souls of men should be lifted. The study of natural science is alone able to do this, but education through natural science for the great mass of the people, even for the select few called the distinguished men of the country, has been quite impossible till recently. I say that it is to engineers that the world owes the possibility of this new study becoming general. In our country nearly all discoveries come from below. The leaders of science, the inventors, receive from a thousand obscure sources the germs of their great discoveries and inventions. When every unit of the population is familiar with scientific ideas our leaders will not only be more numerous, but they will be individually greater. And it is we, and not the schoolmasters, who are familiarizing the people with a better knowledge of nature. When men can hardly take a step without seeing steam engines and electro-motors and telegraphs and telephones and steamships, with drainage and water works, with railways and electric tramways and motor-cars; when every shop-window is filled with the products of engineering enterprise, it is getting rather difficult for people to have any belief in evil spirits and witchcraft.

All the heart-breaking preaching of enthusiasts in education would produce very little effect upon an old society like that of England if it were not for the engineer. He has produced peace. He is turning the brown desert lands of the earth into green pastures. He is producing that intense competition among nations which compels education. If England has always been the last to begin reform, she has always been the most thorough and steadfast of the nations on any reform when once she has started on it. Education, pedagogy, is a progressive science; and who am I that I should say that the system of education advocated by me is that which will be found best for England? In school education of the average boy or man England has as yet had practically no experience, for she has given no real thought to it. Yet when she does, I feel that although the Finsbury scheme for engineers may need great improvement, it contains the germ of that system which must be adopted by a race which has always learned through trial and error, which has been led less by abstract principles or abstract methods of reasoning than any race known in history.

JOHN PERRY.

IN MEMORY OF JOHN WESLEY POWELL.

TO THE EDITOR OF SCIENCE:

Dear Sir:

It has for many years been the custom at the Smithsonian Institution to hold a meeting of the friends and associates of a member of the staff who shall have passed away, not by the way of portraying his life and services, but rather as an immediate mark of respect. These proceedings have usually been private, but I have thought that the minutes of the meeting held on the day of the funeral of Major Powell, so long and so widely known in official and scientific circles and an editor of your journal, should be made a matter of public record, and I am transmitting them to you in the hope that you may find a place for them in SCIENCE. They are words of grief and affection and were not intended as a memorial of the life and work of Major Powell, which I am expecting his friends and associates here in Washington and elsewhere to portray later on. Quite before Major Powell's work as an administrator and a scientific man, before his very great achievements as an explorer, before the influence he had in molding the work and, indeed, the lives, of many scores of young men who came under his influence, there was the man himself, one to be loved and admired, no matter what his walk in life had been. During years of association he had won such an affection from me, and it is a comforting thought, which I cherish, that this affection was returned.

Very respectfully yours,

S. P. LANGLEY,
Secretary.

MINUTES OF A MEETING HELD AT THE U. S. NATIONAL MUSEUM PRECEDING THE FUNERAL OF MAJOR J. W. POWELL, DIRECTOR OF THE BUREAU OF AMERICAN ETHNOLOGY, SEPT. 26, 1902.

THE meeting was called to order by Mr. Richard Rathbun, Assistant Secretary of the Smithsonian Institution. Mr. W J McGee acted as Secretary.

Mr. Rathbun made the following introductory remarks:

"*Ladies and Gentlemen:* You know the sad occasion which has brought us together.

"The Smithsonian Institution, the entire scientific body of Washington, and indeed universal science have lost a devoted official, an affectionate friend, an original, ingenious and forceful contributor to human knowledge in the death of Major Powell. This is not the time to recount his labors or successes or to estimate the work which he pursued with such unflagging zeal amidst sufferings which would have daunted many a less heroic spirit.

"We are met together to give expression in a few words to our sense of loss and the grief which we feel at the passing away of him whom all his friends, and they were legion, affectionately called the 'Major.'

"I shall ask a few of you, who no doubt wish to pay a tribute of respect to him, to say a few words, but before doing so, there is a word which I feel I must say on behalf of Mr. Langley, the Secretary of the Institution, whose affection for the Major was known to you all, and who has lost in him as near a friend as he had either in his official or in his private relations. The affectionate consideration and regard which these two men had for each other was something beautiful to know. I am sure that if Mr. Langley were here to-day he would say so much and even more, and it will be a matter of great regret to him that he cannot pay this tribute to his old friend. He appears to have arrived from Europe in Boston yesterday morning and to have immediately left, before receiving word of the Major's death.

"I presume that the meeting will wish to adopt a minute expressive of its sense of loss, together with a word of condolence to the striken family, and I shall ask that the following gentlemen act as a committee to prepare these words: Doctor Walcott, Doctor McGee, Professor Mason, Doctor Dall and Mr. Hodge."

Mr. W. H. Dall then addressed the meeting as follows:

"Our friend has left us. While the time is not yet appropriate to estimate his scientific labors and to detail the work he has done for his country, the first feeling undoubtedly that has come to all of us, with the news brought from his deathbed, has been that of personal bereavement. I may say from my own experience, which I am sure is uniformly that of every one who was associated with the Major, that few men in official life or out of it have succeeded, without effort apparently, in inciting in the hearts of those who observe, esteem and honor them, so much of real personal affection.

"I look back for over twenty years on my acquaintance and intimacy with Major Powell, and from the very first I knew him as one who would look around among those brought from all sources to his official work, not merely with the supervising eye of a master, the critical mind of a scientist, or the indifference of a disciplinarian, but rather as a friend—one might almost say, as a father—to the young fellows serving him and with him.

"With the feeling of grief so keen, it is hard to say much, or to express that feeling adequately. Perhaps there are some of you who heard, fourteen years ago, his address on the death of Professor Baird,

and in that address there are a few words which seem to me as applicable to Major Powell as they were to Professor Baird, and I will read them. He said, speaking of Professor Baird:

"'In his work with his assistants he scrupulously provided that every one should receive the meed of honor due for successful research and he treated all with generosity. Many an investigation begun by himself was turned over to assistants when he found that valuable conclusions could be reached; and these assistants, who were his warm friends, his younger brothers, reaped the reward; and he had more joy over every young man's success than over the triumphs and honors heaped upon himself from every quarter of the globe. He was the sympathetic counselor of many men; into his ears were poured the sorrows and joys of others, and he mourned with the mourning and rejoiced with the rejoicing. To those in need his hand was ready and his purse was open, and many were the poor who called him "blessed." Though a man of great force of character, a man of great learning, a man upon whom had been showered the honors of the scientific world, in character he was as simple as a child.'"

Doctor Gilman then spoke as follows:

"When I arrived from Europe last evening, after a long absence, the first thing which reached me was a mourning letter. I opened it and read the sad announcement that has called us here to-day. There are others far more competent than I am to give utterance to the sentiments of affection and respect which have brought us together, in this home of science, before we bear the body to the tomb. I came here not to speak, but to bear silent testimony to the work of our departed friend.

"Grief has many languages for its expression. There is the language of silence, the dumb utterance of sorrow. There is the language of flowers and foliage, the forget-me-nots and immortelles, the ivy of friendship and the palm leaves of victory, upon which we are looking. Grief has the language of tears, and there are those who are weeping now and who will continue to weep in the lonely hours that are to come. But why should we, his scientific friends, mourn for one whose labors are over, whose troubles are ended, whose reputation is established, who has forsaken the mortal frame in which he toiled and suffered for so many years, and has gone to his rest and his reward? There is also the language of clear discrimination, of justice and of eulogy, the review of all that such a man has accomplished—the language to which, no doubt, we shall listen at another time.

"At the moment let us employ the language of friendship, whether our voices speak, or only our hearts. Let us think of this departed leader as our friend and recall his characteristics. He began as a gallant and fearless soldier, who lost a limb in the service of his country; he became a courageous and successful explorer, accomplished one of the most marvelous feats in the record of geographical science; he came again to the front as the promoter of many branches of science, complex and difficult, and the conciliator of divergent views in respect to legislation. Everywhere and always he was the friend of those who were working for the advancement of knowledge, a friend on whom we relied, whose voice was always buoyant and cheerful, whose bearing was always hopeful and optimistic, whose strength was always in the confidence of the things he had accomplished and of the things he knew would come to pass, whose judgment was always persuasive.

"As I stand here, I think of him presiding over a meeting of the American Association for the Advancement of Science in Boston, where, attracted by his many endearing qualities and particularly by his genial manner, many men became his friends. I remember the address commemorating Professor Baird from which an appropriate selection has just been read.

I remember his lectures to a body of scientific students and the sparkling enthusiasm with which he inspired all who listened to him. I have sat at his bedside in the hospital and have seen how patiently he bore the infirmities from which he sought relief. Having devoted his life to the study of earth and man, he was fond of the most abstract views, and on his sick-bed he was then endeavoring to work out, or at least to work upon, the philosophy of those complex problems of existence which are so fascinating and so difficult.

"I remember him as the faithful friend and as such I join with you in mourning his loss. I honor him also as the loyal citizen, the indefatigable toiler, the acknowledged leader, 'the happy warrior.'"

Doctor Charles D. Walcott then spoke as follows:

"We have listened to the words of some who learned to admire and love the Major as a result of association in various relations in life. I will add a few remarks on behalf of those who were associated with him for many years in the work of the Geological Survey before he resigned the directorship thereof and turned his attention solely to the Bureau of Ethnology; and first a word of personal recollection.

"I first met Major Powell in the winter of 1879, in Washington. I had been working in the country with which he was so familiar, the Grand Canyon of the Colorado, in Arizona. I was a young man. Putting his arm around me, he said: 'My boy, you have done well; I hope you will stay with us.' From that time to the end the same friendly relations were maintained.

"Major Powell was a natural leader of men. I saw evidence of this often during his career. On one such occasion we were in the forests of the Kaibab of Arizona. Gathered around the camp fire were the camp men, the rough riders of the plains, and Indians, and to them the Major talked of Indian myths and of his wonderful exploration of the great canyon. His influence over all his hearers was so profound that, in the days that followed, a word from him was sufficient to cause the men to go anywhere or to do anything, no matter what the personal danger might be.

"When the Major said good-by as Director of the Survey, it was a meeting in which tears were shed, so much was he loved by many of those who had been associated with him. In the summer of 1892, when it became necessary to make changes in the Survey, the Major said to me: 'Here is a list of persons, some of whom must be dropped. I don't want to do it. I can not do it alone; I must have suggestions from the men about me, and I wish you would take it up with them.' Later he came to a case where there was a wife and children, and he said: 'That man must remain.' Often after that, in discussing the welfare of members of the Survey, he would ask, not so often what they were doing and what were the results, but, 'How are they getting on and what are their prospects?' When he left the Survey I asked him: 'Major, what can we do that would be of interest or pleasure to you in the conduct of the work of the Survey?' He thought a moment and said: 'There is but one thing that I have to request. There is one man who fought with me in the exploration of the great canyon. Look after Jack. I do not care especially about anything else; the work will go on all right.' That showed his feeling for the man who had saved his life. Thus did I often see the thoughtful and affectionate side of the man's nature.

"Another characteristic, one more frequently seen in public, was that which he exhibited in his army career. He was a fighter when once aroused. At Shiloh, on

the line of battle, he lost his arm. He was obliged to retire, but in a few weeks he returned to the front at Vicksburg. Once in the fray, he was there to the end. When he came to Washington to organize scientific work he had the benefit of the advice and experience of Professor Baird; but the organization of scientific work on a broad national basis remained to be accomplished. Through his energy and power of organization he led in the consolidation of the King, Hayden and Powell surveys, and thus helped to win a great fight for scientific research. During his explorations in the West, from 1869 to 1879, he became imbued with the idea that the arid region must be saved through the husbanding of its waters. He thought out a great scheme of irrigation. In 1883, in developing it, he got into a conflict, which culminated in 1892. Through that conflict he showed the same spirit that dominated him when a soldier. He felt that he was right, and although defeated for the time, he lived to see his views accepted by Congress, in June, 1902. It has been said that if he felt his position was right he would follow it up even though by so doing the whole organization should be wiped out.

"Year by year since 1894 I have told the Major of what was going on in the Geological Survey, of the welfare of individuals, and of the welfare of the organization in which he had such great interest. In all our talks, from 1879 to our last meeting, in May, I never heard him say a word of what he had done or what he himself thought of his work.

"We mourn Major Powell as a man, as a soldier, and as one of the great leaders in the development of science and scientific organization in America."

Commissioner W. T. Harris then addressed the meeting as follows:

"When I came to Washington more than twelve years ago Major Powell was one of the first to extend me a friendly greeting. We had not met before. Since that time I have been brought into closer and closer connection with him as the years have gone by. I am glad of this opportunity to testify, as others have done before me, to his goodness. He was one of the most interesting of men; one of the most beautiful characters that I have ever known. It was easy for me, coming as a stranger to Washington, to discover traces of his work and influence in many departments of the government and in many places in the District of Columbia, and I could not help often asking myself, what is the source of Major Powell's power and influence? I knew of his brilliant and brave geological explorations; knew of his high-minded desire to find the scientific truth in regard to nature and man. He looked around the world and tried to explain higher civilizations by the same principles that he found at work in simple forms among the savages in our western border lands. He had an unbiased love of truth combined with such personal amiability that he succeeded beyond most men in attaching to him his associate workers and assistants, as it were with links of steel; he was true to them and they were true to him. He was so broad-minded as to extend his interests beyond his provinces of geology and ethnology and philology to writings of men in other departments of science and history and poetry, and even of philosophy. Whatever was human interested John W. Powell. He took the problems of his contemporaries seriously and tried to make out for himself in his own way of thinking what there was or is of value in these other departments. During his long life he was gradually maturing his views not only of his special department, but his views of the world. One of the first things I came upon in my

acquaintance with him was his altruistic view of the world. He had made for himself a very noble and interesting concept of the relation of nature to man, adopting the spiritual theory of man as Lord of Nature and as having a higher destiny than nature.

"What has interested me most, however, in Major Powell has been the unique work which he has done to perfect the government policy in regard to science and to the national undertaking of improvements which, while they are of interest to the entire nation, yet are too great for individual or even for state accomplishment. Long ago we had made the beginnings in this nation, feeble beginnings as they were, of great undertakings in regard to the surveys of our territory and our coast lines; we had, under the leadership of great and noble men in our former history—we had begun to employ the scientific expert. But for the most part it was not the scientific expert, but the mere laborer or the mere adventurer, who came to the front and performed the details of the work. The expert could not use such assistance as naturally came to him by the regular political methods of appointment in vogue. From what I have been able to see, it was Major Powell who worked little less than a revolution in this matter of educating our national legislature through its committees into the habit of seeking for and obtaining the scientific expert in all places where he is needed. It was he who influenced by his word of persuasion the government to expend very large sums for the production, in worthy style, of publications giving the result of scientific research and exploration.

"We are comparatively a new nation and our experiment is entirely a new one. We are trying to produce a nation of local self-government; we seek a government that while on the one hand it is elected by the masses of the people, yet, on the other hand, has invented for itself formulas of action which sift out selfishness and incompetence and secure the wise and fittest persons to do the work of a great government. Government work, instead of being a matter of reproach, shall become a matter of pride to even the best people in the country. Major Powell thought it a great object to aid this progress of the national government into a proper sense of the importance of true science. They should learn not to squander large salaries on mere attachés of the political machine; the government should learn to know the difference between the true scientific man and one who masquerades in the name of science. The government should have specialists who are learned in matters of geology and engineering and ethnology and botany and zoology and chemistry—specialists in everything that applies to science and that will be found necessary in some department of the great government service which extends around the world and into all climates.

"We all know what a difficult matter it is to aid our government to make progress in these lines. All the weight of conservatism and all the weight of the time-servers and demagogues will be thrown in the other scale, but the future historian will single out the hundreds and thousands of names of congressmen and of public officers who have done something worthy of mention in this great work, and it is my conviction from such observation as I have been able to make that Major John W. Powell's name will be found to shine in the front rank when the list is made up.

"The inventors of local self-government have received from the beginning great praise, but those who make local self-government possible by inventing sieves with which to sift out incompetence and pretenders to science and who invent means of selecting the best talent in the nation to do the nation's work and who create

salaries and positions of permanent dignity shielded from the harm of the necessary fluctuations which occur in our national politics really accomplish something for which the nation will be far prouder in future times than it is or can be now. I have found in Washington these years past a remarkable set of men, men that are to be met with at the Cosmos Club on one of the Mondays of the month; a set of men whose names one finds in the scientific archives of the world, whether he looks into those archives in New York or Boston or London or Paris or Berlin. These are men who have made by original discovery additions to their specialty in science and I have often said that one may find in the Cosmos Club on such an occasion the finest set of scientific men that can be met with anywhere at a club meeting. I should be glad to learn where there is to be found a more noteworthy company of scientific men. A goodly number of the scientific men in our government employ are certainly here through the influence of Major Powell, and I believe that I am right in thinking that other departments which have a splendid array of talent in the way of specialists and experts have found it easy to obtain them because of the victory first gained in the geological survey under Major Powell.

"These matters are known in whole and detail by those present on this solemn occasion, but to an entire stranger to Major Powell and his work I should attempt to convey some idea of the greatness of the subject of our eulogiums to-day by saying that he was one of the few who when our nation was groping its way through darkness assisted it in organizing and developing its scientific work and finding the proper men to place in charge of its great interests, and that each department that has worked in this line has assisted and strengthened the management of other departments to secure the light of science. We who have known Major Powell and his lovely and noble character have shared in the blessings that his life has brought."

Mr. Marcus Baker then addressed the meeting as follows:

"Many things are worthy to be said of our dear friend who is gone, but public speaking at this parting hour is ill adapted for such expression. It is better to be silent than to speak.

"It was my good fortune to be associated with the Major (as everybody loved to call the dear old man) for a dozen years or more, and during a part of that time very intimately. The influence which he exerted in the advancement of science, upon legislation, in his work in anthropology, in his work indeed in many lines, all these sink down on an occasion like this before the personal affection felt for the man himself. I count it as one of the peculiar pleasures of my life to have been so long and so intimately associated with the man, whose fame must increase with the increasing years."

Mr. W J McGee spoke as follows:

"It seems fitting, by reason of my association with Major Powell in his later years, that I should offer the final expression at this meeting. It is not an easy task; the sense of personal bereavement and of public calamity is too strong upon me.

"The old man was a soldier, a born soldier. Not only when rumors of war arose, but during the whole of his life he was actuated by the spirit of the soldier. His life was a battle; more completely than that of any other man I have known was his career one of ceaseless strife.

"Powell was a great man. Twenty-four years ago last month I first saw him. My first impression was of the strength of his grasp. Things large to others were small

to him; and things great to him were past the reach of most others. Three or four years later when I came to Washington the impression was strengthened, especially in listening to an address which he delivered in this building. In the course of it my mind framed a characterization of the man: Other scientific men were making bricks; he too was making bricks; but, unlike the rest, he was putting his own and those of others together in great structures. Then, as before and after, he was associated with the ablest scientific men of the country, the foremost knowledge-makers of the century; but, as it seemed to me then and as it has always seemed since, their units were to him but fractions.

"Powell was a unique character in his generation. I am one of those who regarded him as an intellectual giant among his fellows, a Saul among his brethren. Early in his career he touched natural history, and it was enriched. He touched geography in a vigorous exploration the like of which has never been in our country, and again in the world's most comprehensive plan for the survey of a great country; and geography was enriched. He dwelt longer on geology, and the science was reconstructed. He dwelt longest of all on the great science of Man, and that science was constructed; for the ethnology and anthropology of to-day, not alone in Washington, not alone in America, but throughout the world, is in large measure the product of the great brain of the friend whom we mourn.

"While Major Powell was an intellectual giant, he was more. As I conceive it, he was a moral giant. His strongest character was integrity; next to this was charity. These qualities have been remarked by Director Walcott and have been brought out in the utterances of others. His sympathy went out to all mankind; especially to the struggling youth in the scientific world was he a constant friend. He was ever actuated by the noblest motives; with charity toward all and malice toward none he lived out his days.

"Major Powell was a maker of science through the creation of opportunities for others as well as through his own efforts. There is not a scientific man within the sound of my voice, or indeed in all this broad country of ours, who is not in some measure the beneficiary of his efforts for the development of science. I do not underestimate that which other scientific leaders have accomplished; no one appreciates more highly than I the work of a score of men whose names I should be glad to mention as a tribute to their leadership in science; yet the feeling has long been strong in my mind that it was J. W. Powell who made governmental science respectable. He possessed in unique degree the power of presenting the good of science to statesmen, the faculty of appealing to average citizens; he was able to impress on all the importance of knowledge, the utility of knowledge, the goodness of knowledge. It was in this that his great grasp was best displayed; he intuitively seized on the best of things, and his very simplicity reached out to every heart. It was his efforts more than those of any other that helped our people to make America what it is to-day, a nation of science.

"It is not my purpose to do more than utter a few words as a tribute to the great man who is gone. In some respects I enjoyed an apparently intimate association with him, yet I must say, even if it surprise my friends who are also friends of Major Powell, that in many ways the association was not intimate. There are a score of men present at this moment, and many scores elsewhere in the country, with whom Powell discussed matters scientific and philosophic much more fully than with myself; very seldom indeed was there

discussion between us of scientific topics or even of administrative topics. Somehow I learned early in the association how his mind ran, and came to know fairly well not only the lines of his action, but the course of his thought. So between us discussion was needless. This very fact indicates the closeness of the sympathy existing between us; and I mention it as an apology for any appearance of fulsome eulogy that may have fallen from my lips.

"The feeling that overwhelms me is one of loss. The greatest of scientific men is gone; our warmest friend of scientific progress has passed away; our brightest exemplar of human knowledge is no more.

"This is but little of what I am moved to say; yet I am glad to offer even this small tribute to a great man."

Doctor Walcott, Chairman of the Committee on Resolutions, then offered the following, which was adopted by a rising vote:

"The friends and associates of Major John Wesley Powell here place upon record an expression of their grief at the loss of a loyal friend, a devoted public servant, a daring explorer, and an original contributor to the sum of human knowledge, and they extend to the family of Major Powell their sincere condolence in their great bereavement."

The meeting then adjourned.

SCIENTIFIC BOOKS.

The Chemistry of the Terpenes. By Dr. F. Heusler, Privatdocent of Chemistry in the University at Bonn. Authorized translation by Dr. Francis J. Pond, Assistant Professor in the Pennsylvania State College. Carefully revised, enlarged and corrected. One volume. P. Blakiston's Son & Co., Philadelphia. 1902. $4.00. Pp. 457.

Webster's International Dictionary states that a terpene is 'Any one of a series of isomeric hydrocarbons of pleasant aromatic odor, occurring especially in coniferous plants and represented by oil of turpentine, but including also certain hydrocarbons found in some essential oils.'

This so-called definition may serve, in part at least, the purpose of the publisher, for it may satisfy the curiosity of one who incidentally has stumbled across the word and cares little for positive information. It certainly does not define the word chemically, as it pretends to do.

Some years ago one of the writer's students presented himself with a set of examination questions of an eastern college of pharmacy. One of the questions read: 'What is a terpene?' and the student, who had attended a course on 'hydrocymenes and derivatives,' apparently was curious to know how the writer would briefly define a terpene for the purpose of an examination paper. "A terpene is a dihydro'terpene,'" was the prompt reply. For a moment the student was puzzled. Shortly, however, he recalled sufficient of A. v. Baeyer's application of Geneva Congress nomenclature to the terpenes. He therefore smiled and walked away, seemingly satisfied.

The fact is that the word terpene has been used to designate different groups of compounds. The compiler of Webster's Dictionary seems to know of natural terpenes only. Semmler, on the other hand, thought it necessary to reduce the number of natural terpenes proper and assigned to certain hydrocarbons ($C_{10}H_{16}$) found in volatile oils the name aliphatic terpenes. Not satisfied with this, he coined the name pseudoterpenes for certain other isomeric hydrocarbons of this group.

König, who tried to give a strict chemical meaning to the word alkaloid, defined this term as standing for certain derivatives of pyridine, thereby excluding such well-known alkaloids as caffeine and many others. A. v. Baeyer, in an adaptation of Geneva Congress nomenclature to terpenes and camphors, defined a terpene as a tetrahydrocymene. The terpenes of old, in accordance with the same principles of nomenclature, became terpadienes. However, there are many 'terpenes,' *i. e.*, hydrocarbons ($C_{10}H_{16}$), which cannot be