LISTER CENTENARY.

1827-1927.

THREE DISCOURSES

DELIVERED ON WEDNESDAY, APRIL 6TH, DURING THE LONDON CELEBRATIONS.

LISTER AS A PHYSIOLOGIST.

BY

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THE invitation has been extended to me to offer a few words about the contributions made by Lister to physiology. Lister's very earliest scientific papers were all physiological. Indeed, he may be said to have entered by way of physiology on his surgical researches, which were to achieve so much.

SMOOTH MUSCLE.

His first paper was on the "Contractile tissue of the iris." Work done with the microscope, which he used for the study of function rather than of form alone, it appeared in 1853 in the first number of the first volume of the now well known *Quarterly Journal of Microscopical Science*. Lister was then 25 years of age, and that his maiden voyage of discovery should employ the microscope was but natural in the son of Joseph Jackson Lister, that remarkable man, who, leaving school at the age of 14 for the business he conducted so successfully, had yet found time to cultivate optics to such purpose as to give the world the achromatic microscope. This, Lister's earliest paper, on the iris, supplied the first full and correct description of the radiating muscle dilating the pupil. It thus made a lasting mark upon its subject.

Lister's second paper, of a few months later, dealt likewise with involuntary muscle; this time in the skin, where Kölliker had recently discovered the arrector muscles of the hairs; this discovery Lister confirmed, and in several respects extended.

We may be struck by the remoteness of these, Lister's first themes, not only from surgery, but, indeed, from actual practice; they are academic. I think we have to picture him a young man to whom what really mattered was engagement on research, and less at that time what in particular the research might be: a young man so ardently curious about nature, especially animate nature, that he turned with enthusiasm to the problem that came first to hand. And these papers in the simplicity of their text recall something of the upbringing in Lister's Quaker home. There is already the sobriety of expression which, characteristic of Lister all his life, made yet the more impressive his own self-restrained statements of his great results later on. No man in his career had more excuse for, more justification for, hyperbole of phrase than had Lister, and no man ever indulged in hyperbole less than did he. It is therefore of significance when in these early papers the young author allows himself an expansive adjective, as for instance when he writes "the grand discovery of plain muscle-cells," "the beautiful muscle of the

iris." We feel these expressions to be from him not mere phrases. An abiding interest of these papers is that they reveal points in Lister's so to say original nature; and among these are penetrative and faithful observation, a catholic enthusiasm for research, a restless testing of authority by observed fact, an unhesitating self-submission of opinion to whatever the truth might assert, the fear of nothing except missing the truth.

His third paper, still physiological and on the same theme, smooth muscle, followed some four years later. The cellular nature of that tissue had been denied; Lister returned to its further proof. He furnished it overwhelmingly. Forty years afterwards the then foremost authority on this tissue wrote of this paper of Lister's as being still not only abreast, but in several respects ahead, of other subsequent papers on its subject.

This work was Lister's farewell contribution to that particular theme. Much had by then happened and was happening to him to compel his main interest elsewhere; in short, his scientific enthusiasm had definitely orientated its search in the great field of the unknown. His spirit of inquiry had found a direction of compelling interest to it, a lodestar of overpowering attraction. In his own words, written to his father, he had fallen in love with surgery. And with that wide, though unified, field enchanted before him, the genius within him pointed to the prime and all-pervading problem in that field as being, not this or that particular skill or operation, but the fundamental process and reaction of inflammation itself.

NERVOUS CONTROL OF ARTERIES.

Henceforward his physiological research became merely collateral to the pathological study engaging his main thought. Thus it was with his paper on the nervous control of arteries, distinguishing between the immediately local and, the more distant effects of a stimulus, and especially of an irritant stimulus upon the blood vessels. The local effect, he concluded, was independent of the nervous system, but with a surrounding zone of effect mediated by nerve—a finding closely suggestive of present-day views. Another paper was that on the pigment cells of the frog's skin—those cells on which the animal's well known colour changes depend. Lister concluded the shift of pigment to be a shift of the pigment grains within the cells themselves, and the way in which he consolidated and marshalled his evidence for that is a striking instance of his thoroughness as an investigator. There is little doubt that from detailed study of these pigment cells Lister gained much

of that vivid and intimate conception of cell life struggling against irritant agents which directed his surgical strategy afterwards.

INHIBITORY ACTION OF VISCERAL NERVES.

Another of his physiological investigations concerned the inhibitory nature of certain visceral nerves. He wrote: "I have been led to make an experimental inquiry into this 'so-called inhibitory agency' because it appears to me to have an intimate bearing upon the question how inflammation is developed through the medium of the nervous system at a distance from an irritated part." His main conclusion was that inhibition resulted from more energetic action of those same nerves which when working mildly produce increased action.

Then, more closely related still to his pathological inquiries, followed two papers on clotting of blood, confirmatory, as he himself remarks, of his conclusions arrived at about inflammation. These papers and the year 1863 practically concluded the tale of Lister's researches devoted directly to physiology. Perhaps their main interest now is their revelation of their author in his earliest research career. Conspicuous in them is capacity for noting detail and the rarer power of sifting out from the detail its broader meanings. Another of their qualities is a voracious appetite for seeing for himself phenomena many would be content to take on trust from the excellent descriptions given by others. Lister was satisfied by nothing less than seeing for himself, and his eye never staled. Moreover, even at this stage, though he might appear engaged on diverse problems, he was in fact centred upon one problem, of which from his point of view the several were but several aspects. Thus, these early papers show that in reality quite early in his career he had not only found but had whole-heartedly flung himself upon what was to be his life-work and his life's problem—a problem we may almost subsume under the one broad term "inflammation." That was the study which he was to follow to a practical solution so magnificently, and in doing so exhibit what these earlier papers had less opportunity for showing—the splendid power of establishing, and systematically following through its consequences, a great generalization. Hence from these earlier researches we can see spring that triumphant career of experimentation and observation, in the laboratory and the ward, which, with a really surprising speed of mastery, winged Surgery for that which she is to-day—a far-flighted angel of healing the civilized world over.

ANTISEPTIC SURGERY IN PHYSIOLOGICAL EXPERIMENT.

But these papers whose features we have been examining far from exhaust the gift made by Lister to physiology. In addition to and beyond them he enriched it with the con-

tribution of enhanced means towards its own most cherished aims. He put into the hands of physiology for all time a superlative refinement of its method, and made possible observations otherwise impossible. Sir Berkeley Moynihan has eloquently insisted on the importance of surgery as a means of discovery. In physiology, how could Pavloff have achieved his epoch-opening study of the digestive processes except by leaning upon Lister's surgical principles? Ferrier initiated his study of localization of cerebral function by means of Lister's surgical principles. How could the physiologists of Toronto, less than four years ago, have bestowed upon diabetic sufferers that merciful remedy insulin, had it not been for the legacy of operative principle and science bequeathed to them and to the whole world by Lister?

And Lister's own words leave us in no doubt as to what a source of rejoicing it was to him that among benefits accruing from his work was this one, an enhanced scope and power for physiology and experimental medicine. He dwelt both in public and in private upon the need and importance of such experimentation for the progress of knowledge necessary to civilization. He rejoiced that he had contributed to its power. And indeed the experimentalist owes to Lister an instrument of research whose beneficent future the boldest imagination may well halt to set limit to.

And of the gifts of Lister to humanity one which the experimentalist is with especial gratitude ever mindful of is that, while helping man to mastery over disease alike for animal and man, he contributed to free that necessary experimentation from the infliction of pain. Man, sacrificing animal life as he does to satisfy the material needs of humankind, has the right to regard the intellectual need impelling him to search means of saving human and animalkind from disease as justified in its resort to animal experimentation. He does so with the less heart-searching and with clear conscience because largely owing to Lister he can do so without inflicting pain and suppuration.

Thus it is that through years to come, after indeed it may be that the actual papers contributed to physiology by him may have become matter chiefly for the historian and the antiquarian, Lister will still receive unflinchingly his meed of commemoration from the physiologist and experimentalist, and in a manner which to himself would, of all ritual and offering, have been the most congenial!—namely, in their daily observance and trust of methods which he discovered and inculcated, and in their practice for the alleviation and prevention of disease. It is therefore with peculiar gratitude that Physiology brings its tribute of admiration and veneration to the memory of one great even among the greatest of the benefactors of humanity, Joseph Lister.

LISTER AS A PATHOLOGIST AND BACTERIOLOGIST.

BY

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WE are met to commemorate the centenary of the birth of Lord Lister, and I have been asked to address this representative gathering on his contributions to pathological science.

Proud as I am of the great honour which has been bestowed on me, I am painfully conscious of my own imperfections and limitations for such a task. My qualifications are twofold. In the first place, I have read all Lord Lister's writings and have made a critical study of some of them, not only to discover their intrinsic merits, but to compare them with similar studies of his predecessors and contemporaries.

In the second place, I had the great privilege of knowing Lord Lister for thirteen years, and in a manner which, considering the great disparity of our positions, was, if I may presume to say so, almost intimate. As bacterio-

logist to the British Institute of Preventive Medicine I had to visit Lord Lister, the chairman of the Institute, almost weekly in order to report to him the progress of the work in the antitoxin department. After I left the Institute he frequently asked me to call upon him to discuss various scientific problems in which he was interested. In this way I was a good deal in his company, and among the younger men of that day I probably saw as much of him as anyone else.

When I first knew him, in 1895, he was 68, and I frequently saw him down to 1907. I last saw this great man in a bath-chair by the roadside at Walmer on a lovely sunny morning—December 26th, 1909. He was then 82 and was approaching the lonely end of his splendid career. Both then and now he stands out to me as a most impressive personality. I have known very many of