

I have said something of the duty of the graduate to his special school: but I am reminded of the fact that there is a spontaneity in the response of the graduates of the School of Engineering in regard to maintaining the old sympathies and associations, and a devotion to the interests of the school, which augurs well for its future. The cordiality of our meetings here, the kindly feelings between graduates and undergraduates, and, may I be permitted also to say, between the teaching staff and both, and the spirit of brotherhood in study, are truly in harmony with the ideal spirit of a university, and are a presage of a future of which I feel sure there will be cause to be proud. And need I say that these things are largely dependent upon the hearty sympathy of our old graduates, with all that is going on in the school, with those who are now passing through it, and with every question touching its future and development? This sympathy has also shewn itself in the readiness with which professional papers have been prepared for the meetings of our Society, and by activity in all its affairs. In submitting any thoughts on the theme I have to develop, therefore, I have the earnest that in the graduate of engineering I shall meet with a cordial response.

During your undergraduate years your reading was necessarily intensive, in view of the fact that you had to pass a rigorous examination therein: but since then, with the extension of your reading, the thought must have often pressed itself upon you, what a splendid inheritance is ours of accumulated professional experience, and how, through the art of printing, it has right royally been placed at our disposal! And you must also have been carried away with admiration at the arduous, self-sacrificing, and extremely generous labours of those whose toil and genius have created all this wealth of knowledge. It is impossible to appreciate in any degree the regal gifts of the past, without feeling something of that enthusiasm which must have inspired those whose contributions to human knowledge are monuments of an intellectual energy, challenging alike our esteem and gratitude. And one cannot be touched with that enthusiasm without feeling within him, at least, the impulse to offer such contribution, however humble, as may lie within his power, as his personal tribute of grateful appreciation for the intellectual wealth he has freely received.

These enthusiasms can rarely arise within us without being followed by a chilling recall of our personal limitations, and we are apt to feel that there must have been giants in those days: that any effort on our part would be futile: that we must leave to future giants the task of piling Ossa on Pelion.

Now I may, perhaps, be allowed the opinion, without being open to the charge of being theological, that this recall and these suggestions are after all only whisperings of that particular imp whose function it is to bring to nought all human effort, to crush the spirit of enterprise, and to mock at our better impulses. And I do not believe it is beyond any of us to make during a lifetime, let us say, *one* worthy contribution to our professional wealth. A modesty in regard to our own powers which ventures to interdict all responses to impulses born of an appreciation of our inheritance, has become too self-assertive, and ought to be compelled to retire in a manner becoming its proper character, or at least to find itself the fitter occupation of declining to

let us present anything less perfect than the best of which we are capable. In some institutions it is an essential of membership that original work shall be produced. Every person admitted to the corporate membership of the London Institution of Civil Engineers is required, within twelve months of the date of his election, to contribute an original article on some subject connected with Engineering, and will be excused only on the condition of presenting a book to the library of the Institution—a poor recompense for failure of duty. In the German Universities the presentation of a thesis containing the record of original work is a *conditio sine qua non* for the degree, so that there is nothing novel in the principle involved in my appeal. Could a graduate of our University, or a member of our School here, better further the interests of either, than by the publication of original work of high character? Depend upon it, a University will inevitably be judged by its fruits, and neither modesty nor supineness will excuse either their imperfection or their absence. Gentlemen, we cannot, in view of the splendid theses being produced at the world's great institutions, we dare not, sacrifice the honour of our University and our country, by failing to put forth our best effort in the intellectual rivalries of our day. There may be limitations here—probably they are very much overrated—but even so, the gallant maintenance of our academic and national honour demands that even our limitations should but stimulate us to stronger effort.

I would say a word or two in regard to the type of contribution that you may be expected to make. There are two sides to engineering, one which concerns it as a science, the other as an art. It is sometimes forgotten by the votary of so-called pure science that there is a genius—I might even say a science—of the application of science, and that this is one of the most characteristic requirements of the engineer. His is the privilege of entering the Temple of Minerva, not to profane its mysteries, but to make them minister to the good of humanity. When we come to know ourselves, if that ever happen, we shall generally find within us a distinct leaning, either to what is called the theoretical, or to the practical side of our profession; and this leaning is likely to be most marked where the mental endowments are most brilliant. It is given to few vigorous minds to preserve anything like an even balance between these characteristics. I would say, therefore, let your own idiosyncrasy be your guide as to the essential character of your work, for this will tend to make its quality the highest possible. At the same time the theoretical side is the more far-reaching, and makes the severer demand upon one's faculties, and it is therefore in that region where, if you feel the inspiration to work, you may well find exercise for your highest powers and scope for the most ardent ambition. May I add just one more thought to these remarks to graduates? "Quality, not quantity," said Frederic Harrison in an address last October at Birmingham, "weighs in the impartial scales of history." Surrounded as we are by a wealth of literature, such as in every subject passes the possibility of reading, it is an insult to the intelligence of our colleagues to offer them anything but mature material; and material on the perfecting of which we have exhausted ourselves. Mere multiplication of scientific papers is not scientific development. There are hundreds of papers printed that

ought never to have got further than manuscript; and it is better to have published one classical paper than fifty that can merit only contempt. In regard to experimental work, and indeed all work that is intended to be a contribution to our knowledge, it may be said, there is little to be learned from the mere accumulation of facts, for it is not the accumulation but the systematizing of facts that constitutes science. For this reason, whatever subject we take up, we should know at least the present state of the world's information in regard thereto, both in respect of the facts themselves and in respect of their interpretation. With that equipment as a start, we shall not be guilty of wantonly wasting the time of ourselves and others. Lastly, we do well to remember in every undertaking, that not only have we our own reputation to make and maintain—we also have that of our School of Engineering, our University, and our nation.

And now it remains for me to address the third class of our members, those engineers who are honorarily connected with our Society, whose sympathy with its aims has been testified, as we gratefully remember, not only by the stimulus of their presence from time to time at our meetings, but also by the very generous way in which they have placed elements of their professional information, often of a highly special character, at our disposal. We recognise that this has been done despite the pressure of public duties, and at a considerable sacrifice of their leisure. Some of our honorary members are themselves graduates of Universities; others, however, are not, yet none the less have they shewn in the highest degree the true University spirit, the spirit of the student ever ready to help his brother student. I would like here to say that I believe in no place are the meretricious elements of University life and distinctions so little appreciated as in the University itself; and I believe too there is no place where real merits and attainments are more cordially esteemed. The higher spirit of a University is the spirit of a brotherhood which embraces every honest soul that is toiling to understand itself, the world it inhabits, its own and the cosmic forces, or that is trying by its control of matter and energy to raise life and its surroundings on to a higher plane. To men imbued with this higher spirit it matters little whether in a technical sense one is a member of a University or not. What *does* matter is whether one has within him a spirit of sympathy with that life which a University is designed to maintain, with those objects for which Universities have been created. And I believe it is because we are lifted above the narrow technicalities of what is meant by membership of a University that our relation with our honorary members is so hearty, and our appreciation of their help sincere.

There is no way, Gentlemen, in which you can more effectively help us, as a Society, than by continuing to give us your sympathy and aid as in the past. No one is so well fitted to place the results of professional developments before others as he who has been directing and has been intimately associated with them, and for that reason there will always be the occasion for your assistance.

There is another direction in which you can advance the School here, and through it the future status of the profession. The University is a place singularly well adapted to developing a professional *esprit*, upon the value of which I need not dilate. The opportunity of con-

serving this is yours, and no one so well knows that we stand or fall together as you do. No member of a great profession can afford to neglect its corporate interests. To do so is treason to the brotherhood to which he has been admitted, tending not only to damage individually its members, but, what is of far greater public moment, to damage the efficiency of its service to humanity. We do well to bear in mind that everything which stimulates in us a sense of responsibility to the body to which we belong, that infuses into us a high conception of our vocation, and of the obligations of its honourable discharge, has a value commensurate with the good of humanity itself; and there is no better inspiration than that which comes from the recognition that we do not live to ourselves either as individuals or as a great profession, but play our part on the world's stage for the good of our nation and of our age. We can teach this here in an academic way, but, Gentlemen, yours is the privilege of stimulating the young engineer in the maintenance of those high traditions of duty so nobly illustrated in the lives of those great engineers whose probity and genius have won undying esteem.

I have spoken of the imperative necessity of our taking an active part in the scientific investigations proceeding all over the world. We have, so far, by no means lived up to our privileges in this respect, and the time has come when, if we are not to meet with well-merited contempt, we must bestir ourselves. In the University we have, to some extent, the means for conducting experimental investigations. These, however, are in no sense adequate; and not only will our instrumental equipment have to be further developed, but the requisite funds to meet the expenses of the material required in experiments will have to be forthcoming. It is to be regretted that we have so little opportunity for post-graduate work, but this is not the point to which I at present allude. It will often happen that the great public departments over which some of you have the honour to preside, can without serious expense, and in many cases almost without expense altogether, assist in certain lines of needful scientific investigation. The material and equipment at your disposal, placed in the hands of a competent investigator, could often, without deterioration or injury of any character, be used as apparatus which it would be quite beyond our means here to purchase, and would at any rate be in our way afterwards. No one knows better than you do, gentlemen, the tribute of gratitude which among others the world owes to the French nation, and to their great Academy of Sciences, for the munificent way in which they have endowed experimental research. Let me mention two notable instances, viz., the expeditions to Peru and Lapland to determine the figure of the earth in connection with the theory of gravitation, and the equipment placed at the disposal of M.M. Darcy and Bazin for the purpose of investigating the laws of flowing water: the one instance shewing the theoretical, and the other the practical ardour of that people. A noble example worthy of emulation, and one which suggests a direction in which you may help not only our University, but also the nation. The preoccupation and pressure of public duties will perhaps often prevent you from actually conducting scientific investigations personally; nevertheless, to have made them possible through your office and influence will itself win you the gratitude of those who know what activity of this kind means to a people.

I am aware that I must justify on commercial grounds my appeal for help: nothing is worth doing now-a-days that does not enlarge our pockets, or add to our material comfort. And while we are passing through a phase of existence which incessantly demands commercial justifications, wherever even small items of expenditure are involved, I must assign a sordid as well as a sentimental reason for consideration.

But let us remind ourselves of a certain king who lived in the days of old, whose prayer was for wisdom and understanding, to whom, because he appreciated the higher gift, was added also the lower gifts, and among them wealth. History repeats itself; and to-day no one, contemplating the industrial progress of the German people, and tracing its cause, can fail to see a modern example of the higher choice leading to the strengthening of the hands of a nation. And as long as a people preserves within itself a devotion to the nobler issues of being, wealth is a blessing, a powerful instrument of good. It is a pitiable thing, therefore, to have to appeal to the commercial instincts of a people in justification of what ought to be done from higher motives; but I believe nothing is more certain than that we must take our place in the world's intellectual struggle, and in its ardent pursuit of knowledge, if we are to hold our own even commercially. This struggle and that pursuit involve sacrifice, and we must be prepared to make it, having regard only to the propriety of its object. With so little help, so much may be done; and I feel sure there will arise willing hands to devote themselves to the work. It is the hope of every true son of Australia that we shall be renowned not only for the skill with which we pull a boat, kick a ball, or wield a piece of willow, but also for the way in which we play our part in the nobler rivalries of mind and heart. It is a poor ambition that finds its satisfaction in physical prowess, or even in the accumulation of riches; and the fate of Rome, whose sons lacked neither physical force nor wealth, is a sufficient warning of the folly of low ambitions.

It is well that we should sometimes remind ourselves of the part we fulfil in the world's economy. Who can contemplate the features of modern civilisation without seeing the grandeur of the role that has fallen to the engineer? The great engines of modern commerce, the giant steamships, the railroads and bridges, the cables and telegraphs, all the great constructions that have lengthened life by intensifying it—these are monuments of his energy. One of the most gratifying features of an engineer's life is that his activities and human weal are not antagonistic. Perhaps one is reminded of the sad fact, so patent just now, that the engineer is also concerned with the productions of engines of war and murder. It is but too true that while the spirit of evil plays its part in the world's affairs, we must be prepared to defend our homes, our children, and our liberties, and to create means of imperilling those who attack us. But as a profession, ours is not the blame when these are used unrighteously, and it is no ignoble thing to take our part in those activities which are concerned in menacing a wanton aggressor.

Throughout the world to-day no event of moment can occur but within a few hours the rest of the world has reacted in sympathy with it: any other denizen of earth has become our neighbour. The practical control of matter and energy, and the mechanical arrange-

ments by means of which this fulness of life is realised, are the work of our profession. Let it not be thought that in saying this we forget the glory of the thinker, of the investigator of nature, of the poet, or of any of that vast army of workers whose part in life's task is full of blessing to humanity. No invidious comparisons arise within him who has a noble conception of his own calling, for he feels that in the glow of his own heart there is but that which warms in his brother's. But one might well have the force of a Demosthenes and the grace of a Cicero to do justice to the description of our vocation, if only it be fulfilled in the spirit of loyal service to our age and race. May we be so worthy of our calling, that when our work is done it may be fully summed up in the phrase that so tersely describes the character of an engineer's energies.—*Acta non verba.*

