administrative drawbacks inherent to the constitution of such a body, we have already pointed out. Great changes can rarely be carried out without great expense, even if their final economical results be satisfactory. A corporation can never fill the place in all respects of an individual owner. There is always a danger that subordinates will arrogate to themselves too much authority. But after all this has been said, the fact still remains that a great work for the Church has been done by the Ecclesiastical Commission, and that in doing that work they have deserved well, not of the Church alone, but of the country. Nor will this fact be altered, should it be found advisable as time goes on to direct their attention to the gradual dispersion of the property which has come, from various sources, into their hands. Should such a course be adopted, it will be from motives of public policy alone, and not from any desire to cast a censure upon a body who under circumstances of peculiar difficulty have loyally discharged the trust which was committed to them by the nation.

MIDLETON.

ART. II.—VIVISECTION.

THESE pages are written in consequence of many requests that I should state my opinion on the much-disputed question of Vivisection, and its influence on man.

The task is not so simple as it appears to be. Nothing can be easier than uncompromising denunciation on the one side, or equally uncompromising advocacy on the other. It is easy for the one side to describe vivisectors and their advocates as fiends in human form; or for the other jauntily to sneer at their opponents as "humanitarians who would rather see thousands of human beings perish from preventible diseases than that a frog should suffer half an hour's pain, or a guinea-pig a day's inconvenience."

This sentence, by the way, is a marvel of ingenuity, as it compresses into the smallest possible compass the greatest possible number of fallacies, and "begs the question" no less than five times. I will revert to it presently.

Again, it is very easy to observe an attitude of neutrality, and to say that as doctors cannot agree upon the subject, an outsider has no right to form an opinion, and that the doctors must fight it out among themselves.

The difficulty is further increased by the evidence given before the Royal Commission of 1876, and printed in the "Blue-Book" of that year. It is about the most bewildering evidence

that ever puzzled a human brain to understand. I have read it repeatedly from beginning to end, and out of those who are really competent to give an opinion on the subject, can only find two classes of witnesses who have the courage to say boldly what they mean.

The first are the physiologists pure and simple.

They say openly that they are neither surgeons nor physicians, nor do they concern themselves in the least about the cure of human ailments, nor the amount of pain which they inflict upon the living objects of their experiments, and that they never use anæsthetics except for convenience. Their only object is the advance of physiological science, and they are absolutely indifferent as to the means which they employ.

As teachers of physiology, they furthermore say that they must repeat their operations (experiments no longer) whenever they give lectures to students, because it is necessary to let the students see for themselves, and not to take their teaching from mere hearsay.

Whatever may be our ideas as to this theory, its upholders are at least honest.

On the other side, we have those members of the medical or surgical professions who at one time believed that operations on living animals would enable them to be better surgeons and physicians, who have found that they were mistaken, and have had the courage to avow their mistake.

But between these two extremes all is vague, obscure and uncertain. Non-committal seems to have been the primary object of the witnesses, and their evidence, like the proverbial ferry-boat, only serves to go from one side to the other. Qualifications and fencing with the real question are the rule. A plain categorical answer to a definite question is scarcely to be found, and the real meaning of the speaker is so enveloped in a cloud of such terms as "if," "perhaps," "might," "not aware," and the like, that it cannot be definitely ascertained. On reading the bulk of the evidence, we are irresistibly reminded of Thackeray's Jeames Yellowplush, whose "Mar rapped his buth in a mistry," or of Dickens' Mr. Gregsbury, and his speech to the deputation that asked him to resign his seat in Parliament.

Some say that the average amount of pain caused by vivisection is no more than the pang of a pin-prick, and speak of these experiments as scratching a newt's toe or a tadpole's tail, pricking a mouse with the point of a needle, &c. &c. Others go as far as to admit that the experiments are "severe," while others openly avow that they intentionally inflict the most exquisite agony that remorseless human ingenuity can produce, in order to see what effect it has upon the animal.

Some boldly assert that all vivisections are conducted while

the animal is insensible from the action of anæsthetics. Yet we read of "the twenty-third day of the experiment," an exceptionally severe one, and are asked to believe that a cat or dog can be kept for twenty days under the influence of chloroform.

Some admit that the screams and groans and struggles of vivisected animals are evidences of pain, while others coolly deny this obvious conclusion, and assert that the cries and struggles in question are nothing but "reflex action," such as may be seen in a severed limb when galvanized, or a paralyzed limb when irritated.

See what contemptible quibbles some of the promoters of these experiments are forced to employ.

When animals are placed in a close vessel and slowly baked to death, when they are put into cold water and boiled alive, when turpentine is poured over them and set on fire, they decline to recognize these experiments as vivisection, because, forsooth, the skin is not cut in either of the cases.

Then, they object to the word "baked" alive, because the vessel in which the animals were placed was not an oven, but a glass box. They object to the word "boiled," because the temperature of the water was below 212° Fahr. As in the one case the animals died of the hot air, and in the other of the hot water, they were to all intents and purposes, baked and boiled.

Another defence of the boiling was remarkable for its audacity, the ground being that the frequenters of the Turkish bath are subjected to a much higher temperature than that of the water, and suffer no harm.

So they do. I have repeatedly endured a heat of nearly 250° Fahr., suffered no pain at the time, and felt all the better for it afterwards.

But, in the so-called Turkish bath, the bather is surrounded with heated, but dry air, whereas the animals in question were immersed in heated water.

If a man, who was perfectly comfortable in the Turkish bath at a temperature of 250°, were to be immersed in water of 100° less temperature, he would be scalded to death. The man who could put forward such a defence as this must either be crassly ignorant or wilfully deceptive.

Then, there are controversies within controversies upon the point of anæsthetics. Some reckon curare (or wourali) among the number, while others say that it does not destroy the sense of pain, but that it has the effect of paralyzing the voluntary nerves so as to prevent movement, and destroys life by causing respiration to cease. If respiration can be kept up artificially, the poison will work itself out of the system, and the nerves will gradually regain their power.

Many years ago the late Charles Waterton tried the experiment of wounding an ass with curare-poisoned arrows. The

creature seemed to be dead, but by long-continued artificial respiration, she recovered, and lived to a good old age.

Whether she felt the process of artificial respiration, and retained consciousness while she had lost the power of motion, we cannot tell; but there is one celebrated case mentioned by Lionville and repeatedly quoted, in which a man who had received an overdose of curare, and was restored by artificial respiration, was perfectly conscious, and retained the senses of feeling and hearing. I do not know of other cases, and doubt whether a single instance ought to be accepted as of universal application.

Chloroform has a precisely similar effect on some persons, while in others it annihilates the sense of pain, as well as the power of voluntary movement, though consciousness remains intact. We might multiply such instances to any extent, but our limited space prevents us from doing so.

Now we will revert to the passage which was quoted at the beginning of this article. It was undoubtedly written in good faith, and many medical men with whom I have conversed on the subject, have expressed very similar opinions.

In the first place, it is assumed (No. 1) that all dissection of living animals is made for the purpose of assisting surgeons and physicians in their treatment of the human body.

Next (No. 2), it is assumed that drugs and surgical operations have the same effect on man as on animals.

Next (No. 3), it is assumed that vivisectors avoid giving pain as much as possible, "half-an-hour's pain to a frog or a day's 'inconvenience' to a guinea-pig" being the measure of pain suffered by the animals.

Next (No. 4), it is assumed that diseases are preventible (!) by knowledge gained from vivisection.

Next (No. 5), it is inferred, if not directly stated, that the results of these experiments are final, and not to be gainsaid.

Suppose that we take these assumptions in their order.

First comes the assumption that experiments on living animals are made for the improvement of surgery and medicine, and are therefore intended for the benefit of man.

Is this really the case? I do not mention the foreign experimenters, who are alternately disclaimed and petted according to the occasion, but will take a portion of Dr. S. Wilks' article in the *Nineteenth Century* (December, 1881), p. 945:—"There is an important part of the question which has not been sufficiently dwelt upon by physiologists. They have defended their cause by showing the benefits which have accrued from experiments on animals. All they have said is perfectly true; but it must be remembered that these good results were not immediately in view, *nor were they always the chief object for which the physiologist performed his experiment.*"

"Every fact in Nature, being of necessity the exemplification of

a general law, has its meaning; and thus the most important consequences have resulted from an observation of the most trivial phenomena. Illustrations of this truth abound in every chapter of the history of science. It is therefore only the single object before him at which the experimenter is aiming—he is seeking after truth, and if he finds it he is satisfied." (Note here that the word "truth" is first used in its general, and next in its particular sense.) "Indeed, the true scientific worker is known by the singleness of his purpose, for it is certain that if he is looking to some splendid ulterior object, his eyes become dazzled and he misses his mark. *How absurd then for experimenters to be asked by the Government official before he permits them to commence their work, what good object they can foresee in pursuing their researches! The only answer I, a really scientific man, could give would be 'knowledge.'*"

The same writer then proceeds to compare chemical analysis and botanical anatomy with experiments on living animals. "In animal life, the same method must be adopted to unlock the secrets of Nature. The question of the animal being sensitive cannot alter the mode of investigation."

Here, at least, is plain speaking, and how, in face of such statements as these, vivisection can be defended on the grounds of its utility to man, passes my comprehension.

Contrast Professor Owen in the same magazine, and on the same date. He says that the opponents try to prevent "every effort which the choicest intellects of such small class (the vivisectionists) may make to *add to the power of the beneficent healer, as applied to the prevention, alleviation, or removal of human suffering*"—*Nineteenth Century* December, 1881, p. 395. Which of the two is telling the real truth? With the greatest regret, I cannot but think that Dr. Wilks speaks the truth, and Professor Owen does not.

Not only do these writers contradict each other, but they contradict themselves.

Take for example the article by Dr. S. Wilks in the *Nineteenth Century*, p. 938. He writes as follows:—

"It is no exaggeration or misstatement to affirm that the real question turns not on the cruelty, but on the *utility* of 'vivisection.' I have looked in vain for any speech delivered by cardinal, bishop, peer, judge, or member of Parliament, who has not made this the staple of his argument—the *inutility* of experiments on animals."

Yet, in the very same article (p. 947) the same writer makes the following statement:—"The ostensible reason offered for the suppression of vivisection is its *cruelty*, but when it is objected that other forms of cruelty are unmolested, we are met by the answer that it is useless cruelty."

As to the astonishing statement about cardinals, bishops, &c.,

I wonder where his eyes could have been. If any anti-vivisectionist ever made a speech without putting cruelty in the foreground, I never heard of it. Possible utility is necessarily mentioned as the sole excuse that could be offered for the cruelty.

Others try to raise false issues, and dilate on the cruelties of field sports, pigeon shooting, ill treatment of horses, &c.; and assume that, as the opponents of vivisection make no mention of these cruelties, they approve of them. This mode of argument may be best described as "trailing a red herring across the track." It may be ingenious, but it is certainly disingenuous.

So much for assumption No. 1. Let us pass to assumption No. 2, namely, that drugs and surgical operations have the same effect on man as on animals.

As to drugs, nothing can be more misleading. It is generally assumed that the effect of a drug is in inverse ratio to the dimensions of the animal. Yet, Dr. Richardson gave to a pigeon a dose of opium sufficient to kill a strong man, and the bird was not at all affected by it. Calomel has but slight hold on the system of the dog, and the rabbit can eat belladonna as if it were parsley. The horse will take with impunity half a pound of tartar emetic, though forty grains will kill a man or a dog. Hemlock is no poison to the goat, so that if Socrates had only been gifted with the digestive system of the goat, he might have defied the poisoned bowl.

As to injuries, every one knows that animals vary, according to their nervous structure, in their capability of resistance, and that of all animals, man, as possessing the highest organization, is the least capable of enduring pain or recovering from injury.

Even with human beings, the influence of race upon their capability of endurance is enormous.

Take two extreme types, the Negro and the Caucasian.

The nervous system of the negro is so constituted, that he does not feel pain as does a European; and sustains with indifference bodily injuries which would kill the strongest European that ever lived.

The late Mr. T. Baines (of the Diamond Fields, South Africa) gave me some most remarkable instances of this physiological fact. While I was engaged on my "Natural History of Man," he was good enough to place at my disposal all his diaries and sketches of African life. While we were looking over them, sundry sketches reminded him of incidents that had occurred in the course of his travels, and among them were the following:—

One of his numerous negro attendants had broken his thigh. It was a simple fracture, and Mr. Baines, being skilled, as every traveller should be, in practical surgery, set the broken bone and put up the leg in splints. The sufferer took the operation of setting very quietly, and was then carried by relays of bearers.

Now, a negro always carries everything on his head. If you

employ negro workmen in making a railway cutting, and provide the usual wheelbarrows, native industry leisurely scoops two spadesful of earth into a wheelbarrow, puts the wheelbarrow on its head, and thinks itself a prodigy of intelligent labour. Accordingly, these negroes carried on their heads the litter on which their injured companion was stretched.

While on the march, the procession suddenly stopped, and all the negroes crowded round one spot, shouting and laughing with the loud guffaws peculiar to their race. On going to the scene of excitement, Mr. Baines found that the bearers had carelessly tilted the sufferer off the litter. In his efforts to save himself, he alighted on the injured leg, snapped the splints, and re-broke the bone. The force of the fall, moreover, bent the thigh at right angles, and drove the sharp end of the broken bone through the skin, thus converting the single into a compound fracture of the worst kind.

None of the negroes showed the slightest compunction for what they had done, nor did they exhibit the least pity for their comrade. On the contrary, they were immensely tickled at the ludicrous appearance of a thigh bent in the middle, and with a bone sticking out of it. It was really too funny, and peal after peal of laughter showed their appreciation of the joke.

This seems strange enough to us of the Caucasian race. We should have been sick with remorse; and if we should live to the extremest age of man, should never forgive ourselves for the result of our negligence.

But, odder still, no one seemed more amused than the patient himself, and no laughter was louder than his own.

The leg was again set, and healed with wonderful rapidity. The broken bone united easily, and the wound soon closed. There was, however, the usual "proud flesh" which had to be removed by caustic. If any of my readers have undergone the process of "removing," as the surgeon blandly remarks, the proud flesh, he knows what pain can be. I have undergone it, and know what it is.

The sufferer can hardly endure even to see a finger pointed at the spot, and the idea of having it touched at all is horrible. But, when the surgeon produces from his pocket a neat little silver tube, takes off the cap and begins to stroke the proud flesh with something that looks like a semi-translucent slate-pencil and feels like red-hot iron, pain seems too feeble a word to express a very ecstasy of torture.

So Mr. Baines offered the patient a shilling—*i.e.*, boundless wealth in the eyes of such men—if he would submit to the operation quietly. He took his shilling, behaved like a man of honour, and neither struggled nor even uttered a cry.

Subsequently, Mr. Baines found that the man had thought the whole business a capital joke, and had been holding up Mr.

Baines as an object of derision in being so soft as to part with his money at so easy a rate.

The man had not suffered at all throughout. He had not felt any pain from the fall nor from setting the bone, nor from the consequent wound, nor from the lunar caustic. On the contrary, life was a holiday to him. He did no work, was fed luxuriously and carefully tended, and he drew his pay just as if he had been working like his less fortunate companions.

The same traveller told me of another example of insensibility to bodily injuries.

He described a conspiracy among the negro followers to murder all the white men for the sake of getting at the brandy. The lives of the few whites being in peril, a halt was called, a court-martial convoked, and the ringleader condemned to death. He was shot through the head with a Colt's revolver, the rest of the mutineers, now subdued to obedience by the swift justice, were marched round the corpse and the journey was resumed.

Two days afterwards the corpse presented himself at the camp, and asked Mr. Baines for a stick of tobacco, on the plea that Massa had given him such a bad headache! The bullet had actually flattened against the man's skull, and he had only been stunned for a time.

The skull of the native Australian is of similar thickness. When two natives fight a duel, each brings his thickest and heaviest club, and they deal alternate blows on each other's heads. A white man's brains would be scattered by the least of these blows.

So, supposing that the negro and Australian had been selected for the subjects of experiments upon the human skull and its capability of resisting injuries, or the human capability for feeling pain, it is very clear that these experiments would have been worse than valueless if applied to the skulls of white men.

Then, as regards the question of pain, any one who has even a slight acquaintance with ethnology is aware that the negro and negroid races are not nearly so susceptible of pain as the white races. We have already seen that the nervous system of the dark race suffered no pain from injuries which would have caused the keenest agony to a white man.

The Kaffir, a man of much higher race than the negro, is almost equally insensible to pain.

"My Kaffir, Matakit," writes Mr. Baldwin, in his work on African hunting, "upset the kettle of boiling water over his bare foot the other day, and took almost as much notice of it as I should have done with a strong shooting boot on. They have regular hides, not skins at all."

Now we will see his capability of enduring pain as inflicted through the unpoetical medium of the whip.

In Southern Africa, all transport is performed by waggons, each drawn by twenty oxen or even more. The oxen are managed by two men, one is the driver, who sits on the box and wields an enormous whip. This whip is called a sjambok, and is made of hippopotamus hide fixed to a huge bamboo handle.

There is also a shorter whip called the "after-sjambok, for the benefit of the oxen next the driver. It is made of the same material, is all of one piece, and measures some four or five feet in length. At the butt end it is about an inch in thickness and tapers gradually to the tip. It may rather deserve the name of weapon, and has been used effectually for that purpose.

A Kaffir servant belonging to Mr. White, the celebrated elephant hunter, once saved his master's life with this whip. Two Boers set upon him and were doing their best to murder him, when the Kaffir seized the after-sjambok, and used it with such terrible effect that he drove them off. A blow from the after-sjambok, when wielded by practised hands, will cut a deep groove in a deal board, so that the discomfiture of the Boers is no matter of wonder.

The driver has nothing to do with guiding the oxen. This is done by the "fore-louper," who walks in front, picking out the best path over the roadless country. As the path often leads down steep declivities, one of the chief duties of the fore-louper is to stop the waggon when it comes to a declivity, lock the wheels, fasten branches to it by way of drags, and so lower it very slowly down the slope.

The fore-louper is almost invariably a Bosjesman, one of the tiniest races of men. These people are not black, but dark brown with a yellow tinge, and even the men seldom exceed five feet in height.

An African traveller was on his first journey, the fore-louper being a young Bosjesman, scarcely four feet high. The waggon arrived at the brow of a steep hill, when the fore-louper, from sheer mischief, sent oxen and waggon down the hill at full speed. In some extraordinary way, they reached the bottom uninjured. The traveller, a very powerful man, leaped out of the waggon, seized the after-sjambok and thrashed the fore-louper with all his strength. The blows of this terrible instrument had not the least effect for some time, and after beating the lad until his arm was tired, he only succeeded in eliciting one indication of pain. Had he felt it, he would have shown it.

Now, a single Kaffir, armed with a similar weapon, drove away two powerful and fully-clad white men, whereas the tiny half-naked Bosjesman seemed almost insensible to the strokes.

So here we find that experiments as to the capability of enduring pain would be absolutely useless if applied to different races of men.

In a lesser degree we find a similar diversity even among human beings of the same race.

Take, for example, two boys of the same age at the same school. One is timid, sensitive, retiring, reticent, fond of books, unsuited for rough sports, deficient in physical courage, though perhaps a very hero morally. The other is robust, overflowing with animal spirits, noisy and pugnacious, self-reliant, hating the very sight of books, and never reading but when he is forced to do so.

Suppose that the same flogging were administered to each of these boys, the effects would be very different upon them. The latter cares little for a flogging, and would infinitely rather be flogged "and get it over" than write an imposition or be kept from the playground on a half-holiday. Of course he feels the pain of the flogging, but not nearly so severely as the boy of more delicate nerves, and as soon as the pain has gone off, he thinks no more about it.

Whereas, his schoolfellow will nearly faint beforehand at the very idea of a flogging, he will suffer infinitely more at the time than his hardy companion, and the remembrance of it will rankle in his mind as long as he lives. For the imposition he cares little. It costs him hardly any trouble to write a theme or a copy of verses, and, as he has not the physical capacities for the playground, he is rather glad to be taken from it and allowed the society of his congenial companions—namely, the books which his robust schoolfellow detests and avoids.

So let us suppose that the flogging in question had been employed as an experiment for determining the capacity of boys to endure pain. It is evident that the experiment, if made upon either of these boys, would not only have failed in ascertaining the effect of pain upon boys generally, but that it would have misled any schoolmaster who acted upon it. In the one case he would have inferred that a "good caning" is the best punishment for all boys, and in the other, that it was the worst.

Now, these are facts which cannot be denied, and they prove that pain is not suffered alike in all animals, but that it differs according to the development of the nervous system, and is not always identical even in two individuals of the same species. The argument, therefore, which is based upon the theory of equal pain must be abandoned.

But this very diversity shows that experiments which involve pain cannot be applicable to all animals alike.

No one would take the dragon-fly, the wasp, or the shark, as a proof that a man might have the whole of his digestive organs torn away, and yet suffer no loss of appetite. Nor would any one but a lunatic venture to adduce Mr. Rymer Jones's experiment, or rather experience, with the crabs as a proof that a man

would be able to eat his dinner while he himself was being eaten. Yet, as we shall see, these are facts and not inventions.

Nor would any one argue that nitrate of silver caused no pain to man generally because Mr. Baines's follower did not suffer from its application. Nor that a European would suffer no more inconvenience than a headache from a Colt's revolver bullet, because an African native experienced no worse results. Nor that a European skull could withstand the blow of a heavy club wielded by a strong man, because the Australian skull can do so, and its owner be none the worse for it.

Nor would any schoolmaster think himself justified in using a sjambok in lieu of a cane, and wielding it until his arm was tired, because the Bosjesman lad could endure the infliction almost without wincing.

And no schoolmaster, who is worthy of his post, would consider all boys to be alike in their nervous organization, and administer the same punishment for the same offence.

Mr. H. C. Barkley, in his "Five Years in Bulgaria," has some thoughtful remarks on this subject.

A railway waggon, carrying about two tons' weight of stone, was propelled a little too hard, and was passing its proper stopping-place. Mr. Barkley, seeing a Tartar standing at the spot where the waggon ought to have been brought up, called out to the man to stop it—*i.e.*, to put on the brake.

The waggon was going very slowly, and so the Tartar thought that he could stop it by putting his foot in front of the wheel; of course, the waggon went its way, and crushed off the whole of the toes.

"I called to some one to carry him to his hut close by, but he laughed and said, 'That he had not come to that yet,' and marched off with scarcely a limp. We had the wound bathed for hours with cold water, and bound it up in wet linen. For some days all went well, but then tetanus set in, and the poor fellow died.

"From the first moment the accident happened until he died he showed no sign of pain, and let me dress the wound without flinching. I am quite sure that different men have different capacity for feeling pain, and that what would be torture to one would scarcely be heeded by another.

"I have often noticed this in Englishmen, and have now in my mind a great rough blacksmith, with lots of courage and 'go' in him, but who, if he knocked the skin off his knuckle, would sit on his anvil and writhe with pain, and do little more work all day. This man was sensitive to pain.

"Again, I can mention three English gentlemen, who each deliberately pulled out a firmly fixed double tooth with a pair of common pincers, because the aching annoyed them. These

men had not the same power of feeling pain as the blacksmith. All the people of the East feel pain much less acutely than Europeans, and through this have gained a character for stoicism."

So much for No. 2.

No. 3—*i.e.*, that vivisectors give as little pain as possible, and that the average of pain is a pin-prick, is sufficiently answered by the open avowal of Klein and others, that they pay no regard whatever to the pain which they inflict.

As for No. 4—*i.e.*, that diseases are preventible by knowledge gained by vivisection—it is almost too absurd to need refutation. It is very true that several diseases can be communicated by inoculation, but that they should be prevented by it is absurd.

Some upholders of vivisection are disingenuous enough to class vaccination as a "vivisection." They know well enough that it is an unworthy play on words, and that the slight prick of the lancet which is used for the benefit of the individual, has nothing in common with the protracted tortures of dogs, cats, and other animals, simply to satisfy the curiosity of the operator, and to gain for himself a scientific reputation.

Lastly (No. 5), the results of these operations are anything but final. On the contrary, in proportion to the number of vivisections is the confusion of results; and, moreover, the operators not only dissent from each other, but are perpetually correcting and often reversing the results of their experiments on living animals.

There are the inevitable references to the circulation of the blood, and the new system of employing ligatures in certain operations.

Now the assertion that Harvey discovered the circulation of the blood by means of dissecting living animals has been disproved over and over again. He is said to have *demonstrated* it by means of vivisection, but he did not discover it by such means. And there was not the least reason for him to have dissected living animals for demonstration, as the ordinary injection of the dead subject would have demonstrated the truth of his theory quite as well as vivisection.

Then we have the equally inevitable reference to a certain operation which was once considered fatal, but which, by means of experiments on a dozen rabbits made insensible with chloroform, has been robbed of its terrors, and hundreds of human lives saved.

Had this really been the case; had even one human life been saved by the sacrifice of a few rabbits, there would not have been, or at least ought not to have been a word said against experiments which produced such lasting results for the benefit of man, and inflicted no pain upon the animals. On the contrary, it would have been impossible to find words which could

express our gratitude to the man who made so wonderful a discovery.

But was this the fact?

It is difficult to explain the precise bearing of the case without diagrams, but I will try to do so as far as possible. The reader may, perhaps, be aware that the internal organs are divided into two distinct portions by a flat transverse muscle, called the diaphragm. N.B.—Convulsions of the diaphragm are popularly known as "hiccups." Above it, in the breast, lies the heart, clasped in the embrace of the two lungs, and below it are the rest of the vital organs.

Now, all the organs below the diaphragm are enclosed in a membrane, which is appropriately termed the "peritoneum"—*i.e.*, that which surrounds the intestines. It clings closely to them, dips in and out of the intestinal folds, and is brought in contact with some portion of each of the important organs of the abdomen.

If, therefore, any part of the peritoneum be injured, and inflammation take place, the mischief will not only spread over the whole peritoneum, but will affect those organs with which it comes in contact. Scarcely any constitution can resist peritonitis, as this inflammation is called, and the results are almost invariably fatal.

While attached to the surgical wards of St. Bartholomew's Hospital, I saw several cases of this terrible attendant on the surgeon's knife, and do not remember one instance of recovery when the peritonitis had fairly set in.

It is evident that, when it is necessary to get at any of the organs of the abdomen, the peritoneum must be opened, and equally evident that, after the operation is over, it must be closed again. The only way of doing so is by stitches or "sutures" as they are called in surgical language, and the question was, how to manage these sutures with the least danger of setting up inflammation. Was the peritoneum, as well as the muscular walls and common integument, to be pierced with the needle in addition to the cut made by the knife, or was it to be omitted?

In order to settle this question, a similar operation was performed upon a few animals, and it was found that the safest plan was to include the peritoneum in the sutures. Chloroform was employed, and the animals were nursed as carefully as if they had been human beings, so that no solid accusation of cruelty can be brought against the operation.

But to what purpose were the experiments made?

We put aside for the present the fact that healthy dogs or rabbits were not diseased human beings, and that therefore the results of the operation might not be the same in both cases.

Why, many years ago, it was known that in wounds of the abdomen, it was necessary to include the peritoneum with the sutures, if only to avoid the danger of pus making its way into the cavity of the abdomen.

I have before me a letter written by a military surgeon, who has treated many cases of wounds of the abdomen. He writes as follows:—"Long before ovariotomy was performed, I and thousands of others have seen the peritoneum wounded and divided by accidents and sword-cuts in battle. The peritoneum was placed in apposition, serous surface with serous surface, and mucous surface with mucous surface, and the patients all, or almost all, did well." The sutures, of course, included all the structures.

As we are on the subject of sutures, I may mention that the material of which the thread of either sutures or ligatures is made is necessarily an important element in successful operations. Various materials have been tried, and a short time ago we were told that by means of vivisection, the use of carbolic acid and especially the carbolic ligature, was demonstrated to be "one of the greatest boons to humanity in modern times."

Certainly, the carbolic ligature answered admirably with various animals, but when applied to man it utterly failed, and caused the loss of many human lives. Carbolic acid was, in fact, found to poison both the patient and the operator, and has been therefore abandoned by those who had naturally anticipated the greatest benefit from its use.

It is only fair, while trying to take a dispassionate view of the case, to say that the opponents of vivisection too often injure their own cause by rash assertions, by substituting rhetoric and epithets for calm reasoning, by giving too ready credence to any charge that is brought against the opposite side, by imputation of wrong motives, and by ignorance of physiology and even anatomy.

Both sides err equally in this respect. On the one hand, we have the story of the Girton lobster, and the practical lectures on vivisection supposed to be given to fashionable ladies by Dr. Aveling; on the other, we have the ridiculous myth of Miss Cobb's Bird of Paradise muff. Then, if on the one side, we find that the leading vivisectors are denounced as only seeking their own aggrandisement, on the other, we find Professor Owen descending so low as to denounce his opponents as "hired scribes."

As to ignorance of the subject, the most rabid anti-vivisectionist, in the heat of platform speaking, never made a mistake so outrageously flagrant as did the *Lancet*, the professedly scientific surgical journal of the day, when it calmly classed the frog as an invertebrate animal.

Let us try to eliminate the criminations and recriminations on either side as unworthy of the cause, and especially unworthy of our own.

Equally necessary it is that we should try to avoid false issues, and not to base our arguments on fallacies which can be easily disproved by the opponents.

Just as the vivisectionists have proceeded on the assumption that drugs and surgical operations have the same effects on man and the lower animals, so have the anti-vivisectionists assumed that all living creatures have equal sensitiveness to pain, and that man is the standard by which pain must be measured.

Now, as pain is due to the nerves, it must be evident that the capacity for pain must be dependent on the structure of the nerves, and that in proportion to the development of the nervous system must be the power of feeling pain.

Nothing but the knowledge of this fact can reconcile any thinking person to the seeming reign of cruelty among the lower animals.

Take the inhabitants of the waters, whether salt or fresh. They are almost entirely carnivorous, and feed upon creatures which they eat while living, and in their turn are eaten by others. Or take the bird tribes. By far the greater number of them feed upon living prey, and even the hard-billed birds which, when adult, live on seeds, are fed by their parents on living insects until their beaks are strong enough to crack the hard shells of seeds.

If any of my readers have bred canary birds, they will know that unless soft animal food be provided for the newly-hatched young, they will die. As they pass an artificial existence, they must have artificial food, and so we furnish the parents with mixed egg and bread-crumbs instead of the insects which the birds would have brought to the nest had they been wild in their native land.

Then there are the whole of the eagle and stork tribe, which feed upon living birds and beasts, and there are the cormorants, penguins, puffins, guillemots, and their kin, which feed upon living fish.

Again, we have, on land, the whole of the cat tribe, the weasels, many of the dog tribe, some of the bears, the bats, the hedgehog, mole, and many others, which feed upon living animals.

Judging by ourselves, we should naturally think that the Creator must be strangely insensible to the sufferings of the creatures to which He has given being.

If Shakespeare's aphorism were true, and that the beetle when trodden upon suffers corporeal pain as keenly as if it were a dying giant, there is but one inference that any reasoner could draw from animal life. Out of the countless millions of fishes, insects, and many other creatures that annually come into the world, there is not one in a million that is not eaten alive, or does not die by what we call a violent death.

Did, then, all these creatures possess the same capacity for pain as man does, they were created for the purpose of suffering pain, and not for the enjoyment of life.

Take, for example, the common thrush, which remains with us all the year.

In the autumn it prefers ripe fruit to almost any food, but during the rest of the year it is as much a predacious bird as the eagle or falcon, and seems to be far more cruel than either. If any of my readers have watched a thrush eat a snail or a worm they may have felt horrified at the cruelty of the bird, and the pain suffered by the victim.

The thrush finds a snail, carries it to a convenient stone, bangs the snail against the stone until the shell is smashed, and then pecks to pieces the living and writhing inhabitant of the shell.

Or, it catches a worm. Now, a thrush cannot swallow a large worm entire. So it holds the worm down tightly under its feet, tears it into convenient lengths, and so swallows it piecemeal. If the worm could feel pain as man does, the force of cruelty could no further go, and it would be hard to believe that a God of Love could have gifted the thrush with such an instinct.

But, when we bear in mind that the capacity for pain is proportionate to the development of the nervous system, all these difficulties vanish. Moreover, we shall find that the mode of killing is always proportioned to the capacity for pain in the animal that is killed.

In the case of the hawk tribe, the prey is almost instantaneously killed, or at least stunned, by the shock of the swoop —the "divine dexterity" of a modern writer.

Some years ago, a curious and instructive example of this beneficent provision was exhibited at the Zoological Gardens.

An unlucky cat happened to make its way into the cage of the Harpy Eagle. The bird was sitting motionless, after the habit of its kind. But, as soon as the cat was within reach, the eagle pounced upon it. With one foot it seized the cat by the head and dislocated its neck, while with the other, it seized the animal by the chest, and drove the sharp talons into its heart. Death was instantaneous, and in all probability the cat had no time to be aware of its danger, much less to feel pain.

We all know that between the infliction of an injury, and the consequent sensation of pain, an appreciable time intervenes. If, then, life be extinguished simultaneously with the injury, pain would not be felt. A relative of mine was once struck down by a runaway horse, and suffered concussion of the brain. Yet he felt no pain, and his only recollection of the accident was the sensation of the warm breast of the horse coming against his face.

So with the guillotine, life is extinguished so instantaneously, that not even a finger or a toe quivers when the axe descends.

As to the cat tribe, although man is not their natural food, and therefore might be thought liable to more suffering when attacked than is felt by their ordinary prey, it has been repeatedly proved that the first shock of the lion or tiger onset deprives the man of fear or pain. So, where the victim possesses a highly organized nervous system, there is a merciful provision that the nerves are temporarily paralyzed, as regards pain and fear.

Perhaps it may be objected by persons ignorant of practical zoology, that the statements as to the insensibility to pain which is evinced by animals of low organization are assumptions and not facts.

Suppose we accept the position that man is the standard by which we measure the capacity for pain.

When we are in severe pain, we cannot eat. Even when pain is unaccompanied with injury to structure, as in headache, earache, sciatica, or neuralgia, it will deprive us of all appetite during the paroxysms of agony. But, the lower animals will sustain the severest injuries without losing their desire for food.

There is, for example, Mr. Rymer Jones's story of the shore-crabs, to which reference has already been made. These creatures, like the pike, are confirmed cannibals, and there is no food so grateful to a large crab as that which is afforded by a smaller crab. The story is, perhaps, familiar to many of my readers, but it will bear repetition.

One day, Mr. Jones saw a crab about as large as a crown-piece catch a smaller crab, break it up and devour it. N.B., when crabs eat, they always hold their food with one of their pincers, pull it to pieces with the other, and with the same claw put a morsel into the mouth.

So absorbed was the creature in its meal, that it did not notice a much larger crab which came on it from behind, seized it, and proceeded to break it up and eat it. The victim took no notice of the injuries which it was sustaining, but calmly went on with its own meal as long as there was enough left of it to work the pincers and jaws.

Insects, being of a lower organization than crustacea, display equal insensibility to pain, more is impossible.

On one occasion, I thought that a common "dor" beetle (Geotrupes) "wheeled its drowsy flight" rather awkwardly, and captured it in order to ascertain the reason. I found that some bird had attacked the beetle, had torn off the upper surface of the abdomen, scooped out its entire contents, and pulled off one of the wing cases. As soon as it was caught, the beetle folded

its wings and the remaining wing case, and walked about as unconcernedly as if nothing had happened to it.

Even if the whole abdomen be destroyed, the insect seems to think little of it. A dragon-fly, whose abdomen had been knocked off the body by the edge of the insect net, lost none of its natural voracity, but ate any number of flies in succession, though it had no stomach to put them into, and finished by eating its own abdomen.

One of my artist friends was worried by a wasp, and at snipping at it with a pair of scissors, he cut it asunder. Knowing nothing of entomology, he thought that the insect would die on the spot, but found that the head, throat, wings, and legs were in full movement, while the abdomen was lying in the place where it fell. Out of curiosity he gave the insect some red syrup, which, as it imbibed, gathered into a large ruby head just behind the wings (where the stomach should have been); but really, the creature's pleasure seemed to be only augmented by the change in its anatomy, because it could drink ten times its ordinary fill of sweets, without getting any the fuller.

Worms possess a still lower nervous organization, and consequently little, if any, sense of pain. I have already mentioned the mode in which the earthworm is eaten by the thrush, and indeed, it is the lot of this creature to furnish food for a wonderful number of animals belonging to most of the orders in zoology.

There are worms of the sea as well as worms of the land, and the former often attain a considerable length. They are restless beings, twining in and out of the rocks, and pushing their heads into every crevice in search of food. One of these worms was thus engaged, when the observer, in trying to detach it from the rock, broke off a large portion of the tail, or rather, tore away a considerable number of segments. The creature seemed perfectly unconscious of the injury, and continued its search for food as if nothing had happened to it.

Even creatures that are very much higher in the scale of creation seem to be almost devoid of the sense of pain, as we understand the word. The pike, for example, which feeds entirely on living fish, and which, like the crab, is sure to become a victim to a larger pike, if the two should meet, will seize the angler's bait, even though its stomach be nearly filled with the hooks and leaden weight it had broken from a line, only a few minutes previously.

The shark again, which has been hooked, dragged on deck, apparently killed, opened, the whole of its viscera removed, and then flung back into the sea, has been known to recover almost as soon as it sank below the water, to follow the

ship again in search of food, and to be recaptured with another bait, though the fish had no stomach to put it into.

With the evidence of those facts before them, the more advanced operators have now openly acknowledged that the vivisection of living animals affords no guide to the physiology of man, and have begun to throw out hints that condemned murderers ought to be given up for dissection while still living, and not to be wasted by being swiftly put to death and immediately buried.

Even should this desire be gratified, little, if any, dependence could be placed on the results, partly on account of the difference of race or constitution; and partly on the ground that to cut into living tisues, especially when the nervous system is involved, alters the natural conditions, and makes the experiment worthless. I intentionally avoid the religious and moral views of the case, and only deal with those parts which the hardest hearted materialist would accept.

Some years ago, I thought that vivisection, if carefully restricted—*i.e.*, the animal kept under chloroform or other anæsthetic, and killed before it recovered consciousness—might be useful in treating human ailments.

But, the evidence given by the upholders of vivisection, and recorded in the Blue Book, has convinced me that such restrictions cannot be enforced, and that, if they could, they would nullify the results of the operations.

So, after much thought and long consideration, I am driven to the conclusion that the dissection, hacking, scalding, and otherwise torturing of living animals, is utterly valueless to science, does not forward the welfare of man, and ought to be unconditionally prohibited.

J. G. Wood.

Art. III.—THE CLAIMS OF THE CONVOCATIONS OF THE CLERGY AS TO THE PRAYER BOOK.

(*Concluded from page* 346.)

OUR next dates are the 25th of July, when the Savoy Commission expired, and the 30th of July, when the Convocations ceased to sit till the 21st of November, because Parliament was not sitting. But we know, from Lord Clarendon, that "the Bishops" were at work throughout this interval, at the revision, which *they* wished to make of the Prayer Book; and there can be no reasonable doubt that this occupation of theirs was a continuation of what they had begun to do, before the adjourn-