than by one predominantly devoted to languages, where the scientific training is merely incidental. That the facts of physics or biology are more interesting to the student and to the world than those of Latin and Greek and have more obvious bearing on everyday life is a help to the teacher in securing the voluntary cooperation of the pupil; but it is far from being the fundamental reason why the subjects themselves are educationally valuable. It is not the subject that makes the course scientific; it is the method.

You have been good enough, Mr. President, to refer to my father's connection with the academy, and I for my part am glad to take the opportunity to say that he regarded his election to membership in this body as the greatest honor he ever received. I feel sure, therefore, that I shall be pardoned if I illustrate the point I have just made by reference to my father's teaching.

Fifty years ago the one course in the academic department of Yale College where modern science was really taught, was the course in freshman Greek. For my father, though he had the highest enjoyment of classical literature, was by training and temperament a philologist; and he taught the freshmen who came under him to take Greek verbs to pieces and compare and observe their parts and put them together again, and see what principles were involved in the analysis and synthesis, exactly as the botanist might have done with his plants or the chemist with his elements.

In those days chemistry and physics were taught in Yale College, as distinct from the Sheffield Scientific School, solely by text-books and lectures. Philology was taught by the laboratory method; and for that reason the freshman Greek course was a course in modern science and meant that to the pupils. The courses in chemistry and physics widened the boy's knowledge of facts and doubtless encouraged many of them to get scientific training for themselves afterward; but the course in freshman Greek was a course in science, because the boys learned to do the things, both easy and hard, which are the heritage of the man of science.

Science is not a department of life which may be partitioned off from other parts; it is not the knowledge of certain kinds of facts and the observation of certain kinds of interest, as distinct from other facts and other interests; it is a way of looking at life and dealing with life; a way of finding out facts of every kind and dealing with interests as varied as the world itself,

> Where each for the joy of the working, and each in his separate star,
> Shall draw the thing as he sees it, for the God of things as they are.

ARTHUR T. HADLEY
YALE UNIVERSITY

SPEECHES AT THE ANNIVERSARY DINNER OF THE NATIONAL ACADEMY OF SCIENCES

SPEECH OF THE RIGHT HONORABLE JAMES BRYCE

Doctor Woodward, President Remsen and gentlemen: I am very much touched by the kind words in which my old friend, Dr. Woodward, has introduced me to you, and I am more than grateful to you for the way in which you are kind enough to receive me. It does make one happy to be so received and to be assured that one has not lived in this country six years without having acquired some friendliness on the part of its people.

But, apart from that, gentlemen, I stand before you this evening as a rather unhappy man, because it is the last evening on which I am likely to have the privilege —at any rate, in an official capacity—of

meeting an audience of American men of science.

One of the most delightful parts of my sojourn in Washington has been my intercourse with your men of science. There is not any city in America—I doubt if there be any city in Europe—where so many men of eminence in science are assembled as live in Washington, and the gatherings which you have here, when the men of science from the whole of your wide country come together, have been among the most delightful experiences that I or any Briton has had in this country. I have had it also in Philadelphia and in New York, and I have had the pleasure of making the acquaintance of your men of science in many journeys all over the country; but this, after all, is the focus to which is gathered most of the scientific lights and leaders of the United States at stated intervals when you come together here.

And I can assure you, gentlemen, there is nothing I shall look back to with more pleasure, in so much of life as remains to me, as to the friendships I had formed with your scientific men and the inspiration I have derived from the ardor and energy with which they pursue the studies to which we are all so much debtors.

Dr. Woodward has suggested that I should say something about foreign academies, but my knowledge about foreign academies is, really, practically confined to my own country, for, whenever I have traveled abroad, it has rather been among the historians than among the men of science that my work has lain.

However, I should in any case feel a little doubtful about venturing to talk about scientific academies, knowing that, whatever else "science" means, Mr. Vice-President, it is supposed to mean knowledge; and if a man feels that he does not know a thing, scientific people are the last to whom he should address his remarks.

I received at Oxford my literary education, and I remember "education" being defined by a very eminent professor there, who said: "What our Oxford education does is to teach our men to write plausibly about subjects they do not understand"—an art which we were in the habit of exemplifying by immediately beginning to write for the journals and reviewing books—whose authors knew infinitely more about their subject than we did—in a very superior manner, an experience which, however, is not confined to England.

The vice-president said, gentlemen, that he regarded men of science with fear and veneration. I share those feelings. I have veneration for the lofty and disinterested spirit which you bring to your work. I have fear for the enormous power you exercise.

You are really the rulers of the world. It is in your hands that lies control of the forces of activity; it is you who are going to make the history of the future, because all commerce and all industry is to-day, far more than ever, the child and product of science; and it is you who make these discoveries upon which, when they are applied by industry, the wealth and prosperity of the world depend. It is in your hands that the future lies, far more than in those of military men or politicians.

But I have another feeling besides fear and veneration. It is that of envy. I envy you your happy lives. Compare your lives with the lives of any other class. If the vice-president will permit me, I think the life of a man of science is a great deal happier than the life of a politician or the life of a statesman, who, as we know, is many pegs above the politician, because the politician is occupied, as the vice-president has said, in endeavoring to promote the

interests of his party and not the interests of his country; and I discovered, during my experience in the House of Commons in England, that a legislative assembly is the worst place in the world for the discovery of abstract truth.

Or, take the case of the lawyer. So far from seeking to discover the truth, in one half of the cases which he conducts, he is endeavoring to obscure the truth. Or, even take the case of the artist or the literary man, who has a subject to work upon, delightful and interesting in itself, in evoking from the stone, or by colors, shapes or forms of beauty, which will far outlive him; but these forms of beauty will profit him very little if they do not commend themselves to the popular tastes, and he is constantly under the temptation of doing something less good than he wishes, in order to meet the tastes of his patrons.

It is the man of science who has the really happy life. He is engaged in the discovery of the truth, and nothing but truth. The applause of the multitude is nothing to him. He is working for a mistress more exalted than any popular assembly or any multitude that we can conceive of. He is working for Truth herself, and for the future. He is consecrating his efforts to the highest task that God can lay before man, and in that he needs nothing but the sense of what he is adding to the sum of human knowledge, and he has the incomparable pleasure of feeling that the more he knows, the more the immense ocean of knowledge stretches itself out before him. The further he outlines any path into the untrodden solitudes of ignorance, and the more he blazes those paths and makes them paths of knowledge, the more he sees other paths branch out before him, leading further and further away into the realms which others after him will traverse.

In these things, friends, there are elements of pleasure and delight, elements also of independence, which I think no other profession can equal. I was tempted to add one other charm which your life has. It is the charm of poverty. I have sometimes felt inclined to wish, Mr. Vice-President, that Congress was a little more liberal to the scientific men who are working for Uncle Sam. But perhaps they are to be congratulated on being free from those temptations which beset wealth. Poverty, like other things, is good if you have not too much of it, because it saves one from the temptation of forgetting the end to the means, the temptation to which most of us, and, above all, those who are in search of wealth, succumb. You keep the end always before you, and you proportion your life to that end.

Still, I think you might, with advantage, not only to you, but, what is far more important, to the whole country—and it ought to be possible in a wealthy country like this—provide upon a more ample scale for those who follow science, and give science a more exalted position, by freeing the scientific man from any thought of domestic anxiety.

You enjoy in this country—I speak here of particular branches of science—some things which we, in England, greatly envy. Think of what the geologist or the botanist has before him here! We have been working for one hundred and fifty years upon the geology, and for more than that upon the botany, of our little island; but here you have the whole continent open to you, and any man of science on these subjects can make a reputation for himself by new work in new fields, such as is impossible for us in outgrown Europe.

Gentlemen, one word I venture to say about the scientific bodies of the continent of Europe. We have, in the Royal Society, the oldest of those bodies, and one which, I think, has always maintained the level

which it took in the great days when Isaac Newton was one of its members; and now there has sprung up all over Europe a host of other bodies pursuing science and following it into those infinite ramifications which modern science has discovered. Everywhere there you are welcome. One of the most delightful things of science is that it knows no divisions or allegiance to nationality. It is a republic in which there is no passport to greatness, except service and genius, and it is a republic of which every one is a citizen, and where every one has equal rights in every part of the world.

That has always been our tradition in England and in our Royal Society; and I know it is your tradition here, and I know what hearty welcomes you have always given to our men of science when they have come over here, and how refreshed and invigorated in spirit they have been when they have gone back to their own country.

Gentlemen, I can wish nothing better for any of us than that these comings and goings will be frequent, and I can assure you that it will always be a pleasure to the scientific men of England and Scotland to welcome you to their societies and to all their gatherings and universities. I hope that, more and more, these meetings will take place, and I can assure you that all you have achieved and all that you are achieving in so many ways on so many different lines for the advancement of knowledge, for the extension of human power that comes through knowledge, is followed with gratitude and admiration by the scientific men of Great Britain.

SPEECH OF DR. S. WEIR MITCHELL

Mr. President, Mr. Vice-President, my brothers of the Academy: I am, I presume, the victim of the after-dinner hour, as usual, and am well aware of the treachery of the tongue, and much prefer the loyalty of the pen. I have, therefore, deliberately put on paper that which I want to say to you to-night, feeling that it will be much more probable that I shall interest you than if I trusted to my unassisted words.

I am, I presume, indebted to the liberal forbearance of time for the honor of being asked to speak to you this evening. It does not find me in the careless mood of after-dinner gaiety, nor is it possible to escape altogether from personal remembrances, which elsewhere than at this friendly board might entitle me to be relegated to what Disraeli called the "fatal time of anecdotage."

My diploma is dated August 25, 1865, three years after our foundation. It is signed by Dallas, Bache, Wolcott Gibbs and Louis Agassiz. Since then, one hundred and thirty-six of our fellowship have come and died, with an average duration of academic life of more than eighteen and a half years—very many with far less. This makes clear that in those earlier years our additions were of men older than those we elect now.

At present the liberal endowment of research opens the way to distinction for younger men, unembarrassed by the time-killing need to preach science as well as to practise it.

Between the mere words of our record—*elected—deceased*—you, who are familiar with our history, may read much that is written clear on the roll of scientific achievement.

Here are they to whom, from the depths of space, were whispered in the night watches its long hidden secrets. There, too, are those who, in the silence of the laboratory, rejoiced in the fertile marriage of the elements, or they who, like confessors, heard from dead bones or rock or flower

the immeasurable history of the silent ages of earth.

One might linger long over many of these lives whose interests were so remote from thought of the commercial gains their unselfish work made possible. But there are other compensations, and there are men here to-day who are aware that there is no earthly pleasure more supreme than to find disclosed some secret of nature unknown before, save to Him who set in motion the complex mechanism of the universe.

The later life of the merchant and the lawyer loses vitality of normal interest as age comes on; not so the man of science. The eternal love of nature is his—a mistress of unfading charm.

I remember once that, at my table, some one asked that ever happy naturalist, Joseph Leidy, if he were never tired of life. "Tired!" he said, "Not so long as there is an undescribed intestinal worm, or the riddle of a fossil bone, or a rhizopod new to me."

My first remembrance of an Academy meeting is of 1866. We met in a Smithsonian room. There were not more than fifteen present. Professor Henry was in the chair.

I remember Benjamin Peirce, Wolcott Gibbs and Gould. Agassiz sat on one side of me, and on the other Coffin. It was all very informal. The first scientific paper was by Professor Peirce, who for twenty minutes occupied us with algebraic formulas and mathematical figures, until he turned and said that he had got out of the region of material illustration, and so led us on through the endless equations in which I had lost myself at the very outset.

Agassiz turned to me at the close and said, "Were you able to follow him?" I said, "No; I can not do a sum in the Rule of Three without trying it over two or three times." Upon which the delighted naturalist added, "Ni moi non plus." Professor Coffin remarked, "He was traveling with Seven-league Boots over a country across which I should have to crawl."

Some of this was quite audible to Peirce, who said that the only thing required was more careful attention than men were willing to give to the great science of mathematics, and that our incapacity to understand and follow him was due to our want of proper education.

He was succeeded by Agassiz, who made the first announcement of his discovery of the additional heart found in the tail of the young of the salmon.

I recall very little else about these delightful people, except that they—all of them—were not only in the peerage of science, but also companions as socially interesting as they were learned.

Perhaps the most pleasant remembrance I have of all is of Louis Agassiz and Joseph Henry. The former was good enough to take a great interest in some of the animal physiology with which I occupied the rare leisure of a hard-worked young doctor. His enthusiasms were shown in odd ways at times.

On one occasion he was staying with Professor Frazier, and dismissed me on the front step one slippery day in February. I had got some distance from him when he came after me in haste, sliding over the pavement. "I did want to say to you one thing. Are you acquainted with the opossum?" I said, rather confused, "No." He said, "I advise you to acquire a physiological friendship with the opossum. He is a mine of physiological wealth."

Jeffries Wyman, who was elected in 1872 and died in 1874, was another who held a place in my most honoring regard. He resembled Joseph Leidy in that splendid magnanimity and unselfishness which con-

trasted so agreeably with the disgusting quarrels, happily rare, which sometimes arose among men of science.

As you have made me speak here, I am forced to say something of myself, and hence this anecdote of Wyman. I had written him word of the discovery I had made of the chiasm of the superior laryngeal nerves in the chelonia—that is to say, turtles—and it greatly excited him, especially my prediction that it would be found in serpents and probably in birds. A year afterwards he sent me a large bundle of illustrations and descriptions of what he had found in other classes than the turtle, and insisted that I should use them in the second paper I was about to print, stating that they would not have been discovered had it not been for my predictive aid. Of course, I declined this help; but it was characteristic of the noblest form of the scientific mind.

You will, I trust, pardon me if I close this long talk with a few too personal words about the much loved first director of the Smithsonian Institution, first of the men who sacrificed to that Institution a scientific career. When a boy about fifteen years old, I was sent by my father to Professor Henry at Princeton with some glass apparatus, which could not otherwise be sent without danger of breakage.

He met me at the station, took me to the house, and spent a part of the next morning endeavoring to explain to my bewildered youth the experiments he was making in the transmission of electric signals. I was overcome by the unwonted attention paid to a boy of my age, and expressed myself so warmly that he laughed as he bade me good bye, saying: "Well, life sometimes gives one a chance to return little favors, and perhaps some day you will have an opportunity to oblige me."

Long years passed by, and some time in the beginning of 1878 Professor Henry asked me to come to Washington and advise him. After a thorough examination of his case, he asked me plainly if he was mortally ill. I said, "Yes." Then he asked how long he had to live, but I could not set a date. He said, "Six months?" Hardly, I thought. He died in May of that year.

As I arose to go away, his carriage waiting, he said: "I have yet to discharge my material obligation. How much am I in debt to you?" I replied, "You are not in debt. There are no debts for the Dean of American Science."

He was much overcome, and said: "I have always found the world full of kindness to me, and now here it is again." I could only say: "You do not remember, sir, that once you said to me, a boy, when you had been very kindly attentive to me and I tried to express my obligation, that perhaps a time might come when I could oblige you. If this obliges you, my time has come." And so we parted.

I may add what some of you already know, that Alexander Agassiz wrote me he had intended to return home early from Europe, in order to give a dinner such as we are having here to-night. He died on the way over, and his letter reached me after his death—strangely enough, the fourth letter I have received from men who were not alive at the time their words reached me.

My talk has been of men dead long ago, but I should be ungrateful to the longest friendship of my life if I did not pause to remind you of our latest loss in John Shaw Billings. He was a man of too many competencies to allow of even allusive comment here. Few men have been better loved or had so enviable a capacity to convert mere acquaintance into friendship.

It is difficult for a man as old as I am to talk in the gay after-dinner mood, and

if I have been too somber and too personal, I trust that I may not have been guilty of the social crime of having been uninteresting.

SCIENTIFIC NOTES AND NEWS

ON the occasion of the installation of the Duke of Northumberland as chancellor of Durham University honorary degrees were conferred on the following men of science: D.C.L., Lord Rayleigh; D.Sc., Sir Archibald Geikie, K.C.B., Sir William Ramsay, K.C.B., Sir T. C. Allbutt, K.C.B., Sir J. A. Ewing, K. C. B., Sir William Crookes, O.M., Sir J. J. Thomson, O.M., and Professor E. B. Poulton.

THE Linnean Society, London, has awarded its Linnean medal to Professor Adolf Engler, of Berlin.

THE French Academy of Moral and Political Science has elected M. Pierre Janet, professor of experimental psychology at the Collège de France, to the chair left vacant by the death of M. Fouillée.

WHEN the Lobachewski Prize was recently awarded to Professor Schur, of Strasburg, the committee also awarded an honorable mention to Professor Julian L. Coolidge, of Harvard University, for his book on "Non-Euclidean Geometry," Oxford, 1909.

THE annual meeting of the Iron and Steel Institute was held in London on May 1 and 2, when the Bessemer gold medal for 1913 was presented to Mr. Adolphe Greiner by the president, Mr. Arthur Cooper. The Andrew Carnegie gold medal for 1912 was presented to Dr. J. Newton Friend.

THE Manchester Literary and Philosophical Society has nominated Sir Thomas H. Holland, F.R.S., to represent it at the twelfth International Congress of Geology, to be held in Toronto in August next.

DR. JAMES W. GLOVER, professor of mathematics and insurance at the University of Michigan, has been appointed expert special agent of the Bureau of the Census to supervise the preparation of a special volume on vital statistics. Extensive mortality tables are to be prepared, based on the population and vital statistics of the United States. Dr. Glover has also been appointed collaborator to the Office of Public Roads in the Department of Agriculture to assist in the preparation of several bulletins on the various methods of issuing and financing public highway bonds.

PROFESSOR AMOS S. HERSHEY, head of the department of political science at Indiana University, and Dean Walter Williams, dean of the school of jurisprudence at the University of Missouri, have been appointed fellows of the Kahn Foundation for the coming year, and both will begin a one-year tour around the world within the month. The fellowships carry with them a stipend of $3,000 for each appointee and in addition there is an allowance to each of $300 for purchases.

PROFESSOR HERBERT R. MOODY, of the College of the City of New York, is in residence for the summer term at Oxford University, where he is associated with Mr. T. V. Barker, of the department of mineralogy at the University Museum. Professor Moody is engaged in learning from Mr. Barker the details, so far as developed, of the von Federon method of Crystallo-Analysis. Mr. Barker learned Russian last year in order to work with von Federon in St. Petersburg. The method is not yet made public.

AT the annual general meeting of the Marine Biological Association of the United Kingdom, held in the rooms of the Royal Society on April 30, the following officers and members of council were elected for the year: *President,* Sir Ray Lankester; *Chairman of Council,* Dr. A. E. Shipley; *Hon. Treasurer,* Major J. A. Travers; *Members of Council,* E. T. Browne, L. W. Bryne, Dr. W. T. Calman, Professor H. J. Fleure, Professor F. W. Gamble, Sir Eustace Gurney, Commander Campbell Hepworth, Professor J. P. Hill, E. W. L. Holt, Professor E. W. MacBride, H. G. Maurice, Dr. E. Schuster, G. W. Smith, Professor D'Arcy W. Thompson; *Hon. Secretary,* Dr. E. J. Allen. The following governors are also members of council: G. P. Bidder, the