ADELAIDE UNIVERSITY.

COMMEMORATION DAY.

Commemoration Day was celebrated at the University in the usual manner on Wednesday, December 21. The members of the council and senate proceeded to the library, and were accommodated with seats in front of the platform. The Chancellor, the Vice-Chancellor, Dr. Stirling, and the registrar occupied seats on the platform.

CONFERMENT OF DEGREES.

The deans of the faculties presented the candidates in their respective faculties to the Chancellor, who conferred degrees on the undernamed candidates:—

LL.B. Degree.—Frederick Pelham Rowley, William James Isbister, John Alfred Northmore, Andrew Harriot Henning, Edgar Henry Limbert, Charles Mann.

B.Sc. Degree.—David Walker.

B.A. Degree. — David Henry Hollidge, Richard Bullock Andrews, Cecil Silas Mead, Matthew Williams, Thomas Hudson Beare *(in absentiâ)*

With regard to the last-named candidate the CHANCELLOR said—"Mr. Hudson Beare was a student of this University, and completed his undergraduate course and passed his examination in 1879. He passed this examination with distinction, and the culmination of his undergraduate career was his obtaining the South Australian scholarship for that year. Since Mr. Beare has been in England he has continued the same devotion to the study of science as he first manifested in South Australia, and recently, after a very keen competition, he was appointed to the distinguished office of lecturer in engineering at the Watt-Heriot College in the City of Edinburgh. It was felt by the council of the University, and I am quite sure their feeling will be ratified by the members of the senate and by the public, that Mr. Beare has not merely done honor to himself but to the colony since he left it as the South Australian scholar. Therefore it was felt we could not do less than grant him the degree *in absentiâ*, which he is unable to come here to obtain. (Hear, hear)

The dean of the faculty of law then presented to the Chancellor the Stow prizeman—William James Isbister.

The CHANCELLOR said—Mr. Isbister—I have heard of your distinguished success at the recent examinations. From what I heard of these examinations, and from what I learn from Mr. Phillips previously, I look on you as one of the most distinguished scholars on the law side of the University for some years past. The prize you have attained has not been awarded for two, if not three years, and I sincerely congratulate you on your success in obtaining it.

The dean of the faculty of arts presented to the Chancellor the John Howard Clark Scholar, Alexander Wyllie.

The dean of the faculty of medicine presented to the Chancellor the winners of Sir Thomas Elder's prizes for physiology—Henry Arthur Powell (student of medicine), James Anderson, and Samuel Gent (non graduating students).

ADDRESS BY DR. STIRLING.

Dr. E. C. STIRLING, M.A., M.D., then delivered the following address on "The Aims and Methods of the Biological Sciences":—

Mr. Chancellor, Mr. Vice-Chancellor, members of the council and senate, ladies and gentlemen—Ever since the establishment of this annual address it has seemed as if the principle underlying the selection of him who is called the orator is to afford to each teacher in turn an opportunity of delivering an *apologia*,

and of standing forth as the champion and the exponent of the particular merits of those subjects which he represents in the scheme of University education; and I think it may have been preceived that this principle of selection has led to a pleasant and honorable rivalry between the teachers in the performance of this annual task—a rivalry which has to a great degree resolved itself into a friendly controversy between the advocates of a predominant scientific or literary training. It is a strong temptation to me to follow in the footsteps of my immediate predecessors, to reveal myself a strong partisan of the school of science to which I belong, and, to the best of my humble ability, to make my address somewhat of a counterblast to those who have so ably and so highly advocated literature as the most solid basis for a liberal education. But I shall not deliberately do so. First of all, because a controversy too long continued is apt to become wearisome to those who are not direct participators in it; in the second place, because I perceive that the claims of science as an educational factor in this University run no risk of being either overlooked or underestimated; and lastly, because I have come to the conclusion that my classical colleagues may possibly be right in their contention that a too great predominance of science in our curriculum may possibly lead to an undesirable neglect of pure literary culture and a consequent risk of making our education one-sided. I think that my literary colleagues may have scarcely expected such an admission from me, but I make it ungrudgingly and with due deliberation. Further, if it be any consolation to them, I will add that the position in which I find myself to-day accentuates unpleasantly a regret I have often felt that a purely scientific training has caused me to feel acutely the want of those arts and refinements of a cultured style, which were so conspicuous in an address of my colleague, Professor Kelly, on an occasion similar to this two years ago, and still more recently in an admirable discourse delivered in this hall by the Primate of Australia, Bishop Barry.

I offer these remarks with the intention of making it clear that I wish to approach the thorny subject of educational controversy in a conciliatory frame of mind, and indeed I am willing to admit that the partisans of science may have sometimes been a little lacking in this respect, and that they have sometimes laid themselves open to the charge of that very intolerance and aggressiveness of methods and manner which they so often find necessary to expose and condemn in others. I trust I may be pardoned by my scientific friends for thus presuming to sound this one note of warning, and that I shall not in consequence be looked upon as disloyal to our cause.

At such a time and place I need offer no excuse for making some phase of education the subject of my address. If, as I expect, some portion of what I shall say is familiar to my hearers, I would urge that education is one of those matters in which much that has been said will bear saying over again; and if, in some respects, my point of view of questions differs from that which has been most frequently presented to you, I suggest that in education as in many other matters it is wholesome for the mind to contemplate it from all aspects; and besides, I know not how I should accomplish my task if I were not encouraged and permitted to speak of those things of which I am least ignorant. I will ask you to-day to look at things from the point of

view of the biologist, who, I think above all men, has a right to be heard on this question of education, for he it is, if any one, who holds the key to the fundamental problems of mind, and of that body of which mind is merely an expression. Therefore I propose to speak of the biological sciences—of their scope, aims, and methods, of their educational value, and, if time permits, of their relation to other sciences and to the arts of medicine and surgery.

And first of all, that we may start on common ground, what is this biology of which I presume to speak? Biology belongs to a group of studies which have in common the great fact that they deal with what goes on in the universe, or, in other words, which are concerned in the investigation of the order of nature. It is a very general statement which for the present we may admit that all things are divided by an impassible barrier into the two great realms of animate and inanimate, living and non-living matter. How far the expectation is justified that we may one day pass this barrier will partly appear from what I shall have to say. So far as our studies relate to the world which lives, we designate them as biological, and at present their scope does not extend beyond this earth of ours; but I wish at the outset of my remarks to protest against the too common assumption that the biologist has naught to do with that other great group of studies which relates to inanimate matter, and whose scope is not limited by the confines of our planet. On the contrary, we find that it is a prime feature of all natural knowledge that its constituent parts are independent of one another only as we are ignorant of them, and that as our knowledge advances the bonds which unite all parts become apparent.

Let me illustrate this statement by recalling to your minds the time, not so long ago, when heat, electricity, and chemical action were thought to be manifestations of widely dissimilar forces having no necessary connection with one another. Now we know that they are what we all call correlated, that is to say, each may be converted into the other. The force we call heat may be changed into electricity, and this again by appropriate methods into chemical action, from which again heat may be made to appear once more. And so again, until comparatively recently, plants and animals were considered to be parts of nature differing essentially and widely, and the sciences of botany and zoology which dealt with them, to have no connection with one another, save that in a vague kind of way both animals and plants were recognised as belonging to the living world. Now, how different is our conception of their relations, for we find that the territories of plant and animal not only overlap but coincide in all their essential features. Both zoologist and botanist work with the same tools and deal with the same kind of facts; to the one as to the other the questions encountered are precisely similar; the ultimate problems of all life, in whatever form it exists, are found incontestably to be identical. And again, yet more recently, there has been a still closer tightening of the bonds which unite all parts of science, by the discovery that many of the hitherto inexplicable phenomena of life itself are merely manifestations of those familiar physical forces of the inanimate world—heat, light, chemical action, and electricity. It is this recognition of the intimate relation-

ship and interdependence between the factors of natural knowledge and of the great fact that they form but different parts of one harmonious whole which constitutes the salient idea of the modern scientific position. A veritable sisterhood of science in which—

Facies non omnibus una
Nec diversa tamen, qualis decet esse sororum.

By the term biology, then, we understand that branch of science which treats of living things, and, so far as it concerns man, it deals with him merely in respect of those endowments which he possesses in common with what he is pleased to call the inferior creatures. Out of biology there has sprung recently the fascinating study of anthropology, which treat of man exclusively, and there is a still higher science, sociology, born of biology, yet in its earliest infancy, which deals with man in the aggregate, that is to say, with the laws which regulate the motives, actions, and behavior of societies of men; and it may well be that a better appreciation of this social science, and a recognition of its generalisations, may in the not far distant future lead us to that desideratum of good government, a true science of politics, more rational and more beneficent than is dreamt of in our philosophy.

All living things are capable of being studied in a twofold aspect. First, they possess certain characteristics of form, considerations concerning which supply the basis of the study we call morphology, a science which tells us also the story of how that form has been reached by gradual growth and development. Secondly, we take for the basis of our investigations the fact that, in addition to growth, the living body is the seat of certain constant orderly changes due to the interaction on one another of the organism and the world around it. It is the sum total of all these progressive and retrogressive changes which constitute what we call life, and it is this fundamental idea of action and reaction between the organism and the universe which constitutes the starting point of physiology, or biology, to use the term of somewhat wider application which I have hitherto employed. What physiology can claim to have in some measure accomplished is to have recognised the existence of these relations, and to a large extent to have localised in the body the seats of the interaction between organism and the external world. What remains for it to accomplish is the immeasurably more difficult task of determining the precise nature of the relationship, and of defining the link, or the chain of links, between the influence and the reaction. To solve this problem, to approach as nearly as possible to a solution, or at least to show that it is insoluble, is the ultimate aim of the physiologist.

Let me try to make this also clearer by an illustration. As I stand here, an object I hope of sympathy in my difficult position, at any rate an object of the external world so far as each one of you is concerned, rays of light from my body impinge upon a certain portion of your eyes called the retina. There an image of me is formed as the result of the passage of the rays of light through other parts of your eyes which possess well known simple optical properties. As a consequence of the impact of these rays upon the retina some kind of disturbance takes place in its delicate and sensitive substance. That disturbance acts like the battery in a telegraphic system, in so far that it causes an impulse to travel from the retina along the nerve of sight, which we may liken to the telegraph wire, to certain

portions of the brain at its other end. There again in the nervous tissues of the brain substance other disturbances take place, and it is then, and not till then, that you perceive me, or, as we say, become conscious of my presence before you. Now this sort of statement is all very well as a mere catalogue of the events which take place and of the localities in which they occur, but it does not in the least explain the sense of sight. What we want to know is something more about these disturbances that I speak of. What, for instance, is the exact nature of the events which occur in the retina on the impact of rays of light sufficiently potent to start an impulse travelling along the optic nerve like the current along the electric wire, and to set going other and correlative disturbances in the brain? Is it a change of the electrical condition of the parts? Then we hope to be able to make it evident. Is it a chemical action or decomposition? Then chemical analysis may eventually tell us something of its nature. So again questions of precisely the same nature, only more intricate, await us in the enquiry as to what takes place in the inmost recesses of the brain itself on receipt of the impulse by the optic nerve. What are the subtle events yet unrecognisable by analysis or measurement which ensue amidst the cells and fibres of the brain substance that are the cause of your being able to say with confidence, "I see before me a man struggling to make clear an important physiological conception;" to this perception the man in question hopes that some of you will be able now to add "I begin to have some sort of notion o what he is trying to explain."

Whether the physiologist will ever reach a complete understanding of the problems underlying such operations of the body as I have described may possibly be open to doubt, for it involves a conception in terms of matter and force of that mysterious thing we call life, but nothing short of this is his aim; and it may be at least said of modern physiology that it has perceived the only road by which such a solution can be reached, and that far away through the gloom of our present ignorance it sees a dim glimmering of great truths that may one day be revealed. What then is this road? How have we reached the place whereon we stand? Whither must we wend our way to reach the goal? To these questions, at least, I may venture without presumption to offer an answer.

The foundation stone of modern physiology may be said to have been laid by the elucidation of the circulation of the blood by Harvey in 1628 in his memorable work, "Exercitatio de Motu Cordis et Sanguinis." Although medicine as an empirical art of healing had made some progress, and especially had a considerable acquaintance with anatomy permitted a good many advances to be made in practical and operative surgery, yet there had been nothing approaching a conception of the true principles of physiology until the appearance of Harvey's great work. But, as happens in so many other discoveries, it was for another to realise more fully the significance of the principle involved in Harvey's explanation and to extend its application. That principle was the applicability of physical and mechanical explanations to vital operations generally. Hitherto living actions were explained on the supposition that all parts of the body were permeated and animated by a subtle *pneuma* or spirit, to whose activity the actions were supposed to be due. The lineal descendant of this view was the humoral pathology of our forefathers, which

conceived that diseases were actual entities or humors, which could be concentrated, dispersed, or dragged about from one part of the body to another by blisters, issues, and other active medication, which was so much in vogue with practitioners of the old school. Even now amongst the enthusiastic exponents of domestic medicine one sees a survival of this prevailing idea in a too lively faith in the dispersive or expulsive power of blisters and other forms of counter-irritation. Nor as a scientific idea was the doctrine of animal spirits at all improved upon by the barren conception which succeeded it, that life was due to a special innate vital principle animating and pervading all living things, and quite independent of structure and organisation—a conception which, by making no effort to explain anything, served merely as a convenient cloak for ignorance, and rendered any advance impracticable by placing the whole question at issue beyond the pale of investigation.

It was reserved for René Descartes, the philosopher of Touraine, to set us on the right track, which we have been steadily following ever since. He it was who, stimulated by the discovery of the mechanics of the living body, as shown by Harvey's explanation of the circulation, and by the mechanics of the universe, as displayed by Galileo, formulated from his philosophic retirement in Holland those physical doctrines which were destined to be at once the keynote and the mainspring of modern physiology. He it was whose whole life's work exemplified the lofty guide for conduct which he preached—"Learn what is true in order to do right."

Since the time of Harvey and Descartes the methods of physiology have become more and more the methods of physical science, particularly those of chemistry and electricity, and its best discoveries and greatest progress have been essentially due to the application to it of chemical and electrical methods of research.

Once more let me in explanation offer a familiar illustration. All the movements of the body are due to the shortening or contraction of certain structures called muscles, perhaps better known to you as flesh. Under the old animistic doctrine this well-known swelling or bulging of the muscle when it contracts was supposed to be due to the descent of the *pneuma* or animal spirits along the nerves into the muscles, causing them to contract and swell in the way that is familiar to you. Now we know, at least, that this so-called descent of spirits along the nerve is but the passage of an electrical current, which can be made evident and measured by sensitive instruments. The swelling of the muscle, to which the passage of the electrical current in the nerve gives rise, is similarly associated with measurable electrical disturbances, though the salient feature of a muscular contraction is a chemical rather than an electrical change. There ensues, in response to what may be called the electrical message carried by the nerve, a sudden explosive decomposition of some complex, unstable chemical substance in the muscle, which brings about a rearrangement of its molecules in such a way that it becomes shorter and stouter, and in so shortening pulls upon the bones, which themselves constitute a system of levers. In this way we get the various movements of the body.

So far we see our way pretty clearly. Chemi-

cal analysis and electrical measurement have permitted, if not a complete at least a rational and partial explanation of these and many other actions that were formerly attributed to migratory spirits; but far away in the dim background of this explanation lies another and a greater question, which is yet unsolved. How and whence originates that electrical message to which the muscle answers by the rearrangement of its molecules and the shortening of its fibres? We say that it originates in the brain; nay more, in certain cases involving many muscles and the most complicated movements, we can say that it originates in a particular spot of brain substance no larger than a pea. What, then, is the nature of those events occurring in this nerve substance which, with or without the implication of consciousness or will may lead to the contraction of many muscles, all in orderly, harmonious, and purposive sequence? This brings us back again to the kernel of the whole matter. In the essential nature of nervous actions lies the great problem which is before us, and the solution of it means probably nothing less than an answer to all those other kindred questions which have so often and for so long perplexed men's minds. What mysterious link binds mind to matter; whence consciousness and volition; wherein lies the marvellous potentialities of that microscopic globule we call the ovum that may yet contain the possibilities of a Newton or a Shakespeare? In short, what is the nature of life itself; whence came its earliest germs; why its inevitable ending; does death, in truth, end all "this strange eventful history?" Not in despair, but in all humility, let the physiologist himself answer; I cannot say.

But this is by no means the same thing as saying let us not try to know, and great and difficult as are these questions they are to the physiologist merely problems, insoluble if you like for the present, but which probably differ in degree rather than in kind from other problems of the living body, and which like these it is quite possible may not be beyond the hope of eventual solution.

If this be so—and, as I say, there is at least some reason to believe that it may be—if, in truth, this legitimate striving of the biologist to display the mechanisms of organic actions, which is so often denounced as a hateful attempt to rob life of its mystery, should meet its desired reward in a better and truer insight into the essential nature of vital actions, one thing at least is made abundantly clear, namely, that the only road to the desired solution is through the amplification and extension of the methods of chemistry and electricity, and by a more extended application of these and of the laws of molecular physics to the varied operations of the animal body. Herein lies the key. As in the past chemistry and physics have enabled us to explain much that was formerly mysterious and inexplicable in the simpler phenomena of life, so in the future we may confidently hope that the great and marvellous advances which are being made in both these branches of science will bring to the assistance of the biologist improved methods of research and a more abundant knowledge, which may shed a flood of light upon questions that are at present beyond his ken.

Perhaps it will be a happy relief to some of my hearers if I now pass from questions such as these, which may savor of hopeless transcendentalism, to the more immediately practical issue of the value of the biological

sciences as factors in education. The educational value of any subject may depend either upon its utility as a mental discipline or upon the extent to which its facts contribute to that aggregate of capitalised experience which we call knowledge; and I am well aware that if controversy were the primary object of this address it would be incumbent upon me in this place to enter fully into the merits of biology in its disciplinary aspects. To do this, however, would be to enter directly into a discussion of that very question which I have expressed myself desirous of avoiding, namely, the well-worn controversy as to the relative merits of a classical and scientific training. I shall not be able to avoid this issue altogether, but any allusion to it shall only be incidental. I will claim for biology the highest advantages that are claimed by its advocates for a scientific training generally. Those advantages are very briefly the inculcation and strengthening of habits of observation, accuracy, comparison, and reflection, on the proper exercise of which faculties depend success and advance in any walk of life. That these are indeed the faculties which it is the primary object of education to promote I think will be admitted freely by my classical friends, who can make no higher claim for their own methods; but with this consensus of opinion as to the end to be achieved, I fear there will be no agreement between science and literature as to the means to the end, either in regard to method or to subject matter. According to our ways of thinking, the conspicuous superiority of science, considered as a mental discipline, over the literature of the ancients, lies in the circumstance that in the former the mind is brought into direct relationship with facts in place of forms of expression, with which the classical training primarily deals. There can, I think, be little doubt that when things are presented in the form of demonstrable facts our notions of them acquire a vividness and a reality, which is only possible when mental ideas are reinforced by a constant flow of visual and other impressions that stream into the mind through the various bodily senses. Further, it is a claim of science, and I think a strong one, that it seeks not to carry conviction to the mind by any *obiter dictum* of authority, but expressly suggests by its fundamental methods of observation and experiment in the great realms of nature "an ultimate Court of Appeal," to which all may apply with the certainty that, in things knowable, a verdict uninfluenced by any bias, prejudice, or tradition, will be given to him who understands those methods and rightly applies them. One outcome at least of such an appeal is a practical acquaintance with the value of evidence that can scarcely be reached in any other way. Need I add that the man who commends himself to us for his prudence, sagacity, and that rare commodity, sound common sense, deserves his reputation only to the extent to which his actions and judgments are based upon a correct appreciation of the relative value of the facts and conditions of his surrounding circumstances. So much, I think, can scarcely be said of classics as they are usually learned, where the facts are altogether subordinated to forms of expression or the appreciation of literary elegance; books and not things are their tools, and the dogma of authority overshadows every stage, and constitutes its final and irrevocable court of appeal.

I know well that I am bound to fall foul of those who will say that it is not a good

thing to reject authority, neither am I now maintaining that authority is altogether to be set aside, for education, as well as many other questions, would be manifestly reduced to an absurdity if everything had to be proved anew, and nothing might be taken on trust from our great forefathers, who have honestly labored in their day, and have each added something to our store of knowledge according to his lights; but what I am upholding is the cardinal fact that science invites—nay, insists—that all dogma of authority should from time to time be passed through the salutary crucible of fresh trial and experiment, whereby it may receive either an abundant verification or a clear disproof, healthful alike in the interests of truth and of our mental characters.

There are those, doubtless, to whom such an attitude of mind as this on the part of science savors of a scepticism undesirable and unpardonable, and, in anticipation of such a judgment, I will ask that it shall be remembered that almost every advance in natural knowledge which has contributed so abundantly to the progress of the world has sprung from a flood of scientific discovery, the very mainspring of which has been the rejection of authority, on reference to that ultimate Court of Appeal, trial and experiment; and if this spirit of scepticism be then condemned I see not how the progress itself which has sprung from its wholesome and beneficent exercise shall not also be condemned. Take almost any single scientific discovery which has marked an epoch and revolutionised the course of human affairs, and see whether this has not been the case. By what methods were the doctrines established? By observation, experiment, demonstration. What gave rise to these methods? A philosophic doubt of the correctness of pre-existing authority. What was the greatest obstacle to the acceptance of the new truth? The dogma of authority. And as it was in the dark ages, so we often see it in our own days. That spirit of intolerance which in ancient times brought the aged and infirm Galileo to his knees, and led Giordando Bruno to the stake has its modern equivalent in the abuse and vilification which are heaped upon the devoted heads of those patient seekers after truth, who, having found it, have had the courage of their convictions to enunciate it in the face of the dictates of an unyielding and relentless authority. But which has eventually triumphed? Is not the answer written in the book of time, and is it not the same answer always? "*Magna est veritas et prævalebit.*"

I will pass now from the methods of biology to the question of the intrinsic value of the facts which it presents, and though perhaps the ground on which I shall stand may be more secure against controversy, yet I admit freely that it is not so much by its facts as by its methods that biology should be judged as a means of education. No acquaintance with facts, however useful and valuable in themselves, can be a substitute for that calling forth of the intelligence and systematic discipline of the mental powers which every one will agree is the primary consideration in an educational system. It is only as compared with other facts that I desire to extol those of the biological sciences, and in such a question it becomes necessary of course to set before us some criterion of value. I do not know that we can better estimate the worth of any kind of knowledge as knowledge than in respect to its capacity to give

its possessors the best means of being useful and happy in their generation. If these words are used in their fullest significance, and they imply a good deal, I am not aware that there can be any higher aim for education so far as its subject matter is concerned. For usefulness implies advantage to others as well as to ourselves, and from the power and opportunity to appreciate the good and beautiful springs much of human happiness. This definition may not perhaps meet the requirements of a complete ethical system, but a life in which

Each may find his own in all men's good

constitutes at least a standard not unworthy of our imitation.

To the biologist the primary test of utility of any physical or mental attribute must depend upon its power of contributing to the preservation and perpetuation of the species, and I do not see how the sternest moralist can take any other view of the matter. The maintenance of moral laws implies the existence of a society which is to be guided by them, and without which moral laws would have no reason for existence. The integrity and existence of a society is entirely dependent upon the preservation of the individuals composing it; all those factors, then, which contribute to the preservation of the individual become of fundamental importance as conserving the basis, the raw material, so to speak, of all societies, from whose subsequent operations alone moral laws proceed. All other considerations, therefore, must in the first place give way to those which subserve this end. It will surely not be necessary for me, at this time and place, to take up the cudgels of argument in support of the self-evident proposition that it is biological science, and biological science only, which fulfils this condition. Its very name signalises its character as covering all the activities which together constitute what we call life. It is, in truth, the trunk of the great tree of knowledge whose branches overshadow every phase and aspect of our existence.

I am well aware that to arguments of this nature is commonly meted out the censure implied by the term utilitarianism, more often than not preceded by an uncomplimentary adjective—a mental characteristic which, in the minds of many estimable persons, is only less objectionable than that materialism which is supposed to be the special attribute of scientific men and the *ultima ratio* of the biologist; but I cannot now enter into the question whether these terms are wisely and correctly applied or not. Whether or not, with Bentham and Mill, we make the principle of utility the primary basis of all law, I must confess myself a utilitarian so far as to consider that knowledge to be of the greatest value which tends to this self-preservation and to success in the struggle for existence. But I do not on that account lose sight of the fact that there is largely developed in us an æsthetic side, if I may use in its original sense a term that has become defiled by modern misapplication in one of those strange crazes which, like an attack of hysteria, seems to have infected a section of the community, nor perhaps can we easily overestimate the happiness that springs from the appreciation of all that is good and beautiful. I will claim for the biological sciences that they in a large measure contribute a training of the mind that is essential to this end. By making us familiar with the animate world they offer

an unending series of living pictures whose beauty lies not merely in the more obvious attributes of outward form and color, but in the varied functions and relationships which to the initiated lie hidden in their plan and intimate structure. No plant, no animal but teaches us something new. Every form of life suggests problems of which the simplest may be made intelligible to a little child, while the solution of the more difficult calls for the employment of the highest faculties of the intelligence, and lays contribution on all that kindred science has made known. To the pleasures of intellectual exercise there may be added the joy of the discoverer, and perchance the satisfaction of having contributed something to the stock of human knowledge, something towards the sum of human happiness. It is to me a surprising fact that people should be content to grow up so ignorant of the wonders of Nature, for we have only to touch them with the hand of enquiry for them to be revealed to us in all their marvellousness. If truly we cannot learn all nature's secrets we can at least pass through the gates of science and learn what a world of wonder and of beauty lies beyond; and the more we learn of it the more wonderful and the more beautiful does it appear.

In travelling through new countries how different are the feelings of a man instructed in natural science to those of the uninstructed. To the one all forms of life and vegetation are only what they appear—they teach no lesson, they are barren of suggestion; to the other everything is an object for comparison with the forms he knows—new lights are thrown upon old questions, or new ideas spring into the mind, to ripen ar[illegible]

> Not only with the sense
> Of present pleasure, but with pleasing thoughts
> That in this moment there is life and food
> For future years.

I suspect most of my hearers have read those incomparable books of travel, "A Naturalist's Voyage Round the World," by Charles Darwin, and "The Malay Archipelago," by Alfred Russell Wallace. These voyages illustrate, how to minds, not so much stored with biological lore as trained to appreciate the value of biological facts, the opportunities of travel revealed to their authors the greatest biological conception of our age. If we cannot all, like Darwin or Wallace, cause a new light to break upon the world, we can at least be useful in our generation. And it is only necessary for us to look around at the conditions of our country for us to realise how much its prosperity is due to the practical applications of biological generalisations, how much yet remains to be done in this respect, and how much we have suffered from having in some cases failed to appreciate the conditions affecting both animal and vegetable life. Nor need we in all things be mere learners—the peculiar circumstances of our island continent, in respect of its antique and primitive types of life, quaint survivals of a bygone past, give us an opportunity, not only of investigating in the indigenous fauna biological problems of the highest interest, but also of watching, under aspects altogether novel and exceptional, the variations of types and the growth of species—in short, the great problem of evolution amongst those more recent and more highly developed forms of life which have been introduced.

How is it, then, that with such opportunities awaiting us, Australia has done so little towards the advance of scientific knowledge?

Some important contributions, doubtless, have emanated from the colonies, but they have too often been the work of those who have come to us, and have snatched their discoveries from under our eyes. Of purely Australian work of science, as of art, there has been next to nothing. Who is to blame? Intelligence in our youth is not lacking, as witness many a successful competition in the larger arena of the old country. The teachers who have largely inspired and prepared them for that success are not probably deficient either in zeal and skill in teaching. The standard of University training is at least as high as the average standard in the older institutions in England, nay, higher and more exacting than in many of these, and yet hardly ever do we see the Australian student inspired with the holy zeal of original research, or the wealthy citizen desirous of offering either sympathy or pecuniary assistance to its encouragement. Blame the teachers if you will for not setting more often an example, but remember that they are a feeble folk and few, often heavily weighted with tutorial duties, which more exacting in their demands upon the time than in British Universities, leaves but little leisure for independent work. If you condemn the apathy and want of enterprise of the student forget not that if the ascent to Parnassus is difficult the hill of science is also steep and stony, and that an exacting curriculum scarcely permits him a halting-place whence he may discern the beauties of the surrounding scenery, More than this—and I say it with due deliberation—an excessive tendency on our part to multiply formal lectures not only causes the student delays in his course, but what is worse, diminishes his self-reliance by encouraging him to rely unduly on the assistance of others in difficulties which he ought to surmount with his own stout heart. Rather, I think, must this acknowledged dearth of scientific work be attributed to the various causes inseparably associated with the conditions of a new and growing community, which will probably in the course of time disappear, as they have disappeared elsewhere under similar circumstances.

Of these causes no doubt the most considerable is the absence of a class representing learned leisure, which, by wealth, or at least by competency, is freed from the stern necessity of devoting its best and freshest energies to the pressing task of breadwinning, and, at the same time, possesses the necessary training and qualifications of the investigator. Wealthy citizens we have it is true, and to the honor and credit of some—but very few—it can be said that they have noble and usefully bestowed their riches for the advancement of science. Let us hope that some love of learning also exists amongst us; but how seldom are the two attributes of wealth and learning seen in that happy conjuction from which may flow a beneficent stream of encouragement both to science and to art? Further, there is to be observed a lack of appreciation of the practical benefits derived from science, both in the public and in our rulers, who look upon scientific men with a vague pity as amiable enthusiasts and unpractical dreamers, forgetting altogether that it is largely to the labors of scientific men that the material progress at least of the world is due.

These effects arise, as I have said, from the conditions of our young society, and can only be removed as it advances in wisdom and welfare, but there are others also for which

the same excuse cannot be offered. Does the physical development of our youth require that inordinate devotion in season and out of season to athletic sports which is so characteristic of Australians? Surely it is not unreasonable to desire that a part of that splendid energy, thus expended without adequate return, should be diverted into more useful and rational paths without in any way sacrificing the soundness of the body to the health of the mind, which latter consideration often seems lost sight of altogether. Here, as in all things, moderation is the silken string running through the pearl chain of all virtues, and I respectfully submit this maxim for the consideration of those whom it may concern.

But it will surely be asked to what end have I taken advantage of my position to raise, perhaps unduly, my horn on high and to vaunt the claims of biology in opposition to those great and good men who for so long and so often have told us that the best foundation for a liberal education is that which stands upon the ancient ways. Wherein, in truth, do these poor remarks of mine either

Point a moral or adorn a tale

that is worth your listening to.

I have ventured to speak my convictions perhaps over-boldly, partly to offer such exposition as I can of a group of sciences which are new enough for their scope and aims to be yet ill-understood by many, and partly to express my opinion that the best and surest foundation for that complex superstructure [illegible] call a liberal education is its facts. The facts, [illegible] of its methods and of facts, may be forgotten, but [illegible]nce, like other philosophic enquiry, wholesale scepsit of and veritable craving after accuracy remain ever as a lasting possession and as applicable to any walk of life as they are to the science of which these facilities were begotten. And yet, as I have indicated, the facts are not easily forgotten. First, because the manner in which they are communicated creates a far more vivid and lasting impression of them than those which are derived solely from books; and, secondly, because they in the highest degree are calculated to excite that interest and attention without which the attempt to impart knowledge is to repeat the labors of Sisyphus and the Danaides. Amongst the biological sciences I claim a prominent place for human physiology, not only because of its eminently useful and practical import, as underlying every phase of our existence, whether physical, mental, moral, or material; but also to use the eloquent words of the greatest living biologist—the greatest born biologist of our time—Professor Huxley, because "human physiology is in itself an education broader and more comprehensive than much that passes under that name. There is no side of the intellect which it does not call into play, no region of knowledge into which either its roots or its branches do not extend. Like the Atlantic, between the Old and the New World, its waves wash the shores of the two worlds of matter and mind; its tributary streams flow from both; through its waters, as yet unfurrowed, by the keel of any Columbus, lies the road, if such there be, from the one to the other; far away from that North-West Passage of mere speculation in which so many brave souls have been helplessly frozen up."

I had it in my mind to speak to you of the intimate relationship of the biological sciences to the arts of medicine and surgery,

and especially of the extraordinary light which biological investigations have thrown upon the origin and nature of those terrible scourges of the human race known as the infectious diseases, but a silent monitor warns me that I have already trespassed too long upon your indulgent forbearance. I will merely crave your permission to address a few last words, it may be of hope and encouragement to my friends, the students of the medical school, with whose work it is to me a veritable pleasure to be associated. They have perhaps received scant encouragement by being constantly told that the medical profession is overcrowded, and that their chance of a successful career in it is slender. Alas! it is too true that the stress and strain of competition will make life arduous for them as for others who are engaged in its toil and strife. Assuredly the prizes of the medical profession are few and far between. Its rewards even for the most conspicuous services to humanity are paltry, and offered with so sparing and grudging a hand that they are not worth acceptance. Estimated by a money standard it has been truly said that it is scarcely worth following. How, then, can I stand here and offer, as I do, my sincerest congratulations to those who are about to follow a calling so profitless and barren of what the world calls honor? It is because I believe they will have their reward—a reward far above wealth and social distinction in the content which lies in the fulfilment of a high duty in a great and noble cause, and in the satisfaction which springs from the harmonious exercise of the highest faculties and broadest sympathies of the human [illegible] friends and fellow-students to recall to their minds the words of a character of Charles Dickens, in speaking of her husband, a doctor, and be of good cheer: — "We are not rich in the bank, but we have always prospered, and we have quite enough. I never walk out with my husband but I hear the people bless him; I never go into a house of any degree but I hear his praises, or see them in grateful eyes; I never lie down at night but I know that in the course of that day he has alleviated pain and soothed some fellow-creature in the time of need. I know that from the beds of those who were past recovery thanks have often gone up in the last hour for his patient ministration. Is not this to be rich?"

Yes, I think in after years they will find that there is a true ring in these farewell words of the heroine of "Bleak House," and that through wealth and worldly success may not be theirs, they will still by keeping steadfastly in their minds the high ideal of unselfish duty which lies before them, and by endeavoring to attain unto it, achieve a far better and a nobler success, for they will be good men and true. (Loud cheers.)

The CHANCELLOR said in the present state of the atmosphere he would lean to the side of mercy in omitting the address which it was his custom to deliver on this occasion. He expressed his gratification at the presence of Sir Henry Ayers and the Minister of Education, and took the opportunity of thanking the Government for having successfully carried through Parliament a vote of £250 towards the erection of the fence and wall, which had so much improved the appearance of the exterior of the building. He was sure they would all regret the absence of his Excellency, who was detained by another engagement, as well as that of the warden of the senate.

whose presence was necessary at the speech-day of Prince Alfred College. They would, he was also sure, feel great pleasure at the high honor bestowed on one of their generous founders by her Majesty the Queen—(cheers)—and at the fact that Sir Thomas Elder is rapidly recovering from his dangerous illness. (Hear, hear.) After an allusion to the loss sustained through the death of another great benefactor of the University — Sir Walter Watson Hughes—the Chancellor declared the proceedings at an end.