SCIENCE

VOL. 79 FRIDAY, JUNE 22, 1934 No. 2060

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal
Lancaster, Pa. Garrison, N. Y.
Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.

THE NATIONAL ACADEMY OF SCIENCES

PRESENTATION OF MEDALS AND HONORARIA

AT the annual meeting of the National Academy of Sciences, held from April 23 to 25 in Washington, five medals and four honoraria were awarded. A brief announcement of these awards was included in the address of the president of the academy, published in SCIENCE of May 4. The medals and honoraria are given in recognition of important contributions to knowledge and for encouragement of research activity in the future. As stated by the president in his address, the academy's ability to confer honor upon its members and others of high achievement proceeds from the honors conferred upon the academy by its members through their accomplishments in the advancement of knowledge. The academy is designated in its charter from Congress an adviser to the Government in scientific matters. Election to membership in the academy carries with it the obligation to aid in the solution of any problem of a scientific nature on which the Government seeks advice. In view of this relationship the following extracts from the speeches made at the time of the presentation of the medals and honoraria are of interest.

PRESENTATION OF THE MARCELLUS HARTLEY MEDAL TO DR. DAVID FAIRCHILD

In making the presentation, Dr. Henry H. Donaldson, of the Wistar Institute of Anatomy and Biology, said:

It is my privilege to announce the award of the Marcellus Hartley Gold Medal for the year 1934 to Dr. David G. Fairchild (from 1889 until his retirement two or three years ago, on account of ill health, an invaluable member and officer of the Department of Agriculture), for eminence in the application of science to the public welfare. Specifically, the award is made for Dr. Fair-

child's exceptional accomplishments in the development and promotion of plant experiments; for the introduction of new plants, grains, shrubs and trees into the United States; and for his services of a working lifetime, which have contributed to the easy availability of some of our finest fruits, grains, and vegetables, thus adding to the wealth of the nation by opening new lines of activity to American farmers.

The response in Dr. Fairchild's behalf was made by Mr. Knowles A. Ryerson, chief of the Bureau of Plant Industry in the Department of Agriculture, who read the following letter, addressed to the president of the academy by Dr. Fairchild:

You can imagine, Mr. President, my deep regret that I can not be present in person to receive this Medal, for I regard the awarding of it to me as the greatest honor of my life. Unfortunately, a long and serious illness has led the doctors to advise against the making of the trip from Florida so strongly that I feel obliged to obey.

It has seemed appropriate to ask my colleague, Knowles Ryerson, to act as my representative on this important occasion, for, as one of my successors in the Office of Foreign Plant Introduction, and now as chief of the Bureau of Plant Industry, he is closely identified with the work in which my life has been spent.

In accepting this Medal I have been asked to express my sentiments in a few words; perhaps in justification of my right to it. I feel my unworthiness to such a degree that I find this very difficult. I am perhaps too conscious of the greater, more worthy accomplishments of those with whom I have been associated since my early youth, and who have not been thus honored. I am only too well aware of the fact that in such work as this for which I am being honored others who remain in obscurity have played a major part.

I take it that the purpose of this gold medal is less to call the public's attention to my own doings than to those of a group of personalities whose activities in the Government service have led to a substantial increase in our country's agricultural wealth and have contributed as well to the beauty of the home surroundings of its people.

The pleasure I have found in my work should be recompense enough in itself. I deserve no medal and desire no particular praise. I have done what I wanted to do, and the Government and good fortune have favored me in my desire. And now, as I approach the closing years of my life and look back, the romance of it all seems more than by right should have come to any one man.

I have seen date palms that I collected on the banks of the Tigris grow and become a part of large plantings in our Southwest. I have had the pleasure of picking nectarines in California orchards from trees that came from the hills of Baluchistan. I have mango trees on my own place, and there are thousands of them in South Florida, that have come from seeds and cuttings I collected in British India and Cochin China; these are now heavy with fruit. I have wandered through shady groves of bamboos and have eaten delicious shoots of bamboos that I was instrumental in bringing to America from Japan.

This spring I am painting my house with Florida-grown Chinese Tung-oil. It is a pleasure to remember that I had a hand in the first experimental work done in America with this remarkable nut tree, now grown on thousands of acres in Florida.

It is with a thrill that I remember, each time I drink a glass of soybean milk, that in 1898, before we knew how to grow soybeans in this country, I sent to Tokyo for soil with which to inoculate the root systems of our experimental plantings of them, little thinking that I should see the day when four million acres of soybeans would be grown in America.

It is a satisfaction to feel that I have played my part in the introduction of the Peruvian hairy alfalfa that has been so successful in our Southwest, and to know that hardy varieties of this great forage crop are now covering the plains of our Northwest and the upper Mississippi Valley.

To have advocated and, in a measure, personally taken part in the introduction of such remarkably successful grain crops as the Durum wheats, the Feterita sorghum, the Finnish black oat, the Hannah and Mariot barleys, and other successful varieties of grains, is, it seems to me, to have done something worth while.

To have realized the popularity which would come to the Japanese flowering cherries, to have brought in a special collection of them from Japan in 1902, and to have in every way assisted in their plantings in Washington, may not seem much to others, but they bring a thrill to me.

But more important than any of these accomplishments, I deem to be the building up in the Government Department of Agriculture of a Foreign Plant Introduction Service, whose purpose, through the thirty-six years of its existence, has been to bring into our country a constantly increasing stream of useful plants from other lands. I believe that the future agricultural wealth of America will be concerned with some of the more than a hundred thousand different strains, varieties or species of plants that have been brought in through this Service; for these species will not only make it possible to utilize more thoroughly the different kinds of soils and climates, but to increase in many ways the enjoyment and comfort of a growing class of people who will find their happiness in the great open spaces rather than in our overcrowded cities.

All this work has been possible only with the aid and the advice and the conscientious assistance of a number of remarkable associates whose names I wish I might be able to mention here.

With these thoughts in mind, I accept the honor the National Academy of Sciences sees fit to bestow in the form of its Public Welfare Medal, as a tribute to the success which has accompanied the efforts of my colleagues as well as of myself.

PRESENTATION OF THE DANIEL GIRAUD ELLIOT MEDAL AND HONORARIUM FOR 1930 TO DR. GEORGE ELLETT COGHILL

In making the presentation, Dr. Ross G. Harrison, Sterling professor of biology in Yale University, and chairman of the committee on awards, said:

Last year, on the recommendation of the committee, the academy voted to award the medal and honorarium ($200.00) for 1930 to Dr. George Ellett Coghill, of the Wistar Institute of Anatomy and Biology, for his work entitled "Correlated Anatomical and Physiological Studies of the Growth of the Nervous System of Amphibia." Study IX of this series was published in the year 1930, the first having appeared in 1914. It falls to my lot to state briefly the reasons for the award.

Biologists have long realized that the development of the individual organism is one of the central problems of their science. Judged by popular interest and knowledge, however, one could hardly place embryology in such an exalted position, for, strange to say, the average man seems to care more about his remote origin than about the early history of his own individual past. This is all the more remarkable since the transformation of the single egg cell into the mature organism is an experience through which we have all passed. That we are oblivious of the early period of this transformation does not argue against its power to fix upon us peculiarities we show in later life.

Embryologists have dealt for the most part with the development of organic form, disregarding the fact that with it goes hand in hand the development of activities or function. The correlation of these two phases of development, because of the difficulties involved, has not received the attention it merits. It is precisely in this field that Dr. Coghill's pioneer work has won for him a place of high distinction.

The human organism, which begins its development as a parasite well concealed from observation by the inquisitive, is ill adapted for studies of this kind. It has, therefore, been found advantageous to go to the lower vertebrates, particularly to the frogs and salamanders, for a material that may be obtained in abundance and which from the first is amenable to observation and experiment. That the amphibian mother casts her progeny loose at the time of fertilization, while not praiseworthy from the humane standpoint, is a boon to the embryologist.

The amphibian embryo, still in its envelopes, shows the first muscular movements when its external form begins to shape itself and head, trunk and tail are easily recognized. The character of these movements rapidly undergoes a series of changes during the remainder of embryonic life until at hatching they are quite complex and the young animal is able to shift for itself. The progressive changes in reaction have been followed by Dr. Coghill step by step in individual embryos, and at each stage cases taken immediately after their reactions had been tested were preserved and studied microscopically. In this way the actual state of differentiation of the nervous system in each individual has been correlated with its behavior. It has been found that a progressive differentiation of nerve cells, fibers and sense organs takes place, preceding by a short interval the initiation of the corresponding reactions. Associated with differentiation, but in a certain sense antagonistic to it, is the process of growth, the study of which has required the counting of thousands of cells and charting their positions in the spinal cord and brain at various stages of development. This has involved an immense amount of painstaking work which would all have been to little purpose, had the task not been approached by a man of broad knowledge and subtle insight.

From all this has developed a new conception of the origin of nervous function. At no time does the nervous system work as a collection of independent reflexes, which later become integrated. On the contrary, at each stage it functions as a whole, expanding from stage to stage, and as development proceeds, various partial functions arise within it as more or less discrete reflexes.

These investigations of Dr. Coghill will have a lasting influence in psychology and physiology as well as in embryology.

PRESENTATION OF THE DANIEL GIRAUD ELLIOT MEDAL AND HONORARIUM FOR 1931 TO THE LATE DR. DAVIDSON BLACK

In making the presentation, Dr. Henry Fairfield Osborn said:

I feel sure that Dr. Elliot, a lifelong and intimate personal friend of mine, would warmly endorse for the year 1931 the award to Dr. Davidson Black, professor of anatomy of the Peiping Union Medical College in China.

The honor falls to me of describing his share in the discovery and his unique part in the description, according to the very highest standards of modern prehistoric anthropology, of the Peking man, *Sinanthropus pekinensis*, which has already become a classic. These additions to the great and highly diversified family tree of man were discovered in the years 1926 to 1929 in a cave fissure deposit about thirty-five miles southwest of Peiping, a deposit of very hard limestone known for many years to yield rich fossil remains of the early Pleistocene period estimated at approximately one million years ago. Infinite patience and infinite technical skill were required to free these fragile specimens from the matrix and a very high order of anatomical knowledge to correctly interpret them. From 1926 to 1934 Davidson Black devoted his entire strength, energy and skill to exposing and examining this series, which yielded one type lower molar (1927), two adult or nearly adult skulls, six parts of adult and immature mandibles, various separate teeth, limb and girdle fragments, a wrist bone, phalanges, etc. To these remains the scientific name most aptly applies—"the man of China found near Peking."

In a long series of brilliant publications, culminating in the monograph of 1931 for which this Elliot Medal is

given, "On an Adolescent Skull of Sinanthropus Pekinensis in Comparison with an Adult Skull of the Same Species and with Other Hominid Skulls, Recent and Fossil," all the characteristics of these specimens were carefully set forth, figured and described with the result that Peking man is shown to be extraordinarily similar to the Trinil man (*Pithecanthropus*) in its form and brain size and structure while differing most widely from the Piltdown man of Sussex not only in the beetling forehead but in the relatively massive jaw. Thus its closest affinity is to the Trinil cranium while in its grinding tooth structure thoroughly human or Neanderthaloid.

Death has been making some terrible mistakes of late. A tragic feature of this award is that Davidson Black did not live to receive this medal and enjoy the fellowship with the great names of previous awards. On March 16, while sitting at his desk in his Peiping Laboratory, he died suddenly of heart disease. While anatomy has suffered this great blow, let us express our sentiment of admiration and fellowship by the award of the fourteenth Daniel Giraud Elliot Medal for the year 1931.

May we inscribe to him the lines from Milton's *Lycidas:*

> For Lycidas is dead, dead ere his prime
> Young Lycidas, and hath not left his peer.

PRESENTATION OF THE CHARLES DOOLITTLE WALCOTT MEDAL AND HONORARIUM TO DR. DAVID WHITE

In making the presentation, Professor Emeritus Charles Schuchert said:

The train of events that culminates to-night in the first award of the Walcott Medal might be said to have had its beginning one day in 1867, when a young fossil collector found, near his home in Oneida County, New York, a drift rock containing organic remains that differed wholly from those with which his growing cabinet was filled. His curiosity regarding these strange fossils remained unsatisfied until eleven years later, when he found identical ones in a quarry near Saratoga Springs, and learned that they were of "primordial time," at the base of the New York System. His attention once turned to these early Paleozoic organisms, Walcott's never ceasing study of their specific and generic evolution finally made him the world's authority on the life and history of Cambrian times.

In the late fall of 1882, Major Powell, director of the United States Geological Survey, took Walcott to the Grand Canyon and left him there with this message: "Young man, I now leave you and your helpers to the work assigned you. In a few days all the upper levels of the canyon will be covered so deeply with snow and ice that none of you will be able to get out until early spring. I hope by that time you will have worked out the stratigraphic succession and gathered enough fossils to prove the ages of the various formations!" It was late March when Walcott came out of the canyon, and, in addition to what was expected of him, he again had "primordial" fossils, and not only these, but organisms of a still older time—the first traces of Precambrian life. From then on, as his studies showed the marvelous complexity of Cambrian life, he was ever looking still further backward to find the ancestors of these strange Cambrian creatures, and in this search he was more successful than any other paleontologist of his time. However, no one has yet found in abundance the Precambrian life that Walcott so earnestly sought, and it was with the idea of stimulating others to realize his unfulfilled ambition that Mrs. Walcott, who helped her husband collect many a hundredweight of Precambrian algae, presented to the National Academy the fund which yields the medal and honorarium to be presented here to-night.

The lure of the Grand Canyon is indeed very great, not only for the poet and the painter, but especially for the geologist, since he who stands on the brink of this mighty chasm looks back through the geological ages for more than a thousand million years. In the upper walls of the Canyon occur Carboniferous land plants, which have formed the basis for one of the classics of paleobotanical literature, "Flora of the Hermit Shale, Grand Canyon, Arizona," written by David White, whose extraordinary knowledge of the coal floras has played no small part in the unraveling of our late Paleozoic stratigraphy. In the course of his work in the canyon, Dr. White's attention had been especially directed to the traces of Precambrian organisms which had been found there by Walcott and others, and which had been rendered even more significant by subsequent discoveries of similar forms in the Belt series of Montana. For several field seasons he studied with great care the detailed environment of these ancient fossils, and collected them in abundance, and he has demonstrated, with his customary thoroughness, that the deposits in which they were entombed were those of a shallow sea, and not, as had been supposed, those of a fresh-water lake. What is even more significant, he has, by new methods of laboratory research, both of a physical and a chemical nature, revealed the micro-structure of these remains and established them definitely as algae. His preliminary results have already appeared in a number of papers, and his monograph, to be published by the Carnegie Institution of Washington, will bring together his studies on a great mass of material, much of which was collected by Walcott. His researches thus mark a decided step forward in our knowledge of Precambrian life.

Therefore, Mr. President, I ask you, on behalf of the Walcott Fund Committee, which includes in its membership representatives of the Royal Society of England, the French Academy and the Smithsonian Institution, to make the first award of the Walcott Medal and Honorarium ($1,350.00) to Dr. David White, for his outstanding work on the Precambrian algae of the United States.

Dr. White responded as follows:

While accepting this medal I realize that I have but watered a little the planting—the pioneer work—of that great explorer of ancient life, to whose far-seeing vision, indomitable faith and eminent achievements this memorial is fittingly dedicated.

The greater part of the records of Precambrian life and history are, in effect, palimpsests on which the original records have been overwritten and later perhaps overwritten again by inscriptions which are generally dis-

connected and often without date. The original characters may be disfigured or effaced by rock deformation and intrusions; washed out in the processes of chemical replacement; masked by recrystallization or fused by subterranean heat. Yet records were certainly made covering all the complex events of Precambrian eons, and there can be no doubt that records still exist and that they will eventually be found, deciphered, pieced together and woven into the history of an almost incredible past.

Proofs of the existence of life, of periods of great mountain building, of vast degradation and continental movements are unmistakably visible. Although we can not yet unravel their history, somewhere, in some region, Precambrian strata will, in localities not yet fully investigated, be found to have escaped the withering destruction of metamorphism. Finds of inclusions, nodules, conglomerates and, happily, early replacements of cell structure itself, will eventually be brought to light. These reconstructed records, reaching hundreds of millions of years back into the dawn of life, will, when restored, be found, I am certain, far more thrilling, inspiring and impressive than the hypothetical pictures drawn by the theoretical evolutionist.

The increasing number of Precambrian deposits that are now dated more or less accurately by the ratios of the products of the atomic disintegration of their radioactive minerals—dating late Precambrian rocks at 7 or 8 hundred millions, Huronian at 10 or 11 hundred millions, Laurentian probably beyond 12 hundred millions, and other deposits as far back as 16 hundred million years or more, has changed the quest for knowledge of Precambrian life from a mere lure to a challenge; from hope to command.

It is good for us, and productive of seemly humility, to reflect that the light of a very distant galaxy—a spiral nebula—so far away that it barely records an image of itself on the photographic plate exposed by the 100-inch reflector on Mount Wilson, left its distant source while the giant, silvery Orthocerases were still basking and fighting in the transparent shallows of a late Ordovician sea, and that the duration of life within Precambrian time was much longer than—more likely nearly twice as long as—all the time from the beginning of the Paleozoic to the present moment.

It is true that only a crude beginning has been made in the unraveling of the history of Precambrian life and times. The task is bafflingly arduous; the paths, leading astray, are labyrinthic, but vision, courage and method will prevail. To this end the Walcott Foundation and the Walcott example are continuing and inspiring influences, actuating researches from which should flow galaxies of discoveries rich in intellectual and philosophical profit to mankind.

PRESENTATION OF THE AGASSIZ MEDAL FOR 1933 TO BJORN HELLAND-HANSEN, OF THE OCEANOGRAPHIC INSTITUTE, BERGEN, NORWAY

In his presentation address, Dr. H. B. Bigelow, director of the Woods Hole Oceanographic Institution, said:

In every advance in oceanography, certain names stand forth. And when scientific accounts are cast we find Dr. Björn Helland-Hansen—often linked with his one-time master and life-long associate, Fridtjof Nansen—a key name in developments that have become integral in modern science of the sea.

To-day physical oceanography may justly be named an exact science; it is worth remembering that this was not always the case; so recently, even, that it falls within the memory of many of us. It was Helland-Hansen and Nansen who first clearly appreciated and published to the scientific world the fact that the oceans are so uniform over great distances and over great ranges of depth that only from the most precise measurements and determinations can the true physical characteristics of the high seas be learned. Nor was this an advance in technique only, for practise and theory marched hand in hand. And in 1909 Helland-Hansen and Nansen jointly published their classic study of the Norwegian sea, in which they so accurately traced its essential physical characteristics, with the ebb and flow of the ocean currents, as to make this at a stroke the best known part of the ocean, and their monograph a model for all the regional studies in descriptive oceanography that have followed it.

A second field in which we all think of Helland-Hansen as a master is that of the dynamics of the sea. Here again for perspective we must turn back to the early years of the century. It had long been realized that archimedean forces must be of major import in oceanic circulation. In 1898 the elder Bjerkenes (also an Agassiz medalist) had published his classic discussion of the dynamics of air and sea. In 1903 we find Helland-Hansen and Sandstrom (then young men) developing a simple and workable method by which Bjerkenes' theoretic analysis might be applied numerically to conditions as actually existing in the sea, with calculation of dynamic currents in the waters between Norway and Iceland as a test case. Later came Bjerkenes' monumental volumes on dynamic meteorology and hydrography, following which, and with gradual developments in mathematical method (in which Helland-Hansen's touch is repeatedly to be seen) many dynamic studies have been made for different parts of the sea. The current surveys made on the Grand Banks by the International Ice Patrol Service are a direct result of Helland-Hansen teachings. But again it awaited Helland-Hansen, working with Nansen as so often, to apply dynamic calculation to accumulated data for a great ocean, and so to make clear the circulatory tendencies existing on so broad a scale throughout the whole mile-deep mass of water.

There are many other accomplishments that I must pass by with mere mention—his detection of the penetration of light to great depths; his many regional studies of the sea; his measurements and discussions of tidal currents down into the deeps; his studies (again with Nansen) of thermal variations in sea and atmosphere; his teachings by word and pen. But there is one other picture I must indeed leave with you. And here we must again turn back the pages of oceanographic history. There was a time, even within my own memory, when the practise of sea science was thought to be necessarily a matter of

large ships and great sums of money; therefore the affair of national governments chiefly. And we have to thank Helland-Hansen and the other Scandinavian oceanographers for our present realization that physical and chemical work of the most exacting kind can be done on the high seas on small craft; that the use of sails on oceanographic ships is not obsolete, but may be of high advantage. Trained in a hardy school on the little research steamer *Michael Sars* under Johann Hjort (Agassiz medalist also) and Captain Iversen, Helland-Hansen in 1914 announced to the oceanographic world the launching, the year before, of the still smaller auxiliary ketch *Armauer Hansen*, and of her maiden cruise. It was not long before the fame of this little craft, only 73 feet long, and of her commander, Helland-Hansen, spread far and wide; her voyages crisscrossed the Norwegian sea and northeastern Atlantic; to Iceland; to Portugal; to Morocco; to the Azores. So successful indeed was she, and such a wealth of contribution came from her cruises, that she has served as a model for other research ships; most recently for our own slightly larger *Atlantis*. We thank Helland-Hansen for the fact that these little vessels go and come on the open ocean, carrying on their work with the highest standard of precision, in foul weather as in fair, accumulating threads of data from which a fabric of modern sea science is being spun.

OBITUARY

CARL EWALD GRUNSKY

IN the passing of Dr. C. E. Grunsky, the scientific world has lost an indefatigable worker, a man possessed of a happy combination of faculties which fitted him especially for the rôle he chose to follow. Primarily a civil engineer of renown, his interests were broad and his activity great. He became associated with the California Academy of Sciences in 1896 as a member and served on the Board of Trustees from 1898 to 1904. In 1911 he became corresponding secretary and was elected president in 1912, a position he held until his death. In addition he acted as director of the Museum of the Academy and the Steinhart Aquarium from 1932, succeeding the late Dr. Barton Warren Evermann. He became a patron on May 21, 1934.

He was born in San Joaquin County, California, on April 4, 1855, and attended the public schools of Stockton. In 1872 he went to Germany, thinking of medicine as a career, but changed to civil engineering, which he studied at the Realschule and Polytechnikum at Stuttgart. He graduated from the latter in 1877 and was given the Dr.Ing. degree in 1910. The same honor was received from Rensselaer Polytechnic Institute in 1924. Standard works of reference show the many positions of trust which he held in engineering circles; he was city engineer of San Francisco, 1900–1904; member of the Panama Canal Commission, 1904–1905; consulting engineer, U. S. Reclamation Service, 1905–1907, etc. Much of his life was devoted to matters pertaining to irrigation, drainage and river control.

He received the Norman Medal of the American Society of Civil Engineers in 1910, was vice-president in 1922 and president in 1924. In 1924 he was also president of the Pacific Division of the American Association for the Advancement of Science. He was president of the American Engineering Council in 1930–1931.

One faculty he possessed fitted him particularly for presiding over meetings and groups of people; he was a very clear thinker and could organize his subject-matter rapidly, yet he spoke with deliberation and crisp enunciation.

Political science, particularly those phases dealing with rates, taxation and forms of money, fascinated him and he published extensively on the subject.

He was always interested in art and during his later years found time to paint some of the backgrounds of the habitat groups of African animals now being installed by the academy. His death came suddenly at his home in Berkeley, California, on June 9, while he was mixing pigment and oil.

G. D. HANNA

RECENT DEATHS

GEORGE W. FULLER, consulting engineer of New York City, an authority on municipal sanitation and water supply, died on June 15, in his sixty-sixth year.

DR. CHARLES HENRY GORDON, emeritus professor of geology and mineralogy at the University of Tennessee, died on June 12 at the age of seventy-seven years.

DR. ROBERT GIBSON ECCLES, formerly professor of organic chemistry and dean of the Brooklyn College of Pharmacy, for ten years a member of the committee on revision of the U. S. Pharmacopoeia, died on June 9 as a result of injuries received when struck by a trolley car. He was eighty-six years old.

W. L. FOSTER, professor of civil engineering at the Iowa State College, died on May 22, as a result of an automobile accident.

MARCUS E. JONES, explorer, formerly curator in botany at Pomona College, a resident of Salt Lake City, was killed in an automobile accident on June 3. He was eighty-two years old.