pions and the pyramid, down to the lateral column of the spinal cord. When this condition has been fully developed, no kind of treatment is of any avail; and it appears, therefore, for this reason alone, that your therapeutical efforts should not be postponed a day longer than you can help it. Ergot, in the form of the liquid extract, for the cure of any military aneurisms which may be in the process of formation; phosphorus, for improving the nutrition and function of the injured nerve-cells in the neighbourhood of the lesion; galvanisation and faradisation, for the stimulation of the paralysed parts, are our sheet-anchors in the treatment of this condition; and, if sagaciously used, will do infinitely more good than the merely expectant plan of treatment, which has hitherto been somewhat too much the fashion in these cases.

A FEW PERSONAL FACTS CONCERNING EXPERIMENTS ON ANIMALS OPPOSED TO THE FALSE FANCIES OF THE PERSECUTORS OF VIVISECTION.

By CHARLES J. B. WILLIAMS, M.D., F.R.S.,

Physician Extraordinary to the Queen; Consulting Physician to the Brompton Hospital for Consumption from its foundation; Ten Years Professor of Medicine, University College, London; Late President of the Royal Medical and Chirurgical Society; and First President of the Pathological and New Sydenham Societies.

1. IN February 1835, assisted by several able physicians and surgeons, I conducted an investigation of the causes of the sounds of the heart. Two young donkeys were the subjects of the experiments. They were killed by the insertion of woorara poison (twenty and fifteen grains) into a small wound in the thigh. When they ceased to breathe, and every sign of sensation and voluntary motion was extinct, the chest was cut open, and the heart was found still beating; by the aid of artificial respiration, it continued to beat regularly for upwards of an hour, during which time I made the series of observations on the sounds, and on the means of stopping or altering them, which gave the first complete knowledge of those sounds. This knowledge has ever since supplied the profession with the means of distinguishing the signs of the heart's action in health and in disease. It is difficult to overrate the value of this discovery in the practice of medicine; yet it was obtained at the cost of the lives of only two young animals, with only the suffering of a trifling wound, much less painful than one of the common blows with which these poor brutes are belaboured in their common work. The large dose of woorara destroyed all possibility of suffering; in fact, however doubtful may be the action of small quantities of this poison, it is certain that these animals were dead in all respects except the heart's action, and this was automatically sustained for awhile by artificial respiration.

2. In a series of researches, in which I proved the muscularity of the bronchial tubes and shewed the modes of acting on it in cases of asthma, I made use only of recently dead animals; and the intelligent physiologist knows that there are often residues of life which may be thus profitably questioned by experiment long after the cessation of all feeling. Yet, such cases are ignorantly or mendaciously branded as instances of animal torture.

3. In 1841, I was long engaged in studying the circulation of the blood in the web of the frog's foot; and, among other results, I was enabled to trace the process of determination of blood to enlargement of the arteries on the application of an irritant. Yet, so gentle were the means which I used, and so little hurtful to the feelings of the animal, that I needed no ligature to the toes, but simply spread the web on glass with a wet camel's hair brush; and, by patiently waiting, could best observe the size and current of the vessels during the periods of tranquillity when the animal seemed quite at ease. The nature of the inquiry excluded all strong or painful irritants, and the best results were obtained when there were no signs of uneasiness. These observations have been referred to by Professors Virchow and Burdon Sanderson as the first to demonstrate the true cause of determination of blood in health and in disease, a chief element in the processes of growth and inflammation.

These and other important results of investigation by a private individual, seeking after truth, with full consideration to brute as well as to human suffering, would never have been obtained had that law been in force with which it is now proposed to shackle and insult the members of an enlightened and humane profession.

ON VIVISECTION AND SCIENTIFIC SURGERY.

By SAMPSON GAMGEE, F.R.S. (Edin.),

Surgeon to the Queen's Hospital; President elect of the Birmingham and Midland Counties Branch of the British Medical Association.

THE Parliamentary Committee of the Association has worked so well, in eliciting the opinion of the profession on the Vivisection Bill, and the eminent men who have spoken for us have done so with such weight of authority and discreteness of utterance, as to supply very convincing proof of the power to which the British Medical Association has attained.

Yielding to none of my brother associates for sincerity in acknowledging the obligation imposed on us by those who have fought our battle, I submit that, in the contest for freedom of experimental investigation, the great influence which experiments on living animals have exercised on scientific surgery has been somewhat overlooked.

When Lord Cardwell* put the question "Have the great performers of these painful experiments on animals been generally great surgeons?" Sir William Fergusson is reported to have answered, "No, I am not aware of any great surgeons having been very great experimenters on the lower animals".

Omitting the obvious instance of John Hunter, and his immediate followers in this country, what were Scarpa, Dupuytren, Travers, Syme, Ribès, Jobert, Sédillot, and Porta, unless great surgeons and great experimenters on the lower animals?

In the whole subject of the arrest of hæmorrhage by pressure, ligature, and torsion, in the selection of the best materials for sutures, in the treatment of wounds of the intestines, in the discovery and demonstration of the pathology of pyæmia and allied states of blood-poisoning, in the repair of tissues, experiments on living animals have preceded, and been the foundation of, progress in scientific surgery.

Some proof of this proposition is to be found in the Report of the Royal Commission on Vivisection, but much more evidence might be adduced. While the Hunters in this country were raising surgery towards the dignity of a science, the French school was labouring successfully in the same direction, through the happy coincidence which made Bichat the pupil of Desault, and the editor of his works. It is needless to say how the very brief and brilliant career of Xavier Bichat affected the sciences of anatomy and physiology. If any one doubt how directly his teaching influenced the study of surgery by experiments on living animals, and by clinical observation, let him consult such a work as that of his pupil Ribès' *Mémoires et Observations d'Anatomie, de Physiologie et de Chirurgie* (Paris 1841).

Dupuytren's clinique was one of the greatest schools of practical surgery the world has ever known; not merely pupils in the ordinary sense, but surgeons from all countries crowded round the great teacher in the Hôtel Dieu. Admitting the paramount influence of his intellectual endowments and of his iron will, there is no doubt that Dupuytren's success, as a promoter of surgical science, was largely due to the completeness of his medical education, particularly in anatomy, in chemistry, and in experimental physiology: he worked in Thénard's laboratory, and repeatedly had recourse to experiments on living animals.

As a pioneer to new truths, as an anatomist and physiologist, as a draughtsman and linguist, as a dissector and a mechanician, as an operator and a clinical teacher, Antonio Scarpa has had few rivals in the history of medicine. What a school he was reared in! A favourite pupil of Morgagni, who, when stricken with blindness, made him his amanuensis, and closed his long and glorious life in his arms, Scarpa, as a pathologist, proved himself a worthy follower in the work *De Sedibus et Causis Morborum*. The pupil in Paris of Vicq-d'Azyr and Frère Côme, in London of Pott, the Hunters, and Cruikshank, the companion of Volta in his visit to the Universities of Germany when Wrisberg, Blumenbach, Gmelin, and Richter professed at Göttingen, Scarpa was educated in the highest school of science, and pre-eminently qualified

* Report of Royal Commission on the Practice of subjecting Live Animals to Experiments for Scientific Purposes. London: 1876. Question 1026, p. 49.

† Eloge du Baron Dupuytren in *Histoire des Membres de l'Académie Royale de Médecine*, par E. Pariset et E. F. Dubois; Paris. 1850, tome second, p. 103, et seq. See also *Parallèle de Delpech et de Dupuytren in Tribut à la Chirurgie*, par E. F. Bouisson; Paris et Montpellier, 1861, tome second, p. 1, et seq. *Propositions sur quelques points d'Anatomie de Physiologie et d'Anatomie Pathologique*, par G. Dupuytren, an. xii, 1803.

to become the head of a school of experimental, physiological, and scientific surgery. This is not the place to quote his many original works; but, if any one require proof of what experiments on living animals have done for scientific and practical surgery, let him consult *Degli Aneurismi, Opera del Cavaliere Antonio Scarpa* (Pietro Vannoni edit.; Firenze, 1845).

The experiments therein related of ligature of the large arteries of horses, oxen, sheep, and dogs, were Scarpa's warrant in practising and teaching the surgery of the human body on a subject which he did as much as John Hunter to advance. To use Scarpa's own words, "The good results of my experiments on large animals give me courage in telling you with certainty."

No historical chair of surgery has ever been more worthily filled than was Scarpa's by Luigi Porta, whose great work on the ligature and torsion of arteries† will go down to posterity as a type of what an able man can do by combining experiments on animals with clinical study, and by directing skilled hands with a well-stored brain.

Shipton's famous experiment on the healing of a dog's intestine after a portion of it had been removed,‡ bore little fruit for a century, but becoming, as it did, the incentive to Travers and Jobert's experimental inquiries, the surgery of intestinal wounds has in direct sequence become exact and safe.

After remarking that wounds of the intestine have always been considered as mortal (in the human subject) by the best surgical writers, Mr. Shipton proceeded to relate his experiment of cutting out a considerable portion of a dog's ileum, and sewing the divided ends together with the Glover's suture. The dog recovered, became perfectly lively and healthy, and after some weeks was destroyed; the gut was healed, and Mr. Shipton, who had instituted the experiment on account of the invariable fatality of wounds of the intestine in the human subject under the then prevailing surgical treatment, inferred "that the experiment may serve as an encouragement to sew up wounds of the intestine wherever those parts become wounded in the human subject".

The inference eventually proved prophetic and humane; but it was not until 1812 that Mr. Benjamin Travers published *An Inquiry into the Process of Nature in Repairing Injuries of the Intestines*. Full of the results of experiments on living animals, and of clinical observations, Mr. Travers's classical monograph everywhere breathes the spirit of love for humanity and science. "I have endeavoured", said the author§, "to ascertain the plan and limit of nature's operations in an important class of injuries, to compare the facts of history with the results of experiment, and from these sources to derive a rational and consistent theory of treatment". He goes on to say||, "The benefit which of late years has resulted to practical surgery, from a diligent study of those secret processes by which nature accomplishes her operations, furnishes, I conceive, irresistible argument for the necessity of experiments on brutes". I had the good fortune of knowing Mr. Travers, and all who knew him cannot fail to remember the amiability of his disposition and his thorough kindness of heart. It was only the strongest conviction of their utility which could lead such a man to perform the experiments on living animals which led him to formulate new and reliable canons of surgical practice.

The experiments of Gaspard, and of Castelnau and Ducrest, on the injection of foreign substances into the blood, were the foundation of Sédillot's treatise on *Pyæmia*,¶ a work significantly proving the value of experiments on animals in explaining clinical facts and giving the key to preventive measures.**

No instrument has been invented by a modern surgeon of greater utility than the *éraseur*. Monsieur Chassaignac tells us,†† that he experimented with it on living animals in Flourens's laboratory at the Jardin des Plantes; and, in company with Charlier, at the Grenelle slaughterhouses, removing with it dogs' tongues and cows' ovaries. Contrary to preconceived opinion, he demonstrated the comparative painlessness of the crushing instrument, in consequence of its numbing power; he also proved its safety in preventing primary or secondary hæmorrhage, when used on the human subject, with the regulated

slowness which the experiments on brutes showed to be necessary. The *éraseur* has since been generally adopted, and it is now one of the admittedly most useful instruments in the hands of surgical operators.

The resection of joints and bones, in lieu of amputation, is one of the glories of modern surgery, especially British. Lately, a distinguished surgeon of Lyons, Monsieur Ollier, has been instrumental in introducing a new practice at once scientific and safe. The power of the periosteum to form new bone is at the foundation of Ollier's work. His treatise* consists of two volumes, the first experimental, the second clinical. He dedicated them to Claude Bernard and Velpeau, in these words: "When I left experimental physiology for the practice of surgery, I wished to tread the path you have marked out, the one in determining the methods of scientific medicine; the other, in showing, during forty years, the fertility of its applications." In his introduction (p. 2) Ollier lays down that "experiments on living animals are of the greatest utility to surgery". The author's researches were a repetition and development of those of Duhamel, of Troja, and of Flourens. It is due to Mr. Syme, who more than any other surgeon is entitled to credit for generalising the excision of joints, to point out that, so far back as March 12th, 1837, he read to the Royal Society of Edinburgh, a paper "On the Power of the Periosteum to form new Bone".† In this memoir, the subject is treated with historical accuracy as to the prevailing knowledge at that date; and the Edinburgh professor relates the results of his experiments on dogs, proving the regenerative power of the investing membrane of bones. When the value of experiments on living animals is sustained on surgical grounds by Ollier, fresh from the physiological laboratory, it may be urged that the advocacy is influenced by predilection, and not balanced by sufficient experience. But when a man of Mr. Syme's humane temperament and ripe judgment, in the very zenith of his power and fame, addressed to the Fellows of the Royal Society of Edinburgh, a contribution to human surgery based on clinical observations and experiments on living animals, it is not to be doubted that he had full confidence in the justifiableness of his procedure, and in the safety of his counsel.‡

As a general proposition, it may be stated that the history of the progress of scientific surgery is closely interwoven with that of physiological and pathological investigation, by direct experiment on living animals. Not long ago, surgeons were the leading physiologists. Now, these are advancing boldly on their own scientific path.

Germany was backward in the surgical race; as Scarpa remarked with astonishment, Richter was for long a solitary light; but the names of Chelius, Dieffenbach, Stromeyer, Langenbeck, Pitha, Billroth, and a host of others have come to the fore, while the anatomists and physiologists of the Fatherland, who were always famous, have threatened to outstrip all competition. The revival of anatomy and physiology in Italy preceded the revival of surgery throughout the world; who knows, with the modern instruments and methods of precision, how the more recent revival of experimental physiology may influence the science of pathology, and tend for the benefit of the human race to the discovery of remedies for diseases such as cancer, tetanus, rabies, and a number of others, terrible in their relentless deadliness?

Who knows how largely the physiologists may repay the debt they owe the surgeons, who will fall back in the race unless they are true to the inspirations and traditions which made their predecessors glorious in the possession of learning and in the love of experimental science?

If the Bill now before Parliament be thrown out, the endeavour to pass some such measure will, in all probability, be renewed. It may then be worth while to make an earnest effort to prove, more completely than this sketch pretends to do, with the most friendly feeling towards the distinguished author of the error, that it was a great mistake to say that "great surgeons have not been very great experimenters on the lower animals".

* *Traité Expérimental et Clinique de la Régénération des Os et de la Production artificielle du Tissu osseux*, par L. Ollier. Paris: 1867.

† The paper was republished by Mr. Syme in his *Contributions to the Pathology and Practice of Surgery*. Edinburgh: 1848, p. 30, et seq.

‡ Mr. Ernest Hart informs me that, in his later years, Mr. Syme was proud of the paper in question, and claimed the priority over Ollier.

* "I buoni successi degli sperimenti da me fatti sopra grossi animali, mi fanno animo a dirvi con asseveranza..." *Op. cit.*, p. 739.

† Delle Alterazioni Patologiche delle Arterie per la Legatura e la Torsione. Esperienze ed Osservazioni di Luigi Porta, pp. 337, con tredici Tavole in Rame. Milano: 1845.

‡ Observatio de Portione intestini Canis feliciter abscissa, in *Phil. Transactions*, vol. xxii, 1703.

§ *Op. cit.*, Preface, p. vi.

|| Introduction, p. 3.

¶ *De l'Infection purulente ou Pyæmie*, par le Dr. C. Sédillot. Paris: 1840.

** An Experimental Inquiry into the Effects of Injecting Pus into the Veins of Animals, by J. Sampson Gamgee, ASSOCIATION MEDICAL JOURNAL, vol. i, p. 1079, et seq. London: 1853.

†† *Traité de l'Ecrasement linéaire, Nouvelle Méthode pour prévenir l'Effusion du Sang dans les Opérations Chirurgicales*, par M. E. Chassaignac. Paris: 1856.

INTERNATIONAL MEDICAL CONGRESS AT PHILADELPHIA.—The *New York Medical Record* mentions the following delegates among others: from the Medical Society of Copenhagen, Drs. Edmund Hansen (President), Carl Lange, and S. Engsted; from the Pathological Society of Dublin, Mr. Joliffe Tufnell and Mr. Wm. Stokes; from the Obstetrical Society of Edinburgh, Drs. Alexander R. Simpson (President) and Finlay. The following gentlemen are also expected: H. Power of London; J. A. Estlander of Helsingfors, and Alfred Havi-land of London.