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CONTENTS

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THE APPEAL OF SCIENCE TO THE COMMUNITY

THE subject on which I shall venture to speak to you this evening is one which some of you, perhaps, may deem too threadbare for further consideration. The position which science holds or ought to hold among the general interests of the community has formed the theme of many an eloquent and vigorous address, and leaders among the men of science in this and other English-speaking countries have time and again urged its claims upon an apparently or supposedly slothful and perverse generation. If I then venture once more to speak on this topic it is because there are abundant evidences that the past few years have been a time of awakening and awakened interest in science, and that it is our duty to do our utmost to guide and quicken this interest. Has not the well-known Scottish writer, Sir James Barrie, borne testimony that "the man of science appears to be the only man who has something to say just now," although he somewhat unkindly adds the opinion that he is the only man who does not know how to say it? Although a great change has, I believe, taken place in public opinion, in this as well as in my own country, regarding the work of science, there nevertheless exists the necessity of urging, with persistence but also with restraint, the great importance of cultivating what we may call the scientific habit of mind and of securing the right and proper appreciation of the value of creative scientific work. We can not, therefore, consider too carefully or too frequently how, in a spirit of service, we may best frame our appeal to the community and bring to our fellow men a knowledge and appreciation of those benefits and delights which come from a study of nature.

The ground on which the appeal of science has been most frequently and, perhaps, most noisily made has been that of the utility of science, not merely in the practical business of life and of earning one's livelihood, but also in the preservation of life itself and in the provision of physical comfort. "Real gain, real progress," as the late Sir William Ramsay declared, "consists in learning how better to employ energy, how better to effect its transformation," and, looking back over the history, more especially of the nineteenth and twentieth centuries, down to the present day, it is easy to mark how great have been the achievements of science in this direction. One thinks, for example, of the develop-

ment of the steam engine, the gas engine, the internal combustion engine; of the development of the electric dynamo and the utilization of electrical energy; of the conversion of the energy of falling water into electrical and other forms of energy; of the development of machinery of all kinds; of the concentration of chemical energy, as in explosives, and so on. And in the domain of biological science and of preventive medicine the achievements have been no less remarkable. It is the biologist and bacteriologist who have made Central Africa, for example, safe for man's habitation, and it is no exaggeration to say that the Panama Canal was built not by the engineer but by the biologist. It is the man of science who, through his influence on industrial and agricultural development and the development of natural resources, determines what population a country can support. It is the man of science, indeed, who in the last resort decides the economic fate of nations.

It was Pasteur who claimed that "in our century science is the soul of the prosperity of nations and the living source of all progress. What really leads us forward are a few scientific discoveries and their applications." And these claims can, indeed, be substantiated by the work of Pasteur himself.

In the middle of last century, as you all know, the silk cultivation of France, of Spain and of Italy was threatened with extinction. In 1849, a disease, called *pébrine,* attacked the silkworms of France and in the short space of twelve years, we are told, "the mulberry plantations on the slopes of the Cevennes mountains, which had for long given employment to a happy and contented people, were completely abandoned, and the once radiant faces of men became sad and melancholy because misery and poverty prevailed where before happiness and plenty had reigned." In the same space of time, also, the annual revenue derived by the state from the silk industries fell from 130,000,000 to 8,000,000 francs. From the bankruptcy with which it was faced, the silk industry was saved by the scientific labors of Pasteur. It is to Pasteur, also, that much of the present-day prosperity of the various fermentation industries is due; it is to Pasteur that we owe our earliest knowledge of the bacterial origin of disease and the production of immunity by vaccines which led to the culminating glory of Pasteur's life, the cure of rabies or hydrophobia. It is, moreover, on the foundations of Pasteur's work that the practice of antiseptic surgery was built up, whereby the havoc and torture of festering sores and gangrenous wounds were abolished from the surgical wards of our hospitals. What a glorious life of service to humanity for a single man to achieve! How irresistible must seem this appeal of science! And the people not only of France but of other countries as well answered the appeal and erected the Institut Pasteur as a tribute to the genius of Pasteur and in recognition of the services which science through him had rendered to mankind. The appeal in this case went home because it was centered in a living person whose "science" could be generally understood and whose unselfish work touched the heart and humanity of man. In contrast with the success of that appeal stands the comparative failure of the more general appeal for the support of the science laboratories of France which was made two years ago on the occasion of the national celebration of the hundredth anniversary of Pasteur's birth. The appeal in this case was too general; it awakened small response because the people could not understand its meaning. From this we learn that even the utilitarian appeal of science will arouse a general response only in so far as it is interpreted to the community in terms which the people can individually understand.

And this has been found to be the case, also, with regard to the utility of science in its applications in industry. The different countries of the modern world, and especially the older countries, are becoming more and more industrialized, and however much we may sometimes deplore the fact we must recognize that only by this means can the ever-growing populations of these countries be supported. As the populations grow and as the conditions of life become, through competition, more and more strenuous and exacting, the necessity arises for ever-increasing efficiency in the industries and in the utilization of the natural resources of the country. It is only natural, therefore, that men of science, in a spirit of helpfulness and in the consciousness of their knowledge, should have urged the vital necessity of a wider and fuller application of scientific knowledge and scientific method, for by that means alone was it possible to enlarge the scope of the industries and to increase their efficiency. For a long time the appeal bore little fruit in my own country, and, as I gather, not very much even in this. In this country, the enormous, the apparently almost inexhaustible natural resources of the country, the great and rapidly expanding home market and the absence of any serious competition from outside made it difficult for people to realize the wisdom if not the actual necessity for avoidance of waste and for the application of science in industry. And in England the industries on which, early last century, the country grew wealthy were such that their dependence on science was not very obvious and so, owing to a natural inertia of mind and a fairly widespread prosperity, the necessity of applying more scientific methods with a view to diminishing waste and improving

production, and for the purpose, also, of establishing new industries never entered very fully into the tissues of the people's minds. We prided ourselves on being a practical people; abstract learning and knowledge were held in comparatively slight esteem; the investigations of men of science made little appeal to us, for the people did not understand them; the people, indeed, had not been educated so as to be able to understand them. While it is easy to place on the manufacturers the responsibility of a general backwardness in applying the discoveries of science to industry, it must be confessed that the teachers of science were not wholly free from blame for failing to enter more fully into the difficulties of the manufacturers and for failing to keep in touch with the industrial and practical life of the country and to show more clearly and convincingly the relation between their own sometimes abstract work in pure science and the practical everyday life of the community.

If, however, the appeals of science remained largely unheeded in times of prosperity they had perforce to be responded to in the adversity of war. The highest efficiency of manufacture was necessary if the country was to succeed: men of the widest scientific sympathies and of highest eminence in creative science became the directors and controllers of industry, and the least efficient factory had to be brought to the level of the most efficient. It was the demonstration of the increased efficiency produced by scientific control that made the utilitarian appeal of science carry conviction to the manufacturers, which interpreted to the mind of the layman and of the statesman the true relation between the discoveries of pure science and their applications in industry. As a result of the lessons learned during the war, the government of Great Britain in 1919 appropriated the sum of £1,000,000 for the encouragement of scientific and industrial research. Manufacturers were encouraged to group themselves according to their industries and to establish, with the help of government grants, research institutes where the discoveries of science could be focussed and investigations carried out on the problems of each particular industry. Government assistance was promised for a period of five years, after which time it was hoped the research institutes would have become sufficiently firmly established and would have proved their value so that the industries themselves would assume the whole burden of their maintenance. Upwards of twenty research institutes have been thus established, and they have proved themselves of the greatest value to the industries. The Department of Scientific and Industrial Research, also, instituted or supported the investigation of problems of national importance, such as the economical utilization of coal, including the methods of low temperature carbonization for the supply of a readily burning coke and of a fuel suitable for internal combustion engines. In this direction, it may be said, great advances have been made in recent years, and it is, perhaps, not too much to hope that the present generation will yet live to see a smokeless Britain, freed from the necessity of importing its supplies of motor fuel.

The Department of Scientific and Industrial Research has also sought to encourage the continued supply of adequately trained research workers by awarding scholarships and grants for materials and apparatus to graduates of the universities and to others similarly trained.

The work of the department was, at first, admittedly only an experiment, but it is now an experiment which has succeeded. The future of the application of science in industry in Great Britain is, I believe, full of hope; and although as a result of industrial depression and for other reasons the wave of enthusiasm for the application of science in industry may recede somewhat from the high-water mark of appreciation exhibited at the close of the Great War, there can be no ebbing of the tide to the level of pre-war years.

In the United States, as I am aware, even greater appreciation of the importance of science and of its applications for the material welfare of the people and for the industrial prosperity of the country has been shown by the federal government, by the states and by individual firms; and one can not fail to be profoundly impressed by the very large pecuniary resources now placed at the disposal of the scientific laboratories of the universities, both by the states and by private munificence, nor can one withhold admiration of the great and ever-swelling stream of new knowledge flowing from these laboratories.

While, however, we may rejoice that the importance of science in its applications to manufacturing processes and to the general activities of our workaday life has been so largely recognized, let us always bear in mind that the gospel of efficiency, while it may bring salvation to our industries, will, if carried into action without regard to higher considerations, be productive of great evil to the people and the country. For remember, efficiency calls for organization, and organization demands discipline; but as Sir Arthur Schuster so admirably put in some years ago: "Discipline is not inborn but is acquired by education and training. In an emergency it is essential to success, but if it be made the guiding principle of a nation's activity, it carries dangers with it which are greater than the benefits conferred." The loss

of individual freedom, the suppression of the sense of individual responsibility, the destruction of the human values and the conversion of man into a machine are too great a price to pay for industrial efficiency. From this evil root there can too easily spring the ruthless materialism and lust of power of which recent history has given us an example. No, let us beware of making a god of scientific efficiency; it is enough, as also it is necessary, that we make it one of the articles of our creed.

While the utilitarian appeal of science is at once the easiest to make and at present, perhaps, the most powerful to attract the interest of the community, it will, if pressed too strongly or too exclusively, result not in the development but in the decay of science and will weaken that pursuit of truth and knowledge on which the applications of science depend.

One often hears people at the present day speak as if pure science and applied science were two quite distinct and independent activities; and the so-called practical man, the man of business not specially trained in science and without the scientific habit of mind, is inclined to despise pure science and to insist that what is wanted is applied science. Now we know, of course, that there are not two sciences but only one science—there is science pure and unqualified, aspiring only to truth and knowledge, and there are the applications of science. There can be no application of science, no application of knowledge unless that science, that knowledge, previously exist. It is necessary to realize, it is necessary that the community shall realize that all the great revolutionary changes in our industrial life, all the great inventions which have so powerfully altered the character of our civilization have come not as the result of effort to achieve results of immediately utilitarian value, but as the result of a patient and persevering pursuit of knowledge without thought of practical or industrial applications. "These grand innovations," said Cuvier, "are only the facile applications of verities of a superior order, not sought with a practical intent, verities which their authors have pursued for their own sake, impelled solely by an ardor for knowledge. Those who put them in practice could not have discovered them; those who have discovered them had neither the time nor the inclination to pursue them to a practical result." The invention of the electric dynamo, for example, was rendered possible only by the previous discovery of electromagnetic induction by Faraday; the coal tar dye industry arose not out of an attempt to find some use for the evil-smelling liquid and still less as the result of a conscious effort to prepare from it a dye. The production of mauve did not come on the demand of the dyers (for who could have conceived the possibility of such a thing), but was the outcome of the purely scientific investigations of Perkin on the constitution of quinine. The X-ray tube also was not the result of a consciously directed effort to discover a means whereby we might, as it were, see through a brick wall, might examine the internal structure of the living body or of the inanimate crystal, but as the result of an investigation into the nature of the electric discharge in gases. And, lastly, the invention of the thermionic valve, which has rendered possible the transmission of the spoken word over the length and breadth of the earth, was rendered possible only by the study of the emission of electrons by hot bodies, carried out by men searching only for truth and knowledge. As Professor Whitehead has said: "Necessity is *not* the mother of invention; knowledge and experiment are its parents." "It is no paradox to say that in our most theoretical moods we may be nearest to our most practical applications." The applications of science to the utilities of our daily life may be the result of many years of laborious searching after knowledge, and although it is now widely, but not sufficiently widely recognized that the rule of thumb is dead and that the rule of science has taken its place, advance can continue to be made, even in the utilitarian domain, only if the people have acquired a faith in the power of science and have become convinced that the acquisition of knowledge, sought for its own sake alone, is the necessary precedent of all great inventions and applications of science.

Powerful as the utilitarian appeal of science undoubtedly is, it does not, I believe, and in the highest interests of mankind and of our western civilization I hope never will make the strongest appeal to the minds of thinking men or to men whose mental horizon lies beyond that of a purely materialistic existence. The numerous inventions which enter so largely into our modern life, the mechanical appliances and material benefits which have come from the applications more especially of physical and chemical science affect chiefly the machinery of life and are not the prime movers of men's actions; and over-emphasis of its utilitarian value may and I believe does do harm to the highest interests of science. It is, indeed, all too easy for the cynic to point to science not as the uplifter but as the destroyer of the finer qualities of mankind and to represent the aim of science as purely materialistic. The great danger, I would suggest, which we have to face in all our appeals to the community is that while proclaiming the great achievements of science in the creation of

pecuniary gain and material prosperity, we lose sight of the idealism of science and destroy the true sense of values by raising the lower above the higher, the material above the spiritual. The real claim of science to fuller appreciation by the community, the claim which we should seek to urge in all our publicity activity and propaganda, yes, and in all our schemes of education in school or university is the cultural, the spiritual and the moral importance of science. It is for the idealistic aim and not only for the materialistic purpose of science that we must endeavor to win appreciation. For the community as a whole it is not the acquisition of a knowledge of the facts of science but the becoming imbued with the spirit of science that is of chief importance.

What, then, is the scientific spirit which we desire that all men should cultivate, and on what grounds can we urge its cultivation? The first great aim of science is the seeking out of truth, the penetration into that unknown land which always we see lying half-veiled in mist beyond the continuously receding boundaries of the known. It is the beckoning finger of the spirit of truth and knowledge that lures the man of science forward. "It is the truth alone," said Scheele, "that we desire to know, and what joy there is in searching it out." It is, then, this desire for truth, the constant urge after truth, as the great German writer, Lessing, put it, that we must hold up as an aspiration to the community.

There are some who have been repelled by science and the scientific method of acquiring knowledge by the belief that science can explain nothing and that all it can do is to accumulate and record facts, the cold facts of science, as one has called them. But this is far from the truth. The recording of facts is one of the tasks of science, one of the steps towards truth, but it is not the whole of science. As Oliver Wendell Holmes said:

> There are one-story intellects, two-story intellects, three-story intellects with skylights. All fact collectors, who have no aim beyond their facts, are one-story men. Two-story men compare, reason, generalize, using the labors of the fact collectors as well as their own. Three-story men idealize, imagine, predict; their best illumination comes from above, through the skylight.

In these sentences we have summed up for us the steps of advance towards truth by the scientific method, towards the formation of those beliefs according to which, in the physical universe, we act. The universe is not a mere mass of uncoordinated facts and phenomena, but is like a noble edifice, the order and arrangement of whose stones are dominated by one grand idea, born in the mind of the architect. It is the work of the man of science, from partial glimpses illuminated by the light of inspired vision, to discover the divine idea by which the whole universe is ordered. Science, then, takes on a nobler and a higher purpose. As the poet, Alfred Noyes, has written:

> . . . What is all science, then,
> But pure religion, seeking everywhere
> The true commandments, and through many forms
> The eternal power that binds all worlds in one?
> It is man's age-long struggle to draw near
> His Maker, learn His thoughts, discern His law—
> A boundless task, in whose infinitude,
> As in the unfolding light and law of love,
> Abides our hope, and our eternal joy.

To the misconception regarding the work of science to which I have alluded is doubtless due the discrimination made by Sir Henry Newbolt between science and poetry—"Science is prose, poetry is imagination." Well, the facts and applications of science are no doubt prose, frequently very romantic prose; they are the results of observation and of reason by which man rises superior to the beasts and which mark the upward steps of civilization. But they are not the soul and spirit of science. The spirit of science is to be found in the great hypotheses and theories of science which, like poetry, are not the product of reason but of imagination and of inspiration which are superior to reason. For the great hypotheses of science are but attempts to gather within the bounds of a brilliant instant of inspired vision a multitude of experiences and to show the harmony of their parts. As Alfred Noyes again has said, "the great moments of science have an intense human interest and belong essentially to the creative imagination of poetry." In the great work of scientific exploration, in the work

> Of those who searching inward, saw the rocks
> Dissolving into the new abyss, and saw
> Those planetary systems far within,
> Atoms, electrons, whirling on their way
> To build and to unbuild our solid world,

and in the attempts to interpret the order and harmony of the universe, the man of science becomes the poet. Without imagination, the great discoveries of science could not be made. As the late Sir Benjamin Brodie, president of the Royal Society, said:

> Physical investigation more than anything besides helps to teach us the actual value and right use of the imagination—of that wondrous faculty which, left to ramble uncontrolled, leads us astray into a wilderness of perplexities and errors, a land of mists and shadows; but which, properly controlled by experience and reflec-

tion, becomes the noblest attribute of man; the source of poetic genius, the instrument of discovery in science.

The cultivation of the spirit of science appeals not only to the intellect, but creates also an emotional and esthetic pleasure and so ministers to that other side of the mental and spiritual life, the desire for beauty. The aim of science is the pursuit of truth and from the roots of truth springs beauty; and whether the truth be sought in the movements of the heavenly bodies, in the architecture of the molecules or in the grandeur of the sub-atomic universe, everywhere we find beauty. "Were nature not beautiful," wrote the mathematician Henri Poincaré, "she would not be worth knowing, life would not be worth living. I do not mean here, of course, that beauty which impresses the senses, the beauty of qualities and appearances; not that I despise it—far from it—; but that has nought to do with science; I mean that subtler beauty of the harmonious order of the parts which pure intellect appreciates." There are some indeed who moan that the joy and beauty of life have departed and that poetry has been buried under the facts of science. "The gods are dead," moaned W. E. Henley, the English poet:

> The world, a world of prose,
> Full-crammed with facts, in science swathed and sheeted,
> Nods in a stertorous after-dinner doze!
> Plangent and sad, in every wind that blows
> Who will may hear the sorry words repeated:
> "The gods are dead."

To this we must reply: the phenomena of nature do not lose in beauty as we gain an understanding of them; they become not less but more wonderful, the more fully we learn their meaning. Science does not destroy the beauty of nature, it interprets it; and the gods of joy, of beauty, of wonder and of poetry come back to life as we gaze on the mystery and beauty of the universe which science unfolds to our eyes, and as we see, in imagination, the possibilities of a fuller and nobler life through the widely and more widely opening doors of truth and knowledge.

Some there are who, impressed by the mighty achievements of science in the past and confident that still greater boons would be showered on mankind by the greater diffusion of scientific knowledge throughout the body politic, become impatient when they see, as Dr. A. D. Little has recently put it, "in the ranks of science knowledge without power and in politics power without knowledge"; and they demand for men of science a special position of power in the government of the country. Is this demand really justified? Is the claim made on behalf of the man of science not somewhat too arrogant? In connection with some of the practical activities of a government, in the planning and execution of schemes of a technical character, schemes for the conservation and economic utilization of natural resources, in the practical work of national defense, in the control of the purity of food, etc., the claims of the man of science are indisputable and have been largely recognized. But can we claim for men of science a special place in the general work of government, in the multifarious tasks of adjusting the conflicting claims, prejudices, aspirations of men not only amongst their own people but as between the different races of mankind? The man of science may, in Dr. Little's words, have "moved the earth from the center of the universe to its proper place within the Cosmos"; may have "extended the horizon of the mind until its sweep includes the 30,000 suns within the wisp of smoke in the constellation Hercules and the electrons in their orbits within the atom," but as a legislator these achievements will avail him little. It is not the 30,000 suns in the constellation Hercules but the 100,000,000 people of his own country that will claim his attention. It is not the motions of the electrons that he should understand, but the motives which influence human conduct; he should have expert knowledge not of atomic nature but of human nature, and human nature is not amenable to the laws of science. The more eminent a man is in the domain of creative science, the less successful is he likely to be in the field of politics; and to remove him from his laboratory to the legislative chamber would be to waste his special gifts and ability. One may expect to find agreement among men of science regarding the laws of science, but there is no reason to expect any unanimity among them in the domain of civil legislation. We do not strengthen but rather weaken the cause of science by making claims which neither experience nor reason can substantiate.

But while we ought not to claim for the man of science, as such, a special place in the machinery of government, we shall do well to encourage him to take a fuller share, perhaps, than he has hitherto done in the common duties of citizenship; to place more fully and unreservedly, at the disposal of his fellow men, that contribution of special knowledge and outlook which his training and studies enable him to make; to endeavor, without ostentation or arrogance, through social intercourse with men of different interests from his own, to form a more enlightened public opinion, and thereby to help in the solution of the educational, social, economic and other problems which face the community and country to which more especially he owes allegiance.

To cure or even to ameliorate the evils which flow

from the weaknesses to which all democratic government is subject, we must rather work for a greater knowledge and honesty of purpose, a higher cultural level, in the community as a whole; and although we must certainly beware of claiming that the diffusion of scientific knowledge and of the spirit of science is alone sufficient, we may safely claim that it would be an important factor in the moral and social development of the people. "The cultivation of science in its highest expression," to quote the words of Pasteur, "the cultivation of science in its highest expression is perhaps even more necessary to the moral condition than to the material prosperity of a nation." It is because science inculcates "veracity of thought and action" without which, as Huxley said, "there can be no alleviation to the sufferings of mankind," that we must work for its more widespread diffusion throughout all classes of the community. It is, moreover, largely because of its moral and spiritual value, as I have said, that we must claim the inclusion of science in our general educational curricula, whether of the schools or of the universities. A knowledge of the facts of science and of the physical universe in which we live is good and necessary, but if we fail to communicate to the student the spirit of science, the passion for truth, the spirit of cooperation, of tolerance, of charity and of unselfishness which are the spirit of true scientific endeavor, we shall have failed in our most important work.

In conclusion let me say that while we must urge the claims of science on the grounds both of its practical and spiritual value, we should do so with restraint and moderation, for, in pursuing truth according to the methods of scientific investigation, we must bear in mind that the truth to which we attain is only a partial truth. Let us always remind ourselves of the all-roundness of truth and let us remember that in our scientific approach we see but one side, one aspect of truth. Let us always recognize that through religion, art, literature and philosophy we have other paths of approach and see other aspects of the truth. Let us then carry with us the thought of the English poet, Sir William Watson, as expressed in his epigram, "The guests of heaven":

> Science and Art, compeers in glory,
> Boast each a haunt divine,
> "My place is in God's laboratory,"
> "And in His garden mine."

ALEXANDER FINDLAY

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REYNOLD ALBRECHT SPAETH

REYNOLD ALBRECHT SPAETH died in Bangkok, Siam, on June 26, 1925. In his untimely death zoology and physiology alike have lost a valued student; their followers the companionship of a rare and charming personality. In writing from Woods Hole, where for many summers he had made his home, I must express particularly the personal bereavement which so many of us feel, for he possessed in great measure qualities which endeared him to his fellows.

Spaeth was born in Philadelphia thirty-eight years ago, of a family containing many members distinguished for their achievements in medicine, theology, philosophy and literature. His schooling was received at the Germantown Academy and the North Eastern Manual Training School in Philadelphia. As a boy he was greatly interested in natural history and became proficient in bird photography.

At Haverford College his interests were first turned into definitely scholarly and scientific channels, largely under the influence of Professor Henry S. Pratt. Of this period a college mate, who later became one of his most valued friends, writes:

> I think he was the freshest freshman that ever entered the institution, and, with his usual alertness, as soon as he found how irritating this was he exaggerated it artfully. I was president of the sophomore class at the time and he annoyed me as much as he could. Later on we often laughed about it.
>
> I remember that almost from the beginning of his sophomore year he began to be spoken of by the fellows in the college as some one a bit peculiar, since he had an extraordinary taste for settling down with Dr. Pratt in the biological laboratory and actually working over the classification of the small organisms in which he had become interested. During the four years when I was at college he was the only student who I remember doing anything intellectual for its own sake and because he liked it. The rest of us did what we were told. Some of us had sense enough to do this in a minimal degree; others, being rather more obedient, did a full stint, but I can not see that it ever netted much. I think that Ren was quite unique in the fact that he actually accomplished a piece of work, parts of which were published, during his undergraduate life at Haverford. I can emphasize the fact that I and several others viewed Ren with considerable wonderment because of his real attachment to this intellectual pursuit. I can even remember I envied him to some degree, and later, when I entered the medical school, I came to realize how much more his education must have meant to him than mine had to me.
>
> He was always well liked, but owing to his powers of mimicry and his great capacity for detecting bluff he found it exceedingly easy to make enemies. As I see it now I believe that they sensed his greater degree of intellectual alertness and the fact that he did not hesitate to laugh at them.