toneal and vaginal surgical procedures advocated in such cases, as well as on the value of electrolytical treatment. With regard to the former, I may venture to repeat that in the majority of cases of interstitial and subperitoneal uterine tumours no active treatment whatever appears to me essential, inasmuch as such growths seldom if ever directly destroy life, and in many cases become arrested in their development and quiescent in their symptoms at the menopause, or may even possibly disappear altogether in the course of time. The latter event is, however, too exceptional to have much influence in determining the expediency of surgical treatment, and more especially that by oophorectomy, which is unquestionably called for in the case of fast-growing fibroids giving rise to otherwise uncontrollable urgent hæmorrhagic or pressure troubles, particularly when occurring in young patients.

With regard to hysterectomy, although exceptional cases may also be met with in which this procedure is necessitated, the average mortality that has followed its performance is such as to forbid its general employment as an operation of election in a disease the average mortality of which, when left to Nature, is so comparatively insignificant. Whilst as to myotomy, in view of its too common results, I can only repeat that it would appear to be a method by which a patient may be effectually removed from a tumour, rather than an operation by which a tumour may be safely removed from a patient.

Treatment of Uterine Fibroids by Electricity.—Although I have so nearly exhausted the allotted limits of this address, I cannot in this connection omit a few words in reference to the latest and apparently most promising of the methods available in the treatment of uterine fibromata, namely, that by electricity. Within the past year and a half I have had occasion to try this method in some ten instances in my hospital and private practice; and, so far as the arrest of hæmorrhage is concerned, the result was most satisfactory, the bleeding being thus arrested in six of these cases. With regard, however, to the cure of the disease by this treatment, the possibility of which in this way had been demonstrated by the experience of Dr. Apostoli and others, who had employed it on a larger scale, I can only say that whilst I have not as yet seen the complete subsidence of the tumour effected in any of the cases so treated by myself, in several of them its apparent bulk became distinctly diminished even after six weeks' or two months' treatment of this kind. It should, perhaps, be added that in all these cases I used Dr. Apostoli's original plastic abdominal electrode, the current used being, of course, unipolar, and acting directly on the growth by the intra-uterine pole, and was obtained from an ordinary twenty-celled Leclanché battery, of an estimated maximum current strength of 200 milliampères. In the first of these cases I employed the electrolytic negative current, but, after a little experience, I abandoned this, and in the subsequent cases used only the positive current, which, although non-energetic as a galvanic-caustic, is far less liable to give rise to trouble, and, from its decided hæmostatic action, is more suitable to those cases of large hæmorrhage-producing tumours, in which alone this or any other active treatment seems to me generally necessary.

If, however, the results obtained by Dr. Cutter, and still more conspicuously those recorded by Dr. Apostoli from the employment of electricity, namely, permanent benefit in 95 per cent. of the cases of fibromata thus treated by him, should be confirmed, as I hope may be possibly the case, by the experience of those who are here about to discuss this disease, then we may well congratulate ourselves on having at last arrived within sight of the long sought-for safe and effectual curative treatment of uterine tumours.

In conclusion, Gentlemen,—it only remains for me again to thank you for the honour you have conferred upon me, as well as for the patience with which you have listened to this address; and I may venture to hope that you will agree with me in thinking that the foregoing summary of some of the recent developments of gynecological science, imperfect as it is, affords a sufficient vindication of our branch of medicine from the aspersions which have been poured upon its followers. These advances and their results are surely more than enough to show at least that those by whom so much has been accomplished are engaged in no narrow specialism, but on the contrary, should rank high in that noble and ever progressive Profession of Medicine whose great objects are the prolongation of life and the relief of every form of human suffering.

BEQUEST.—Mr. Fleetwood Pellew Wilson, of Portman Square and of Wappingham Manor, bequeathed £2,000 to St. Mary's Hospital.

AN ADDRESS

DELIVERED AT THE OPENING OF

THE SECTION OF ANATOMY AND PHYSIOLOGY.

At the Annual Meeting of the British Medical Association, held in Glasgow, August, 1888.

By JOHN CLELAND, M.D., LL.D., F.R.S.

Professor of Anatomy in the University of Glasgow; President of the Section.

RATIONAL TERATOLOGY.

APPRECIATING as I do the honour conferred upon me in being asked to preside over this Section, I shall endeavour to comply with the request which has been issued that Presidents of Sections shall be brief in their opening remarks.

I am glad that in this Association there is a Section of Anatomy and Physiology, and I think it well that two subjects so closely allied that they are in many respects one should be dealt with together. Specialisation, though a good thing in its own place, is liable to go too far. It may be possible to find a surgeon who knows nothing of the medical conditions with which the surgical affections of his patients are complicated, and oculists who forget the constitutional causes in limiting and defining the topographic peculiarities of diseases of the eye; and in like manner it is possible to make too broad a distinction between anatomy and physiology. Yet you will agree with me that he is no all round physiologist who neglects any of the three subjects—anatomy, chemistry, and physics—forming the tripod on which physiology securely rests.

It is, moreover, mainly in its physiological relations that anatomy can claim a place at a meeting of a medical association, for, when most strictly human, anatomy becomes most especially physiological. Structure, when not looked at purely physiologically, must be studied in its morphological relations, and these can only be established by embryology and comparative anatomy. Thus the true anatomist is carried far above the mere technicalities immediately useful to the practitioner, and anatomy asserts itself as the highest branch of biology; and, absorbed into the larger conception of the study of structure and functions of living bodies in all time, anatomy and physiology again united may boldly claim their place among the most ennobling pursuits that can engage the human faculties, and among the best suited to evolve them and liberalise the mind.

To you then, anatomists and physiologists, we in Scotland about to enter, as it seems, on an era of university reform—brave in its talk but perhaps too indefinite in its aims—look for support to give to natural science its proper place in the education of the country. We have educationalists who are incompetent to describe with accuracy the simplest object before their eyes, and philosophers with theories of the universe, but untrained to investigate or learn the phenomena which the world around them presents; and it is precisely because literature and philosophy are important, that this is a state of matters which ought not so to be. But, whilst I thus protest that it is pernicious and ignorant folly which fails to see that the *studium generale* of centuries long gone-by is no longer fit to be the *studium generale* of the universities of to-day, and that biology must take its place in the higher general education, as a branch of knowledge important to all, and not of a merely professional interest, I claim the attention of medical men particularly to the necessity, from a sanitary point of view, of having diffused among the community at large a greater acquaintance with anatomy and physiology. I cannot help thinking that parents would bring up their children better, that many lives of misery would be prevented, and that temptations to prurience would be taken away, were more accurate notions prevalent of the functions of the body and, within the bounds of reason and judgment, imparted to the young.

The neutral ground between anatomy and physiology is embryology. It is anatomical structure which is developed, and the development takes place by physiological processes. The examination of the specimens is mostly anatomical, while the means by which they are obtained belong more to physiological method. This is a study, the relations of which to medicine are often very imperfectly appreciated, and yet by it alone can we hope to understand the nature of anomalies and monsters. Disease, after the

organs of the body have been completely formed, may deface them and modify their appearance by changing the character of their textures and altering the nutrition of parts to the extent of great deformity; but similar processes of interference with corpuscular life taking place in the embryo before organs are completed, or at a period antecedent to their formation, must obviously have far greater effect on the structure of the body; and, in this circumstance, we have the great key to unlock the secrets of teratology. In point of fact it is time for scientific men to define teratology as pathological embryology. If, therefore, Sir William Aitken (himself formerly engaged in the teaching of anatomy in the University of Glasgow) should claim this subject for Section F, I must acknowledge the propriety of the demand, and can only excuse my interference on the plea that it has ever been the habit of the anatomist to give fatherly guidance to physician, surgeon, and pathologist alike; and for the same reason that we willingly receive in this Section communications on surgical anatomy, I intend, with your permission, directing your attention to teratology.

In every organism the internal hereditary properties are acted on by external circumstances. Every nucleated corpuscle is affected by the fluids, the temperature, and the other conditions to which it is exposed; and life is nothing else than the interaction of internal properties and external agents. In disease the ordinary sequence of events in tissues or organs is interfered with by the influence of irritations other or greater than they can bear. The tissues of the embryo have greater activity and potentialities than the tissues of the adult, and they are very dependent on constancy of surroundings, for example, on an even temperature. Thus, apart from direct evidence, which is abundant, there is an antecedent probability that disease may occur in the embryonic structure; and, if it does, it is evident that the masses of corpuscles implicated will not be left afterwards in the normal condition suited for developing into new organs; and, therefore, the organs dependent on these masses will either fail to be formed or will be abnormal. On the other hand, the circumstance that the early embryo is destitute of nerves and of a vascular system to bring its parts into connection, and consists wholly of sheets of corpuscles, favours the simplification and localisation of the effects of irritation; and in this I do not doubt we have the explanation of the fact that grave abnormality of important parts may accompany a perfectly healthy condition of the rest of the body. Not only do we find such minor affections as hare-lip and cleft palate in children who grow up to be well developed men, but it is not very uncommon for an anencephalus to be born at full time with trunk and limbs as sound and large as in a perfectly formed infant; and even when the diseased condition has involved the whole length of the cerebro-spinal axis, so as to produce complete rachischisis or open spina bifida in combination with the anencephalus, the deformity of the trunk is merely the result of the spinal column having been rendered, by increased density in its early state, less expansive, so that it has refused to elongate, and has thus forced the sprouting ribs and enlarging viscera to accommodate themselves to their abnormal conditions, while their textures and growing powers have remained quite healthy. And here I may point out how instructive these cases of complete open spina bifida are in demonstrating the effects of alteration of pressure in changing the forms of parts. We meet with laminae and transverse processes marvellously expanded, because freed from the normal pressure, subject to which they have the hereditary tendency to take the normal shape; and probably to the same cause may be referred the branching and coalescence of ribs and transverse processes, for which, in detail, it is often difficult to account.

But it will be said that all this has reference merely to abnormality by defect, and is inapplicable to double monsters. Not so. The law is really one throughout. The proliferation of the corpuscles of which the body is composed plays the most important part in defects of development. Proliferation is multiplication by division and the transmission of the characteristics of the parent to the offspring, and this is precisely what can be traced as taking place in all varieties of double monstrosity; for, instead of one embryo on an ovum, two completely separate embryos are sometimes found on one ovum, or an embryo partially divided; and we judge, therefore, that the essence of double monstrosity consists in the division of the embryo more or less perfectly into two parts, each of which inherits the properties of a complete embryo. Thus, in monstrosity by defect, the external irritation acts on individual corpuscles, affecting their proliferation as well as their other activities; while in double monsters it is the whole mass of corpuscles

which is stimulated to unwonted proliferation. In fact, double monstrosity consists in the outbreak of proliferation at an unusual period, with consequences dependent on the greater or less perfection of the process; and this outbreak we may fairly impute to irritation, especially when we consider that double monstrosity is remarkably common in fish ova artificially impregnated, and in hen's eggs artificially incubated. The mode in which duplication of the embryo occurs admits of division into three varieties; it may extend from the cephalic end, in which case it may be conveniently termed abcranial; or it may extend forwards from the tail-end of the embryo, and may be termed abcaudal; or it may be both abcranial and abcaudal. To one of these three varieties every double monster may be referred; further variety being occasioned by the equal or unequal growth of the divisions of the embryo, their pressure one on the other, and, in the event of unequal growth of the divisions, the continued adhesion of the less to the more nourished division, or its separation by rupture to form an acornus or acephalus.

Besides double monsters, there is another form of anomaly by excess, referable to the same principle of increased proliferation—namely, polydactylism; for apparently the carpus and tarsus are the first parts of the limbs to be developed, while the elongated part of the limb appears subsequently as a peduncle, and the division into digits by the breaking up of the distal edge; and, considering the similarity of the digits one to another, it seems to me very probable that polydactylism is due to a cause similar to that by which an embryo may be divided, affecting the dactylogenic blastema. But this requires detailed investigation.

I must, however, await a more fitting opportunity for launching into the details of a reformed teratology. What I specially wish to point out at present is that, just as in the case of varieties of races, external influences modify the internal or hereditary tendency; just as in the nourishment of both plants and animals, modifications of the external conditions affect the configuration of both individuals and races; and just as, in disease, the external factor has a constant importance in accounting for aberration from health, so also, in the modification of the form of the embryo, it is to the operation of external agents not always easy to appreciate, that generally, if not always, the modification is to be traced.

The more that in detail we are able to trace all sorts of monstrosity to physical irritations acting directly on the tissues or the early embryonic mass, the more disinclined, I think, we shall be to believe in the curious stories, widely disseminated, of imaginations on the part of the mother affecting the form of the offspring. If we were the creatures of stray imaginings fleeting through the minds of our mothers, monstrosities might indeed be not only more frequent, but more various and more comical even than those depicted in the works of old writers. How easily mistakes may be made I may illustrate by showing you a common old Scotch chimney-piece decoration—the sixth cervical vertebra of a horse painted to represent a minister preaching. It was brought to me along with this anencephalous monster, to which it has a considerable resemblance, and got credit for producing the monster by attracting the mother's attention. But anencephalus is now so thoroughly investigated that we know that in this instance the minister was falsely accused. This case I consider specially instructive, for, were we as ignorant of the nature of monstrosities as once we were, the appreciable resemblance between the accused minister and the anencephalus might well be thought sufficient to support the accusation. But anencephalus is a subject which has received a large amount of attention, and I believe I shall be held warranted in saying that in my own memoir on the subject (*Journal of Anatomy and Physiology*, April, 1883) I have completed the chain of evidence which traces its origin conclusively to dropsy of the cerebro-spinal axis setting in at a very early period subsequent to the closure of the cerebro-spinal cylinder and obliteration of the communication of the primary optic vesicles with the brain. The principles on which Cyclopians and other well-known monstrosities are to be explained can in like manner be carried out with considerable precision; and when this is done it is possible even already to account in some measure for that curious constancy of type seen in different kinds of monstrosity, which attracts the attention of every investigator since Geoffrey St. Hilaire. I shall only add that not only does teratology, now that it is appreciated as depending on fixed laws, offer an interesting study in itself, but it is calculated to exhibit to the thoughtful biologist the operation of natural laws in unusual circumstances, and thus to throw light on the laws themselves, and

afford advances in biology which cannot otherwise be obtained.

A number of specimens illustrating such teratological work as I have been able to overtake since coming to Glasgow may be studied in the practical anatomy rooms by members wishing to consult them. I have there placed in such a position that they may be conveniently inspected during the meeting of the Association a large part of the anatomical collection prepared under my direction. I only regret that there is no accommodation at present for the permanent exhibition of museum specimens in such a manner as would enable the students attending the anatomical classes to profit by them. I live, however, in hope that a proper building will be provided before my interest in the chair shall terminate, that I may have the gratification of handing over to the University the whole of my private museum.

AN ADDRESS

DELIVERED AT THE OPENING OF

THE SECTION OF PATHOLOGY.

At the Annual Meeting of the British Medical Association, held in Glasgow, August 1888.

By SIR WILLIAM AITKEN, KNT., M.D., LL.D., F.R.S.,
Professor of Pathology in the Army Medical School, Netley;
President of the Section.

ON THE PROGRESS OF SCIENTIFIC PATHOLOGY.

To have been invited to preside over the Section of Pathology at this important annual meeting of our Association in this famous city, is, for me, a very great honour. And, in spite of an overpowering consciousness of inefficiency to discharge the duties of a president from sheer inexperience in such duties, I nevertheless accepted the position, because in the selection made by your Council I consider that a compliment has been paid to the Army Medical School at Netley, to which I have the honour to belong, not less than to myself.

Nevertheless, I feel the responsibility of venturing to follow those distinguished men who have year by year from this chair addressed the Sections in Pathology—men whose names are famous throughout the world for their genius, their talents, and their culture. But I am encouraged to undertake the duty believing that I can rely upon your indulgence and upon the able assistance of my friends who are associated with me as Vice-Presidents and Secretaries of the Section.

Personally, it is a great gratification to me to occupy this position, because of my previous connection with the ancient University of this great city, in which I had formed friendships that have never ceased to be, for me, a source of the most pleasant recollections. My remembrances of this University are of "long ago"—forty years ago—(1848), when I became associated as Demonstrator of Anatomy with one of its most distinguished professors—the late Dr. Allen Thomson—the memory of whose name must be ever cherished by the thousands of pupils he helped to teach, not less than by his colleagues, who are still left to add lustre to the University of Glasgow.

My first duty, therefore, is respectfully to acknowledge and to express thus publicly my personal appreciation of this distinction, and to thank the members of your Council for an opportunity of revisiting this ancient city under such auspicious circumstances.

I would here also speak a word of welcome, in the name of this Section, to our foreign friends, many of whom have come long distances to take part in its work. We feel highly honoured that men so distinguished in pathology should be with us to-day—men whose names are not only "familiar as household words" in their own country, but of world-wide reputation wherever pathology is studied as a science.

The object of the British Medical Association, throughout all its Sections, is "to promote the progress of medicine;" and in this respect its combined work may be said to have a practical rather than a purely scientific aim. But in this Section of Pathology (as a branch of biology) the Association finds a link which immediately connects it with the science side of medicine, as distinguished from the art or practice of our profession; and in the records of pathology, if we seek diligently, we shall find those maxims which will most safely guide us to the rational practice of our art.

But pathology must be studied as a branch of biology, in the widest acceptance of that term; and when medicine is thus thought of as a pure science, it implies a "pathology" which has no more necessary subservience to practical ends than zoology or botany. The logical connection between this purely scientific doctrine of disease or pathology and ordinary biology has been traced out by the master-mind of Professor Huxley, and expressed in these words:—"Living matter is characterised by its innate tendency to exhibit a definite series of the morphological and physiological phenomena which constitute organisation and life. Given a certain range of conditions, and these phenomena remain the same, within narrow limits, for each kind of thing. They furnish the normal and typical character of the species; and, as such, they are the subject-matter of ordinary biology. Outside the range of these conditions, the normal course of the cycle of vital phenomena is disturbed, abnormal structure makes its appearance, or the proper character and mutual adjustment of the functions cease to be preserved. The extent and the importance of these deviations from the typical life may vary indefinitely. They may have no notable influence on the general well-being of the economy, or they may favour it. On the other hand, they may be of such a nature as to impede the activities of the organism, or even to involve its destruction. In the first case, these perturbations are ranged under the wide and somewhat vague category of 'variations'; in the second, they are called 'lesions,' 'states of poisoning,' or 'diseases'; and, as morbid states, they lie within the province of pathology. No sharp line of demarcation can be drawn between the two classes of phenomena. No one can say, for example, where anatomical variations end and tumours begin; nor where modification of function, which may at first promote health, passes into disease. All that can be said is that whatever change of structure or function is hurtful belongs to pathology. Hence it is obvious that pathology is a branch of biology; it is the morphology, the physiology, the distribution, the etiology of abnormal life. Henceforward the connection of medicine with the biological sciences is clearly defined, and pure pathology is that branch of biology which defines the particular disturbances of cell-life, or of the co-ordinating machinery, or of both, on which the phenomena of disease depend."¹

Our first object, therefore, is to ascertain the laws under which organic bodies live in their usual healthy or normal course of life; on the other hand, we desire to ascertain how those laws come to be altered in an unusual, unhealthy, or abnormal course. When we attempt to do the first of these things, we are physiologists. When we attempt to do the second, we are pathologists;² and pathology may be still more concisely described in the words of a veteran and most distinguished pathologist—Sir John Simon—as "a study of the science of life under other conditions than those of ideal perfection."

As to the mode of working in pathology, it is essentially by research—a searching out of the secrets of Nature by experiments. And while such may be described as the very essence of practical pathology, we have also a speculative pathology (too apt at times to run rampant) in which we are constantly tempted to speculate on the nature and origin of diseases, from a most fascinating desire to understand and explain all that we observe. Hence we are tempted to speculate as to the intimate nature, the origin, and essence of the "morbid processes," we have more or less constantly before our eyes, even before we know what these processes really are. By such speculation we seek for and obtain what has been called "a good working hypothesis"—a theory of disease.

It is only through the agency of practical pathology that we are safeguarded from the errors inherent in all kinds of speculation, and in speculative pathology in particular. Theory and experiment, so long as they go hand in hand, help and check each other; and I think you will agree with me that there never was a time in which there has been greater activity than now in all kinds of pathological work, or more encouragement given to workers in pathology.

Your Association, under its excellent management, has greatly contributed to this activity by the far-seeing organisation through which it has sought to extend the area of original research: 1, by arrangements for the collective investigation of diseases; 2, by its grants in aid to members of the profession engaged in researches for the advancement of medicine and the allied sciences;

¹ *Science and Culture, and Other Essays*, by T. H. Huxley, LL.D., F.R.S., 1881, p. 329-345.

² *History of Civilisation in England*, by Henry Thomas Buckle, 1867, vol. iii, p. 410.