit by a mad dog, of whom only one was afterwards attacked with rabies;" while Dr. J. Hunter tell us of an instance in which out of twenty-one persons bit only one became affected. On the other hand, out of fifteen persons bit by a mad dog, and taken care of at Senlis, three were seized with the disorder; of seventeen others bit by a wolf, ten succumbed; and of twenty-three bit by a she-wolf, thirteen died of rabies.

Bearing in mind these facts, it should always be recollected that the disease may be often prevented, although it cannot be said to be cured. Experience has fully demonstrated and proved that when hydrophobia once begins, it pursues its dreadful course to a fatal termination, the records of medicine furnishing very few and unequivocal cases to the contrary. Hence the imperious necessity of using every possible means for the prevention of the disorder.

Probably, however, many things which possess the character of being preventive of hydrophobia have no real claim to

such reputation, such as mercurial frictions, plunging the patient for a considerable time under water, &c.

The instances in which a prevention is inferred to have taken place by different writers in consequence of such means may all very rationally be ascribed to other circumstances. Facts already cited in these pages sufficiently prove that out of the great number of persons frequently bitten by the same dog, only a limited proportion is commonly affected.

The hydrophobic poison is known to reside in the saliva of the animal; consequently the chance of being affected must greatly depend upon the quantity of this fluid which is insinuated into the wound; and if the teeth of the animal should have previously pierced a thick boot or other clothing before entering the skin, the danger must obviously be much diminished. Many wash and suck the wound immediately after its occurrence, and thus, no doubt, very often succeed in getting rid of the poison. And even when it is lodged in the wound, it may not be immediately absorbed, but be thrown off with the discharge. It is therefore advisable, and all prudent patients ought, to submit at once to excision of the bitten part. Now it must be remembered that under each of the above circumstances escapes have frequently occurred, while internal medicines, half drowning of, or salivating the patients, had also not been neglected; so that all the efficacy of prevention has too often been most unjustly ascribed to means which in all probability never yet had, and never will have, any beneficial effect whatever. Should the reader search for confirmation of these truths, it will be found that persons bitten by the same animal have been treated in a particular way, and have escaped hydrophobia, while others, bitten at the same time by the same animal, have neglected all medicine, and have followed no particular plan, yet notwithstanding never had any constitutional effects. If, then, to these reflections be added the consideration that it is frequently doubtful whether the bite has actually been inflicted by a truly rabid animal, and that the

mental alarm will sometimes bring on a symptomatic hydrophobia, it is easily conceivable how mistaken a person may be who believes that he has prevented the disorder, and how unmerited is the reputation of the means which he has employed for the purpose.

Again, the bite of a naturally ferocious beast has often been thought to be attended with more risk than that of an animal naturally tame; and hence the bite of a wolf is said to be more frequently followed by rabies than that of the dog. This proposition is admitted to be true, but the explanation is erroneous. The true reason of the difference is, that a wolf usually seizes the face and inflicts a deeper bite, while a dog only snaps as he runs along, and mostly bites through the clothes. Then, again, the bite of a rabid animal may be rendered much more dangerous by being situated near a part or an organ which increases the difficulty or risk of adopting an effectual mode of removing the whole of the flesh in which the virus may be lodged. For example, bites near the large arteries, the eyes, the joints, &c., are of a more serious description than others. In fact, Dr. Hunter rated the hazard in some degree by the vascularity of the bitten parts.

The prognosis will always be more unfavourable when no proper measures have been applied to the bite soon after its infliction, and perhaps the risk may be increased by certain causes not having been duly avoided, which, as already stated, are thought to have a tendency to accelerate the attack of rabies. The exact time after a bite when the prevention of rabies is no longer practicable is quite an undetermined point, but every fact known upon the subject evinces in an urgent manner the stern necessity of adopting preservative measures without the least possible delay.

In almost all the dissections of patients who have died of rabies, certain indications of inflammation have been perceptible, more frequently in some part of the space between the pharynx and the cardiac opening of the stomach (or, in other

words, the gullet), in the stomach itself, in the lungs, and membranes of the brain.

Dr. Trolliet opened with the greatest care six bodies of persons destroyed by this disease. "The mouth and fauces in each subject were first examined, and found of a pale greyish colour, scarcely lubricated with mucus, and quite free from all frothy matter. All the salivary glands seemed perfectly healthy. When the larynx, trachea, and bronchi were opened, they appeared to have been the seat of inflammation, the traces of which were most marked low down; here the mucous membrane was of the colour of wine-lees. In four of the bodies frothy mucus was perceived in the bronchi, larynx, and trachea." By this he infers "that the frothy matter seen about the mouth and lips of patients affected with rabies is secreted by the inflamed mucous membrane of the bronchi, and that it is this secretion, and not the real saliva, which contains the hydrophobic poison."

In giving an account of a dissection, another authority also remarked "that the frothy matter was only met with in the air-passages; that the salivary organs were unaffected, and that the saliva itself did not contribute to the formation of the thick slaver, which appeared to have issued from the chest."

From the preceding observations it would then appear—

First, that the mouth, strictly so called, and the salivary glands are without any alteration.

Secondly, that the mucous membrane of the air-passages is affected with inflammation, which in its highest degree extends from the division of the bronchi to the pharynx. When the inflammation is of less extent the pharynx appears sound, and when yet more limited it is usually not to be traced in the larynx, a neighbouring organ. The point where it seems to commence and is most strongly marked is at the lower part of the windpipe or in the bronchial tubes. Lastly, when none of these parts are found inflamed, the lungs themselves present vestiges of inflammation.

Now with respect to Trolliet's theory, wherein the hydro-

phobic poison is said to be contained in the mucous secretion voided from the lungs, and to be the product of inflammation of the membrane of the bronchi, and not derived from the salivary glands, the question requires the confirmation of experiment; for although the salivary glands are not the seat of pain, swelling, &c., it by no means follows that their secreting process may not have been subject to some peculiar modification on which the production of the hydrophobic virus depended. Thus severe and obstinate ptyalisms often occur, and yet there is no manifest change in the state of the salivary glands. According to Swieten and Mead, "there are sometimes no morbid appearances either in the head, fauces, chest, or stomach."

The dissections of two rabid sheep have been lately given, and it is particularly noticed that in these animals the lungs were sound, a fact that is very repugnant to the hypothesis adopted by Trolliet.

In three cases out of six the lungs were found emphysematous, that is to say, their interlobular substance was distended with air, and the pleura covering the lungs raised into a great number of transparent vesicles on the surface of these organs. In a fourth instance the emphysema was not observed in the lungs themselves, but in the cellular substance between the two layers of the mediastinum and under the muscles of the neck.

Morgagni also noticed vesicles of air on the surface of the lungs of a person that died of hydrophobia; while Trolliet presumes that this emphysema is occasioned by the rupture of one of the air-cells in the convulsive efforts of respiration, as sometimes happens when a foreign body is lodged in the throat.

In all the six subjects dissected by Trolliet they were observed to be gorged with blood. Now with respect to the state of the organs of the circulation as described by this authority, in three cases a good deal of air escaped from the heart and aorta. Morgagni is supposed to be the only other

writer who has noticed a similar occurrence, and who also in another case saw air escape from beneath one of the coverings of the brain.

In two of Trolliet's cases some gelatinous clots were found in the heart and large vessels, but the great mass of blood was black, and very fluid in the heart, arteries, and veins, as in subjects who have died of asphyxia. In all the six cases traces of inflammation were noticed in the brain or its membranes. The sinuses were filled with dark fluid blood, and one of the coverings (the pia mater) was much injected, and of a brownish hue. The same appearances were found upon the brain matter, and the vessels at the termination of the spinal cord were considerably enlarged. The surface of the brain was also studded with scarlet spots, which appeared to arise from blood effused from the small vessels of the pia mater into its cellular substance. In two subjects blood was extravasated towards the base of the brain in larger quantities. The plexus choroides was gorged with blood of a brown colour. Besides these and other changes there was a thickening of the pia mater. The substance of the brain was softer than usual, but the fluid in the lateral ventricles was in small quantity, and in two cases had a bloody tinge. The late Dr. Marshall believed that in rabies the brain was the part principally affected. Dr. R. Reid believed than an alteration of the spinal marrow was essentially concerned in the disease.

In dogs Dr. Gillman found the pharynx and œsophagus in a state of inflammation. Dr. Ribes found the pharynx and soft palate slightly inflamed. It is also conjectured that in many of these instances the inflammation extended to the gullet from the windpipe and bronchi.

Inflammation of the mucous membrane of the stomach and small intestines has likewise been very generally noticed in dogs. However, according to Dr. Gillman, no vestige of inflammation or any other morbid appearances are discoverable on the examination of animals that have died of rabies. By

some the gall-bladder was found empty, the mucous coat of the stomach and bowels inflamed, and these organs much contracted.

From recent investigations made the following are the morbid appearances noticed in the dissection of dogs, horses, cows, and sheep destroyed by rabies :—

Firstly, The lungs and brain universally gorged with blood.

Secondly, Greater or lesser marks of inflammation in the mucous membranes of the bronchi, trachea, larynx, throat, œsophagus, stomach, and frequently even in that of the bowels, vagina, uterus, and bladder. Yet in two dissections more recently no particular changes were discoverable in the pharynx and œsophagus.

Thirdly, The air-passages filled with frothy mucus..

Fourthly, A collection of serum in the ventricles of the brain, and sometimes even between the membranes covering the spinal marrow ; and,

Fifthly, An unusual redness of the investment of the pneumogastric nerves.

Treatment.—Happily surgery possesses one tolerably certain means of preventing hydrophobia, when it is practised in time and in a complete manner.

Every reader will immediately conclude that the excision of the bitten parts is the operation to which I allude. Now it is absolutely necessary that the operation should be done completely ; for a timorous surgeon, afraid of cutting deep enough or of removing a sufficient quantity of the surrounding flesh, would be a most dangerous one for the patient. For it must be borne in mind that all hope of life depends on the prevention of the dreadful disease ; for, in the present state of medical knowledge, none can rest with the slightest security upon the efficacy of any plan except the extirpation of the part. For this purpose caustics have often been employed. However, as their action can never be regulated with the same precision as that of the knife, and consequently they may not destroy the flesh to a sufficient depth, excision

should always be preferred. The latter method is also the safest for another important reason, namely, the part, and poison lodged in it, are removed from the body at once and for ever; but when the cautery or caustic is used, the slough must remain a certain time undetached.

Some men are not content with cutting out the part, but after the operation fill the wound with the liquor ammoniæ, or cauterise its surface for the sake of greater security. This is an additional precaution greatly to be commended. How late excision may be done with any prospect of utility I am not prepared to say, but there are medical men who deem excision right even when heat, irritation, or inflammation is observed in the bitten part.

Cases may present themselves in which it is even preferable to amputate the limb than attempt to extirpate either with the knife or cauterise the whole of the bitten parts,—an endeavour which could not be accomplished with any degree of certainty. For example, if the hand or foot was deeply bitten in several places by a mad dog or other rabid animal, it is obvious that it would be impossible to make caustic or the actual cautery reach every part which the saliva of the animal may have touched. Besides, the mischief resulting both from the injury and the other proceedings together might be such as to afford no prospect of saving the limb, or at least of preserving it in a useful state.

Two cases occurred in which the patients lost their lives in consequence of the excision or destruction of the bitten parts not having been attempted, on account of the surgeon's reluctance to cut tendons or wound a large artery.

In such cases the fear of rendering a muscle useless or of wounding an artery is no justification for leaving the patient exposed to danger so surely fatal as that of the hydrophobic virus if it once affects the constitution. Now, when once the hydrophobic symptoms have commenced, there is no hope of saving the patient, the disease having up to the present

time invariably baffled every plan of treatment which the united talents of numerous medical generations have suggested.

All the most powerful medicines of every class have been tried again and again and again—mercury, opium, musk, camphor, belládonna, ammonia, bleeding, plunging the patient in the sea, &c.—but all have signally failed, and proved ineffectual to cope with this gigantic enemy.

The insufficiency of opium is now generally acknowledged. In the space of fourteen hours Dr. Vaughan gave one patient fifty-seven grains of opium and also half an ounce of laudanum in a glyster, but the fatal termination of the disease was not prevented. Dr. Babington even prescribed the enormous quantity of one hundred and eighty grains in eleven hours, without the least amendment, or even any narcotic effect.

Again, on the very first day that rabies decidedly showed itself, a man who had been bit by a mad dog had injected into his veins, by means of a syringe, two grains of the extract of opium dissolved in distilled water; and as a degree of calm appeared to be the result, four grains more were thrown into the vein. The patient remained perfectly tranquil three hours longer, but the symptoms afterwards recurred with increased violence. The next morning eight grains more were dissolved and thrown into the circulation, but all was in vain, as the patient died in three-quarters of an hour after the last injection. A solution of the acetate of morphia has been tried also, but without success.

As for belladonna, its employment for the prevention and cure of hydrophobia is very ancient. Its external use for this purpose has been mentioned by Pliny, and its internal, with the same view, as far back as the year 1696. In 1763 belladonna was recommended by Schmidt as a remedy for hydrophobia, and in 1779 by J. H. Munch. But as this remedy has so often failed, very little confidence is placed in it in this country. In Italy, however, it is still em-

ployed, as Brera certifies, where its exhibition in very powerful doses, in conjunction with the warm bath and mercurial friction, tends to show that it will sometimes arrest the disease in its incipient state.

A few years ago the public hope was raised by the accounts given of hydrochlorine. In fact, Wendelstadt even published the story of an Englishman who allowed himself to be bit several times by a mad dog, and then saved himself by washing the bites with this acid; and still more recently the Italian "Journal of Physic," &c., published some observations tending to prove its efficacy. The bites were covered with charpie, which was wet with the acid; and when the symptoms commence, if it can be swallowed in a fluid state, so much the better; if not, it must be given in bread-pills imbued with it. For a child eight years old the dose is ℈ ij. four or five times a day, but gradually increased.

Now, in order to give hydrochlorine a fair trial, it was used internally and externally on seven patients at Lyons. The bites were washed and bathed with it, and some of them also cauterised; each patient took one drachm of the acid made into an agreeable sweetened drink. Notwithstanding, all these unfortunate individuals afterwards died of rabies, although the treatment was begun the day after the wounds were inflicted.

The excision of the bite seventy hours after infliction and washing the wounds with oxymuriatic acid did not, in Dr. Johnson's case, prevent the disease.

In America, the plant *Scutellaria laterifolia* has been greatly extolled as a certain specific for hydrophobia, and Dr. Marochetti of Moscow has described a new treatment, which consists in giving large doses of genista tinctoria, or butcher's broom, and pricking with a lancet, and then cauterising with a hot needle some little pustules said by him to form at the orifice of the submaxillary glands between the third and ninth day from the period of the bite, the mouth being afterwards well washed out with the afore-

said decoction of broom. Magendie, West, and various English practitioners, however, have not been able to discern those pustules in the mouth, possibly in consequence of their having looked for them too late, that is, after the accession of the constitutional disorder. For it appears that another authority noticed such pustules in several patients, namely, Majistel of Saintes. Some arose on the sixth, others later, and the latest on the thirty-second day.

M. Villermé also observed a transparent pustule under the left side of the tongue, in the case of a female, on the eighth day from the bite. Now in relation to this part of the subject, it is worthy of notice that the vesicles were particularly sought for in two rabid sheep, but could not be found.

Another remedy, the prussic or hydrocyanic acid, has likewise been proposed, on account of its reputed anti-spasmodic properties; but experiments made with it on dogs furnish no results in favour of its being likely to prove useful in the present disorder.

Indeed, the following statement (if correct) leaves little hope that any effectual medicine for hydrophobia will ever be discovered:—"The most active substances, the most powerful narcotics (says M. Magendie), have no effect upon man or animals attacked with rabies. I do not merely speak of substances introduced into the stomach, and the operation of which may be prevented or diminished by so many circumstances. I speak of substances injected into the veins, and the effects of which must be equally prompt and energetic. For instance, I have several times introduced into the veins of rabid dogs very strong doses of opium (ten grains) without producing the least narcotic effect, while a single grain of the watery extract injected into the veins of a healthy dog immediately makes him fall asleep, and often continue so eight or ten hours. The same phenomena are remarked in our species. M. Dupuytren and I injected into the radial vein of a young man labouring under hydrophobia eight grains of the gummy extract of

opium without any apparent result. We have also seen mad dogs bear the introduction of prussic acid into their veins without an instant's remission in the progress of the disorder."

Magendie frequently noticed in his experiments that an artificial aqueous plethora manifestly enfeebles all the functions of the animals subjected to it, and especially those of the nervous system. Hence he was led to think that some benefit might arise from it in a case where the activity of the nervous system is at its greatest height. His idea received encouragement also from considering that, in hydrophobia, the patient takes no drink to replace the fluid separated from the circulation by the skin and pulmonary perspiration, and that after venesection the blood seems as if it hardly contained any serum (or water). The experiment was first tried on a rabid dog, from which a pound of blood was drawn, and then sixty ounces of water injected into the left jugular vein, about ten or twelve ounces of blood mixed with water, however, being purposely allowed to flow out during the latter part of the operation. The animal, which had previously been quite furious, now became tranquil; but five hours after it was attacked with difficulty of breathing, which ended fatally in half an hour.

He again tried the following experiment upon a man. He injected a Paris pint of heated water into the veins of the man's arm, who was labouring under hydrophobia in an advanced and violent form. Directly after the operation, the patient from being furious became tranquil; the pulse fell from one hundred and fifty to one hundred and twenty, then to one hundred, and in twenty minutes to eighty. The convulsive motions ceased, and the patient drank a glass of water without any difficulty. Notwithstanding a hæmorrhage from the bowels, he continued to improve till the fifth day, when he was seized with acute pain, accompanied by swelling of the wrists, knees, and elbows, and threatened with an extensive abscess of the leg, the conse-

quence of the lodgment in the foot of two pieces of lancets, broken in the attempt to bleed him while he was suffering violent paroxysms in a previous stage of the disorder. Despondency and mental agitation again came on, and he died on the ninth day after the experiment. On dissection the swelled joints were found filled with pus, the mucous membrane of a part of the small intestines reddened by the expansion of the veins, several small ulcerations in the large bowels, the blood in a decidedly putrified state, the heart and large vessels distended with gas, air under the peritoneal coat of the stomach and intestines, posterior part of the lungs a little swelled, windpipe sound, but the bronchi red. Magendie, therefore, considers this case on the whole very favourable to the practice; and when it is reflected that the patient underwent, directly after the experiment, a great and sudden change for the better, lived eight days after the injection, and then possibly died rather from accidental complaints, it must be acknowledged that the method seemed deserving of further trial. I would also particularly recommend its adoption in an earlier stage, and while the patient is less reduced than the one on whom the experiment was tried, and failed.

Galvanism has also been tried and found wanting. Again, the rapid and powerful effects of the bite of a viper on the whole system, and perhaps the idea that the operation of this animal's venom might counteract that of the hydrophobic virus, led some experimenters to try what would be the result of subjecting patients affected with rabies to the bite of that kind of snake. The project, however, was attended with no success. Three cases of this description were communicated to the Royal Society of Medicine. Other trials are also said to have been made in France and Germany with no better success.

Some facts which occurred in the East Indies tended for a time to raise an expectation that a copious abstraction of blood might be the means of preserving patients actually

attacked with this fatal disorder. "One medical tried (he says successfully) the method of taking away at once an immense quantity of blood; in fact, he bled him until scarcely a pulsation could be felt in either arm. Opium was afterwards given, and the patient salivated with mercury." Now it is to be regretted that fuller information was not given. For instance, we have no account of pain or changes in the bitten part at the first coming on of the indisposition. The early constitutional symptoms are not described, and the violent spasms, screamings, &c., are not mentioned. Some of these particulars would have been interesting. Dr. Shoolbred of Calcutta published a case cured by bleeding, and afterwards exhibiting calomel and opium. The patient being threatened with a relapse, was largely bled again. The whole of the success is imputed by Dr. Shoolbred to venesection. But he is not so sanguine as to believe that bleeding will cure every case of hydrophobia. It is probable that there is a period beyond which its curative effect cannot extend, and, therefore, it is upon the first appearance of unequivocal symptoms of the disease that he thinks copious bleeding will cure or afford a prospect of success, while the delay of only a few hours may prove fatal. He observes that the medical profession, taught by numerous disappointments, admit very cautiously the claims of any new practice to general adoption. If several patients in hydrophobia, therefore, should happen to be bled in an advanced stage of the disease, and died (as they inevitably would do, whether they had been bled or not), such cases would be quoted against the new practice as failures. But Dr. Shoolbred argues that numerous failures in an advanced stage of the disease can form no just ground for the rejection of a remedy which has effected a cure in an earlier stage. He insists upon the necessity of making a large orifice in the vein, so as to evacuate the blood quickly, which must be allowed to flow without regard to quantity.

He was well aware that bleeding had often been tried in

hydrophobia, "but," says he, "owing probably to the evacuation not having been pushed far enough when used in the early stage of the disease, or to the period of its beneficial employment having elapsed, the cases in which it was tried afforded little or no encouragement to the continuance of the practice.

Since the preceding cases, the effect of bleeding has had the fairest trial made of it, and it is now clearly demonstrated that it entirely fails in hindering the usual melancholy event. This unpleasant truth, I think, receives further confirmation from the fact that the practice is far from being new.

Dr. Mead, who was very confident that he had found an infallible preventive of the disease in a little *liverwort and black pepper* aided by bleeding and cold bathing before the commencement of the course of medicine, says: "As to all other ways of curing hydrophobia, I own I have not been so happy as to find any success from the many I have tried. Bathing is ineffectual. I have taken away large quantities of blood, have given opiates, volatile salts, &c. All has been in vain."

At Edinburgh sixty ounces of blood was taken away from a patient who had already been bled the same morning. The method was tried early in the disease; notwithstanding the patient lived only forty-eight hours. This is set down as a fair instance of the failure of the practice, while the trials that have been made in this country since the receipt of the news from India, I am sorry to say, have not confirmed its efficacy.

Early excision or amputation of the bitten parts, the application of cupping-glasses to the wound, or the removal of the atmospheric pressure, the injection of warm water into the veins in the early stages, are the plans which have most evidence in their favour. The investigations of Sir David Barry made the application of a cupping-glass to the wound inflicted by the bite of a rabid animal, or any other poisoned

wound, appear one of the most efficacious measures which can be adopted with the view of preventing the entrance of the poison into the system. The removal of the atmospheric pressure from the part not only has the effect of drawing the blood and a portion of the poison out of the orifice of the vessels, but suspends the function of absorption. Hence Sir David Barry was an advocate for the practice both before and after the excision of the wounded part.

It is not often, however, that one can immediately secure the services of a medical man; therefore a simple ligature above the injured part, if it is possible to apply it, should at once be resorted to. This will, if tied sufficiently tight, prevent the absorption of the poison until you can secure proper medical aid. Among the liquids that would be advisable to employ for the destruction of the virus, I would strongly suggest the free application of carbolic acid, because it possesses the power to destroy any germ that may be endowed with life at once and for ever; besides, there is a certain degree of certainty of it reaching the root of the injury.

According to Dr. Marochetti of Moscow, the existence of the hydrophobic poison in an individual is denoted by the appearance of two small tumours, one on each side of the prœnum of the tongue, within six weeks after the bite. As the tumours only continue twenty-four hours, they are to be looked for twice a day during this space of time. If they have disappeared without treatment, he represents the case as sure to end fatally. His plan, as already stated, is to open the tumours and cauterise them as soon as discovered. A lymph escapes which the patient is to spit out and then wash his mouth with a decoction of the tops and flowers of genista tinctoria. A pint and a half of this decoction is to be drunk daily for six weeks. Now, with reference to these tumours referred to by the above writer, they have often been sought for in Great Britain, but without success, so the proposal has gained no confidence.

Before I close this subject I may allude to a superstition that still exists among some of the uneducated inhabitants of East Kent, to the effect that there is an old woman residing at a place called Burling who possesses an extraordinary elixir that exercises the desired result, and cures all and sundry who partake of this infallible "Burling drink," as it is designated. My informant is a chemist, who has known many reputed instances where the imagination had led them into the belief that a cure for rabies rested with this old woman. This is another illustration of credulity that is often obstinate to contend with among the peasantry of our rural districts.

PART III.

FRACTURES.

THESE constitute so interesting a subject in connection with the ailments of the dog, that we are bound to bestow upon them earnest and due consideration; besides, the more scientific and successful views now entertained of the whole question, compared with those prevalent forty or fifty years ago, must be highly gratifying to every admirer of the incessant progress of science, surgery, and medicine towards perfection. Nor is this branch of surgery simply mechanical, or restricted to the consideration of bandages, splints, &c., but comprises questions and investigations not surpassed in respect of their scientific character by any other in the whole range of surgery which appertains to the canine species.

Nor are we without considerable difficulty so certain of ttaining ultimate success as our brethren in the sister profession, because they can place their patients almost always in the proper position, and enforce their maintaining it at their peril. But not so with ours; we cannot command the dog or any subject upon our sick-list to lie still and keep the position in which they are placed. Hence the great drawback to our surgical success.

Now so long as the process by which broken bones unite was less correctly understood, and while the symptoms characteristic of each patient or fracture had been less minutely traced than at the present time, this department of practice must have been conducted under great disadvantages. The several complications of fracture are also now more accurately comprehended and more judiciously considered. Bandages

are applied not for useless display, but to promote and fulfil some more desirable purpose, some indication which the circumstances of the accident truly require to be accomplished.

Let it therefore not be any longer supposed that the treatment of fractures is only a mechanical business, for whoever pretends to be capable of conducting it efficiently, without a due acquaintance with anatomy and pathology, and the principles on which inflammation, abscesses, gangrene, wounds, ulcers, and various febrile disturbances of the constitution should be treated, must absolutely be a simpleton or an impostor, for all these complications frequently accompany or follow fractures.

The Differences of Fractures.

The differences of fractures depend upon what bone is broken, what portion of it is fractured, the direction of the fracture, the respective position of the fragments, and lastly, upon circumstances accompanying the injury and making it simple, compound, or variously complicated.

Firstly, then, with respect to the bone affected. Sometimes it is one of the broad bones, such as the scapula or shoulder-blade, &c., sometimes it is a short bone; but far more commonly it is one of the long bones. The situation and functions of the broad bones render their fractures unfrequent.

Then, again, fractures of the short bones are still more unusual, because these bones, being nearly equal in their three dimensions, are capable of greater resistance, and are not often within the reach of external violence. Besides, most of them are little exposed to the operation of outward force by their situation of function. Hence, except when a paw is crushed, accidents to them are rare. But the long bones which serve as pillars of support to the dog are from the very nature of their functions particularly liable to fracture.

Secondly, with respect to the part of the bone broken. The long bones may be fractured at different points. Very often their middle portion is broken, and in this circumstance they generally break like a stick which has been bent beyond its extensibility by a force applied at each end of it. Sometimes the fracture occurs more or less near the extremities of the bone, which is always a very undesirable event. Lastly, the bone is sometimes broken in several places, and the injury may be produced by two different causes which operate successively, or simultaneously, upon the broken parts of the bone, or it may be occasioned by one single cause which acts at the same moment upon several points of it. Now these distinctions of fractures, be it remembered, are not mere scholastic refinements; they have a truly important influence over the prognosis and treatment of the case.

Thirdly, with respect to the direction in which the bone is broken. Thus fractures are distinguished into *transverse* and *oblique*. The obliquity renders the surface of the injury larger, and materially increases the difficulty of maintaining the ends of the bone in contact after the fracture has been set. Oblique fractures are subject to considerable variety, which depends upon the degree of their obliquity, and whether they are partly oblique and partly transverse.

When a bone is broken in different places at once and divided into several fragments or splinters, the fracture is termed *comminuted*.

Fourthly, with regard to the respective position of the fragments. These differences are highly important, because the treatment essentially consists in obviating or preventing the displacement of the fragments. It is not, however, to be supposed that such displacement is a constant effect of all fractures, for it seldom takes place where there are two bones and only one of them broken. But when both bones are broken there is generally more or less displacement, and

such is always the case where we have one of the long pillars broken.

Again, the displacement may happen in respect to the diameter, length, direction, or circumference of the bone.

With respect to the length. The mode of displacement in which the ends of the broken bone pass more or less over each other is chiefly noticed in oblique fractures, but sometimes in transverse ones, when the displacement in the direction of the diameter of the bone has been such that the surfaces of the fracture are no longer in contact. So whenever the limb is shortened, it is by displacement of the lower fragment.

With respect to the causes of displacement I may remark, that as the bones are only passive instruments of locomotion, they do not possess in their own organisation any power capable of causing the change of situation which takes place, but yield to the impulse of external bodies, the weight of the limb or part, and the action of the muscles.

The displacement may be produced by an external force, either at the moment when the fracture happens, and by the very action of the same cause as breaks the bone, or it may be caused by the weight of the body when the fracture precedes the fall, or lastly, it may be brought on by some other external force, acting on the fragments sooner or later after the occurrence of the injury.

The outward violence operates sometimes directly on the situation of the fracture, sometimes on parts more or less distant from it. In both cases, then, the action of the force is not confined to the production of the fracture, but is partly spent in causing a displacement of the fragments.

Again, the weight of the limb itself may produce displacement, according to the direction or circumference of the bone, as already detailed. The disturbance of the limb by the patient may sometimes alter the relative situation of the fragments and thus cause displacement.

But of all the causes of the displacement of fractures, the action of the muscles must always be taken into consideration; because amongst the muscles surrounding a fractured bone some are attached to it throughout its whole length and are equally connected with both fragments. Some arise from the bone above, and are inserted either into that which is articulated with the lower fragment or into the lower fragment itself. Lastly, others come from a point more or less distant, and terminate in the upper fragment.

Now, the muscles attached to both fragments perhaps contribute but little to the displacement. Still they may, however, draw them to the side on which they are situated, and thus change the direction of the limb. A most unfortunate sequel, especially if the dog is a valuable one.

Fifthly, with respect to circumstances with which fractures are accompanied. The most important division of fractures is into *simple* and *compound*.

By a *simple fracture* is meant a suddenly formed breach in the continuity of one or more bones, without any external wound, communicating internally with the fracture.

By a *compound fracture* is meant to signify the same sort of injury of a bone, or bones, with the following addition. That is, it is attended with a laceration of the integuments, which laceration may be produced by the protrusion of one or both ends of the fracture through the skin, or by a ball or other body which enters or otherwise wounds the soft parts, at the same moment that it breaks the bone.

Fractures are said to be *complicated* when they are attended with disease or accidents, which render the indications in the treatment more numerous, and require the employment of different remedies or the practice of sundry operations for the accomplishment of the cure.

Thus fractures may be *complicated* with severe degrees of contusion, wounds of the soft parts, injury of bloodvessels, a dislocation, or diseases and particular states of the con-

stitution—for example, rickets, cancer, or pregnancy in bitches, &c.

The Causes of Fractures

are divided into *Predisposing* and *Remote.*

In the first class are comprehended the situations and functions of the bones, the age of the patients and their diseases. Superficial bones are more easily fractured than those which are covered by a considerable quantity of soft parts, while the functions of some bones render them more liable to be fractured than others; for example, the bones of the leg.

Again, the gradual increase of the quantity of the phosphate of lime in the structure of the bones makes them brittle in proportion as years advance, so that in old age the proportion of the inorganised to the organised part is so great that the bones are fractured by the slightest causes. Therefore in puppies the animal and organised part bears a greater proportion to the earthy, and the bones, being consequently more elastic and flexible, are not so easily broken as in old age. Now several writers set down cold as a predisposing cause of fractures. This doctrine has originated from these injuries being more frequent in the winter time. But this is erroneous, since in cold countries these observations are contradicted and denied, both in man and the lower animals.

The remote cause of fractures is external force variously applied in falls, blows, kicks, &c.

Symptoms of Fractures.

Some of the symptoms of fracture are certainly ambiguous. The pain and inability to move the limb commonly enumerated may arise from a mere bruise, a dislocation, or other cause; but the crepitus, the separation, and inequalities of the ends of the fracture, when the bone is superficial, the change in the form of the limb, and the shortening of it are

circumstances communicating the most certain and definite information, and the crepitus in particular is the principal symptom to be depended upon, although this occasionally is attendant on dislocations, and arises from a change in the quality of the synovia or joint-oil.

The signs of fractures, however, are so exceedingly various, according to the bones which are the subject of injury, that it cannot be said that there is any one which is invariably present, and characteristically confined to them. The writers of systems usually notice loss of motion in the injured limb, deformity, swelling, tension, pain, &c., as forming the general diagnosis of fractures. However, it is easily comprehensible by any one acquainted with anatomy that numerous fractures cannot prevent the motion of the part, nor occasion outward deformity, and every one must know that though at first there may be pain in the situation of a fracture, no inflammation, swelling, and tension can take place till after a certain period. There may be, however, a swelling produced in the first instance by extravasation of blood, or by displacement of the ends of the bone.

When, therefore, a limb is broken, and the event is not manifest from the distortion of the part, it is proper to trace with the fingers the outlines of the suspected bone, and examine whether any inequality can be discovered along the anterior surface or along the edges. If it be the shoulder, trace the superficial course of the bone in the same attentive manner. Wherever any unusual pain occurs, or any unnatural irregularity appears, try if a grating or crepitus cannot be felt, on endeavouring to make one end of the suspected fracture rub against the other. In this manner you will, as a rule, arrive at a pretty accurate conclusion as to the exact seat of the injury.

Prognosis of Fractures.

The prognosis of fractures varies according to the kind of bone injured, what part of it is broken, the direction of

the breach of continuity, and what other mischief complicates the case. Fractures of bones which have many strong muscles inserted into them are more difficult of cure than those of other bones, which have not so many powers or levers attached to them capable of displacing the fragments.

A fracture of the middle part of a long bone is less dangerous than a similar injury near one of its joints, which may be followed by synovial inflammation and ultimate anchylosis of the joint.

Inflammation of a joint, brought on by fractures, is attended with more severe symptoms in proportion as the contusion has been more violent. In a fracture near an articulation it is to be observed also that common splints have little command over the short fragments, so that it is often difficult with them to prevent displacement, and with respect to transverse fractures of the neck of a long bone, though the possibility of the reunion of such cases *by means of bony matter* is no longer a disputed point. The cure is more commonly effected only by means of a fibrous ligamentous substance.

When a bone is fractured in several places the case is more serious, while the difficulty of cure is far greater.

Again, oblique fractures are more troublesome and difficult of cure than transverse ones, because an oblique surface does not resist the retraction of the lower portion of the broken bone; and consequently the ends of the fracture are kept duly applied to each other with difficulty.

Fractures complicated with violent contusions of the soft parts, or with a wound, rendering them *compound*, are much more dangerous than others free from such accidents. The bad symptoms which render compound fractures so dangerous are of many kinds, such as hemorrhage, violent and extensive inflammation, fever, &c., while the wound of a large artery may add considerably to the danger of a fracture.

Treatment of Fractures.

Now the treatment embraces three principal indications. The first is to reduce the pieces of bone into their natural situation; the second is to secure and keep them in this state; and the third is to prevent any unpleasant symptoms likely to arise, and to relieve them if they do come on.

The first indication is only applicable to cases attended with displacement, for when the fragments are not out of their relative position, you must strictly refrain from all avoidable disturbance of the limb. Your interference should then be limited to putting up the fracture, resisting the accession of unfavourable symptoms, and removing them, if possible, after they have taken place.

The means then employed for the reduction of fractures in general are chiefly three, namely:—*extension*, *counter-extension*, and *coaptation*, or setting.

Extension signifies the act of pulling the broken part in a direction from the trunk, with the view of bringing the ends of the fracture into their natural situation. Counter-extension implies the act of making extension in the opposite direction, in order to hinder the limb, or even the body of the patient, from being drawn along by the extending power, which would then be unavailing.

Now, it is rather difficult to lay down rules respecting the precise degree of force which should be used in making an extension, for it must necessarily vary in different cases, according to the species of displacement, and the number and power of the muscles concerned in producing it. In transverse fractures displaced only according to the diameter of the bone a very moderate extension suffices, as it is merely practised with a view of lessening the friction and pressure of the surfaces of the fracture against one another.

But whatever be the direction of the fracture when the fragments pass over each other, the extension and counter-extension should be such as to remove the shortening of the

limb and overcome the force of those muscles which, after all the attention has been paid to their relaxation, still oppose the reduction.

Now, extension ought never to be practised in a violent and sudden way, but in as gradual a manner as possible, the utmost care being taken not to shake or even move the limb any more than can be avoided, because when you extend a broken limb all at once violently you excite the muscles to strong spasmodic action, and there is some danger in lacerating them, for the reason that these fibres are not allowed the requisite time to yield to the force which elongates them. The extension is to begin, then, in the direction of the lower fragment, and be continued in that which is natural to the body of the bone.

In every case of fracture with displacement, as soon as the necessary extension has been made, you are now to endeavour to place the ends of the broken bone in their natural situation; this is termed coaptation, or setting. This operation is to be undertaken in different ways, according to the species of displacement, and you must execute it by acting upon the lower fragment, without applying your fingers to the fracture itself, in order to regulate the contact of the extremities of the bone. When, however, it is judged necessary for this purpose to touch the broken part itself, it should be done with the utmost gentleness, so as to avoid pressing the soft parts against the points and splinters of bone.

Although the reduction of fractures may in general be accomplished with tolerable facility, it sometimes happens that the first attempts fail. This is occasionally ascribable to the employment of too much force and too little management in making the extension, whereby the muscles are irritated, and act so powerfully that the design is completely frustrated. Here the grand means of success is putting the limb into such a position as will relax the most powerful muscles which oppose the reduction; but the next question is, Can you maintain it? Sometimes, however, the irri-

table and convulsive state of the muscles is not the effect of any wrong mode of proceeding, but arises from the alarm, pain, and injury caused by the accident itself, the comminuted state of the bone, the irritation, or the very oblique direction of the fissure. But supposing the bone cannot be made to lie well at first, it will easily be made to do so in the course of a few days, when the tendency to spasm has diminished, and the pain and first irritation have subsided. Only watch and regulate the position of the limb about this period, and the cure will be completed in the most satisfactory way.

Now, after the bones have been put into their natural position, time alone would complete their cure, were there not in the muscles a continual propensity to displace the ends of the fracture again. This is one of the most gigantic difficulties that beset the recovery in the horse, because in cases of fracture the muscles are affected with involuntary spasmodic action, by which the broken parts are again displaced. Hence the absolute necessity of fixing the broken limb so effectually that it may continue perfectly motionless during the whole time requisite for the union of the fracture. The means employed for the fulfilment of this indication are an advantageous position, quietude, starch bandages, splints, and various kinds of apparatus. These can be had recourse to in the dog with success, but in the horse and cow the best appliances are defeated. Regarding splints, they are generally made of pasteboard, wood, or some resisting kind of stuff, and are applied lengthways on the broken limb, in some cases three, in others four, for the more steady and quiet detention of the fracture. Over these, then, you apply a dry bandage, and over this again another starch one, always remembering to proceed right to the toes, so that the circulation might not be arrested at the extremity, for should this occur death of the foot would be the sequel; therefore it is important to bear this in mind.

That splints, properly made and judiciously applied, are very serviceable, is beyond all doubt, but their utility depends upon their size, and the manner in which they are applied.

The true and proper use of splints is to preserve steadiness in the whole limb, without compressing the fracture at all. By the former they become very assistant to the curative intention; by the latter they are very capable of causing pain and other inconvenience. At the same time they cannot, in the nature of things, contribute to the steadiness of the limb; therefore, in order to be of any real use at all, splints should reach above the knee, and below the fetlock. They should be so guarded with tow, rag, or cotton, that they should press only on the joints, and not at all on the fracture. By this they become really serviceable. But a short splint, which extends only a little above and a little below the fracture, and does not take in the two joints, is an absurdity, and, what is worse, it is a mischievous remedy; because, if we consider the principles on which the mechanical means operate usefully in the treatment of fractures, we shall find that they are various. For the most part they have this effect by holding the ends of the fracture steadily in contact, maintaining the proper length of the limb, and hindering motion, not only of the broken bone itself, but of the joints connected with it, without which object being fulfilled the fracture must always be liable to hurtful disturbance.

When a fracture is well set, the position of the part right, and the bandages and splints neither too tight nor too slack, the less the broken bone is moved, and the less the apparatus and dressings are disturbed, the better. Sometimes, however, you are obliged to take off the splints and undo the bandage in order to ascertain that the ends of the fracture lie in even contact. Were you to leave the splints or the starch bandages on the part too long, without ever being sure of this important point, you might find, when too late

for alteration, that the fracture was in a state of displacement, and the limb seriously deformed.

Now all fractures, however simple and well treated they may be, are constantly followed by weakness and stiffness of the limb. These unpleasant consequences are the greater the more violently the limb has been contused, the nearer the fracture is to a joint, and the longer the part has remained motionless and without exercise. Again, the stiffness always affects the inferior joint of the broken bone much more than the superior. For the relief of these effects of fractures it is customary (or at all events it ought to be) to employ friction, liniments, emollient applications, cold water, &c. Still, notwithstanding such remedies, the leg does not quickly recover its strength, but often continues weak for a long time, as evinced when in running the dog will carry the injured limb instead of putting it to the ground. The most effectual plans for the prevention of this state should therefore be resorted to early. These consist in exerting the joints nearest the fracture, causing slight motions as soon as the union is sufficiently advanced not to be in danger from this practice. A great deal of caution, however, is necessary in moving the part, therefore it is safer for the veterinary surgeon to superintend the business than leave it to others. One of the best proceedings also for the prevention of much weakness and stiffness in the limb after a fracture, is to discontinue the splints or tight bandages immediately the state of the callus will allow. The manner in which their pressure retards the circulation, and prevents the action of the muscles, is one of the principal causes of the stiffness of the limb, and consequently the sooner they can be safely left off, the sooner will the patient regain the free use of the limb.

Again, fractures are always attended with a certain degree of contusion, which is constantly more severe in cases where the violence has acted directly on the situation of the fracture. But such contusion can only be regarded as a

complication of the accident when it exists in so violent a degree as to demand a different treatment from that which is employed in simple fractures.

In this circumstance the splints and bandages should be applied rather slackly, and the latter ought to be wet with cold water. The next day the splints and bandages should be opened, a thing highly necessary to be observed, for where it has been neglected the limb has been known to mortify in consequence of the swelling having rendered the bandage too tight. In conclusion then, three local circumstances are necessary to obtain a firm callus without deformity. Firstly, the two fragments must be possessed of sufficient vascularity. Secondly, the surfaces of the fracture must correspond. Thirdly, they must be kept in a completely motionless state.

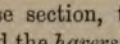
Composition of the Bones.

Before entering upon the diseases that are peculiar to bones, it will be advantageous to the reader to understand the structure and composition of the material that supports the weight of the animal, and protects the internal organs.

Bone, then, is composed of two distinct parts, namely, earthy and animal matter, in the following proportions:—

Phosphate of lime	51·04
Chloride of lime	2·00
Soda and chloride of sodium	1·20
Carbonate of lime	11·30
Carbonate of magnesia	1·16
Gelatine and fat	33·30
Total,	100·00

The earthy and animal matters are so completely blended together that they appear like a homogeneous mass. Such, however, is not the case, as they can be separated in the following manner. If you steep a bone in hydrochloric acid, you can dissolve out the earthy matter, and by burning

you leave the earthy matter, while you destroy the animal. These earthy salts are found in all animal structures. If you make a transverse section, thus  , in a bone, you find an opening called the *haversian canal*, which ramifies into the compact structure. Around these canals the osseous matter is deposited in layers or laminæ. Then, again, around these canals are spaces of an oval shape, termed lacunæ, or empty spaces. There are also numerous fine thread-like canals which run outwards from these haversian ones, and joining the lacunæ are termed *canaliculi*, or little canals. Inside of these are the true bone-cells, extending from the lacunæ to the haversian canal, which conveys the plasma of the blood, thereby affording nourishment to the whole bone.

Bones are covered with a material called *periosteum*, which is nothing more or less than fibrous tissue adhering firmly to the bone. This periosteum is the chief source of supply for the compact tissue. It is from its inner surface that the blood vessels pass into the cancellated tissue, while the bone also receives support from the nutrient arteries which traverse the internal canal, and then break up into fine plexuses of bloodvessels.

DISEASES OF THE BONES.

Rachitis, or Rickets.

When bones are deficient in earthy matter, we generally find rachitis present.

This disease, then, may even take place in the fœtus *in utero*, but the most common period is when the animals are young. It consists of a want of due firmness in the bones, in consequence of a deficiency in the phosphate of lime in their structure. The bones are lighter than natural, and of a red brown colour. They are penetrated by many enlarged vessels, being porous, and as it were spongy, soft, and compressible. They are moistened by a kind of sanies, which may be pressed

out of their texture, as out of a sponge, or rather a macerated hide after it has been tanned. The walls of the medullary cylinder of the great bones of the extremities are very thin. Then again, all the affected bones, especially the long ones, acquire a remarkable suppleness, but if they are bent beyond a certain point they break.

Again, many rickety and deformed pups improve as they grow up, and acquire strength. The deformity of their limbs spontaneously diminishes, and the bones gain a proper degree of firmness, a due quantity of the phosphate of lime being deposited in their texture. Though the bones may never acquire their right shape, they become exceedingly firm. Still, it is a question whether the restoration of the proper figure of the bones can be promoted by the constant pressure of bandages and other mechanical appliances.

Young animals are liable to attacks of the acute form, known as joint-ill. It affects the articulations, causing lameness, with swelling of the joints, more especially the knees. The inflammation increases, so does the lameness; suppuration sets in, and the result is an open joint. This form terminates fatally, as the patient wastes and dies in great agony.

Causes.—Insufficient supply of milk, and exposure to damp and cold; also where the water is soft and deficient in lime salts, one of the essential constituents of bone.

Treatment.—As the causes here are removable, you must attend to them, but with careful management you need hardly ever be troubled with the disease, as its prevention is easy and better than cure. In the chronic or sub-acute form, the shaft of the bone towards its extremities begins to bend. This will not happen until the animal is a few months old. Commence at once by giving an excess of lime water, with the best food and shelter you can command. Be careful that your kennels are kept dry. Put splints on the limbs; bandage up, but not too tight, just as if you were setting a broken bone, and the probability is, that it will again recover something like its former shape. Perseverance

should be maintained until the dog is say ten months old. But if at the expiration of this time there is no appreciable improvement, why then the pond or a dose of poison must terminate the unfortunate animal's existence. There are a few other bone diseases, but as they are of rare occurrence we take leave of the subject here and concentrate our attention upon

Caries.

This is a disease worthy of serious investigation—one, in fact, that we cannot lightly slip, because it is of great importance. It is a disease of the bones, supposed to be very analogous to ulceration of the soft parts. This comparison is one of great antiquity.

Now it must be borne in mind that the bones, like other parts of the body, are composed of vessels that are endued with vitality; they are nourished, they grow, they waste, and are repaired; they undergo various changes, and are subject to diseases analogous to those of the soft parts. To the phosphate of lime, which is more or less abundantly distributed in their texture, they owe all their solidity, and perhaps it is to the same inorganic substance that the difference in their vital properties and in their diseases from those of the rest of the body is to be referred. In fact, this particular organisation and inferior vitality of the bones are generally supposed to account for the small number, peculiar character, and usually slow progress of their diseases.

Bones of a spongy texture are more frequently attacked by caries than such as are compact. Hence the vertebræ and other bones, the knee, the pelvis, and the heads of the long bones are often affected, and the bones of young animals are unquestionably more frequently the seat of caries than those of old subjects. But although the soft and spongy bones are most subject to caries, they sometimes suffer a degree of injury sufficient to produce the death of a portion of their texture.

Now in necrosis the bone is entirely deprived of life. In caries the vital principle exists, but a morbid action is going on whereby the texture of the bone is altered, and rendered softer and lighter than natural. But although these disorders are essentially different from each other they often occur together in the same part.

In the most common species of caries a loose fungous flesh grows out of the interstices formed on the surface of the diseased bone, and bleeds from the slightest causes; while in the soft parts a sinus generally leads down to the caries, and emits a fetid, dark-coloured fluid. These symptoms, however, as well as the tendency in the accompanying ulcer or sinus to produce large fungous granulations, are more constant in cases of necrosis than in those of caries, some of which may remain a considerable time unattended with any outward sore, abscess, or sinus, as is illustrated in caries produced by various diseases of the joints, and indeed particular forms of caries (if they deserve that name) are rarely accompanied with suppuration.

"The absorption of bone, like that of soft parts," says Dr. Thomson, "may be distinguished into interstitial, progressive, and ulcerative." We have ample proofs of the interstitial absorption, or that which is daily and hourly taking place from every part of the substance of bone, in the deposition and removal of phosphate of lime that has been tinged with madder. If too much earth be removed, the quantity of animal matter will be relatively increased, and a disposition given to softness of the bones, a state which exists in the disease called rickets, which we have already noticed.

Again, hydatids in the brains of sheep, &c., are often the cause of the whole substance of the bone being removed layer after layer by progressive absorption, without the formation of a single particle of pus. This state of the bone has often been confounded, but improperly, with that state of the bone which arises from ulcerative absorption, the state which is properly denominated caries, and in which one

or more solutions of continuity may be produced upon the surface or in the substance of the bones.

In caries absorption is preceded by a change in the bone, which (with very few and doubtful exceptions) has a well-marked inflammatory character. The same condition exists during the progress of the absorption. There is further present an imperfect restorative action, which is shown in the more or less partial growth of unwholesome granulations from the ulcerated surface. Of these changes the inflamed condition of the bone is the primary and most important. The absorption is secondary and accidental.

Absorption may be prevented by subduing the inflammation, or may, after having begun, be arrested, and the crop of unwholesome granulations converted into a healthy restorative growth if the case is of such a nature as to allow of the suppression of the inflammatory or specific action.

Caries has been divided into several kinds, according to the nature of its causes.

Firstly, caries from external causes. Secondly, caries from constitutional disease. Besides local remedies, it is necessary to employ such medicines as are calculated to obviate the particular affection of the system whence the diseased state of the bone has originated.

If the situation of the bones, the nature of their organisation, and the slowness of their diseases, would let an attentive observer trace the formation, development, and progress of caries, no doubt there would be noticed a diversity in its symptoms corresponding to its different species, and probably it would be found that a scrofulous caries would vary in its origin and progress as much from a caries arising from a purely local cause as a scrofulous ulcer differs from the kind of ulceration that follows a common abscess.

The *worm-eaten* caries, as it has been termed, which penetrates the whole substance of a bone, and gives it the appearance as if it had been bored in hundreds of places, is a very different affection from some other forms of the

disease, whether superficial or extending to the deeper texture of the bone.

Around the carious part there is always a deposit of new osseous matter, in the form of tubercles, extending to a considerable distance, and greatly increasing the thickness of the bone. The new bone, on superficial inspection, appears rough and porous, the pores being for the transmission of bloodvessels. A carious bone, after maceration, looks as if it had been burned, being harder, whiter, and more brittle than usual, and always attended with more or less excavation, so as to expose the cellular structure. It resembles a piece of loaf sugar that has been partially dissolved by momentary immersion in hot water.

"Abscesses situated in the vicinity of bones are frequently thought to be the cause of caries and necrosis." This was the ancient doctrine, and it has found various advocates in modern times; hence the rule to open such abscesses at an early period in order to prevent the bone from being affected. When, therefore, caries is fairly established, and the integuments have given way, the indications point to the immediate removal of the bone, or the employment of means calculated to make it be thrown off by the constitution. The first indication is to be accomplished by the proper use of such instruments as trephines, perforators, saws, forceps, &c., for dividing or extracting, the second by cauteries; but in general a combination of both is required.

Necrosis.

This word, the strict meaning of which is only mortification, is by general consent confined to this affection of the bones. It was first used in this particular sense by the old writers, who restricted its application, however, to examples in which the whole thickness of a bone was destroyed. By the ancients, the death of parts of bones was not distinguished from caries; but necrosis and caries are essentially different, for in the first the affected part of the bone is

deprived of the vital principle, but this is not the case when it is simply carious. Caries, as I have already stated, is very analogous to ulceration, while necrosis closely resembles mortification of the soft parts.

Between caries and necrosis there is all that difference which exists between ulcers and gangrene, or sphacelus of the soft parts. In caries the nutrition of the bone is only impaired, and an irregular action disunites the elements of the bony structure, which consequently sustain a loss of substance; but every remaining part of it is yet alive. In necrosis, on the contrary, the vitality and nutritive functions cease altogether in a certain portion of the bone, the separation of which then becomes indispensable. It therefore follows that a true necrosis must always be said to exist whenever a dead portion of bone has either separated, or is about to separate. Lastly, necrosis may affect the long bones, or the broad, the large, or the small, and even those of the very least size.

Besides the differences arising from the particular bones affected, necrosis also varies, according as the portion of bone attacked happens to be thin and of little extent, or large and of considerable thickness. The disease is simple when it is confined to one bone, compound when several parts of the same bone or several distinct bones are affected at the same time, and when other parts of the body are also diseased. It should also be known, because the information is of practical importance in the treatment, that necrosis has three different stages or periods. In the first the bone affected perishes; in the second, the process of exfoliation or separation of the dead bone from the living is going on; and in the third, the separation is completed. The causes of necrosis are not essentially different from those which produce ulcers and gangrene of the soft parts. As, however, the vitality of the bones is weaker, we may infer that necrosis may be occasioned in them by causes which are less numerous and intense, and as such would only give rise to suppuration in the soft parts.

Everything, whether in the periosteum (that is, the covering of bone) or the substance of the bone itself, that tends to interrupt the nutrition of the bone, must be regarded as conducive to the origin of necrosis. It is observed, however, that when the mischief in the covering or substance of the bone is of a trivial extent the consequences may be merely an abscess.

Causes of Necrosis.

Some of the causes are *external*, while others are *internal* or constitutional. Sometimes the life of the bone is instantaneously destroyed by them; but in other instances, the bone is first stimulated, and its death is preceded by true inflammation. The external causes which injure the periosteum and medullary structure, and thus produce necrosis, are wounds, contusions, pressure, fractures, comminutions, acrid substances, caustics, extreme degrees of heat or cold.

When the outer covering of bone, in consequence of an external cause, inflames and sloughs, or is at once deprived of its vitality, as may be by the action of caustic, fire, or intense frost, the vessels which conveyed nourishment to the bone are destroyed, and as a result the death and exfoliation of the denuded portions of the bone are inevitable. But if the detachment of the periosteum (that is, the covering) is of little extent, the patient young and healthy, and the treatment calculated to prevent inflammation, and preserve uninjured the vessels distributed to the bone, hopes may be entertained that no part of the bone will die, but that granulations will very soon arise from its surface, being adherent to it as the periosteum was, and that they will grow too, and cicatrize with the surrounding parts.

On the other hand, when the detached piece of the periosteum is extensive, when the bone itself is contused, or when it has been long exposed to the air, when the inflammation is violent and extensive, when the patient is old and worthless, when the constitution is bad, and more

especially when improper applications are used, necrosis cannot be avoided.

Now the inflammation arising from the causes which excite necrosis may be *acute* or *chronic*. It is *chronic* when it begins and passes through its different stages slowly, and when the mildness of the symptoms may lead us to mistake the nature of the case. This sort of inflammation chiefly happens in debilitated constitutions, in which the necrosis only affects the external part of a bone, and originates from some chronic cause, such as scrofula, &c. But when necrosis attacks the interior, and the disease occurs in a strong, irritable, plethoric animal, inflammation is immediately kindled, attended with the most acute symptoms, severe pain, fever, restlessness, &c. Again, chronic inflammation is more supportable, but its duration is longer; acute inflammation is more afflicting, but sooner comes to a crisis.

The part in which a necrosis is situated is affected with swelling. What has been observed respecting the inflammation is also applicable to this tumour, which most frequently forms gradually, but sometimes with great rapidity. In the first case the accompanying pain is dull and inconsiderable, in the second it is violent. The swelling has not, like that of abscesses, an elevated apex. On the contrary, it is so widely diffused, that the limits which circumscribe it can hardly be distinguished. This diffusion of the swelling is the greater in proportion as the diseased bone is more deeply buried in soft parts; it may extend over the whole morbid bone, or even over the whole limb. Again, the swelling comes on at the very beginning of the disorder, and continues to increase until the matter which it contains finds its way out, when the evacuation is followed by a partial subsidence of the tumour.

When the inflammation is acute, purulent matter of good quality soon collects in the vicinity of the necrosis. In the contrary case, the pus forms slowly, and is thinner and less healthy.

The abscess which accompanies a necrosis naturally soon bursts when it arises from intense inflammation, and is situated near the skin, which is itself inflamed. But when the bone is surrounded by a great thickness of soft parts, and the inflammation is chronic, the quantity of matter daily increases, the cavity which it occupies becomes larger and larger, while considerable pressure is made by the abscess on every side. The bones and tendons resist for a long time the progress of the matter, but the cellular tissue yields, and different sinuses form, which sometimes run to a vast distance from the main collection of matter, especially when the abscess lies under a fascia.

Signs of Necrosis.

Let us next endeavour to trace the signs by which we may not only ascertain the presence of the disease, but its modifications.

In the first place, we should make ourselves acquainted with everything which may have predisposed to the disorder; as, for instance, what accidental circumstances have occurred, and what symptoms followed them. We should also inquire into any previous treatment which may have been adopted, because injudicious remedies have caused many a necrosis that would not have occurred at all, if the case had been properly treated, or even if Nature had been allowed to take its own course.

The kind of inflammation with which the disease commences may afford grounds for suspecting that necrosis will happen. It is generally slow and deeply seated, passing through its stages tardily, and the attendant symptoms are severe. The matter does not reach the skin till a considerable time has elapsed, and when the abscess bursts, the inflammatory symptoms are still slow in subsiding. When the inflammation is acute, the patient suffers intolerable pain a long time.

There are also other symptoms of necrosis, namely, the swelling which accompanies when the inflammation is situated

upon a bone, or rather the bone is included in the tumour. The swelling at the same time is very diffused, and the suppuration lies deeply, and can only be felt in an obscure way. Now none of the preceding symptoms convey such information as leaves no doubt of the positive existence of necrosis. The touch is the only reliable thing in the absence of seeing which can give us this knowledge when the bone is not too deeply situated, and the sinuses not tortuous, nor obstructed with fungous growths.

When the openings of the ulcers are considerable, the finger may be introduced. If in this way the bone can be felt to be extensively uncovered by the periosteum, you have just reason for concluding that all such portions of the bone have perished. And you will still be more certain of the fact when you find the edges of the bone unequal and rough. The examinations made with the finger give the most correct and exact information of the state of the bone; but the orifice of the sores are sometimes so small, that the finger cannot be introduced without causing great pain. A probe must then be used for the purpose of ascertaining the extent of the denudation of the bone, whether its edges are rough, whether the dead portion is loose, and likely to separate soon. It is also necessary to distinguish with the greatest attention the different stages of the disease.

The *first stage* may be considered as existing when the attack is yet recent, and the inflammation and its concomitant symptoms, the pain, swelling, and symptomatic fever, prevail in a high degree, and no suppuration has taken place, or at least no discharge of matter.

The *second stage*, in which the dead bone is undergoing the process of separation, is indicated by a diminution of the inflammation, a partial subsidence of the swelling, and the discharge of purulent matter. When a probe is passed into the ulcers, the bone is felt bare and dry, and towards the limits of the swelling it is rough, where, as will be afterwards noticed, an excavation is formed. Every part of

the bone, however, which is to be detached, still continues adherent to the rest of the living bone. At length, we know that the disease has reached the *last stage*, or that in which the dead portion of bone is entirely separated, when sufficient time for the completion of this separation has transpired, and when the dead bone can be distinguished with the finger, probe, or even the eye, to be loose and free from all connections.

When a portion of bone dies, Nature uses all her efforts to bring about the separation from the part of the bone that still remains alive. This process has been denominated *exfoliation*, which resembles the separation of the soft parts affected with sphacelus from the living. The exfoliation of bone, however, happens much more slowly than the separation of a slough. Again, exfoliations are not completed at any regular and fixed periods, for they proceed most quickly when the animal is young, when the system is usually more full of energy, the bones are more vascular, and less replete with solid, inorganic, earthy matter. On the other hand, the process is slower in old subjects, whose vitality is less active. A thin small scale of bone separates sooner than a large, thick portion, and the most tedious exfoliation is that of a thick bone from which a portion, including its entire diameter, is coming away. The separation of a necrosis takes place more expeditiously in bones of a light texture than in those of a solid structure, and sooner in the less compact parts of bones, such as the spongy substance, than in those of greater density. The separation occurs precisely at the different points where the living and dead parts of the bone come into contact, and it is obvious that the particles of the dead bone which are at a distance from the part that retains its vitality cannot be acted upon by it.

A variety of opinions have been entertained concerning the means employed by Nature in effecting this separation. Hippocrates believed that the dead part was pushed away by a fleshy substance which grew underneath it. And many others adopted the same idea. Another theory was, that

the dead part was forced away by the incessant beating of the arteries. Others supposed that the exfoliating piece of bone became loosened partly by the suppuration, and partly by the rising of new granulations.

Now when a piece of bone perishes, it is then with regard to the rest of the body completely an extraneous substance, and, as such, proves a source of irritation to the surface of the living bone, which becomes inflamed, and acquires increased vascularity.

The next stage of the process is the formation of a groove between the dead and living bone, the earthy matter of which is first taken away and then the animal substance. This has been often noticed in cases where the exfoliation of the end of a fracture was taking place. When it had just begun, the living bone immediately adjacent to the dead portion was found softened by absorption of its earthy particles, as if it had been immersed in diluted acid. A channel was soon formed in it, and as this became gradually deeper, the dead was separated from the living bone. As this groove grows deeper it is filled by granulations arising from the living bone, and hence, on separating a piece of necrosed bone, there is seen next to it, not the surface of the living bone, but the layer of very vascular granulations, by which it is completely covered, and whose soft velvety-like appearance one never forgets. And in correspondence with the granulations that have sprung up from the living bone, we have the well-known rough surface of the dead, with its multitude of prominences and excavations fitted to the granulations. In every one of its processes, therefore, the exfoliation of dead bone is but the repetition of that of the separation of a slough from soft parts. In both may be recognised—

Firstly, increased vascularity in the contiguous parts.

Secondly, the groove between the dead and the living parts.

Thirdly, the granulations from the surface exposed by the removal of the dead bone.

PART IV.

INFLAMMATION, &c.

THIS, as the term signifies, a setting on fire, is so alarming, that whenever the expression escapes the speaker's lips, the announcement is received by every one conversant with the ailments of the lower animals with the utmost concern and anxiety—such fears being unhappily justified by its extraordinary fatality, more especially when the disease is in the bowels and the surrounding coverings, and the animal a valuable one.

There are few diseases affecting the dog where more intense pain is endured. Fortunately, the issue is so rapid and incisive that death soon releases the sufferer.

Inflammation is itself the occasion of many conflicting disorders and diseases, the number of which might be reduced if they were understood in their early stage and properly treated. It follows every operation, and if it attain a high degree, frequently prevents a successful issue. Yet, notwithstanding this, in some cases the process is absolutely necessary for the cure, and hence the surgeon intentionally employs such means as are calculated to excite it.

By the term inflammation is generally understood the state of a part in which it is painful, hotter, redder, and more swollen and turgid than natural; which symptoms, when present in any considerable degree, or when they affect very sensible parts, are attended with fever, or a general disturbance of the system.

It is more easy, however, to explain the treatment than

to say what is the essence of inflammation, or what is a satisfactory definition of it. The solution of these problems is peculiarly difficult; for when we describe it as that form of disease which is characterised by pain, heat, redness, and swelling associated with fever and loss of function, this is only one view of the manner in which the affection presents itself, or, at most, only an enumeration of its appearances; and the questions, Where is the seat of the disorder? and, What is the cause of those appearances? remain to a certain extent unanswered.

The determination of these points is the more important and necessary because the appearances of inflammation are subject to great variety, because it is not every inflamed part that is red, and the pain is likewise attended with differences. Neither are these symptoms present in an equal degree, and one or the other may be entirely absent. Inflammation, therefore, is liable to numerous modifications according to the organisation of the parts affected, and yet the essence of the disorder is constantly the same. Therefore, in all the works already published, the account of the nature of inflammation is nothing more or less than a notice of its symptoms.

The susceptibility of the body for inflammation is of two kinds—the one original, constituting a part of the animal economy, and beyond the reach of human investigation; the other acquired from the influence of the climate, habits of life, and state of the constitution. The first kind of susceptibility being innate, cannot be diminished by art; the second may be lessened by the mere avoidance of the particular causes upon which it depends.

Inflammation may, with great propriety, be divided into *healthy* and *unhealthy*. Of the first there can only be one kind, though divisible into different stages; of the second there must be an infinite number of species, according to the peculiarities of different constitutions, and the nature of diseases, which are numberless.

Another general division is into common and specific inflammation, the latter term implying that the affection has some strongly marked particularity about it, rendering it in some degree independent of such circumstances as would control and regulate the progress of common inflammation. Such are, for example, *venereal*, *variolous*, *vaccine*, *erysipelatous*, and *rheumatic* inflammations.

Inflammation may be also divided into *acute* and *chronic*. This division of the subject is one of the most ancient, and seems to have obtained the sanction of all the best writers.

Healthy inflammation is invariably quick in its progress, for which reason it must always rank as an *active* species of the affection. However, there are numerous inflammations controlled by a diseased principle, which are also quick in their progress, and are therefore to be considered *acute*.

Chronic inflammation, which, in some of its forms, seems to be principally a perversion of the nutritive function of parts, or of the function of secretion from mucous surfaces, is always accompanied with diseased action.

Dr. James objects to the division of inflammation into the acute, sub-acute, or chronic. He says that in many instances these are merely different stages of the same disease. The arrangement into the *adhesive*, *suppurative*, *ulcerative*, or *gangrenous* inflammation he does not altogether approve, because it is merely founded on the modes in which either different, or, in some instances, the same kinds of inflammation terminate. Under the heads of *phlegmonous*, *erysipelatous*, and *gangrenous* inflammation, he argues that diseases of the most opposite nature have been indiscriminately brought together. The disposition to terminate in gangrene, he admits, will afford a basis for subdivision, but not for primary separation. He makes some judicious observations on the arrangement of the kinds of inflammation according to the elementary tissue in which they occur. The tissues in question are five, and the doctrine supposes that the inflammation of each is essentially different; the

first, phlegmonous inflammation, which affects the cellular membranes, including the parenchyma of the several viscera; the second, inflammation of serous membranes; the third, inflammation of mucous membranes; the fourth, which is named *erysipelatous*, is inflammation of the skin; and the fifth, termed rheumatic, belongs to fibrous structure. That inflammations differ materially from the circumstances of their affecting one of those elementary tissues rather than another, Dr. James freely admits; but he makes the following objection to this system:—

I. Different kinds of inflammation are liable to occur in the same tissue.

II. The same kind of inflammation is often met with in different tissues.

III. The same inflammation may be transferred from one to another—an argument, however, on which he lays less stress, as being difficult of direct proof.

Now, although difference of structure accounts for some of the varieties in the appearance and character of inflammation, it has been objected to as the foundation of a nosological arrangement, not only for reasons pointed out by Dr. James, but because the common distinctions of inflammation at present in vogue (and some of them at least are striking) cannot be solved by reference merely to texture. Nor did this theory satisfy Dr. Hunter, who observed, that if it were true, we should soon be made acquainted with all the different inflammations in the same patients, at the same time, and even in the same wound. For example, suppose we have a deep injury inflicted whereby the skin, the cellular membrane, muscle, tendon, periosteum, the covering of bone, bone and marrow is cut, the skin should give us inflammation, the cellular membrane inflammation of its kind, the muscle of its kind, and so on. But no; we find it the same inflammation in them all. However, although Dr. Hunter did not admit the possibility of referring the different kinds of inflammation to peculiarities of texture, his

doctrines assign to this cause considerable influence over every form of the disorder.

But, subsequently to the time of this distinguished man, a great deal has been made out in regard to the peculiarities and different course and effects of inflammation, as it presents itself in the various textures of the body. Even in its acute, and still more in its chronic form, inflammation frequently spreads extensively, lasts long, and produces decided lesions in one texture, without in the slightest affecting others in its immediate vicinity. Repeated observations upon subjects that have died from pleurisy, bronchitis, peritonitis, as well as of more external inflammation, leave no room for doubt upon this point. Formerly, the diagnosis of different inflammatory diseases seldom extended further than the organs chiefly affected, and the functions of which were deranged; but now we consider the texture primarily affected to be one of the most important objects of inquiry, and to be frequently within the reach of careful scrutiny. In no case is the truth of these illustrations more beautifully displayed than in the varieties of inflammation to which the eye is subject.

Dr. Alison says:—"Not only have the effects of inflammation in the various textures been ascertained by dissection, but the characteristic symptoms resulting during life from these consequences of inflammation in several parts of the body, not open to inspection, have been clearly pointed out. Thus the usual effects of inflammation of the pleura and bronchi may almost always be recognised and distinguished by percussion and auscultation."

The existence of inflammation of the mucous membrane of the great intestines in all cases of dysentery, and of inflammation of the same membrane of the small intestines in a certain class of cases of diarrhœa, the diagnosis of inflammation of this membrane from those of the peritoneum, its remarkable tendency to ulceration, its frequent (though by no means uniform) combination with inflammation of the

liver, with continued fever, and the indications of its degree and of its stage, to be drawn from the evacuated material, are very important additions to our knowledge of abdominal inflammations. Enough, then, I think, has been stated to prove the practical use of attending to the effects of inflammation, as determined by texture.

This mode of reasoning, adopted by Dr. James, leads him to propose:—

1. The division of inflammations into two great classes, according to their disposition, either to be limited by the effusion of organisable coagulable lymph, or to spread.

2. The orders are established on the principle of the degree of connection of the organs with the vital functions of the animal. Another cause which exerts a predominant influence over the character of the inflammation, acts invariably in the same degree, the constitutional sympathy being in proportion to the danger, the difficulty of resisting that danger, and of repairing the mischief done.

3. The genera are founded on the original disposition of inflammation to have particular modes of termination; for some inflammations tend to suppurate, others to slough, and others to resolve. And this disposition is so strong, that it is very difficult to procure any other termination.

It may happen, however, that there shall be more than one mode in which the inflammation is disposed to terminate, as in either resolution, suppuration, sphacelus, or ulceration. Dr. James conceives "that these general principles will perhaps afford a sufficient basis for such arrangement as shall be both natural and useful in its application to all kinds of common inflammation, rheumatism, and scrofula, having peculiarities which require them to be separated. Also with respect to inflammations arising from external injuries, as they are more simple in their nature, may take place in sound constitutions, and are accompanied with disorganisations which do not exist in other cases." But the same authority purposely excludes from his classification inflammations of the

organs of sense, and of the bones, the peculiarities in their structure and functions rendering them fit subjects for separate description. Dr. Hunter was well acquainted with the frequent usefulness of the adhesive inflammation in setting limits to disease. Yet he did not venture to refer the circumstances of every inflammation to this cause, or the spreading of the disorder entirely to its absence. Nor, indeed, does it seem essential that any cause should be assigned for the disposition of one class of inflammation to be limited, and of another to spread, the two facts themselves being sufficient for the basis of the division.

There is much foundation for believing that healthy inflammation is invariably a homogeneous process, obedient to ordinary principles, and that in similar structures, situations, and constitutions it uniformly assumes the same features. If experience reveals to us that *here* it is commonly productive of certain effects, and *there* of different ones, the same unbounded source of wisdom communicates to the mind a knowledge that there is some difference in the tone of the constitution, or in the structure or situation of the parts affected, assignable as the cause of this variety.

Some authors make the nature of the exciting cause one principal ground of the specific distinctions in inflammation; and with good reason, for they take into account the action of morbid poisons, and the qualities of disease in general.

In burns, for example, the inflammation is unquestionably attended with great peculiarity, requiring different treatment from that of common inflammation in general. But when the exciting cause is strictly mechanical, its violence and extent may cause differences in the degree and quantity of inflammation; but with respect to its quality, this must be accounted for by constitution or other circumstances.

It was Dr. Hunter's doctrine that parts which, from their vicinity to the source of the circulation, enjoy a vigorous circulation of blood through them, undergo inflammation more favourably, and resist disease better, than other parts of similar structure more remote from the heart. The lower

extremities are more liable to inflammation than parts about the chest. When inflamed they are longer in getting well, and the circumstances of their being depending parts, which retards the return of blood through the veins, must also increase their backwardness in any salutary process.

Common inflammation, when situated in highly organised and vascular parts, is generally more disposed to take a prosperous course, and is more governable by art than in parts of an opposite texture. Hence common inflammation of the skin, cellular tissue, muscles, &c., more frequently ends favourably than the same affection of bones, tendons, ligaments, &c.; but inflammation of vital parts, though they may be exceedingly vascular, is less likely to go on favourably than in other parts of resembling structure but of different functions, because the natural operations of universal health depend so much upon the sound condition of such organs.

Again, all new-formed parts, not constituting any portion of the original structure of the body, such as tumours, both of the encysted and sarcomatous kind, excrescences, &c., cannot endure the disturbance of inflammation long, nor in great degree. The vital powers of such parts are weak, and when irritated by the presence of inflammation, these adventitious substances are sometimes removed by the lymphatics, but more commonly mortify. This remark applies also to substances generated as substitutes for the original matter of the body; for instance, the substance of a *cicatrix*, or of callus. Now, the knowledge of this fact leads us to a rational principle of cure in the treatment of several diseases. It is, again, worthy of notice that inflammation always proceeds more favourably in strong than in weak constitutions; for where there is much strength there is little irritability. In weak constitutions the operations of inflammation are backward, notwithstanding the part in which it is situated, and may, comparatively speaking, possess considerable organisation and powers of life.

Healthy inflammation, wherever situated, is disposed to be

most violent on that side of the point of inflammation which is next to the external surface of the body. Take an illustration which will more explicitly express my meaning: When inflammation attacks the socket of a tooth, it prevails in the greatest degree, not at the inner side of the alveolary process, but towards the cheek.

We may observe the influence of this law in several diseases, but more particularly in gunshot wounds. Suppose a ball were to pass into the thigh, to within an inch of the opposite side of the limb, we should not find that inflammation would be excited along the track of the ball, but on the side next to the skin which had not been hurt; or, if a ball were to pass quite through a limb, and carry into the wound a piece of cloth, which lodged in the middle, equidistant from the two orifices, the skin immediately over the extraneous or foreign body would inflame, providing the passage of the ball was superficial.

We now notice three remarkable effects often following common inflammation; namely, adhesions of parts of the body to each other, the formation of pus, or suppuration, and ulceration, a process in which the lymphatics are sometimes thought to be more or less actively concerned than the bloodvessels. Hence Dr. Hunter termed the different stages of inflammation the *adhesive*, the *suppurative*, and the *ulcerative*. But all parts of the body are not equally liable to each of these consequences.

In the cellular textures, and in the circumscribed cavities, or those lined by a serous membrane, the adhesive stage takes place more readily than the others; suppuration may be said to follow next in order of frequency, and, lastly, ulceration. This statement must be received, however, with the understanding that the inflammation is healthy, and not excessive; for, when it is erysipelatous, carbuncular, or influenced by unfavourable conditions of the general health, or marked by violence of degree, no texture suffers injury and even destruction so frequently, or to so great an

extent, as the cellular tissue; and where it does not actually mortify under these circumstances, it becomes a frequent seat of abscesses and sinuses.

In internal canals, on the inner surface of the eyelids, nose, mouth, and trachea, in the air-cells of the lungs, in the œsophagus or gullet, stomach, intestines, pelvis of the kidney, ureters, bladder, urethra, and in all the ducts and outlets of the organs of secretion, being what are termed *mucous membranes*, the suppurative inflammation comes on more readily than either the adhesive or the ulcerative.

Adhesions which originate from the slightest degree of inflammation in other situations and structures, can only be produced by a violent kind in the above-mentioned parts. Ulceration is more frequently met with upon mucous surfaces than adhesions. Then again, the cellular tissue appears to be much more susceptible of the adhesive inflammation than the adipose, and much more readily passes into the suppurative. Thus we see the cellular tissue connecting the muscles together, and the adipose substance to the muscles, inflaming, suppurating, and the matter separating the muscles from their lateral connections, and even the fat from the muscles, while the latter substance and the skin are only highly inflamed. With respect to fat being inflamed, however, the expression is not strictly true, because fat has no vessels, principle of life, nor action of its own; consequently we cannot suppose that it can itself either inflame or suppurate. We know that it is itself a secretion, and when an abscess forms in it, we understand that the mode of action in the vessels naturally destined to deposit fat has been altered to that adapted to the formation of pus. When, therefore, the fat is said to be inflamed, it is only meant that the membranous cells in which it is contained, and by which it is secreted, are thus affected. The deeply situated parts of the body, more especially the vital, readily admit of the adhesive stage of inflammation.

The circumstance of deeply-seated parts not so readily

taking on the suppurative stage of inflammation as the superficial ones do, is strikingly illustrated in cases of smooth extraneous bodies, which, if deeply lodged, only produce the adhesive inflammation. By this process a cyst or sac is formed, in which they lie without much inconvenience, and they may even gradually change their situation without disturbing the parts through which they pass; but no sooner do these same bodies approach the skin, than abscesses form immediately.

Now, all inflammations attended with disease partake of some specific quality, from which simple inflammation is entirely free. When the constitution allows the true adhesive and suppurative stages to occur, it is to be regarded as the most healthy; for were it in an opposite state, we should see the very same irritation excite some other kind of inflammation, such as the erysipelatous, scrofulous, &c.

In specific inflammations, the position, structure, and distance of the part affected from the source of the circulation, as well as from the surface of the body, seem also to have much influence. Let us now proceed to discuss the symptoms, nature, and causes of inflammation.

Redness, swelling, heat, pain, and loss of function are the five principal symptoms of phlegmonous inflammation. If we refer to any writer on this interesting subject, we shall find the above symptoms enumerated as characterising phlegmon (or healthy inflammation); in short, this term is usually applied to a circumscribed tumour, attended with heat, redness, tension, and a throbbing pain. These are the appearances first observed; and when they are slight, and inflammation is of no great extent, they have commonly very little, and sometimes no apparent influence on the general system. But when they are more considerable, and the inflammation becomes extensive, a full, quick, and generally a hard pulse takes place, and the patient at the same time evinces universal heat, thirst, and other symptoms of fever, while the inflamed part becomes red, painful, and

swollen, and its functions are also impaired. The same degree of inflammation produces more swelling in soft parts, and less in those of a harder structure, while of textures naturally transparent, inflammation usually produces opacity.

Most commonly it thickens parts and renders them more solid, but in certain instances it may occasion the opposite effect, a softening of them, as in the brain and *medulla spinalis*. The softening of some textures is regarded by Professor Carswell as a variety of gangrene.

In discussing inflammation it is necessary to remember the febrile disturbance of the constitution. I will therefore now offer a few particulars upon the subject.

Fever.

The fever about to be described to the reader is known and distinguished by several names, some calling it *inflammatory*, some *symptomatic*, and others *sympathetic*. It is also supposed by some to be idiopathic, that is, to originate at the same time with the local inflammation, and from the same causes. But in other instances, and, indeed, we may say in all ordinary cases, it is produced not directly by the causes which originally produced the inflammation, but in consequence of the sympathy of the whole constitution with the disturbed state of a part.

Now, some authorities consider constitutional irritation to be of two kinds, namely, direct and reflected, by which is implied that the first is wholly and immediately derived from the part, commences and is identified with the local mischief, and the constitution has no share in its production. The second, on the contrary, originates in a peculiar morbid state of the constitution to which the injury or inflammation has given birth, or it may be previously existing.

The first is truly symptomatic, never originating spontaneously; and being immediately induced by the local irritation, is capable of being essentially mitigated or arrested by its removal.

The second is occasionally purely idiopathic, and, being oftener the cause than the effect of the local action, is seldom influenced by the local treatment. In the first the local changes are dependent on local causes, in the second they depend on constitutional causes.

As the expression "reflected irritation," if understood in the literal sense, involves the reader in a hypothesis which is, perhaps, not correct, I do not see the advantage in the employment of it. However, used figuratively, it may be as allowable as many other expressions in medical language.

Idiopathic inflammatory fever is said to be always preceded by chilliness. The symptomatic or sympathetic inflammatory fever sometimes takes place so quickly, in consequence of the violence of the exciting cause or of the local inflammation, that no preceding coldness is observable. If, however, the local inflammation be more slowly induced, and consequently operates more gradually on the system, then the coldness is evidently perceived. The symptomatic fever induced by scalding or burning a part is quickly produced, and we have very little time to attend to the earliest period of its formation. On the other hand, the symptomatic fever induced by wounds is excited more slowly, and the period of its formation is longer. This fever is not produced when the inflammation only affects parts in a slight degree, but it makes its appearance if the local inflammation be considerable, or if it affects very sensible parts.

Now, the degree in which the symptomatic fever is excited does not altogether depend upon the absolute quantity or violence of the inflammation, but in a great measure upon the degree of the local inflammatory action compared with the natural power and action of the part affected. Then, again, parts in which the action is naturally low are extremely painful when inflamed, and the system sympathises greatly with them. Hence, the constitution is very much affected when tendons, bones, or ligaments are the parts inflamed.

Severe inflammation of a large joint, every one knows, is apt to excite the most alarming symptoms, and even fatal derangement of the system; and when very sensible parts are inflamed, as, for instance, the eye, the symptomatic fever is generally more considerable than it would be were it to arise from an equal quantity and degree of inflammation in a less sensitive organ.

In common parts, such as muscles, cellular membrane, skin, &c., the symptoms will be acute, the pulse strong and full, and the more so if the inflammation be near the heart, but perhaps not so quick as when the part is far from it; the stomach will sympathise less, and the blood will be pushed farther into the small vessels. But, on the other hand, if the inflammation be in tendinous, ligamentous, or bony parts, the symptoms will be less acute, the stomach will sympathise more, the pulse will not be so full, but perhaps quicker, there will be more irritability, and the blood, not being propelled so well into the small vessels, will forsake the skin.

It seems to be a material circumstance whether the inflammation be situated far from or near the heart; for the symptoms are more violent, the constitution more affected, and the power of recovery less when the part inflamed is far from the source of the circulation than when near it, even where the parts are similar both in texture and use.

Should the heart or lungs be inflamed either immediately or secondarily by sympathy, the disease has more violent effects upon the constitution than the same quantity of inflammation would, if the part affected were not a vital one, or one with which the vital parts did not sympathise. If the part be such as the vital ones readily sympathise with, then the sympathetic action of the latter will affect the constitution, as in inflammation of the urinary organs. In such cases the pulse is much quicker than if the inflammation were in a common part, such as muscles, cellular tissue, and skin.

We may, therefore, set down the ordinary symptoms of

inflammatory fever, occurring in consequence of local inflammation in common parts, and in a healthy habit, as follows:—The pulse is frequent, full, and strong, all the secretions are diminished, the patient is vigilant and restless, the skin is hot and dry, the urine is high-coloured, an oppressive thirst is present, with general disturbance of the nervous system, loss of appetite, and, in some cases, unconsciousness.

Now allow me to observe here, that inflammation of small extent, particularly if not affecting organs of great importance in the economy, frequently commence, run their course, and terminate, without the action of the heart being in the least implicated. In Dr. Hunter's language, "the constitution does not sympathise with this minor degree of inflammation." Hence, since the action of the heart is not increased except when a considerable extent of inflammation exists, or, I would add, a more limited inflammation of highly important and sensible organs, the increased action of the heart cannot be regarded as a necessary constituent of inflammation. Consequently, no argument in favour of an increased action of the heart, or of the larger vessels, as causes of inflammation, drawn from extensive inflammations in which the heart is affected secondarily, can apply to those which are circumscribed and small, and during the whole course of which the heart may not beat even once oftener in a minute than it did before the local disease existed.

Again, though the redness, swelling, throbbing, tension, and other symptoms of inflammation are less manifest when the affection is deeply seated, yet their existence is undoubted. When an animal dies from inflammation of the lungs, the air-cells of these organs are found crowded with a larger number of turgid bloodvessels than in the healthy state, and, of course, the parts must appear preternaturally red. Coagulating lymph, or a mixture of fibrine and serum, and even blood, are extravasated in the substance of these viscera, which become heavier, and feel more solid.

The extravasation of coagulating lymph, which is one of the chief causes of the swelling, is also one of the most characteristic signs of phlegmonous inflammation.

Some writers restrict the seat of phlegmon to the cellular tissue; but this is erroneous, for, had they duly discriminated the nature of common inflammation, they would have allowed that this affection existed wherever the capillaries (or smallest vessels) appeared to be more numerous and enlarged than in the natural state, accompanied with an effusion of coagulating lymph, whether upon the surface of a membrane or a bone, or in the interstices of the cellular substance, and attended with acute pain and a throbbing pulsation in the part.

As Dr. Thompson has observed, the epithet *remote*, as applied to the causes of inflammation, does not appear to be happily chosen, for under this term are comprehended all those agents, events, and states which contribute immediately, as well as remotely, directly as well as indirectly, to the production of the affection.

The remote causes of inflammation are infinite in number, but easy of comprehension, because divisible into two general classes. The first includes all such agents as operate by their stimulant or chemical qualities; for example, cantharides, heat, the action of concentrated acids, alkalies, metallic oxides, and metallic salts, acrid vapours, gases, alcohol, animal poisons, &c.

The second class of causes are those which act mechanically, such as bruises, wounds, pressure, friction, &c.

The principle on which the application of cold to a part becomes the remote cause of inflammation is rather difficult to explain. "No subject," says a distinguished professor, "is more deserving of investigation than the effects which are produced in the body by the operation of cold applied to its surface; but the subject is at the same time exceedingly extensive, complicated, and difficult. These effects differ according to the degree in which the cold is applied, and

the mode of its application. So diversified, indeed, are these effects, that it requires no mean confidence in theoretical reasoning to believe that the operation of cold in producing them is explicable upon any single general principle."

The operation of cold upon the body affords the best example I can suggest of the production of inflammation from the operation of a power acting upon a part at a distance from that in which the inflammation takes place, such as inflammation of the organs situated within the chest and abdomen.

Again, in some instances cold, or a diminution of temperature, seems to act more directly upon the parts with which it comes in contact, familiar examples being witnessed in the inflammation of the mucous membranes of the nose, trachea or windpipe, bronchiæ, &c., from the inhalation of cold air, and in the production of rheumatic inflammation from the exposure of the body to cold.

From these facts it will be observed that the application of cold seems to have somewhat of a directly exciting effect, and perhaps the same remark is still more applicable to the local effects of cold in the production of inflammation which is usually denominated frost-bite. Touching a solid body, as a piece of metal, the temperature of which has been greatly reduced, or a piece of ice, produces a sensation like that of burning, and may be followed, like the application of a fire, by a blister.

Numerous opinions have been entertained and promulgated respecting the *proximate cause of inflammation*, but almost every theory has been built upon the supposition of some kind of obstruction in the inflamed part.

While the circulation of the blood was unknown, the opinion prevailed that the liver was the centre of the vascular system, from which the blood went forth by day to the extremities, and returned at night. If, then, any peccant matter irritated the liver, the blood was sent out more forcibly;

and if, at the same time, any part of the body were weakened, or otherwise disposed to receive a greater quantity of fluid than the rest, then a swelling was produced by the flow of humours to this place. Fluxions, or flows of humour to a part, might happen either from weakness of it, which allowed the humours to enter more abundantly, or from its attracting the humours in consequence of the application of heat or other agents.

But from the theories of fluxion and congestion, which were quite incompatible with the laws of the circulation of the blood, we will turn our attention to the doctrine of

Obstruction.

Boerhaave entertained the theory that inflammation was caused by an impediment to the free circulation of the blood in the minute vessels; and this obstruction, he supposed, might be caused by heat, diarrhœa, too copious flow of urine, and sweat, or whatever could dissipate the thinner parts of the blood, and produce a thickness or viscidity of that fluid. He imagined that the larger globules of the blood passed into the small vessels, and thus plugged them up.

This theory of obstruction was too circumscribed and too mechanical; it reduced all inflammations to one species; the only distinctions which could have arisen must have proceeded from the nature of the obstruction itself; and it was a doctrine that never could account for the action of many specific diseases and morbid poisons.

The decided impossibility of giving a rational explanation of the immediate cause of inflammation by any supposed state of the blood alone, led pathologists to investigate how far a change in the bloodvessels themselves might account for the process, to explain the various facts and experiments in support of the opinion that the arterial tubes, and especially the capillaries, possess a high degree of vital contractibility, whereby the motion of the fluids in them, the process of secretion, and other local phenomena, may be importantly

affected, in a manner not at all explicable by reference only to the action and power of the heart.

The bloodvessels through every part of the system are commonly believed to possess a considerable share of irritability, by which they contract and propel forwards their contents. Hence the blood, by the action of the vessels, receives a new impulse in the most minute tubes, and a well-regulated momentum is preserved in every part of its course. But of all parts of the sanguiferous system the capillaries seem most eminently endowed with this facility, and are least indebted to the presiding influence of the heart. Yet even in these vessels the action of the heart is of high importance in sustaining the healthy circulation, inasmuch as it gives the first impulse to the blood, and preserves the harmony of the system.

The vessels, then, are endowed with this vital property in order that each organ of the body may receive such a supply of blood as will enable it to exercise its functions in the manner due. Hence, a healthy state of this property is absolutely necessary for the preservation of the animal functions; for if the vital contraction of the bloodvessels be either increased or diminished, irregular distribution of the blood inevitably follows, and from this source numerous diseases arise, and none more frequently than inflammation. Such was the doctrine favoured by Dr. Hastings, but I am not prepared to join in the opinion that inflammation is ever produced simply by an inequality in the distribution of the blood.

Dr. Cullen attributed the proximate cause of inflammation to a "spasm of the extreme arteries supporting an increased action in the course of them." This theory only differs from that of Boerhaave in the cause which is assigned for the obstruction, for he says again :—

"A spasm of the extreme arteries supporting an increased action in the course of them, may therefore be considered as the proximate cause of inflammation, at least in all cases

not arising from direct stimuli applied, and even in this case the stimuli may be supposed to produce a spasm of the extreme vessels."

Let us now notice the celebrated and very original opinions promulgated on this subject by Dr. Hunter.

According to this authority, "inflammation is to be considered only as a disturbed state of parts which require a new but salutary mode of action to restore them to that state wherein a natural mode of action alone is necessary." Again, the same authority remarks:—"The act of inflammation is to be considered as an increased action of the vessels, which at first consists simply in an increase or distension beyond their natural size." This increase seems to depend upon a diminution of the muscular power of the vessels; at the same time the elastic power of the artery must be dilated in the same proportion. This is, therefore, something more than simply a common relaxation. We must suppose it an action in the parts to produce an increase of size for particular purposes, and this Dr. Hunter would call *an act of dilatation*. The whole is to be considered as a necessary operation of nature. Owing to this dilatation there is a greater quantity of blood circulating in the part, which is according to the common rules of the animal economy; for whenever a part has more to do than simply to support itself, the blood is there collected in large quantity. The swelling is produced by an extravasation of coagulable lymph, with some serum, but this lymph differs from the common lymph in consequence of passing through inflamed vessels. It is this lymph that becomes the uniting medium of inflamed parts, vessels shoot into it, and it has even the power of becoming vascular itself. The pain proceeds from spasm. The redness is produced either by the arteries being more dilated than the veins, or because the blood is not changed in the veins.

As the vessels become larger, and the part becomes more of the colour of blood, it is to be supposed that there is more

blood in the part, and as the true inflammatory colour is scarlet, or that colour which the blood has when in the arteries, one would conclude either that the arteries were principally dilated, or, at least, if the veins are equally distended, that the blood undergoes no change in such inflammation in its passage from the arteries into the veins (which Dr. Hunter thought most probably the case). When a part cannot be restored to health after injury by inflammation alone, or by adhesion, then suppuration, as a preparatory step to the formation of granulations, and the consequent restoration of the part, takes place. The vessels are nearly in the same state as in inflammation, but they are more quiescent, and have acquired a new mode of action.

Now, with respect to this theory, which has deservedly had vast influence in regulating the judgment of professional men on the nature of the process called inflammation, it cannot be received in the present state of knowledge without some limitation. The hypothesis that the bloodvessels possess an active power of dilatation, independently of their elasticity, must as yet be regarded as devoid of proof, and, therefore, should not be assumed as a basis on which any theory of inflammation can be founded; and as a writer has truthfully remarked, "How different would have been Dr. Hunter's inferences if, instead of trusting to the unassisted eye, he had viewed the inflamed vessels through a microscope." He would then have seen the blood moving, and, instead of its passage being quickened in the inflamed parts or vessels, he would have found it uniformly rendered slower in proportion to the degree of inflammation, and in the most inflamed parts *stasis*, or complete stagnation, being the result.

In modern times, the vague but convenient expression "increased action of the vessels," has been very generally used as an adequate expression of the proximate cause of inflammation. The doctrine, it is said, derives support from a review of the several exciting causes of inflammation, which,

being in general of an irritating nature, must, when applied to any living or sensible parts, occasion such increased action of the vessels, while the method of cure also tends to confirm the opinion. But before one can judge whether this doctrine is correct, and supported by facts and observations, it is necessary to understand precisely what is implied by increased action of vessels; for it is not every affection of the vessels, capable of being thus denominated, which will of itself constitute inflammation. For example, during gestation the arteries of the womb are enlarged, and a greater quantity of blood is sent into them, yet this organ is not inflamed. Other examples may be cited, but for all practical purposes the one already given is sufficient. If, then, the proximate cause of inflammation is to be called an increased action of the vessels, we must first be informed not only what is meant by the term, but what particular vessels are spoken of, whether the arterial trunks, branches, or capillaries; because, if the phrase is intended to signify increased alternate expansions and contractions of all the arteries of the inflamed part, it is a hypothesis entirely destitute of foundation; or if it be meant to denote an increased velocity of the motion of the blood in the part affected, the doctrine is rather contradicted than confirmed by the latest and most carefully instituted microscopical experiments. But if the expression refers only to the dilated state of the capillaries, the throbbing of the arteries leading to the seat of inflammation, the effusion of lymph, &c., less fault can be found with the language, though yet requiring much further explanation ere it can communicate any precise information.

"There are," says a learned professor, "two suppositions which at present divide the opinion of pathologists respecting the state of the capillary vessels affected with inflammation. According to the first of these suppositions, the inflamed vessels are in a state of increased action. According to the second, they act with less force than the trunks from which they are derived." The first of these opinions,

according to Dr. Thomson, was suggested by the views which Stahl took of the animal economy, and his ideas respecting the tonic or vital action of the capillary vessels. The doctrine, however, was more particularly insisted upon by his disciples and followers, especially Dr. Garter, who, in one place, expressly states, "that the proximate cause of inflammation consists in an increased vital action of some particular artery or arteries, by which the blood is propelled with greater force than usual into the communicating lymphatic and colourless vessels." Again Dr. Thomson says: "There are certain points in which the two doctrines agree, as well as others in which they differ."

The advocates for each hypothesis agree in admitting; First, that inflammation has its seat in the capillary vessels; and second, that the redness in inflammation is owing to an unusual quantity of blood in the vessels of the inflamed part, and consequently that the capillary arteries are much dilated during the state of inflammation. The contractions of these vessels, indeed, it has been said, are increased also in a ratio proportional to the dilations, but this is an assertion which has not yet been proved, either in the way of experiment or of observation.

The sense of throbbing which the advocates for the hypothesis of increased capillary action regard as the strongest proof of that action, are disposed to attribute it to the difficulty which the blood meets with in passing from the trunk to the capillary branches. This sensation of throbbing and appearance of increased action may be produced in an instant by tying a cord round an uninflamed finger, so as to obstruct the motion of the blood through it; besides, this throbbing, or pulsatory motion, can afford us no criterion by which to judge of the force with which the arteries contract, for it is produced by the dilations also, and by a power foreign to the artery itself.

Dr. Philip gives the following definition, namely: "Inflammation seems to consist in the debility of the capillaries,

followed by an increased action of the larger arteries, and is terminated by resolution when the capillaries are so far excited, and the larger arteries so far weakened by the preternatural action of the latter, that the power of the capillaries is again in due proportion to the *vis à tergo.*" "Thus far," says the same writer, "I cannot help thinking the nature of inflammation appears sufficiently evident. The motion of the blood is retarded in the capillaries in consequence of the debility induced in them; an unusual obstacle is thus opposed to its motion in the arteries preceding them in the course of the circulation, which are thus excited to increased action."

But it must be remembered that several difficulties remain, upon which experiments throw no light. For why does a failure of power of small extent in the capillaries of a vital part strongly excite, not only the larger arteries of the part affected, but those of the whole system, while a more extensive debility of the capillaries of an external part excites less increased action in the larger arteries of that part, and often none at all in those of the system in general?

Why does inflammation often move suddenly from one part to another, when we see no cause either increasing the action of the capillaries of the inflamed part, or weakening those of the part now affected? Why does inflammation often arise in parts only sympathetically affected, and consequently far removed from the offending cause? Why is inflammation often apt to spread to neighbouring parts, between which and the part first affected there is no direct communication of vessels, as to parts in continuation with that part?

These phenomena, it is evident, are referable to the agency of the nervous system, and seem readily explained by experiments, which prove that the effects of both stimuli and sedatives, acting through the system, are felt by the vessels, and that independently of the intervention of any effect produced by the heart. Thus the irritation of the

nerves of an inflamed part may excite the larger arteries of this part, or of distant parts, or of the whole sanguiferous system. It will, of course, be most apt to do so where the irritation excited by the inflammation is greatest, and consequently in the more important vital parts. It cannot appear surprising that inflammation should suddenly cease in one part and attack another, when we know that the nerves are capable of exciting to due action the capillaries of the one part, and in the other of impairing the vigour of those which have not suffered. In the same way we account for parts only sympathetically affected becoming inflamed, and for inflammation readily spreading to neighbouring parts, which always sympathise, although there is no direct communication between them, either of vessels or nerves.

Now in order to reconcile this difference, Dr. Hastings' investigations with the microscope brought him to the following conclusions: "That certain stimuli, applied to living parts, produce an increased velocity of the blood's motion, and a contraction of the blood-vessels. During this state of excitement, the part affected is so far from giving anything like the appearances of inflammation that the size of the vessels is diminished and the part paler. But if the stimulus be long continued, or increased in power, the small vessels which, in the natural state, admit only of one series of globules, become so dilated as to allow an accumulation of a much less fluid and redder blood in them, which loses its globular appearance, and moves much more slowly, than that which previously passed through the vessels; the part now appearing inflamed. If the stimulus be removed, the vessels do not soon regain their original state, time is necessary to allow them to recover their contractile power, so as to prevent the impetus with which the blood is propelled by the heart and larger arteries from keeping up the dilated state of the capillaries. Here then we are obliged to admit with Boerhaave that there is an error loci; for a denser and redder blood passes into small vessels, which

much more fluid contents, but the error loci does not cause the inflammation, but results from the previously weakened state of the capillaries. In this manner the blood may occasionally be extravasated in inflammation, without any actual rupture of a vessel, for the exhalents may be so weakened and dilated as to allow globules to pass through them.

If the stimulus which produces the inflammation be of a very acrid nature, debility of the vessels is frequently induced without any previous excitement. The blood in all the smaller vessels becomes very red, circulates very slowly, and in some vessels stagnates.

The application of a stimulus, different from that which produced inflammation, will sometimes bring on resolution. When this occurs the dilated vessels contract; they no longer contain a red, dense, homogeneous fluid, but again receive blood, consisting of small nearly colourless globules, which float in a colourless fluid, and the motion of these globules at length becomes as quick as before the inflammation took place. If, however, the inflammation proceed, the blood becomes nearly stagnant; it continues very red, and the vessels are much dilated.

When this high degree of inflammation is not relieved, sphacelus ensues. The part then feels softer to the finger and gives way with less force. The vessels are much dilated; the blood does not move, it loses its red colour, and becomes of a yellowish-brown hue. The separation of the dead from the living part takes place soon after this change in the colour of the blood. Whilst the ulceration produced by this separation of the dead from the living part of the web is healing, the capillary vessels distributed on the ulcerated surface and the contiguous parts are much distended with arterial red blood, which is moved very slowly. When the ulceration is healed, the vessels become contracted, and circulate the fluid with the same degree of velocity as before the inflammation was excited. With respect to the seat

of inflammation, it may be observed that the capillaries are first affected, but even the small arteries of the web are also occasionally distended. (Such were Dr. Hastings' opinions.)

With respect to the doctrine espoused by some authorities, that the smaller branches of veins are the exclusive seat of inflammation, it may be observed that this idea is difficult to solve, for how can we tell whether the arteries or the veins are exclusively affected? Is the distinction even practicable? If we trace the vessels of a part, we soon come to the points at which we can no longer distinguish between arteries and veins; we find a minute network of vascular ramifications, which cannot be unravelled or distinguished.

Again, in the course of Dr. Hastings' inquiry, it is proved that the healthy circulation of the blood essentially depends upon a due degree of action in the vessels throughout the system; that the application of stimuli, whilst it increases the action of the vessels, produces none of the symptoms of inflammation. When, however, the excessive action of these stimuli has impaired the excitability of the small vessels, the phenomena of inflammation are fully manifested, and when their excitability is restored the inflammation subsides. It may be logically inferred, therefore, says this writer, that inflammation consists in a weakened action of the capillaries, by which the equilibrium between the larger and smaller vessels is destroyed, and the latter become distended. And with respect to the conclusion drawn by Dr. Thomson from his experiments, that inflammation in moderate degrees consists of an increased action of the vessels, Dr. Hastings maintains that the writer's belief in the excitement of the capillaries, in some cases of inflammation, arises from his having denominated that a state of inflammation which ought not to be so called. "The application of salt" (says Dr. Thomson) "produced an increased velocity in the dilated larger and smaller arteries and capillary vessels to which it was more immediately applied.

In nine experiments, the phenomena of which I have minutely recorded, the application of salt was not only followed by a bright red colour visible to the naked eye, and a sensible enlargement of the arterial and venous branches, but with an increased rapidity of circulation in the capillary vessels, the globules becoming less distinct than before the application of salt, and obviously less distinct, from the rapidity of their motion, than the globules in the capillary vessels in the uninflamed part of the frog's web. The repeated application of salt was, however, sooner or later followed by retarded capillary circulation, or even by complete stagnation."

Now, with regard to those experiments which seemed to Dr. Thomson to justify the inference that moderate degrees of inflammation may be attended with an increased velocity of the blood in the inflamed vessels, Dr. Hastings, as I have already said, objects that the appearances seen, while such velocity of the circulation presented itself in the vessels affected, ought not to have been denominated inflammation, because it constantly happened in his own experiments that when inflammation commenced, no globules could be seen even in the blood of the affected vessels. It was universally converted into a bright red homogeneous fluid. So that globules could never be seen in the capillaries of a really inflamed part, much less moving with great rapidity. He argues that the state alluded to by Dr. Thomson is only that temporary excitement of the capillaries generally preceding their debility, which is inseparable from inflammation.

Another writer asks "whether either of the variations in the state of the capillaries, and in the flow of the blood, which have been described by Dr. Thomson, was accompanied with an effusion of lymph, of pus, or by mortification, which are the usual attendants upon the state of inflammation, and by which the existence of that condition might have been distinctly recognised? To this question" (he says), "as far as I am

capable of judging, there appears to be but one answer, which is, that although that state of parts which was induced by the application of salt—namely, retardation and stagnation of the blood—presented the strongest resemblance to inflammation, yet in no one instance did either state continue for a sufficient length of time to allow any one of the usual accompaniments of inflammation being produced, since each variation terminated more or less speedily in the restoration of the natural current." He maintains that no sign of inflammation can be detected while the velocity of the blood's motion is increased, but that inflammation is immediately recognised when it is retarded, and disappears as the healthy current is restored.

Now for the purpose of demonstrating clearly the effects of irritation it is necessary to procure the frog, the web of which affords a splendid illustration of the circulation. If you now apply an irritant to a given portion of the web, the globules are seen crowding into the capillaries, which are dilated, and which all carry the blood towards the point irritated. This movement is so evident, that one need only place a red-hot needle upon the course of the minute vessel in which the flow of the globules has been distinctly noticed, in order to see them instantly retrograde towards the point irritated. The capillaries around this point dilate, and seem to multiply themselves, because a greater number is perceived on account of the presence of the red blood, which, in colouring them, renders them more visible. The globules arrive, they are crowded together, their motion is retarded, and at length suspended; they revolve upon themselves, and finally remain entirely at rest, this being the stage where complete stagnation takes place. From this it will be clearly and definitely observed that irritation must be looked upon as the primary cause of inflammation, and that the capillary circulation is suspended in the part irritated. But for some distance around, the retardation of the circulation and dilation of the capillaries are plainly seen. A little

further off the circulation is more rapid, the capillaries being still dilated, and the globules of the blood less distinct. Here, then, is the explanation regarding the increased velocity of the capillary circulation in the immediate vicinity of an inflamed part, and which never ought to be lost sight of, since it clearly shows that more blood may pass through the surrounding channels during the stagnation in the focus of the inflammation, than through the whole part before the stagnation existed.

It therefore appears that all the vessels of an inflamed part are dilated, and that while the motion of the blood is retarded or completely arrested in some, a greater quantity than usual is forced through the others.

I have only another observation to make ere we proceed to the consideration of the symptoms, and that is this: The period of true inflammation is characterised by complete interruption of the circulation: the blood coagulates, clogs the vessels, and stagnates in several points of the inflamed part, due to an increase of fibrine, which fibrine exerts such an all-powerful sway that it draws the blood to itself, holding it by an unseen power; serum then ensues, a change of structure is produced, while the functions of the part are completely suspended. These changes, then, are attended with increase of the swelling, heat, redness, and pain.

Redness.—Healthy inflammation is of a pale red, when less healthy it is of a darker shade; but, according to Dr. Hunter, the inflamed parts in every constitution will partake more of the healthy red the nearer they are to the source of the circulation. The redness is manifestly owing in a great measure to the increased quantity of blood in an inflamed part; more blood must necessarily be contained there, because the vessels which previously conveyed this fluid are preternaturally distended, and the small vessels, which naturally contained lymph, are now so enlarged as to be capable of receiving red blood. "I froze" (says Dr. Hunter) "the ear of a rabbit, and thawed it again; this oc-

casioned a considerable inflammation, an increased heat, and thickening of the part. This rabbit was killed when the ear was in the height of inflammation, and the head being injected, the two ears were removed and dried. The uninflamed ear dried clear and transparent, the vessels were distinctly seen ramifying through its substance; but the inflamed ear dried thicker and more opaque, and its arteries were considerably larger."

Many have supposed that the redness of common inflammation is partly occasioned by the generation of new vessels. This doctrine, however, is losing ground; when coagulated lymph is extravasated upon the surface of a wound or an inflamed membrane, unquestionably it often becomes vascular, in other words furnished with new vessels. But in the extravasated lymph of a phlegmonous tumour we have no evidence that there is any formation of new vessels. Were the lymph to be rendered organised and vascular, the swelling and redness would probably be more permanent, and at least not admit so easily of resolution. When adhesions are formed between two inflamed surfaces, the organised substance forming the connection lives after the subsidence of the inflammation, and is a permanent effect. In the experiments detailed by Dr. Hastings, when the inflammation began and terminated without any lesions of the part affected, new vessels were never formed.

At the same time it must be confessed that great obscurity prevails on this very difficult part of the subject; for when suppuration happens in a phlegmonous tumour, the cavity is lined by a kind of cyst, or membraneous layer of lymph, which is unquestionably furnished both with secreting vessels and absorbents; for otherwise how could the continued secretion of pus or its occasional sudden disappearance be at all explicable? It was probably the enlargement of the small vessels, and the circumstance of their being filled with red blood, that led to the theory of new vessels being usually formed in inflammation.

It has, however, been justly observed that the supposition easily admits of refutation; for heat and many other causes of inflammation operate so quickly that there can be no time for the formation of new vessels, and yet the redness is as great and the inflammation as perfect in one minute as it is in an hour, or a day, after the application of the exciting cause.

Another reason assigned for the redness of inflammation is, that the blood after it has become venous retains more or less its red colour; and in some late, very carefully conducted experiments, it was remarked that the weakened action of the smaller vessels was always accompanied with an alteration in the appearance of the blood. Now in the natural state of this fluid, globules can be distinctly seen, but after inflammation has commenced the globular structure disappears, the blood becomes redder, and the most minute capillaries are distended with it.

Swelling.—This effect arises from several causes. First, The increased quantity of blood in the vessels. Second, The effusion of coagulating lymph and serum, and the deposition of new matter; and, third, The interruption of absorption.

Pain.—This is observed to be greatest during the diastole of the arteries. The affection is probably owing to the unnatural state of the nerves, and not to mere distension, as many have asserted: were the latter cause a real one, the pain would always be proportioned to it.

Heat.—The heat or real increase of temperature in an inflamed part, when judged of by the thermometer, is generally much less than might be supposed from the sensations produced. It is said never to exceed the heat of the blood at the heart. This in health is usually about 100°, Fahrenheit's thermometer; but sometimes in diseases it rises to 106°, or even 107°. Dr. Hunter artificially excited inflammation in the chest of a dog, and in the abdomen, rectum, and vagina of an ass, without being able to discover any obvious rise of temperature in these parts; and as Dr. Hastings observes, the advocates for excited action of the

vessels in an inflamed part have thought that the increase of temperature favours their hypothesis, and have called to their aid ingenious calculations. Daily experience convinces us (he says) that the temperature is not always proportional to the velocity of the circulation.

It appears certain, therefore, that the generation of animal heat, either in an inflamed or uninflamed part, can never be satisfactorily explained by any reference merely to chemical principles, for the process is essentially connected with, and influenced by, the state of the functions of the brain and nervous system, and no doubt also by the principle of life itself.

The terminations of Inflammation.

Inflammation is said to have several different terminations; or, in other words, we may say that after this process has continued for a certain time, it either subsides entirely, occasions the formation of pus with or without ulceration, or completely destroys the vitality of the part. Before the inflammation has reached its greatest height, and any considerable change of structure has taken place, it may gradually subside.

The quickness of the circulation begins to decrease at the circumference, and there is a reflux of blood toward the centre. A thin, serous, or sanguineous fluid is poured out on the surface, or in the cellular texture of the part, and from secreting surfaces there may be a profuse exhalation of fluids. The small coagula of lymph and blood contained within the vessels, or deposited in the parenchyma, are softened and removed.

When inflammation is to end in this manner, the pain, heat, redness, and swelling subside, the fever and every other symptom gradually abate, till at last the part is wholly restored to its natural size and colour. This termination of inflammation is termed resolution. If, however, notwithstanding the application of the usual remedies, the several symptoms of heat, pain, and redness, instead of diminishing

rather increase, if the febrile symptoms are likewise augmented, and the part gradually acquires a larger size, turns soft, somewhat prominent in the middle or towards its most depending part; if it should next acquire a clear shining appearance and become less painful, the different symptoms of fever being at the same time diminished, and a fluctuation perceptible—the inflammation has ended in suppuration, the fluid termed pus having now been formed.

The worst consequence of common inflammation is the death or mortification of the part affected. In the microscopical experiments of Dr. Hastings it was observed that on the approach of gangrene the blood entirely loses its red colour, and acquires a yellowish-brown tinge. The part which was of a bright red becomes of a livid hue; small vesicles filled with thin fetid serum arise on its surface, and air is plainly felt within the cellular membrane. The pain is indeed diminished, the pulse sinks, and the part becomes black.

The adhesion of contiguous surfaces to one another so often exemplified in the serous membranes of the chest and abdomen is also sometimes spoken of as another termination of inflammation. However, in numerous instances inflammation is a salutary process, inasmuch as it acts in preventing, repairing, or removing the consequences of injury or disease. But it is also a noteworthy fact that the great majority of diseases begin with, end with, or are connected with the effects of inflammation in some manner or another. Hence the necessity of knowing its progress in all its stages.

Treatment of Inflammation.

The first step that requires to be taken is to ascertain without delay what the cause is of inflammation; having satisfied yourself, the next duty you have to perform is the *removal of the exciting cause*. If the irritation of a splinter were to excite inflammation in your finger (as undoubtedly it would), who would not of his own accord directly take

away the extraneous body? Therefore other similar exciting causes may be often detected and removed at once, and this is doing a great deal towards the cure, and even the prevention of inflammation. However, many of the exciting causes of this affection are only of momentary application; yet, though their action is thus short, the process of inflammation must follow as a kind of salutary operation, without which the injured organisation and tone of the parts still remaining could not be rectified again. Hence, besides taking away the remote cause, whenever this can be done, it is proper to moderate by other means the increased action of the larger arteries, and lessen the velocity of the blood's motion towards the inflamed part. But how can this be accomplished unless by bleeding? The old theory was, by all means bleed, and you diminish the supply; bleed, and you check the disorder; bleed, and you lessen the action of the whole sanguiferous system, for upon this remedy your patient's life hangs. Now, however, we are no longer bound down by this obsolete theory, for by the rapid advancement of science we are enabled to contend with this malady not only with greater success, but without the unnecessary infliction of any additional pain. We can reduce the flow of blood to an inflamed part by lessening the heart's action, while at the same time we reduce the fever as well. Aconite is the agent that possesses this salutary effect. Fomentations come next, and should be patiently resorted to. Opium is of great service, as it allays the pain, while the ordinary saltpetre prevents the formation of fibrine when given in the water to drink.

I shall now conclude this part of our subject by briefly alluding to blisters. My opinion is that they should never be applied to a part, or near to the region of a part that is actually inflamed, because from their irritating properties they excite inflammation. Wherever you apply a blister it acts directly as an irritant to the immediate part; the result is, you have an undue formation of fibrine, the

very element that opposes the successful treatment of the disease, the element that glues the globules together, and prevents their circulation, and the increase of which is detrimental to inflammation.

Mortification

is of two kinds; the one without any or much inflammation, the other preceded and accompanied by it. To this last species of mortification, the terms *inflammatory, humid*, or *acute gangrene* are often applied; while the second, or that which is preceded by little or no inflammation, has been distinguished by the epithets *dry*, or chronic, and sometimes *idiopathic*, when no external cause for the origin of the disease can be assigned. The expression *hot gangrene* has also been applied to mortification attended with inflammation, and *cold* to that which seems scarcely to be connected with it, at least in its commencement. According to Hunter, inflammation is an increased action of that power which a part naturally possesses; and in healthy inflammation, at least, it is probably attended with an increase of power. In cases, however, which are to terminate in mortification, there is no increase of power, but, on the contrary, a diminution of it. This, when joined to an increased action, becomes a cause of mortification, by destroying the balance which ought to subsist between the power and action of every part. There are, besides, cases of mortification preceded by inflammation which do not arise wholly from that as a cause; of this kind are the carbuncle, and the slough formed in cow and sheep, pox pustute.

The first general division of mortification, therefore, is into two kinds, namely, the *inflammatory, humid, hot*, or *acute*, and the *dry, cold*, or *chronic*. But the disorder is also subdivided into many species, which are determined by the nature of the particular exciting cause, and these are referred to the three following heads: First, Mortification from the cessation of the circulation; second, From the violent

operation of mechanical, chemical, and physical agents; third, From the deleterious influence of certain poisons. It is remarked also that acute or rapid mortification is not necessarily humid, as the slough from the application of caustic potassa proves. Again, the doctrine that any case of mortification is entirely without inflammation has sometimes been deemed questionable; but whether mortification be a consequence of inflammation or not, it may perhaps with reason be considered as standing in the same relation to inflammation as adhesion, suppuration, or ulceration; they may all be preceded by a high degree, or it may be scarcely sensible.

When any part of the body loses all motion, sensibility, and natural heat, and becomes of a brown, livid, or black colour, it is said to be affected with *sphacelus*, that is, complete mortification; and so long as any sensibility, motion, or warmth continue, the state of the disorder is termed gangrene. This word is here made use of to signify only a degree of sphacelus, or rather the process by which any local disorder falls into the state of complete mortification. Frequently the terms are used synonymously, but it is to be observed that gangrene does not invariably end in sphacelus, nor is the latter always preceded by the former.

Dr. Thomson says, "I shall employ the term *gangrene* to express that state of mortification in inflamed parts which precedes the death of the part, a stage in which there is a diminution but not a total destruction of the powers of life, in which the blood appears to circulate through the larger vessels, in which the nerves retain a portion of their sensibility, and in which the part affected may still be supposed to be capable of recovery. The word *sphacelus* I shall use to denote the complete death or mortification of a part, that state in which the powers of life have become extinct, in which the blood ceases to circulate, and in which the sensibility of the nerves is lost; whether the dead or mortified part has or has not become actually putrid, or shown any tendency

to separate and fall away from the living and sound parts."

Putrefaction, or the spontaneous process by which animal bodies are decomposed, is an accidental, and not a necessary, effect of the state of mortification. It takes place at very different periods after the death of particular parts, and these periods, it may be remarked, are always regulated, not only by external circumstances such as the humidity and temperature of the atmosphere, but also by the peculiar structure and morbid conditions of the animal structure, or organ, in which the putrefaction occurs.

The term sphacelus has, I know, been employed to express that a part is not only dead and completely mortified, but also that the part has become putrid, and is in a state of separation from the surrounding and living parts. But as putrefaction is not a necessary or immediate consequence of mortification or partial death in animal bodies, this use of the term sphacelus is obviously improper.

It is an interesting observation, made by one of the greatest pathological anatomists, that "as the descriptive characters of mortification were originally drawn from the appearance which this disease presents when it attacks the external parts of the body, they have ever since been employed by the pathologist as the means of enabling him to detect it in internal organs after death. It may, however, be fairly questioned whether the application of the term mortification has not been too restricted, and whether parts deprived of their vitality, and separated from the living tissues, should not be designated by the same appellation as those which, similarly circumscribed, differ from them only in point of colour, and perhaps smell. Softening of the cerebral substance of the mucous, and frequently of the serous membranes, constitutes a state of positive death; but the softened substance in those instances presenting neither the peculiar colour nor odour of the external parts when mortified, it has been considered proper to distinguish soften-

ing from mortification by a term expressive of its principal character—that of softness."

Now the causes of mortification are either *internal* or *external*.

It is commonly taught in Continental schools that the internal causes probably operate after the manner of a deleterious substance, which, being introduced into the circulation, occasions a putrefaction of the fluids. However, the doctrine is supported by no sort of proof, and may be considered as entirely hypothetical, if not decidedly erroneous. Certain poisonous, acrid, caustic substances taken inwardly, or introduced under the skin, may have the same effect by annihilating the vital action, or destroying the texture of the parts. But though these observations may all be entirely correct, they by no means justify the conclusion that the internal causes of mortification ever act by inducing a putrefaction of the fluids.

There is, however, an unquestionable specimen of mortification from an internal cause, and that is the introduction of rye into the stomach of herbivorous animals. It occurs in districts only after wet seasons in which the grain is affected with a particular disease; in this disease the grains of rye grow to a large size, acquire a black colour, and have a compact horny consistence. The species of mortification produced by eating this substance produces the following symptoms—the part affected becomes insensible and cold, and, in the progress of the disorder, dry, hard, and withered; stupidity and delirium finally ensue.

The external causes of mortification which are manifest, and act mechanically or chemically, are as follows:—Burns, excessive cold, the application of caustics, the presence of any ichorous, urinary, or fæcal matter effused in the cellular substance, violent contusions, bad fractures, a high degree of inflammation, and everything that has the power of stopping the circulation and nervous energy in parts.

Inflammation must, therefore, be looked upon as one of

the most frequent causes of mortification. But it will be as well to bear in mind that death of a part may take place without any well-marked appearance of previous inflammatory disorder, and the latter, even when present, has frequently less share in the mischief than other incidental circumstances, and is in reality only an effect of the very same cause which produces the sphacelus itself. It is often a matter of doubt whether actual inflammation precedes the occurrence or not, for a part before it mortifies is in certain instances only affected with pain, and with no degree of preternatural redness. Lastly, when mortification is unquestionably preceded by inflammation, there are so many varieties of the disorder, depending on incidental causes, that these latter demand more attention than the inflammation.

The following circumstances are, therefore, capable of influencing in a very great degree the disposition of inflammation to terminate in mortification:—

1. The powers of the part in which the inflammation occurs being naturally weak, as in fibrous membranes—for example, the *scrotum*, &c.
2. The remote supply of blood, or nervous energy, as in the lower extremities.
3. Obstruction to the return of blood.
4. To the supply of b ood.
5. Disease in the heart, or vessels.
6. Debility from age, disorder of the digestive organs, or fever.
7. Poor living, foul air, improper food.
8. Impairment of organisation from external injury.
9. Impairment of the nervous power by poisons.
10. Undue excitement of weakened parts.
11. Depressing remedies.
12. Pressure and tension.
13. Excessive violence of inflammatory action, and
14. Peculiar disposition in the constitution.

Healthy phlegmonous inflammation seldom ends in mortification, except when it is unusually violent and extensive.

The symptoms of mortification from inflammation take place variously, yet generally as follows.

The pain and sympathetic fever suddenly diminish, the part affected generally becomes soft, and of a livid colour, losing at the same time more or less of its natural warmth and sensibility. In some places the cuticle is detached, while in other situations vesicles arise, filled with a clear or turbid fluid. Such is the state to which we apply the term *gangrene*, and which stage of the disorder too often rapidly advances to *sphacelus*, when the part becomes cold, black, fibrous, senseless substance, called in technical language a *slough*.

Again, it merits notice, that in cases in which gangrene immediately succeeds inflammation, these two morbid states may, in some measure, be regarded as stages or periods of the same disease. They pass insensibly into one another. Nor is it possible to say precisely where the one state ends and the other commences. The symptoms of inflammation in these cases do not disappear before those of gangrene come on, but seem rather to undergo a gradual and almost imperceptible change or conversion into one another. The redness acquires a deeper tinge and spreads farther than formerly, the swelling increases and becomes more doughy, and in this incipient stage, the gangrene, particularly when it attacks the cutaneous texture, often bears a considerable resemblance to *erysipelas*. It must also be observed that the part of the body which becomes affected with gangrene does not immediately lose its sensibility, for the pain, on the contrary, is often very much aggravated by the approach of this state. The blood also still continues to circulate, at least in the larger vessels of the part, but perhaps with less force, and, from the resistance which it meets with in passing through the capillaries, in less quantity than formerly. The serous effusion into the cellular membrane continuing to

increase, and the action of the absorbents and sanguiferous vessels to diminish, the part becomes at length incapable of being restored to its former office in the animal economy. It is, therefore, in its earlier stages only that gangrene is to be considered as an affection admitting of cure, for there are limits, beyond which if it pass, recovery becomes impossible. These limits it may not be easy to define in every instance, but they form the boundaries between incipient gangrene and the ultimate termination of that state in *sphacelus*.

Mortification often arises from a mechanical obstacle to the circulation of the blood; thus, the blood may be hindered from arriving at or returning from a part. In both cases mortification is the consequence of the cessation of the functions of nutrition, either from a deficiency of the arterial or a stagnation of the venous blood. A deficiency of the arterial blood may be occasioned by ligature, by coagulated blood, organised or unorganised fibrine, and in several other ways. Therefore there is no tissue nor organ of the body which may not become affected with mortification as the immediate or mediate effect of inflammation. Mortification is, however, much more frequently observed in those organs in which the vascular system predominates, or in which an inordinate accumulation of blood is readily produced on account of their greater sensibility, and their direct exposure to the influence of those causes which give rise to inflammation. Hence the reason why gangrene and *sphacelus* occur more frequently in the skin and cellular tissue, mucous membranes, and lungs than in any other tissue or organs of the body as immediate effects of inflammation, and why they are so rarely observed in serous and fibrous tissues, which contain few or no bloodvessels. In fact, these tissues are never found in a state of gangrene or *sphacelus* unless the cellular tissue, with which they are in contact, and from whose vascular system their nutrition is derived, has previously been diseased.

The red line appears in the form of a narrow circle, in-

dicating the boundary between the dead and living parts, and the commencement of the adhesive inflammation, which nature employs to stop the progress of the disorder. Ulceration then takes place along the internal border of the inflamed skin, and a separation is thereby affected between the living and dead tissues, the latter falling off in what is termed a *slough*. A groove is first formed by the ulcerative process on the surface, and advancing by degrees more and more deeply, at length accomplishes the perfect separation. The loss of substance which is thus occasioned, is repaired to a greater or less extent by means of coagulable lymph which is thrown out on the denuded surface, and which, becoming organised, assumes a membranous or granular form, according to the situation of the part, or the nature of the tissue to be repaired, and constituting ultimately what is denominated a *cicatrix*.

Treatment of Mortification.

In the treatment we must always have one thing under consideration, namely, whether the case is acute mortification, attended with inflammation and inflammatory fever, or whether it is a chronic mortification beginning without fever, or attended with a sinking fever and great prostration of strength. By arriving at a correct decision you establish a useful general principle for your guidance, especially in the commencement of the treatment.

When mortification is acute, and seems to depend on the violence of inflammation, the first indication is to moderate the inordinate action of the sanguiferous system, by the prudent employment of such means as are proper for counteracting inflammation. In short, relief must be sought in the administration of purgatives, diaphoretics, and diluents, and in abstinence from all substances which have a tendency to excite, or to augment, the febrile action. Opium must be given to allay the pain, and aconite to reduce the frequency of the pulse. When there is great prostration, the strength

must be supported by tonics and good food. Now, of all the medicines hitherto recommended for the stoppage of mortification, none ever acquired such a character for efficacy as Peruvian bark. It is said that this remedy often stops, in a very evident and expeditious manner, the course of the disorder. Being a powerful tonic, it is thought to operate by strengthening the system, and thus maintaining in every part the necessary tone for resisting the progress of mortification. But whatever be its mode of acting, it ought to be amployed in almost all cases of mortification as soon as the violence of the inflammatory symptoms has been subdued.

Tumours.

According to the language of Abernethy, "a tumour consists in a swelling arising from some new production which made no part of the original composition of the body."

Now, in considering all the various tumours and indurations which occur in inflammation and disease, we have reason to suspect that the process by which they are formed must be attended with considerable diversity. Yet, notwithstanding this, the general principles of morbid changes of structure may admit of being reduced to a small number, for if we take the acknowledged products of inflammation, and to them add tubercle, scirrhus, fungus, and melanosis, we have at once a bird's-eye view of the most important changes which occur in the solids.

It appears, then, from the preceding observations, that a tumour is a new growth, or the deposit of an adventitious substance upon, amongst, or within the textures of the body, whereby these textures or organs acquire increased magnitude, so as to constitute themselves at once swellings, and to undergo changes or the obliteration of original structure. As an illustration, fungus hœmatodes, or medullary cancer, may be cited, which is a new growth or deposit met with in three distinct forms, sometimes as a new product enclosed in a cyst, sometimes as a new formation unprovided with

any cyst, and, in other instances, as an infiltration in the substance of an organ.

The process by which tumours are formed has sometimes been thought to be attended with an increased action of the vessels which supply them with blood. It has been compared to the process which forms all the thickenings and indurations met with under various circumstances in different parts of the body, and has often been referred to chronic inflammation. This subject of chronic or passive inflammation is one about which, so far as particular forms of it are concerned, very little certain is known, and even the name itself has commonly been admitted only on the supposition that some kind of increased action exists in the vessels, though of a slower and less evident kind than what prevails in acute inflammation.

Now, upon this part of the inquiry, different views are entertained. Three explanations have been offered of the mode in which tumours originate and grow. Firstly, the effusion of blood and its coagulation, and the subsequent organisation of the coagulum. Secondly, the effusion and organisation of coagulating lymph. Thirdly, chronic inflammation. Therefore, according to these explanations tumours ought to pass through successive stages, and to present different appearances at different periods of their development. For instance, we ought to find them at first as masses of coagulated blood, or coagulating lymph, and then to observe various degrees of transition from those substances to the textures which characterise the perfect growth. But this is not so, for a tumour in its earliest state and smallest size has its peculiar structure as well marked as in its subsequent progress and full development. An adipose tumour, not exceeding the bulk of a pea, differs only in size from one as large as a goblet. Effusions of blood into the cellular texture from external violence are of daily occurrence; if, therefore, such extravasations could become organised, and then form tumours, they would prevail almost universally.

We see, however, that the blood thus poured out either disappears by absorption, or irritates the surrounding parts and causes suppuration, by which it is expelled.

It would appear, however, that coagula of blood and fibrine are capable of becoming organised under peculiar circumstances; because in the production of some kinds of tumours and new formations, little doubt, I think, can be entertained that the organisation of these substances, and especially coagulable lymph or fibrine, is an essential part of the process.

Dr. Carswell, who adopted the expression "analogous tissues" to signify all solid, morbid products which resemble the natural elementary tissues of the body, remarks that they present two important differences in regard to their origin. The plastic element of the blood, the spontaneously coagulable part of this fluid, or the fibrine, is by far the most frequent source, and furnishes the materials for the formation of the most perfect examples of the analogous tissue. It is to those which have this origin that the term analogous, accidental, adventitious, or *pseudo-formations* is correctly applied.

Another and entirely different origin of many of these tissues, is a change taking place in the primary or existing elementary tissues, and even in organs, by means of which they are converted into tissues of a different kind; as for example, when cartilage is converted into bone, or cellular into serous or fibrous tissue. The analogous tissues which have this mode of origin are, in order to distinguish them from the former, called analogous transformations. These tissues are again subdivided, and although originating in the plastic element of the blood, they may be formed out of this substance, whether it be separated from the blood, and effused on the surface of organs in the state of coagulable lymph in consequence of inflammation, or whether it be separated from this fluid, which had ceased to circulate in the vessels, or had escaped from them in consequence of

mere physical causes. Now, in support of this doctrine, which maintains that analogous formations may originate in the fibrine of the blood, the evidence is derived from the changes which are observed to take place in the blood which has ceased to circulate in the heart or bloodvessels, or which has been effused into the substance of an organ. The cessation of the circulation, which precedes these changes in the blood, may be effected by the operation of mechanical, physical, and vital agents, which act either on the blood itself, or on the vessels in which it is contained. The most obvious examples of the operation of the first kind of agents are those in which the circulation is at once arrested, either in an artery or a vein, or both, by the application of a ligature, or in which the blood stagnates in the veins, for example, of the lower extremities, from a mechanical obstacle to its return situated in a remote part, or in the heart. The first change which the blood is observed to undergo in these circumstances is coagulation, the extent of which in an artery is almost always determined by the situation of the first branch of considerable size sent off from the obstructed vessel between the ligature and heart, but which in the veins varies with the situation of the obstacle, and the greater or less facilities afforded for the development of a collateral circulation.

Whatever may be the extent of the coagulation, the subsequent changes which take place in the blood are as follow: The coagulum acquires gradually an increase of density, which is accompanied by the removal of the red colouring matter of the blood. The fibrine becomes thus more and more apparent, and is recognised by its pale straw colour, and more especially by the manifestation of its plastic properties, whereby it assumes, almost from the commencement, a laminated or fibriform arrangement. In this, the early stage of what may be called the process of organisation of the fibrine, there is one circumstance which is peculiarly interesting, not only because it enables us to explain the

origin and mode of formation of some analogous tissues, but because it shows that the vital endowments, or plastic properties of fibrine under the circumstances in which we are now considering it, are of the same kind as those of coagulable lymph, however much they may vary in degree.

The circumstance to which I allude, is the tendency of the fibrine, from the commencement, to escape towards, and to accumulate at, the circumference of the coagulum, or to place itself in contact with the living tissues which surround the coagulum. It is not only in a bloodvessel that this is observed; it is seen to take place in the cavity of the heart in the formation of what are called polypi, whatever may be their mode of attachment, as well when they occupy the greater part of one of the cavities of this organ, as when they are small, and connected only by a narrow pedicle.

Sarcomatous Tumours.

These have been so named from their firm fleshy feel. They are of many kinds, some of which are simple, while others are complicated with a malignant tendency. Under the title of *common vascular* or *organised sarcoma* are included all those tumours which appear to be composed of the gelatinous part of the blood, rendered more or less vascular by the growth of vessels through it; the vessels which pervade this substance are, in different instances, either larger or smaller, and more or less numerous, being distributed in their usual arborescent manner, without any describable peculiarity of arrangement. The structure under consideration is met with not only in distinct tumours, but also in the testis, mamma, and absorbent glands.

When a common vascular or organised sarcoma has attained a certain magnitude, the veins of the skin seem remarkably large and elevated. This kind of sarcoma is not at all tender, so that it may be freely handled without inflicting pain. The tumour sometimes grows to such a size that the skin bursts, the substance of the swelling sloughs

out, and the disease is got rid off. However, the removal of the disease with the knife is to be preferred.

Adipose Sarcoma or Fatty Tumours.

As the substance of adipose tumours is never furnished with very large bloodvessels, the fear of hemorrhage need not deter us from operating, because it is an undoubted fact that there is no species of tumour that can be removed with so much celerity, with such apparent dexterity, or with such complete security against future consequences as those of an adipose nature.

However, now and then when the tumour has been previously in an inflammatory state, the capsule becomes thickened, and intimately adherent to the surface of the swelling; so that the separation of the disease is more difficult, and requires the knife to be more freely employed. The tumour also sometimes becomes, after inflammation, closely adherent to the contiguous parts. Now, these adipose tumours often acquire an enormous magnitude; therefore the immense size of the wound requisite for their removal must be dangerous, and is a strong argument in favour of having recourse to the operation at an earlier period. Yet it is equally true, that large fatty swellings may be taken out with a greater prospect of success than any other kind of tumour of equal size.

Encysted Tumours

Are generally of a roundish shape, and more elastic than the generality of fleshy swellings. However, the latter circumstance depends very much upon the nature of their contents and the thickness of their cysts. These tumours form more frequently on the head than any other part, but they are frequently met with in all situations under the integuments and sometimes in deeper places. They are in general nearly globular, feel very firm, the skin covering them is not inflamed; but in the centre of the tumour on the skin (if white) it often happens that in its early stage a

black or dark coloured spot may be seen. In general they are unattended with pain, are never in themselves dangerous, and only require removal from the parts in which they occur, on account of the unseemly appearance they produce. There are other tumours situated in different regions of the body, the most important of which are those affecting the udder, and which we will describe when we consider mammitis and its sequels. Meantime, I would direct your attention to another important subject, known as

Ulceration.

This is the process by which sores or ulcers are produced in animal bodies. In this operation, the lymphatics are commonly believed to be at least as active as the bloodvessels; an ulcer being, according to the doctrines most prevalent, a chasm formed in some surface of the body by the removal of parts back into the system by the action of the former vessels. At first it may be difficult to conceive how a part of the body can be removed by itself; but to the renowned Dr. Hunter there was no more difficulty in conceiving this, than how the body could form itself—both facts seemed to him equally well confirmed. When it becomes necessary that some whole living parts should be removed, it is evident (says he) that nature in order to effect this object must not only confer a new activity on the absorbents, but must throw the part to be absorbed into a state which yields to this operation. The absorption of whole parts in disease are referable to five causes; namely, pressure, irritation of stimulating substances, weakness, inutility of parts, and death of them.

Ulceration takes place more readily in the skin, mucous, cellular, and adipose tissues than in muscles, tendons, ligaments, nerves, and bloodvessels. Hence in the progress of pus to the surface of the body, in consequence of the intervention of textures backward to ulcerate, ulceration often takes a circuitous course for the purpose of bringing the matter to the skin.

Again, parts at a considerable distance from the source of circulation are generally more disposed to ulcerate than others situated nearer the heart, hence one reason of the greater number of ulcers on the lower extremities. Here, however, another cause is likewise concerned, and that is the retardation and stagnant state to which the blood in the veins of the lower extremities is so frequently subjected. In this instance the probability is that ulceration does not take place till the venous blood, accumulated largely in the capillary vessels, excites by its presence an irritation like that resulting from the presence of a foreign body. Now, there are three modes in which texture seems to modify the nature and course of this process; firstly, as it occurs in highly vascular structures; secondly, in parts possessing a somewhat lower degree of vascularity; and thirdly, as it is observed to take place in parts endowed with the least degree of organisation.

The remarkable disposition to ulceration in those textures that are well supplied with blood must be obvious, if not familiar, to all interested, more especially in the mucous membranes. These parts abound in vessels of large size, and are liable under moderate degrees of inflammation to pass into the ulcerative state. The mucous lining of the intestines, holding a first rank among vascular structures, quickly ulcerates under some forms of inflammation; that of the trachea (or windpipe) being somewhat less vascular, is less prone to ulceration. The lining membrane of the mouth speedily exhibits an aphthous surface (this being well defined in epizootic aphtha—foot-and-mouth disease), or even a deeper extent of ulceration from trivial causes; and the gums, disposed as they are to ulcerate, have this disposition still further increased when they become spongy and more vascular. Now, when ulceration takes place in consequence of the death of an external part, it occurs first on the outer edge between the dead and living substance.

A tumour, when it makes equal pressure in every direction

around, will only make its way in an external course, because interstitial absorption happens in no other direction.

The parts situated between an abscess or any extraneous substance and the nearest surface are those which are most susceptible of ulceration. This is one of the most curious phenomena connected with the process under consideration. It shows that there is a principle in the body by which parts are always prone to free themselves from disease. Slight pressure from without will often produce a thickening of parts; consequently there appears to be a corresponding backwardness to admit disease, because, if the lining membrane of the nose becomes thickened, it forms a barrier against the progress of the disease inwards.

Again, that pressure is a frequent cause of ulceration, is also evinced by the occasional effects of chains and harness on horses. But whatever be the lesion preceding ulceration, it must not be forgotten that its production, though the work of acute or chronic stimulation, does not depend upon such stimulation alone, for by varying the degrees of the latter a texture cannot always be made to ulcerate at option.

The causes of ulceration are special conditions, which consist neither in the intensity nor in the duration of the irritation by which the process is constantly either preceded or accompanied. Frequently an extensive ulceration originates from a very slight, transient, and scarcely appreciable irritation; while in other instances a most intense stimulation, such as is produced by the passage of concentrated acid into the stomach, or a stimulation of very long continuance, such as exists in the alimentary canal when a patient is afflicted with a diarrhœa of long standing, does not give rise to any ulceration. There are, moreover, cases in which ulceration cannot be regarded as the simple result of a local affection; and, like many other lesions of the circulation, nutrition, or secretion, it is only one of the modes in which a general morbid state of the system is manifested, the existence of which is revealed by local lesions of the

most different kinds in respect to their seat and apparent nature.

Absorption with suppuration, or, in other words, ulceration, either happens in consequence of suppuration already begun, in which event the pus acts as pressure, or else absorption attacks external surfaces from particular irritations or weakness, in which case suppuration must follow.

Again, the production of ulceration requires much greater pressure from without than from within. The process is always disposed to take place more quickly when the cause is near the surface of the body, and its progress becomes accelerated in proportion as it arrives near the skin.

The adhesive inflammation precedes the suppurative, and prevents the pus from becoming diffused as soon as it is secreted; and when the cyst afterwards ulcerates, in order to let the matter approach the skin, the adhesive inflammation still continues to go before the ulcerative process, and thus prevents the matter from insinuating itself into the interstices of the cellular substance.

Now, the pain of ulceration is in some degree proportioned to its quickness. When ulceration begins on a surface, or takes place for the purpose of bringing matter to the skin, the pain is always considerable; but when ulceration takes place in order to separate a dead part, as in sloughing, exfoliations, &c., there is seldom any great degree of pain.

The ulcerating sore always exhibits little cavities, while the edge of the skin is scalloped and thin, at the same time turning a little out and overhanging more or less the ulcerated surface. The face of the sore appears foul, and the discharge is very thin. When ulceration stops, the edges of the skin become regular, smooth, a little rounded or turned in, and of a purple colour, covered with a semi-transparent white.

Again, ulceration may be looked upon as a degeneration of tissue, a change in the affinities existing between its component parts, by which it becomes changed from a solid

organised texture to a fluid inorganic mass. It differs from gangrene in being a vital action, while gangrene, by at once producing death in a part, prevents any such change taking place. In gangrene the supply of blood to the part ceases altogether, while the integrity of tissue is preserved; under ulceration the circulation in the vessels continues during the action, and the part still belongs to the living mass, and remains under the influence of vital action until its separation is completed.

Ulcers of all kinds, if closely watched in their formation, clearly exhibit the breaking up of the tissue, and its gradual conversion into pus. In the earliest stage of an ulcer, before the vesicle has burst or the skin given way, the extent of substance lost is compensated for by the amount of fluid formed. In its progress, when rapid, and when a large portion of structure is quickly destroyed by ulceration, a corresponding quantity of pus may be always seen to occupy its place; and when the action is more chronic, as in fibrous structures, the *débris* of the tissue can be seen mixed with the purulent fluid. These observations of the process by which a dead is separated from a living part, will prove that this, like others that have been improperly attributed to absorption, is an act in which the absorbents do not take a part.

Ulcers

May be defined as a solution of continuity in any of the soft parts of the body, attended with a secretion of pus, or some kind of discharge. "A granulating surface secreting matter" has been proposed as another definition, and which is very applicable when ulcers have formed granulations, but cannot include cases in which the effects of ulceration are extending, and the granulating process has not yet commenced.

Ulcers are divided into local and constitutional. However, it is only within certain limits that this distinction is well

founded, for an ulcer which is at first completely local may in time affect the system, so as to become constitutional, and ulcers which derive their origin from some general affection of the system, may remain after the removal of the constitutional disorder by which they were originally produced.

Every ulcer, strictly speaking, is of a local nature; but there are ulcers which, though necessarily local in their appearance, are connected with, or dependent upon, diseases which affect the general system.

These ulcers ought to be regarded as modifications of, or forms in which the diseases appear with which they are connected. Considered in this light, it is obvious that specific ulcers can be treated of with propriety only under the head of the diseases to which they respectively belong.

We call those ulcers *simple* which do not appear to proceed from any specific disease or morbid diathesis existing in the constitution of those animals in whom they take place. They are usually solitary occurrences, and the consequences of accidental injuries and improper modes of management. They may occur in every part of the body, but as a rule most frequently upon the lower extremities.

Treatment.—It is absolutely necessary to keep the surface clean and the part quiet. Great benefit is produced by the application of dry lint, for the purpose of absorbing and retaining the matter. Fomentations, I think, ought to be avoided for the following reasons—they render the textures of the granulations closer, and diminish the disposition to form skin. When, however, they are small and free from inflammation, the discharge little and the parts not exposed to much motion, the nitrate of silver applied to the sore, and lightly to the surrounding skin, has a wholesome effect; in fact, it is the best remedy that can be applied. There are many others, but for all practical purposes this one will suffice.

Suppuration

is a process by which a peculiar fluid termed pus is formed in the substance, or from the surface of parts of the body.

When purulent matter accumulates in the part affected, it is termed an *abscess*, which is distinguished and divided into several kinds, acute, chronic, scrofulous, &c.

The texture in which suppuration seems to be most readily produced by a certain degree of inflammation is mucous membrane, whether this lines excretory ducts or canals, or covers the inner surfaces of the respiratory or urinary organs. In a few hours after an irritating cause has been applied to these surfaces, the physical and chemical qualities of the fluid which they secrete in their natural state are changed.

From being a tough viscid substance, not easily miscible with water, the mucus of the nose and bronchi becomes, during an attack of inflammation, very readily miscible with water, and of a yellowish-white colour and fluid consistence. If in this state the secretions from these membranes be examined with the microscope, it will be found to contain small globules similar to those which are seen in the blood, and these globules are found to increase in number in proportion to the degree and continuance of the inflammation.

Suppuration may be readily produced in the skin by whatever excites inflammation in that texture, or causes a separation of the cuticle; we have examples of this fact in blisters from cantharides, and in vesications from superficial burns. If the cuticle covering a recent blister or burn be removed, and the true skin exposed to the irritation of stimulating substances, pus will soon be discharged from the abraded surface. Suppuration can be kept up in the skin for an indefinite length of time by perpetual blisters. Here ulceration is seldom observed, and consequently, in the skin, loss of substance is by no means necessary for the production of pus.

If the cutis be divided, as in a wound, or a portion of it removed, as in the extirpation of tumours, and either the air or any other external body be permitted to remain in contact with the divided surfaces, the process of suppuration is speedily induced in the adjacent cellular texture. After the hemorrhage which takes place from the small vessels has ceased, an oozing of a fluid, at first resembling serum, occurs, which is gradually changed into pus. But in this case the surface of the wound is previously covered with a layer of coagulable lymph, which is penetrated with blood-vessels, and gradually raised into the little red eminences called granulations.

Appearances similar, though slighter in degree, are observed in cutaneous suppuration, giving probability to the opinion that in inflammation a vascular surface is produced previously to the formation of pus in a cellular substance, and perhaps also in cutaneous texture. However, no new vascular surface is generated in the inflammation of mucous membrane. Thus we see that in the formation of pus in mucous membranes, cutaneous textures, and exposed cellular substances, no ulceration, no breach of substance is essential; but that, on the contrary, in two of these textures, the cutaneous and cellular, there is an addition made to the parts by the exudation of coagulating lymph, which becomes organised.

The surface of an inflamed serous membrane soon becomes covered with a very thin layer of an albuminous and gelatinous substance, and when this is removed, the membrane is found to have lost its smooth polish. This deposit gradually becomes thicker and more adherent, and forms the rudiment of a false membrane. It is almost constantly accompanied with a serous or sero-purulent effusion. This organised matter has been proved to consist of two parts, one concrescible and adhesive, formed of fibrine; the other fluid, and contained in cells of the former, consisting of albumen. It constitutes what is usually termed coagulable

or coagulating lymph, and by undergoing certain modifications it appears to be converted into pus. Thus, when adventitious membranes do not become organised, they are generally softened down into pus. Pus is sometimes formed within a muscle, and here it seems to be deposited in the intermuscular cellular tissue, the muscular fibre itself being apparently incapable of suppuration.

Purulent matter is met with in all the parenchymatous tissues, either in the form of abscess or of purulent infiltration, as for instance in the lungs, liver, spleen, kidneys, &c., a circumscribed or encysted abscess being more common in the liver, a purulent infiltration in other organs.

Again, mucous membranes are more prone to suppuration than serous ones, in which last there is a far greater tendency to the adhesive inflammation.

Pus is also sometimes met with within the bloodvessels and lymphatics, and even in the heart itself. It has been detected in veins which return the blood from parts in which pus has been collected, as well as in lymphatics, originating in textures in the state of suppuration. In *phlebitis* its presence in the veins, and its mixture with the circulating blood without any preparatory action of the absorbents upon it, are believed to be the principal causes of the frequently fatal termination of this dangerous affection.

Symptoms of Suppuration.

When matter is fully formed in a tumour, there is a change or even a remission of some of the symptoms. The throbbing pain which was so severe on the approach of suppuration from acute phlegmonous inflammation now subsides, and the patient appears dull, with increased pain in part. A conical eminence, or pointing as it is termed, mostly takes place at some part of the tumour, generally near its middle. In this situation a whitish or yellowish appearance is observable instead of a deep red, which was previously apparent, and a fluctuation under it may be discovered on a careful examina-

tion with the fingers. Sometimes, indeed, when an abscess is thickly covered with muscles and other parts, the fluctuation cannot be easily distinguished, though, from other concurring circumstances, hardly a doubt can be entertained of there being even a very remarkable collection of matter. An œdematous swelling over the situation of deeply seated abscesses is a symptom which sometimes throws light on cases of this description. When matter is formed upon the natural surfaces of the body which are connected with vital organs, much irritation and disturbance takes place, but when matter is produced upon the surface of a wound, or upon parts of little vital importance, then its formation is often unpreceded by irritative fever.

The constitutional symptoms which attend the formation of pus in the progress of chronic suppurations are generally comprehended under the head of fever already described.

Theory of Suppuration.

The dissolution of the living solids of an animal body into pus, as an essential part of the process of suppuration, and the power of the fluid to continue the dissolution, are opinions which are no longer entertained. If these notions were true, no sore which discharges matter could be exempted from a continual dissolution. Such ideas probably arose from the circumstance of an abscess being a hollow cavity in the solids, and from the supposition that the whole of the original substance of that cavity was now the matter which was found in it. This was a natural way of accounting for the formation of pus by one entirely ignorant of the circulation, and what takes place in an abscess after it is opened. According to the above erroneous principle, abscesses would continue to increase after being opened as fast as before. Upon the principle of the solids being dissolved into pus, was founded the practice of bringing all indurated parts to suppuration if possible, and not making an early opening. This was done for the purpose of giving

time for the solids to melt down into pus; but it was apparently forgotten that abscesses formed matter after they were opened, and, therefore, the parts stood the same chance of dissolution into pus as before. Blinded with the idea that the solids entered into the composition of pus, the partisans of this doctrine could never see pus flowing from any internal canal without supposing the existence of an ulcer in the passage. Such sentiments might be forgiven while it was not known that these surfaces could, and generally did, form pus without a breach in the solids, but the continuance of this way of thinking now is nothing short of stupidity. The formation of pints of matter in the cavities of the chest and abdomen, without any breach in the solids, could not be overlooked by the most zealous advocates for the doctrine of dissolution.

The moderns have been still more ridiculous; for, knowing that it was denied that the solids were ever dissolved into pus, and that there was not a single proof of it, they have been busy in producing what to them seemed the best of evidence; they have been putting dead animal matter into abscesses, and finding that it was either wholly or in part dissolved, they therefore attributed the loss to its being turned into pus.

This, however, was putting living and dead animal matter upon the same footing, which is a contradiction in itself, for if the result of this experiment were really what they supposed it to be, the idea of living parts being dissolved into pus must be abandoned, because living and dead animal matter can never be considered in the same light. It might have been remarked, that even extraneous animal matter would lie in abscesses for a considerable time without being dissolved, and that in abscesses arising either from violence or from a species of erysipelatous inflammation, there were often sloughs of the cellular membrane, which sloughs would come away like wet tow, and therefore were not dissolved into pus.

Again, it is observed that in abscesses of tendinous parts,

a tendon often mortifies and sloughs away, and that the sores will not heal till such sloughs are detached; but though this separation is sometimes not completed for several months, yet the sloughs are at last thrown off and not converted into pus.

Pieces of dead bone often lie soaking in matter for many months without being changed into pus, and although bones so circumstanced may lose a considerable deal of their substance, a loss which some might compute to the dissolution of the bone into pus, yet such waste can be accounted for on the principle of absorption. The loss is always upon that surface where the continuity is broken off, and it is a part of the process by which the exfoliation of a dead piece of bone is accomplished.

The formation of pus has been attributed to a kind of fermentation, in which both the solids and fluids are fancied to be concerned. This doctrine is easily refuted by stating what happens in internal canals which naturally secrete mucus, but frequently form pus without any loss of substance, or any previous fermenting process.

It may be asked, likewise, by what power the first particle of pus in an abscess, or on a sore, is formed before there is any particle existing which is capable of dissolving the solids? An abscess may be stationary for months, and at last be absorbed, but what becomes of the fermentation all the while the collection of matter continues stationary?

Extravasated blood has been supposed to be capable of being converted into pus. We find, however, that blood, when extravasated, either from violence or the rupture of a vessel, never of itself becomes pus, nor was pus ever formed in these cases without being preceded by inflammation. Both the blood and the matter are formed together in the same cavity under such circumstances. If the blood had coagulated, it would be found in that state, and if it had not coagulated the pus would be bloody.

Violence done to parts is one of the great exciting causes

of suppuration, but simple violence does not always occasion it. The violence must be followed by something that prevents the cure in a more simple way, something that prevents the restoration of the structure and the continuance of the animal functions of the parts. The parts must be kept long enough in that state into which they were put by the violence, or, what is somewhat similar to this, the violence must be attended with death of the part, as in many bruises, all mortifications, and all sloughs, in consequence of the application of caustic, which, when the dead parts separate, leave internal surfaces exposed.

As every injury, or effect of outward violence, under the above circumstances, is more or less exposed to the surrounding air, the application of air to internal surfaces has been assigned as a cause of suppuration; but certainly the air has not the least effect upon parts circumstanced as the above, for a stimulus would arise from a wound, were it even contained in a vacuum. In circumscribed abscesses the air cannot possibly get to the parts, so as to have any share in causing them to suppurate.

The Qualities of Pus.

True pus has certain properties which, when taken singly, may belong to other secretions, but which conjointly form the peculiar character of this fluid, namely, globules swimming in a fluid which is coagulable by a solution of the muriate (hydrochlorate) of ammonia, which no other animal secretion is, and, at the same time, a consequence of inflammation. This fluid-like serum is coagulable by heat. Pus also contains abundance of fibrine; if water be poured upon pus until the solid part which remains at the bottom of the vessel be entirely deprived of its serum and globules, numerous portions of fibrine are found remaining, and although not exactly of the same size, yet they have a great uniformity of appearance. Thus pus is composed of serum, fibrine, and globules, say some authorities; but if I were to hazard a

theory upon this subject, I should say that pus was composed of the constituent parts of the blood, slightly changed in their character by inflammation. The colour and the consistence of pus are the two qualities which first attract the notice of the most superficial observer. The colour arises from the largest portion of this fluid being composed of very small round bodies, much resembling the globules of cream. The fluid in which the globules of pus swim might at first be supposed to be the serum of the blood, for it coagulates with heat, like the latter fluid. Pus is also probably mixed with a small quantity of coagulating lymph, as it partly coagulates after it is secreted. However, the fluid part of pus is found to have properties which serum has not. There being a similarity between pus and milk, experiments have been made to ascertain whether the fluid of pus could be coagulated with the gastric juice of animals, but no coagulation could be effected in this manner; a solution of muriate of ammonia made the fluid parts of pus coagulate, but not any other secretion or natural fluid, and hence it was concluded that whenever globules were found swimming in a fluid coagulable by muriate of ammonia, the matter was to be considered as pus.

Now, besides the above properties, pus has a sweetish mawkish taste, very different from that of most other secretions, and this whether it be pus from a sore or from an inflamed surface. It has likewise a smell, in some degree peculiar to itself, but different in different cases.

Pus is specifically heavier than water, consequently sinks in that fluid. It is probably about as heavy as blood.

Pus also communicates to water an uniformly white troubled colour; mucus gives the appearance of stringy portions floating in it. Again, mucus is said to be more readily dissolved by sulphuric acid than pus is. It has also been asserted, that if water be added to such solutions, the pus is precipitated to the bottom of the vessel; while the mucus, instead of being completely precipitated, forms swim-

ming flakes. These and other distinctions between pus and mucus are not, however, deemed of much importance. at the present day, when pus is no longer regarded as a sure proof of the existence of ulceration.

Pus has been suspected to have a great tendency to putrefaction; but this is not the case with pure pus, which, when first discharged from an abscess, is perfectly sweet. But if the abscess has any communication with the air while the matter is confined in it, or if the collection has been so near the rectum as to have been affected by the fæces, then the matter will quickly become putrid.

When blood is blended with pus, when sloughs are mixed with it, when the parts forming the seat of the abscess are in a gangrenous state from an erysipelatous affection, the matter has a greater tendency to putrefy than the pure pus discharged from sound abscesses or healing sores.

Pure matter, though easily rendered susceptible of change by extraneous additions, is in its own nature tolerably uniform and immutable. It appears so unchangeable that we find it retained in an abscess for weeks without having undergone any alteration. These qualities, however, only belong to perfect pus. If a healthy sore inflames, the matter now produced from it, though unmixed with extravasated blood or dead solids, becomes much sooner putrid, and more irritating than the discharge formed before this alteration of the ulcer. When dead bone or other extraneous bodies are present, and keep up irritation, or when blood becomes mixed with the purulent matter, the discharge is always fetid and offensive. This state of it is one mark of the presence of carious or dead bone. The discharge of an unhealthy sore blackens a silver probe.

The Use of Pus.

The secretion of pus has been looked upon as a general prevention of many or of all the causes of disease. Hence issues have been made to keep off universal as well as local

diseases. However, the use of pus is perhaps unknown, for it is formed most perfectly from healthy sores, and in healthy constitutions, and large discharges from parts not essential to life produce very little change in the constitution, and as little upon being healed up, whatever some may suppose to the contrary.

When the surface of a sore is left uncovered, the thin part of the matter evaporates, and the thick part dries and forms a scab. Nature, therefore, seems to have designed that one use of pus should be to make a cover, or protection, for ulcerated surfaces. That being so, I must herein lodge my dissent from the theory that the natural healing of a sore under a scab usually takes place more quickly than when the proper dressings are employed.

Now, among the secondary uses of suppuration may be mentioned that of opening a communication between a disease and the external surface of the body, and that of leading to the formation of a passage for the exit of extraneous bodies, &c.

Though an abscess is sometimes dispersed by its contents being absorbed, this is not the usual course of the case, and the tumour, instead of diminishing, generally continues to increase, instead of subsiding or remaining stationary. Under such circumstances the pus commonly advances either to the skin or a mucous surface, in which an outlet for it is produced by an ulcerative process. Here, then, we find that pus is subject to the general law of the animal economy, which tends to expel from the body all deleterious substances capable of irritating and disturbing its textures. It is scarcely necessary to observe that when pus makes its way into a cavity, passage, or organ lined by a mucous membrane, it finds almost as ready an outlet from the body as if the abscess had taken its still more frequent course to the cutaneous surface. If an abscess be near a mucous texture, then nature will often make the pus take this direction to discharge itself instead of conducting it to the

skin, which may be more remote. But we do not remark a similar tendency of abscesses to make their way into cavities invested by a serous membrane, because, as this always constitutes a close sac, the advantage of an outlet for the purulent matter would not thereby be obtained. Illustrations of this disposition are afforded in abscesses in the vicinity of bones, or in the parietes of the abdomen or chest, or situated near fibrous or synovial membranes, where, instead of weakening the textures, abscesses frequently have the contrary effect, by thickening the periosteum (the covering of bone), the pleura (the lining of the chest and the covering of the lungs), the peritoneum (the covering of the bowels), and the fibrous and synovial structures.

The Treatment of Abscesses.

In cases of inflammation arising from external violence, but so circumstanced that suppuration cannot be prevented, the indication is to moderate the inflammation, which, if the injury be considerable, will probably be violent. Therefore, the best means calculated to lessen the inflammation and constitutional disturbance must be employed without delay.

To free the part from the purulent matter, and to promote the approximation, and afterwards the reciprocal agglutination of the opposite surface of the cavity which contained the matter, are the general indications in the treatment of abscesses. These objects must be fulfilled, either by bringing about absorption and dispersion of the matter, or by discharging it, and healing the part with the aid of methodical dressings and suitable medicines.

Instances of the rapid absorption of abscesses in consequence of a sudden attack of profuse diarrhœa, or copious increase of urine or perspiration, are not unfrequent, and this is unquestionably the least painful mode of cure; so that what nature thus occasionally brings about, art has likewise attempted to accomplish by means of active purgatives, diureties, sudorifics, and stimulating applications.

But abscesses resulting from acute inflammation seldom admit of absorption, they are almost sure to burst, and the continuance of a degree of suppuration seems afterwards to be essential to bring the cavity into a healing state. Nor are the thick cysts of certain chronic abscesses more favourable to this mode of cure, because before their opposite sides will enter into the adhesive process, fresh inflammation is requisite to modify their texture.

In consequence of the general ill-success, however, which attends the plan of endeavouring to disperse abscesses by absorption, we do not as a rule make the attempt. We try indeed to prevent acute inflammation from advancing to suppuration at all, and when this cannot be accomplished, we must aim at lessening the abscess in its early stage; but as soon as purulent matter has been unequivocally formed, we more commonly direct our plans to the discharge of pus than to the absorption of it.

The common applications to inflammation which is to suppurate and form an abscess, are poultices and fomentations. These are useful when inflammation attacks the skin, either in the first instance, or after an abscess has approached so near the skin, that this becomes secondarily affected. This benefit appears to arise from the skin being kept soft and moist. Such is the use of a poultice in inflammation, either before or after suppuration, until the abscess is opened. But when poultices and fomentations are applied to inflamed parts in which we wish to avoid suppuration, reason and principle will not justify the practice, though such applications may be proclaimed by experience to be proper. When, however, suppuration cannot be avoided, the most approved plan is not to persist in the use of cold applications, but to have recourse at once to emollient applications. If it should happen that the parts are indolent, and hardly admit of true inflammation, in consequence of which a perfect suppuration cannot take place, stimulating the skin brings on a more salutary, and of course a quicker

inflammation. Acting then upon this principle, blistering preparations applied over chronic abscesses may sometimes be proper.

Emollient poultices are commonly applied to inflamed parts in which suppuration is known to have taken place. These can have no effect upon suppuration, except that of lessening the inflammation, or making the skin more easy. The inflammation must have reached the skin before poultices can have much effect, for they can only affect that part. But we must consider in a humane spirit the ease of our patient; therefore poultices and fomentations are, on this principle, very beneficial, for by keeping the skin moist and warm the sensitive operations of the nerves of the parts are directly soothed. On the other hand, if the inflamed skin is allowed to dry, the inflammation is increased, and the patient's suffering is unnecessarily prolonged and lengthened. As warmth excites action, the fomentations should be as warm as the animal can bear without causing inconvenience. Warm emollient applications are also very useful in accelerating the progress of the matter to the surface of the body.

The Opening of Abscesses.

Abscesses situated in the region of the neck, chest, or abdomen should be opened without delay, in order to prevent with certainty the effusion of pus inwardly. Certain abscesses of the neck call for an early opening, because they not only cause a considerable and very painful swelling, but the matter may easily descend towards the chest in the course of the vessels and nerves;—in short, all abscesses producing serious disturbance or interruption of the functions of very important organs, and thereby endangering life, as abscesses of the throat, may threaten suffocation. In such cases, if you defer making an opening until the swelling has softened and the abscess perfectly formed, the animal would be in great danger of perishing ere such changes had taken place.

The generality of chronic abscesses should be opened early, more especially if the means usually resorted to for promoting the absorption of the matter present no prospect of success. By omitting to make an outlet for the matter, we allow the accumulation of it to increase, and sometimes the abscess then becomes dangerous from its mere size, the inner surface of it, or the cyst, acquiring vast magnitude.

Where the Opening should be made.

If a free opening be not required, or the making of such free opening impracticable, it is at least proper to make whatever outlet for the matter can be made in a depending situation. By this means the pus will more readily escape, and all pressure arising from its confinement or lodgment will be prevented. When circumstances forbid an opening at the most depending part of an abscess, we should make a freer opening than would otherwise be required, press out the matter as often as necessary, and keep the sides of the abscess together with a bandage, but, if possible, always endeavour to open them in a low situation.

Different Methods of Opening Abscesses.

All abscesses will sooner or later burst naturally of themselves, unless the matter be absorbed, and sometimes they ought to be allowed to take this course. There are, however, particular circumstances which urgently require an early opening; but when the skin over the abscess is very thin, it is not of much consequence whether the case be permitted to burst of itself or opened.

When abscesses are large, it is generally necessary to open them by art, whether they have burst of themselves or not, for the natural opening will seldom be sufficient for the completion of a cure, and although it may be sufficient for the free discharge of the matter, yet these abscesses will heal much more readily when a free opening is made; for the thin skin over the cavity granulates but indifferently, and therefore unites but slowly with the parts underneath.

Abscesses may be opened either with a lancet or knife, or occasionally by an escharotic. Against the latter plan, however, strong objections lie, as the use of caustic is not usually attended with any advantage which may not be obtained by a simple puncture or incision; upon a tender inflamed part it gives much more pain, it is more slow in its effects, and we can never direct its action so nicely as to destroy exactly the parts which we wish and no more; and if the eschar be not deep enough, the lancet must be used after all. Caustic also leaves a greater scar; but it may sometimes be advantageously resorted to when there is a good deal of indolent hardness around a small abscess.

However, in almost all cases it is better to use the lancet, or sharp-pointed narrow knife. Either of these instruments opens the abscess at once, and with less pain than results from caustic; it occasions no loss of substance; you can make your opening in the most advantageous direction, and of the exact size required.

Dressings for Abscesses.

When an abscess has burst of itself, the surrounding skin is to be kept clean, and the emollient applications are to be continued until the discharge has considerably diminished, and the accompanying inflammation has subsided. Should such opening be too small in relation to the size of the abscess, it is to be enlarged; and should it not be depending, it may sometimes be rendered so. If this cannot be accomplished, and the lodgment of matter is considerable, a new or counter opening must be formed in an advantageous place for the exit of the pus.

Now, an abscess opened with a cutting instrument is both a wound and a sore, and partakes more of the nature of a fresh wound in proportion to the thickness of the parts cut. Hence it is sometimes necessary that something should be put into the wound in order to keep it open and prevent healing by the first intention. If it is lint or tow, it may

be dipped in olive oil, or sweet oil, which will prevent it from adhering, and allow it to be removed sooner, without causing pain and irritation, than would otherwise be practicable. This is advantageous, because the ulcerated opening should be dressed the next day, or at the latest on the second day, in order that the pus may be discharged again. As soon, then, as the cut edges of the opening have suppurated, the dressing cannot be too simple, such as cold water, and afterwards such other applications as the state of the sore may require (see Wound Dressings). Openings spontaneously formed in abscesses have less disposition to close than those made with a cutting instrument, and seldom therefore require anything introduced into them for the purpose of maintaining them in this condition. The previously thinned state of the integuments, and their ulcerated condition, are considerable impediments to any prompt closure of the openings by adhesion. But the edges of an incision which extends through some thickness of textures, if allowed to be in contact with one another, are also disposed to unite.

If the abscess has been opened with caustic, and the slough has separated, the case is to be regarded altogether as a suppurating sore, and dressings suitable for such are according applied.

A linseed-meal poultice or water-dressing is as good an application as any, until the nature of the sore is known. If it should be a good kind, the same dressing may be continued; but if not, then it must be dressed accordingly. Parts which at first appear to be sound, sometimes assume every species of disease, whether from want of exercise or from irritability. In some instances this tendency to disease arises from the nature of the parts affected, as, for example, bone, ligament, &c.

Wounds.

A wound may be defined to be a recent solution of continuity in the soft parts, suddenly occasioned by

external causes, and attended at first with more or less hemorrhage.

Wounds in general are subject to considerable variety in their nature, degree of danger, facility of cure, and the consequences which are to be apprehended from them. Some wounds are quite trivial, not extending more deeply than the skin and cellular tissue, while others are very serious and dangerous, penetrating the muscles, tendons, large blood-vessels, nerves, and viscera; while there are wounds which are not confined to the soft parts, but injure even the bones.

Again, many wounds of the head, chest and abdomen injure the organs contained in those cavities. In short, the varieties and the degree of danger attending wounds in general depend very much upon some of the following facts: namely, the extent of the injury; the kind of instrument with which it has been inflicted; the violence which the fibres of the part have sustained in addition to their division; the size and importance of the bloodvessels and nerves which happen to be injured; the nature of the wounded part, in respect to its general power of healing favourably, or not; whether the operations of the system at large, and life itself, can well be supported or not, while the functions of the wounded part are disturbed, interrupted, or suspended by the accident; the age of the animal; the condition of its constitution; and the opportunities which there may be of administering proper medical aid and assistance of every kind.

Now all wounds of considerable size or depth, not producing immediate death, are followed by more or less disturbance of the whole constitution—by a fever which, on account of its being an effect of the local injury, is sometimes called *traumatic*, or *symptomatic*, or *sympathetic*, in consequence of its being, as it were, in sympathy with the whole animal economy through the wounded part. It is likewise frequently named inflammatory fever, as being a constant attendant on severe inflammation.

Profusely suppurating wounds, the cure of which is retarded by any incidental circumstances, invariably bring on great debility, and a particular disturbance of the sanguiferous, secreting, digestive, nervous, and other systems.

Incised Wounds.

As a general observation, it may be stated that a wound made with a sharp cutting instrument (a mere incision) is attended with less hazard of dangerous consequences than any other kind of wound whatsoever. The fibres have only been simply divided, they have suffered no contusion, nor laceration, consequently they are less likely to inflame severely or to suppurate or slough, while they commonly admit of being united again in a very expeditious manner. Generally, however, simple incised wounds bleed more freely than contused and lacerated ones.

In a recent simple incised wound there are three objects which we should endeavour to accomplish without the least delay. The first, and that which requires our immediate interference, is the bleeding, which must be checked. The second is the removal of all extraneous or foreign bodies from the wound. The third is the reunion of the opposite sides of the injury. When the divided vessels are not above a certain size the bleeding soon spontaneously ceases, and no surgical measures need be taken on this particular account.

When the wounded vessels are somewhat larger, and their situation is favourable for compression with a bandage, it is often advisable to close the wound and apply such compression rather than have recourse to a ligature, which always creates a certain amount of irritation and suppuration. However, although I make this observation, I should be exceedingly sorry to appear at all against the general preference to ligatures, whenever the wounded arteries are above a certain magnitude. In this circumstance, tying the bleeding vessels is the only safe mode of proceeding if the artery is of considerable size, and its mouth can be readily seen;

the proper instrument for taking hold of it is a pair of forceps.

The bleeding having now been suppressed, the next object is to remove any extraneous matter, such as gravel, bits of grass, clots of blood, and clay from the wound; were this neglected the plan of uniting the opposite sides of the cut by the adhesive inflammation, or by what is more frequently termed union of the first intention, would generally fail, and abscesses follow; or if there were union, it would only confine the foreign bodies, which would keep up pain in the part, and interfere with its functions. These foreign bodies, if allowed to remain, often produce such consequences, and if not extracted at first they sometimes become difficult to find and remove at a later period.

When attention has been paid to the foregoing indications, we must now put the lips of the wound in contact, and employ measures to keep them in this state, until they have grown firmly together; this can be done by means of adhesive plaster cut into strips, or by sutures, or by the employment of bandages.

When attention is paid to these rules, it often happens that the two opposite surfaces of the wound grow together in the course of forty-eight or sixty hours without any degree of suppuration. The process by which this desirable event is accomplished is well known by the name of *union by the first* intention. Now besides the advantage of the cure being effected in this way with the greatest possible expedition, there is another consideration highly in favour of constantly promoting this method of healing wounds, which is that the scar is much less than after any other mode of recovery, and the part is covered with original skin, which is always stronger than any which can be formed as a substitute for it.

Contused and Lacerated Wounds.

Lacerated wounds are those in which the fibres, instead of being divided by a cutting instrument, have been torn

asunder by some violence capable of overcoming their force of cohesion. The edges of such wounds, instead of being straight and regular, are jagged or unequal.

The term contused is applied to wounds occasioned by some blunt instrument or surface which has violently struck a part of the body.

These two species of wounds greatly resemble one another, and as they require nearly the same kind of treatment it is better to class them together.

Lacerated and contused wounds differ from simple incised ones in appearing at first view less alarming than the latter, while in reality they are infinitely more dangerous. In simple cut wounds the retraction of the parts and the hemorrhage are generally much more considerable than in a lacerated wound of the same size. However, notwithstanding these facts they commonly admit of being healed with far greater ease. It is worthy of particular notice that lacerated and contused wounds are not in general attended with any serious effusion of blood, even though large blood-vessels be injured.

In contused and lacerated wounds the pain is in an inverse ratio to the cause of the accident; it is generally very severe when the wound is only moderately contused, and on the other hand, when there has been so violent a degree of contusion as at once to destroy the organization of the part, the animal suffers scarcely any pain at all.

When the bruised fibres have not been injured above a certain extent the part suppurates, but such portions of the wound as have suffered greater violence inevitably die and are cast off in the form of sloughs. Granulations are afterwards formed, and the breach of continuity is repaired.

When a still greater amount of violence has been inflicted, and especially where arteries of a certain magnitude have been at the same time injured, mortification is too frequently the result. However, if the constitution be good and the mischief not too extensive, the case may still end well.

But in other instances the event is a just cause of apprehension, for the mischief is then not limited to the wounded parts which have suffered the greatest extent of contusion, but too often extends over such parts as were not at all interested by the wound itself. Now, the mortification arising directly from the impaired organisation of parts is not the most alarming circumstance. A still more dangerous kind of mortification is that which originates from the violent inflammation produced by the accident. This effect demands the utmost attention, and we must allow no useful means to be neglected, with the view of diminishing the inflammation before it has attained too high a degree, and threatening symptoms have commenced. In the first instance we should not be afraid of allowing the wound to bleed a little if it should be disposed to do so. The edges of the wound should be gently drawn towards each other, and retained in this position by a few strips of plaster, so as to lessen the extent of the exposed surface. Some authorities object to this mode, but I have ever found good reason to recommend its adoption.

Now, under the most favourable circumstances, hardly any part of such a wound as the one we are describing can be expected to unite by the first intention, because the whole, or the greater part of it, will necessarily suppurate after the detachment of the sloughs. The surface will then granulate, new skin will be formed, and the part heal, just like a common wound. So, perhaps, until the sloughs separate, the best application is a soft, nice poultice, or the cold water remedy may be adopted.

Punctured Wounds.

A punctured wound signifies one made with a narrow pointed instrument, the external orifice of the injury being small and contracted, instead of being of a size proportionate to its depth. A wound produced by the thrust of a pitchfork or nail affords an example of a punctured wound.

Wounds of this description are in general infinitely more dangerous than cuts, notwithstanding the latter have the appearance of being by far the most extensive. In stabs the greatest degree of danger always depends on the injury and rough violence which the fibres have suffered in addition to their mere division. Many of the disagreeable results are also imputed to the considerable depth to which these wounds extend, whereby numerous textures, important parts, and organs are frequently injured.

Again, it sometimes occurs that the treatment is rendered perplexing by the difficulty of removing extraneous substances—as, for instance, foreign bodies may be carried into the wound at the time it was inflicted; and lastly, experience proves that punctured wounds are particularly liable to be followed by a great deal of inflammation, fever, deep-seated abscesses, and sinuses. In fact, some authors regard a punctured wound as a recent sinus, and in order to make the inner surfaces unite, they recommend exciting inflammation in them, either by means of setons or injections.

Now the time when incisions are proper is when there are foreign bodies to be removed, abscesses to be opened, or sinuses to be divided. But to make painful incisions sooner than they can answer any end, is both injudicious and hurtful; in fact, they are sometimes rendered quite unnecessary by the union of the wound throughout its whole extent, without any suppuration at all.

Making, then, a free incision in the early stage of these cases undoubtedly seems a reasonable method of preventing the formation of sinuses by preventing the confinement of matter; and were sinuses an inevitable result of all punctured wounds, for which no incision had been practised at the moment of the occurrence, it would undoubtedly be unpardonable to omit them. Fair, however, as this reason may appear, it is only superficially plausible, and a little reflection soon discovers its want of real solidity. Under what circumstances do sinuses form? Do they not only

form where there is some cause existing to prevent the healing of an abscess? This cause may either be the indirect way in which the abscess communicates with the external opening, so that the pus cannot readily escape; or it may be the presence of some foreign body or carious bone; or, lastly, it may be an indisposition of the inner surface of the abscess to form granulations, arising from its long duration, but removable by laying the cyst completely open. Thus it becomes manifest that the occurrence of suppuration in punctured wounds is followed by sinuses only when we neglect to procure a free issue for the matter after its accumulation, or when we neglect to remove any extraneous body.

Now as dilating the wound at first can only tend to augment the inflammation and render the suppuration more extensive, it ought never to be practised except for the direct object of giving free exit to matter already collected, and of being able to remove foreign bodies palpably lodged. And here let me observe, that it is an erroneous idea to suppose the narrowness of punctured wounds to be so principal a cause of the bad symptoms with which they are often attended, that the treatment ought invariably to aim at its removal.

In the first stage, then, of a punctured wound, the indication is to guard against the attack of violent inflammation. When no considerable quantity of blood has been lost, a little local bleeding is beneficial. And as no man can pronounce whether such a wound will unite or not, and as no harm can result from the attempt, the orifice ought to be closed, and covered with simple dressings: but whether gentle compression might be made to promote the adhesive inflammation or not, may be doubtful. However, perfect quietude must be observed, and if the pain is severe, opium is to be administered, followed by a purgative.

Sometimes under this treatment we are agreeably surprised to find the consequent inflammation mild, and the wound speedily united by the first intention. Indeed, numerous

examples of wounds which penetrate the large cavities are found healed by the first intention, that is to say, without any suppuration. But in deep stabs the pain is intolerable, and the inflammatory symptoms run so high as to leave no hope of avoiding suppuration. In this condition emollient poultices and fomentations are the best local remedies. And when the matter is formed, the treatment is like that of abscesses in general.

Poisoned Wounds.

If we exclude from present consideration the bites of mad dogs and other rabid animals, this will reduce and limit the number to those inflicted by wasps, hornets, &c.

The stings of these insects are attended with a sharp pain in the part, very quickly succeeded by an inflammatory swelling, which after a short time generally subsides of itself. Experiments tend to prove that when the little poison-bladder, situated at the base of the sting, has been cut off, a wound with the sting produces then no pain. The poison flows from the vesicle through the sting at the instant when this passes into the flesh. But the exact nature of the venomous fluid is not known. When applied to mucous surfaces, or even to the eye, it causes no disagreeable sensation; but when it is introduced into the skin by means of a needle, it immediately excites very acute pain.

Oil, honey, spirit of wine, and a variety of other local applications have been extolled as specifics for the relief of such stings. However, modern experience does not sanction their claim to this character; in fact, none of these agents either neutralise the poison, or appease with superior efficacy the pain of the sting.

These cases should all be treated on the most rational principal, that is, to extract the sting, taking care in the first instance to cut off the little poison vesicle with scissors, lest in the attempt to withdraw the sting more of the virus be compressed into the part. If possible, the part stung should

be immersed in ice-cold water, and afterwards covered with wet cloths that have been dipped in a solution of sugar of lead.

For the treatment of the bite of a viper or mad dog the principal object must be the destruction of the venom, the prevention of its entrance into the vessels, or the removal of it from the wound.

Now the plan commonly preferred is that of destroying the envenomed part with caustic, or the actual cautery; or in other words, firing the part with a red-hot iron. When this is done in time, it is said that the poison will be prevented from extending its irritation over the system. The caustic and cautery, it is also conjectured, may have the effect of chemically destroying the venom itself, while they tend to arrest and hinder its passage into the circulation, inasmuch as they destroy the neighbouring absorbent vessels. In France, liquid caustics are preferred, such as the fluid muriate of antimony, the liquor ammoniæ, or the sulphuric or nitric acids, because their action is quicker, and they more certainly penetrate to the bottom of the wound. Either of these liquids may be applied by means of a thin piece of wood, which is to be dipped in it, and then introduced into the puncture made by the fangs of the animal. This should be repeated in order to make sure that you have gone to the root, or if you can drop a little of the caustic into the cavity so much the better.

When the bite is very narrow and deep, it is a good plan to enlarge the mouth of the wound with a lancet, so that the caustic may be properly introduced, or a little lint may be wet in one of the aforesaid fluids and then pressed deeply into the wound. After the caustic has produced an eschar, the best application is an emollient poultice.

There are, of course, wounds inflicted in almost every conceivable part of the body, upon which it will be wholly unnecessary to dwell. Suffice it to say that the first duty in every case is to remove the cause, and attend to the general instructions already given; but I may here add one

or two formulas, which will be found of great advantage in the treatment of wounds in general. The following is a very useful dressing, to be applied shortly after an injury is inflicted :—

Carbolic acid 1 oz., olive oil 8 oz.; mix and apply once daily. Astringent lotion: sulphate of zinc ½ oz., lig. plumbi. dia. ½ oz., water 12 oz.; mix and apply twice daily (this forms the white lotion). Of course, when proud flesh appears it must be reduced with caustic, such as the nitrate of silver, blue stone, &c.

Diseases of the Liver.

The liver is a highly organised gland, situated in the abdominal cavity; it is the largest secreting gland in the body, and manufactures that element known as bile. Modern science has also discovered that it plays an important part in the process of blood-making. Proceeding then with the diseases that appertain to this important organ, let us first briefly notice.

Intestinal Concretions.

Comprehending under this head both gall-stones and other concretions, we will first, then, observe that some hepatic concretions cannot pass from the place of their origin into the intestines, but only such as are situated in the main branches of the liver, in the gall bladder, &c.; that when their size is not disproportionate to the diameter of the ducts, they pass with facility, but when their dimensions are larger than those ducts can naturally admit, the latter become stretched and dilated, whence arise the sharp colicky pains which usually attend the disorder. Now as all crystallisations depend upon the fluids in which they form, and from which they receive their crystallising elements, it must be evident that inasmuch as the fluids of the hepatic organs differ in their constituent principles from the fluids contained in the intestinal canal, the concretions produced

in the first system must differ from those originating in the second, whilst the hepatico-gastric calculi will combine the nature and properties of both together.

Arriving at this conclusion, the fluid from which hepatic concretions are formed is unquestionably the bile, either some or all of its ingredients entering into their composition. Indeed, at one time hepatic calculi were generally considered as being simply condensed indurated bile.

From investigations made in more modern times, however, when the art of analysis has attained a precision of which the old chemistry school was not susceptible, it appears that although biliary calculi yield the same products as the bile, there is contained in them more or less of a peculiar substance which was considered to be very similar to spermaceti, but which has since been proved to be cholesterine. Now the presence of this substance in the concretion is of such importance that when it is abundant and in large proportion the calculus is regular and the crystallisation well finished, and when it is small the crystallisation is confused and disordered; the calculus only exhibiting an irregular misshapen concretion.

According to other authorities, biliary concretions in general are composed of the yellow colouring matter of the bile and cholesterine, the latter predominating, and being sometimes in a state of purity.

While the hepatic system contains a fluid which is always nearly of the same quality, namely the bile, the alimentary canal contains a hundred different fluids, and is continually occupied by substances of various natures, kinds, and properties, consisting of food, drink, and diverse secretions. All the principles which are to serve for the formation and renewal of the different species of living solids, and of the many kinds of fluids, at first remain more or less time in the alimentary canal, and there undergo peculiar changes. All the principles which under different circumstances may contribute to the production of morbid concretions, either in the

gall bladder, the urinary bladder, the kidneys, or in any other part of the body where they ever occur, pass at first into the intestinal canal, where they continue for some time. Such a multiplicity of principles, disposed to crystallise and be converted into calculi, would almost daily produce these concretions in the bowels, were there not many circumstances which counteract this tendency; as, for instance, exercise; the incessant motion of the matter itself along the intestinal tube; the variety of these elements, whereby their natural tendency to unite is disturbed; and the decomposing and recomposing influence of the gastric secretions, whereby parts are united, disposed of, dissolved, and analogous matter kept divided. But whenever these circumstances are not actively operating, as may be the case in a noose or fold of the bowels, or in some preternatural spot belonging to them; whenever the intestinal fluids undergo such an alteration that the production of these concretions cannot be prevented, or, lastly, whenever some favourable circumstance, such as an extraneous nucleus, forms a centre of reunion which is most disposed to crystallise, the earthy and mucilaginous substances are attracted together, and produce more or less perfect crystallisations.

Millers' horses are subject to alvine concretions formed of collections of the grit of the stone-dust in the mills, taken into their stomachs when fed upon soft bruised foods. In cows and sheep the concretions are found often in the alimentary canal, consisting of hairs and anything that will form a nucleus; of course if these are evacuated so much the better, but as a rule the patient dies after frequent attacks of colic and indigestion and constipation.

Acute Hepatites, or Inflammation of the Liver.

This disease rarely occurs as an idiopathic affection, but it is commonly met with in the ox in the chronic form. It may be brought on by the animal being highly fed without receiving any exercise, or sudden change from bad to good

nutritious food. This causes a great and undue secretion of bile, whereby the glands of the organ become engorged with blood, and as a result inflammation is set up.

Symptoms.—The animal is dull and listless, but indicates no startling evidence to guide one to the conclusion that the pain is severe. The skin is hard, rough, and itchy, the appetite is wholly suspended, the visible mucous membrane—that is to say, the linings of the eyes and nose—are of a reddish-yellow colour. The tongue appears dirty and foul; small quantities of feces are passed, they are often dark and glassy; at other times the excrement is of a white clay colour possessing a very disagreeable odour: this appearance is due to the secretion of the bile being arrested. If the peritoneal coverings become implicated the fibrile symptoms are very severe; dropsy is frequently the result, great emaciation ensues, and finally death claims the sufferer as his own.

Treatment.—Endeavour to relieve the bowels by administering an active aperient as speedily as possible, allow plenty of water with nitre in it to drink, apply hot fomentations to the region of the liver, or put the dog in a nice warm bath, or apply a smart active blister, composed of mustard and acetic acid. These agents are generally handy, and require little preparation further than to mix together until you acquire the proper consistence. Avoid stimulating food of every description, and otherwise attend to the patient's comfort. If the bowels are obstinate and difficult to move, an injection will be of material assistance in this complaint.

Chronic Hepatitis.

In this disease the primary symptoms are not well defined, but for some considerable time the animal will be found dull and listless, and evince little desire to move; the appetite is very capricious, and at other times entirely lost; the bowels are constipated, and feces that may be passed are hard, dark, and clay-coloured, and seem to be imperfectly digested; the urine is scanty and high-coloured. But upon

the whole the disease is obscure, and generally far advanced before medical aid is thought about.

Treatment.—Saline medicines must be employed; that is to say, plenty of salt must be administered along with calomel, and frequently repeated, injection thrown up, blisters applied over the region of the liver, and food of an easily digested nature must be given.

The post-mortem appearances are: the liver large, soft, and friable, and frequently attached to surrounding part.

Icterus or Jaundice.

This disease is called in some parts of the country Golden Pheasant, from its distinguishing and characteristic symptom being yellowness of the mucous membrane.

It generally follows low debilitating diseases, such as pleuro-pneumonia, but it may also occur as an idiopathic from various causes, the most common being the obstruction of the bile-ducts of the liver. It may also occur by the muscles of the vital circulation becoming engorged.

This disease approaches much more rapidly in the human subject than in the lower animals; of course the causes that produce it are generally intensified the higher up the scale we go.

Symptoms.—Intense yellowness of the mucous membranes, the skin partaking of the same yellow tinge, quick pulse, appetite and bowels very irregular, the latter sometimes constipated, the feces glassy, urine copious and of a brown colour; the milk, if any, also partakes of the same nature as the urine in colour.

Treatment.—Saline purges with calomel; if no effect be produced, repeat the dose upon the following day, and give salt with plenty of fluids until the bowels are freely moved. If the patient is weak give stimulants and tonics, with repeated injections; great benefit may also be derived from employing formula already recommended in Acute Hepatitis.

Post-mortem Appearances.—The fat, flesh, blood, liver, all partake of a yellow-brown tinge.

Biliary Calculi, or Gall Stones.

These are commonly met with in the ducts of the liver, but as I have dwelt upon concretions in general, we will only require to add here a few additional symptoms in order to assist in the proper diagnosis of the disease. These stones may vary in size from a pin-head to a pigeon's egg. The colouring matter of the bile seems to be reabsorbed, it then circulates with the blood, giving to the tissues that peculiar unhealthy yellow tinge. The signs are at first very obscure, but general yellowness of the mucous membranes will be observed; the animal will be restless and uneasy, respiration quickened, with an anxious expression about the face; but the most unpleasant symptom arises when the gall-stones pass through the ducts and become fixed in other parts. The pain produced is very acute, but the true and violent intensity of the sufferings are never properly comprehended in the lower animals even by the most descriptive and sympathetic witness.

Treatment useless.

There are other diseases of the liver, such as chronic enlargement, serous and fatty degeneration, and rupture, &c., of which little distinguishing difference is perceptible from the diseases already described, therefore we need not occupy space by a repetition of analogous symptoms and remedies.

Aneurism.

The tumours which are formed by a preternatural dilation of a part of an artery, as well as those swellings which are occasioned by a collection of arterial blood effused in the cellular tissue in consequence of a rupture or wound of the coats of the artery, but having no outlet in the integuments, receive the name of aneurisms. According to these opinions, then, aneurisms are of two kinds, the first being termed *true*, the second *spurious* or *false*.

Some writers reckon another form of aneurism, which is

said to happen when the external coats of an artery being weakened by mechanical injury or disease, the internal coat protrudes through the breach in the outer coat, so as to form a tumour distended with blood.

An aneurism may then be defined to be a tumour filled with blood, either in a fluid or solid state, usually attended with pulsation, and the sac of which has an opening in it by which it communicates with the artery from which the blood is transmitted into it. Another definition is, that it is a tumour filled by arterial blood and communicating with an artery, and divides all aneurisms into *traumatic* and *spontaneous*, according as they happen to be produced by a wound or disease of the coats of the artery.

Now when any part of an artery is dilated (attended with particular circumstances marking its difference from another form of dilation which, as I shall explain, perhaps ought not to be set down as aneurismal), the swelling is commonly named a *true* or *genuine* aneurism. In such cases the artery is either enlarged at only a small part of its track, and the tumour has a determinate border, or the vessel is dilated for a considerable length, in which circumstances the swelling is oblong, and loses itself so gradually in the surrounding parts, that its margin cannot be exactly ascertained. The first case, which is the most common, is termed the circumscribed true aneurism, the last the diffused true aneurism.

Again, when blood escapes from a wound or rupture of an artery into the adjoining cellular substance, the opening in the skin having closed, the swelling is denominated a spurious or false aneurism. In this instance, the blood either collects in one mass, distends the cellular substance, and condenses it into a cyst, so as to form a distinctly circumscribed tumour, or it is injected into all the adjacent cellular substance, and extends along the course of the great vessels, from one end of the leg to the other, thus producing an irregular oblong swelling.

Now, in true aneurism, the coats of the artery are not

always in the same state, the kind of changes observed depending upon the progress of the tumour. In the early stage of the disease, either the whole cylinder of the vessel or only a part of the circumference is dilated, but this period is generally of short duration, especially in arteries of middling size, because their middle coat is capable of less resistance than that of the larger arteries. At length, in consequence of the increasing distension, some of the coats of the artery possessing the least elasticity give way, and these are found to be the internal and middle coats, while the external one still makes resistance, and continues to be more and more dilated by the lateral impulse of the blood. A false aneurism is always attended with at least a rupture, or giving way of the inner coat of the vessel, and usually with breach in both this and the muscular coat, the outer elastic tissue forming the pouch in which the blood collects. But after the swelling has attained a certain size, this coat also bursts, and then the blood either becomes diffused, or a large circumscribed space is formed for it by the condensation of the surrounding cellular membrane. False aneurisms, when produced by a wound or puncture, are of course from the first attended with a division of all the coats of the vessel. This form is often seen in horses and cattle that are bled.

The Treatment of Aneurisms.

Now, the grand means most to be depended upon for curing aneurisms, is tying the artery above the tumour. This more certainly prevents the great ingress of blood into the sac, and, what is quite as important, more certainly excites adhesive inflammation within the tied part of the vessel, and by holding the opposite sides of it steadily in contact, brings about their union, and an obliteration of the tube of the vessel with tolerable regularity. The chief current of blood into the sac is thus stopped, the contents of the aneurism are afterwards gradually absorbed, and the tumour dwindles away in proportion. The natural course

of the blood being now permanently interrupted in the arterial trunk, it passes more copiously into the collateral branches, and these enlarging and anastomising with others which originate from the large arteries beyond the obstruction, the necessary circulation is carried on. It appears then, from these facts, that the obliteration of the artery, for a certain extent above and below the tumour, forms the primary indication in the radical cure of aneurism, whether compression or the ligature be employed; all other means are only auxiliary.

Internal remedies may be useful, inasmuch as they tend to moderate the determination of the blood towards the place where the artery has been tied or compressed.

Bronchitis, or Inflammation of the Bronchial Tubes.

This disease may be confined to the parent tube, or it may extend to the ultimate ramifications of the smaller branches. There is an increased secretion of mucus collecting in the inferior parts of the tubes and plugging up the orifices, thus throwing the greater part of the lungs out of action. The changes, then, that occur, are, in the first stage the membrane is reddened owing to the increased vascularity, it then becomes dry, when it is termed congestion. Then exudation commences with the formation of lymph, this lymph becomes passive and mixed up with the pus, which again becomes mixed up with the secretions of the tubes, filling them and giving to the respired air a frothy-looking appearance. When the disease has arrived at this stage, we find congestion of the lungs, owing to the fact that the blood cannot get purified; therefore it remains stagnant in the capillaries or small vessels. In the favourable stage the exudation is taken up by the absorbents into the blood, then excreted by the various organs of the body as deleterious material; therefore it will often be observed, that when an animal is recovering from this and like affections, it passes an extraordinary quantity of water. Herein is witnessed an effort of nature

to throw off from the system those poisonous ingredients which are foreign to a healthy organisation.

Post-mortem Appearances.—Bronchial mucous membrane almost black, that is, the lining membrane of all the tubes is in this condition. There is also a frothy purulent mucus present so thick that it can be drawn from the place on which it lies in strings, while congestion of the lungs is beautifully illustrated, and often inflammation.

When bronchitis terminates in recovery, it is by a softening of this lymph, which, as I have already stated, becomes absorbed. Man can amuse himself by spitting it up, which of course accelerates recovery, but not so with our patients; hence it is that a much longer time is required to effect a cure. The unfavourable signs are, pulse increasing in frequency and losing strength; the membrane of the nose becomes of a leaden hue, legs deathly cold, ears the same; excessive weakness, irregularity in the bowels, with secretion of urine defective.

The favourable symptoms are, pulse slower and stronger, cough getting looser, and breathing and lifting of the flanks not so great; the patient gets warmer about the extremities, and looks altogether more lively, with returning appetite and the natural excretions taking place.

Symptoms of bronchitis are invariably ushered in by a cough which is short, dry, and husky. It is dry because the mucous membrane is dry, but soon becomes hoarse and moist when exudation has set in. By-and-by it becomes rough and painful, then short and frequent, and if you place your ear to the patient's side, just behind the shoulder-blade, you will in the first stage hear a dry sound, but this soon changes into one that is hoarse and rattling, produced by the air becoming entangled in the mucus.

In a healthy animal you can hear the air passing into the lungs, but it comes out noiselessly, while in bronchitis the opposite is exactly the case. The respirations now become increased, the breathing gets shallow and short, with heavy lifting at the flanks. There is irritative fever, with the

pulse soft, quick, and compressible. In the latter stages the ears and legs are cold, mouth dry and clammy, while the animal stands with its head and nose extended. There is not much dulness or pain in the chest, but there is early weakness, which is always the greatest when the disease is brought on by epizootic causes.

Bronchitis causes death by suspending the action of the lungs, or rendering them incapable of performing their functions, and this is termed asphyxia, or suffocation. The action of the lungs being arrested, the blood does not get purified; hence we find them congested, or, in other words, loaded with blood. We may have this congestion without the lungs being inflamed at all, but, as a rule, they are affected.

Treatment.—First, it is of great importance to place the dog in a cool, comfortable place, where the atmosphere is not too cold, and where you have security from draughts. If the patient is inclined to eat you must be very cautious, and feed sparingly, as the food in large quantities distends the abdomen, causing injury through pressure to the respiratory organs.

Great caution must be observed in the giving of medicines, as purgatives are intolerable. This is due to the mucous membranes of the bowels often participating with those of the lungs; therefore this warning ought to be remembered. Apply plenty of hot water, and if this cannot be procured, blister the sides with mustard made up with acetic acid, and administer extract of belladona, sweet spirits of nitre given in whisky or ale twice daily, and allow also nitre in the water to drink.

Should these instructions be carefully carried into execution, you may expect that your efforts will be rewarded by the animal's recovery in about a fortnight. But should the disease run on to pneumonia (or inflammation of the lungs), there is now little hope of a successful issue.

Pneumonia, or Inflammation of the Lungs,

attacks all animals that we have to do with, the causes being similar to those producing catarrh and other affections of the same nature.

In health the lungs are of a beautiful pink colour, highly elastic, and when put into water float, crepitating when pressed between the finger and thumb. In pneumonia things are exactly the reverse of what they are in health. The substance becomes of a red-brown colour, ultimately grey, and when put into water, sinks.

Pathological Appearances.—First, in the scarlet stage there is a period of increased vascularity; this is called the period of congestion, or sanguineous engorgement. Second, when fully confirmed, the lungs are of a reddish-brown colour, and sink in water; this is called the stage of red hepatisation. The third and last stage is called grey hepatisation, when it is denser and more solid. These three stages are often found existing in one lung at the same time, and the lowest part of the lung is usually the worst.

It does not, however, always attack both lungs at once, and the right one as a rule is invariably the first affected; but in all severe cases they are both implicated. How this occurs is not easily explained; the right lung is larger, contains more air, and consequently has more bloodvessels. But why it should select this side first remains a mystery; it is also the same with pleurisy.

Symptoms.—Pneumonia is generally ushered in by a shivering fit, more or less violent according to the severity of the attack. The breathing becomes accelerated and laborious, the mouth hot and dry, owing to the presence of irritative fever; there may or there may not be a cough; the pulse is laboured and depressed, the lungs being overdistended; the blood is improperly purified, the appetite is arrested, the kidneys refuse to act, the bowels are irregular; and in a single sentence the whole condition of the system may be summed up under the head of general impairment in all the secretions.

Treatment.—In the first place, secure the patient's comfort by having it conveyed to a suitable house, which must be well ventilated and airy. By adopting this plan you promote a sedative action at once. If the animal has been ill for a day or two, as in all probability it will, if there is the

slightest evidence of debility or weakness, then you must support the strength by giving stimulants. If, on the other hand, the pulse is active and the fever high, you must give the tincture of aconite twice or thrice daily, combined with a diffusible stimulant. Nitre, digitalis, and tartar emetic are also valuable agents, and ought to be had recourse to in this complaint. Give easily digested food. Of course, hot fomentations, or blistering the sides, must not be forgotten, and when the inflammation has subsided, good food, with tonics, such as gentian, &c., ought to be employed.

Common Cold, Catarrh, and Laryngitis

may be classed together, as there is a sameness of symptoms attending them that is sometimes difficult to separate. We will therefore consider them collectively, as the same remedies that are employed in the one are also administered in the other.

These diseases, then, consist in inflammation in the upper parts of the mucous membrane of the nose and throat. This membrane is studded with a number of follicles which in health secrete a large quantity of mucus for the purpose of lubricating the parts. This membrane has also another function to fulfil, and that is, it raises the temperature of the air before it reaches the lungs.

Now, when catarrh commences, the mucous membrane loses its moist appearance, and becomes dry and inflamed; the bloodvessels appear to be standing prominently out; the eyes are also reddened, because the membrane covering them is simply a continuation of the same lining of the nose and throat.

Symptoms.—The animal is dull, refuses to eat; soon there is considerable difficulty in swallowing, the breathing and pulse are both hurried a little, the redness gradually increases, the blood continues to accumulate in the capillaries, which are now overloaded; and in order to relieve them effusion of serum takes place, that is to say, in other words, water pours from the nose and eyes. Stagnation of the blood is the result of this inflammation, the patient gets feverish, the

mouth hot and muzzle dry, the urine scanty and high-coloured, bowels often constipated or feces hard and glazed, irregularity of the temperature of the body, legs and ears hot and cold alternately, cough easily excited, which is full and loud, often accompanied by sneezing, with a discharge of thick yellow lymph from the nose, which speedily becomes converted into pus.

Treatment.—Place the animal in a clean comfortable place, keep the temperature as even as possible, and give the following:—Nitre, one drachm; sweet spirits of nitre, three drachms; treacle, four ounces; water, six ounces. Mix, and give two tablespoonfuls every six hours.

Ascites, or Abdominal Dropsy,

may occur as a sequel to peritonitis, and is an accumulation of fluid in the abdominal cavity. When swelling extends equally over the whole abdomen, the fluid is usually diffused among all the viscera, and is only circumscribed by the boundaries of the peritoneum (or covering of the bowels). When the water is contained in different cysts, it is frequently thick and gelatinous; but when it is uniformly diffused all over the cavity it is generally thinner, and even quite limpid. Sometimes a considerable number of hydatids are found floating in the fluid. With regard to the symptoms, the disease is attended with great uneasiness from all kinds of pressure on the abdomen. A gradual swelling is first observed in this part of the body, not inclining more to the one side than the other, a fluctuation that is perceptible when the hand is pressed on the side; there is always a considerable difficulty in breathing, caused by the collection of fluid interrupting the action of the midriff. The fluid usually consists of serum, exhibiting various shades of colour, from a light to a deep brown.

Occasionally the serum is mixed with pus, and not unfrequently it contains portions of coagulating lymph, an evidence denoting that there has been inflammation of the peritoneum.

Treatment.—Whenever a considerable quantity of fluid is suddenly let out of the abdomen by tapping, the quick removal of the pressure of the water off the large vessels and viscera may produce convulsions, and even sudden death. These consequences have led many to believe that the operation (*paracentesis*) is dangerous; but it is not so when you take care to allow a small supply of water to escape at a time, gradually, and at intervals. But it is not uncommon for the water suddenly to stop long before the quantity is discharged; sometimes this is owing to a small piece of intestine obstructing the canula. This kind of stoppage may be removed by just introducing a probe or director, and holding the portion of the bowel back.

Again, when the water is viscid, the only thing we can do is to introduce a large trocar, if doing so should promise to facilitate the evacuation; also when hydatids obstruct the canula, a larger instrument, or the enlargement of the opening, would allow them to escape. The operation is performed by making an incision in the skin and through the abdominal muscles at the anterior part of the udder, and one inch from the centre line of the abdomen. Should the operation be performed, it must be followed up with diuretics and tonics, and if the animal is weak give stimulants.

Prolapsus Ani,

but more correctly speaking, *prolapsus recti*, is a common disease met with in all domestic animals; it occurs in three forms. In one the protrusion of the rectum involves both its mucous and muscular tunics, in a second its mucous coat alone, and in the third the inner portion protrudes into the outer, and the displacement is truly what is termed a *volvulus*, or intussusception.

The disease may originate from various causes. Firstly, from circumstances tending to relax and weaken the parts which retain the rectum, or its inner membrane, in its situation; secondly, from various kinds of irritation and

pressure on the bowel itself, having the effect of increasing the powers by which it is liable to be forced outward; thirdly, from disease or the presence of worms in the adjacent parts and affecting the rectum sympathetically, or from difficult labour.

Hence a prolapsus ani may be caused by hard dry feces and much straining to void them, or obstinate diarrhœa, or various diseases of the rectum itself, the abuse of purgatives and emollient injections, excrescences and thickenings of the inner membrane of the rectum, the difficulty of voiding water, the efforts of parturition, a calculi in the bladder, and paralysis.

The Treatment of Prolapsus Ani

embraces three principal indications. Firstly, the speedy reduction of the prolapsed part;

Secondly, the retention of the reduced bowel;

Thirdly, the removal and avoidance of the causes by which the disease has been induced.

In general, when the case is recent and the tumour not of immoderate size, the reduction may be accomplished with tolerable ease by putting the animal in a suitable position. With the hind quarters raised, the fore ones depressed, and by making gentle and skilful pressure with the closed fist, you will in all probability succeed.

When, however, the inflammation and swelling are urgent, there is a difference of opinion regarding the treatment. Many assert that the part ought on no account to be irritated by repeated attempts at reduction, and advise recourse to fomentations or cold washes, as the case may be, and not to attempt reduction until the swelling has been lessened. And when the reduction is prevented by a spasmodic resistance, the use of anodyne poultices, fomentations, and the internal use of opium, are advocated.

Distemper.

Few young dogs have immunity from this affection, and if you are bent upon purchasing or selling a young animal, the

first query that is invariably put is, "Is he over the distemper?"

This disease is somewhat analogous to typhus fever in the human subject, that is to say, it is a low febrile sinking complaint, and runs a prescribed course. It is admitted that it is due to some specific poison, which is capable of being communicated from one dog to another. It exercises a rapid and depressing effect upon the patient; it deprives the animal of all muscular exertion, emaciation is very effectively and completely accomplished, and if recourse to the proper remedies is neglected or delayed, death soon ends the sufferings of the wretched patient. In fact, I know of no disease affecting the canine species where more abject helplessness and suffering is witnessed than in this disease. Every one who evinces any interest at all in the dog must be familiar with the characteristic signs of distemper; therefore we will proceed with the symptoms, which are as follows:—

A low, sinking, insidious fever, producing great prostration, shivering, accelerated pulse, and quickened respiration. The appetite is almost or entirely suspended; there is a running at the nose and eyes of a watery secretion; a short husky cough, which is easily excited. Accompanying these symptoms you may find congestion of the lungs present, or inflammation of the bowels, &c. Therefore when we speak of distemper, it may affect the following organs separately or collectively:—firstly, the nose and its lining membranes; secondly, the head, eyes, and brain; thirdly, the chest; fourthly, the bowels; and lastly, the skin.

The feces are as a rule black, the urine scanty and high-coloured, the eyes injected, mucus appearing at the corners of them, the teeth are coated with a thick sort of fur, the breath is very disagreeable, and altogether the animal presents an unwelcome appearance. (I don't like to use the word loathsome.) Delirium often ensues; and when this occurs, chorea generally attends the animal for the remainder of its life.

Assuming, then, that the reader is familiar with these

symptoms, he must conclude that he has a case of distemper to deal with; so in order to plump straight for the best remedy, I unhesitatingly advise one and all to employ nothing else but the sulphate of quinine in doses according to the size of the dog, from one to five grains, three times a day in a tablespoonful of port-wine. Attend to the comfort of the animal, keep its nose and eyes clean, and the temperature as equal as possible. If these instructions are faithfully carried into execution, you will be successful in your efforts. Coax the patient with choice tit-bits of food, and on no account administer any aperient. Remember that it is a low, sinking, debilitating disease, that is bound to run a certain course. Nurse then, and support the patient over it.

Some breeders have tried inoculation as a preventive for distemper, and assert that it succeeds; others, again, maintain that it is not so.

Kennel Lameness or Rheumatism.

This is another very common disease in the dog, due to frequent and constant exposure to cold and wet; it is often produced through damp, uncomfortable kennels. Dogs that are exposed to varied temperatures are extremely liable to rheumatism. By some authorities this affection is classified under inflammation, but it is easily diagnosed from the following symptoms:—

There is considerable fever present, pulse full, but not particularly quick, shivering and dulness present. When you approach the patient it actually howls, being afraid of pain; it will seek a retired corner if possible, and will only leave it with great reluctance. Should you attempt to remove it forcibly, it will snap; in fact, it cannot bear to be patted with the hand, and will snarl at its best friend. The urine is scanty and high-coloured, and the bowels constipated. The shoulders become stiff and sore, rendering the animal totally unfit to gallop, and often even afraid to move. It often attacks a whole kennel of fox-hounds. House pets are

also very liable to its attacks. When it exists for some months it becomes chronic and generally incurable, although instances are recorded where the stiffness has disappeared.

Treatment.—Remove the cause and you will have cessation of effects. Give food composed of as much vegetable materials as you can, place the patient in a hot bath for fifteen minutes, after which thoroughly dry and keep warm. Administer—Calomel, one grain; opium, one grain; colchicum, two grains; chlorate of potassium, five to fifteen grains. This is suitable for an ordinary-sized dog, to be given either in the shape of a pill or solution daily. Of course due attention must be paid to the bowels.

Canker of the Ears.

Water-dogs are specially liable to canker of the internal ears, owing to the fluid producing irritation by not being properly dried out of the ear. The animal shakes his head continually, thereby exciting inflammation of the membrane or lining of these organs. All dogs with long pendulous ears are susceptible to canker. So whenever a dog is observed to be constantly engaged in shaking his head and making frequent attempts to scratch his ear, you should institute a careful examination of the interior of the passage leading into the head, and if you discover that the lining is red and inflamed, such evidence is conclusive that the disease exists.

Treatment.—Administer a good dose of physic to begin with, and then drop a little of the following mixture into the ear that is affected once a day:—Opium tincture, one drachm; liq. plumb. dia. one drachm; olive oil, one ounce; glycerine, one ounce. Mix. When you have done this, hold the head for some time to prevent the animal shaking it.

Colic and Inflammation of the Bowels

is also a frequent complaint among the canine race; the symptoms being intense pain, aggravated at intervals to such an extent that the poor brute will howl in the most

appalling manner. The back will be arched, the legs drawn together; he will suddenly start up with a sharp painful moan, and then lying down again, appear at rest for a short interval. The start and moaning, however, are repeated in a few minutes with increased intenseness, and gradually become more and more prolonged as the disease advances. The nose appears natural; there is no fever; all the evidences of pain are situated in the belly.

Treatment.—First, good dose of physic, followed up with tincture of opium one drachm, sweet spirits of nitre one drachm, given in a little warm water every three hours. Apply hot fomentations, or, better still, put the animal in a bath and keep it there until you observe signs of relief.

Mange.

As a rule, all skin diseases which affect the dog are positively due to carelessness or neglect in some way or other, and mostly all of them are easily removed by a change of diet, a dose of physic, and a good wash, excepting mange. This is often a very determined opponent to active remedies, and one that has often in my experience baffled a few knowing ones.

Properly speaking, mange is of two distinct species; the one arises from a parasite, the other from a vegetable origin.

In the first illustration, which is the most common form of it, it appears frequently in large kennels, because it is highly contagious, and there is now no difference of opinion but that it can be bred and propagated by bad management.

The hair falls off in patches of irregular form, the skin is dry and rough, and cracks and creases in almost every direction; from some of these cracks an ichorous discharge flows. The dog eats well, but appears listless and languid, owing to the want of sleep; there is great thirst and slight fever; the patient is for ever scratching and tearing himself.

Treatment.—Carbolic acid crude, one ounce; spirits of tar, one ounce; black sulphur, one ounce; corrosive sublimate,

twelve grains; common oil, twelve ounces. Mix and apply with a brush, allowing the dressing to remain on for fourteen days; then wash off with carbolic soap. Should any evidence remain to testify that the disease still lingers, repeat the dressing, at the same time taking care to administer a good aperient; remove the dog from the place it usually occupied to a fresh clean kennel. If the disease is very obstinate and will not yield, then arsenic must be had recourse to in the following doses: $\frac{1}{10}$ to $\frac{1}{15}$ of a grain; or you may give the liquor arsenicalis with the food, the dose being one drop to every four lbs. weight of the dog.

Worms.

These destroy, I believe, quite as many puppies as distemper, and are a fertile source of disease. Some authorities believe that the *ova* remain in kennels from year to year attached either to the walls or benches. Now, besides the worms usually met with in the intestines, there are others, including the large kidney worm, and the hydatid found in the dog's brain. We will, therefore, briefly enumerate the respective kinds.

The maw-worm is considerably larger than its fellow, which is found in the human subject, it being about an inch long and of a white milky colour, with one end abruptly terminating, and the other end pointed. They exist in large numbers, and occupy the great intestines chiefly. They do not injure the health to any serious extent unless they exist in very great numbers. They are male and female, and propagated by *ova*.

The round-worm measures from four to seven inches long, is round, firm, and of a pink colour. Both extremities are exactly alike; they often accumulate or collect together, forming a solid mass something like an egg. They are also developed from *ova*.

The tape-worm is, generally speaking, the most unpleasant of the tribe; it attains the length of several feet, and is divided into separate sections, each section being capable of

producing *ova* to an almost indefinite extent; and as these are passed from the body with the feces, they are readily communicated from one dog to another. The injury inflicted by these worms is certainly great, because they not only abstract the nourishment from the dog, but they continually keep up a systematic irritation which is very annoying to the patient, therefore it is of the utmost importance that they should be expelled as soon as possible.

The kidney-worm claims the kidneys as its habitation. It is of a dark blood-colour, probably owing to the nature of its food, which is derived from the vessels of the kidneys. In the human subject this worm has been known to be the length of three feet, and half an inch in diameter.

The presence of worms in the dog, and their symptoms, should be intelligently looked for and noted carefully, if the animal's health is considered at all.

The evidences are as follows—unhealthy appearance of the coat, hair appears as if it was dead and standing erect, appetite ravenous, condition generally low, feces passed frequently and in small quantities, with small quantities of mucus each time. The spirits of the dog seem depressed, nose hot and dry, breath offensive. When these symptoms are observed, the feces ought to be watched, and shortly you will discover the sort of worm that is producing the mischief.

Treatment.—For maw-worm, areca nut, stinking hellebore, calomel, wormwood, cowhage, &c.

For tape-worm, spirit of turpentine is the most deadly, or the oil of male fern. Turpentine ought always to be given with oil, as the oil protects it, or prevents it from injuring the mucous membranes or the kidneys. Any of these remedies ought to be followed up next day with a dose of castor-oil administered to the patient fasting.

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