far-reaching good from a faithful carrying out and expansion of the policy here indicated.

A second question raised by this meeting concerning the policy of the congress for future meetings is: What should be the relation between "pure" and "applied" science in the formal programs and in the actual work of the meetings? Numerous, close-at-hand, and urgent as are the practical problems confronting all the countries of the Pacific region, the tendency will always be strong for applied science to push itself too much into the foreground. There will be constant danger that pure science will not get a chance to play the part which it really must play in order that the central idea of the congress may yield its best fruits.

This question dips too far down into the nature and true function of science to permit any adequate discussion of it here. But this much of practical moment may be said on the subject: An examination of the nature of science discovers that scientific research is one of the means acquired by man in the long and hard course of his evolution to assist him in solving the problems of his life upon the earth. It is one of man's adaptations to the environing conditions under which his life is possible. From this it follows that every problem of natural science may be seen to have both a pure and an applied phase. The widely held notion that some scientific problems are wholly pure, while others are wholly applied, rests upon a defective understanding of the nature of science. The practical value of seeing what the true relation is between pure and applied as used in connection with problems of natural science is that it brings home to the scientific worker the important truth that the more pressing and difficult is a given problem of applied science, the more necessary is it to study that problem broadly and deeply as a problem of pure science.

When one views the program of the Australian meeting in the light of what has just been said, he notices certain rather serious defects in it. For instance, the two most basic natural sciences, hence the ones most broadly relative to all special and applied problems, namely, physics and chemistry, were not formally represented in the program. To leave out the great sciences of mathematics and astronomy altogether was more than sound theory and healthy practice in science could approve. Theoretically and practically, these sciences should be added as soon as circumstances make it possible to do this effectively. The question of further enlarging the group of biological sciences so as to include such major divisions as physiology and bacteriology will naturally come up sooner or later.

But from the standpoint from which this glance at the general idea of the Pan-Pacific Science Congress is taken, the most important expansion of the work which ought to be made is in the realm of the humanistic sciences.

This fundamental matter I propose to make the subject of a special article in the near future.

WM. E. RITTER

BERKELEY, CALIF.,
JANUARY 25, 1924

THE TWENTY-FIFTH ANNIVERSARY OF THE DISCOVERY OF RADIUM

THE discovery of radium by the Curies was officially announced to the world in a paper read before the Academy of Sciences of Paris on December 26, 1898. The twenty-fifth anniversary of this momentous event in the progress of science was appropriately celebrated in Paris on the initiation of the Curie Foundation. The writer happened to be in Paris at the time, and was kindly invited to take part in the celebration.

The principal ceremony took place at the Sorbonne and was presided over by President Millerand. The program was as follows:

(1) *La Marsellaise,* played by the band of the Republican Guard.

(2) *Allocution by M. Paul Appell,* rector of the Academy of Paris and president of the Curie Foundation.

(3) *Polonaise Number 4* (Chopin), played by the band of the Republican Guard. The sentimental appropriateness of this selection is obvious since Poland is Madame Curie's native country.

(4) The presence of Professor Lorentz, who came from Leyden to take part in the ceremony, caused a change in the program. President Millerand called on the eminent Dutch physicist to speak at this point. In very good French he brought out clearly the importance of radioactivity in modern physics, its relation in the unification of chemistry and physics, and the part played in the determination of atomic structure.

(5) *Conference by M. Jean Perrin, "Radioactivity and its importance in the universe."* Professor Perrin compared the advent of radioactivity to the conquest of fire by primitive man. He then reviewed the salient points of the discovery and of the properties of radioactive substances, emphasizing the transmutation of one element into another and mentioning the possibility of being able to do this at will in the future.

(6) *Reading of the significant passages in the scientific communications of the Curies* in which the initial discoveries relative to radioactive bodies were originally announced to the Academy of Sciences.

Very appropriately these excerpts were read by M. André Debierne, who was associated with the Curies in the early days of the work, and has continued his collaboration with Madame Curie. To the physicist this was the most dramatic part of the program. It gave a vivid picture of the different steps which culminated in the discovery of radium.

(7) *Some Fundamental Experiments.* These were made by M. Holweck and Mlle. Irene Curie of the Curie Laboratory. They were executed most successfully and impressed the audience greatly. The first was the discharge of a gold leaf electroscope by radium radiations, demonstrating the ionizing property of the rays. The second illustrated the random emission of alpha particles. In this experiment use was made of a radio-telephony amplifying system and loud speaker to "announce" the arrival of one alpha particle in a suitable ionization chamber. A so-called "radium clock" was then shown. The last experiment consisted in allowing radium emanation to diffuse into a glass tube coated with zinc sulfid which became phosphorescent, due to the bombardment of the alpha and beta particles.

(8) *Conference by Dr. Antoine Beclère, "Radium and Medicine."* In his address, Dr. Beclère outlined the rapid progress of radium therapy and the important place which it now occupies in the treatment of malignant disease. *Le Temps* of December 27, 1923, quoted the following vivid passage:

> Formerly surgery was the only means to combat cancer. To-day there is a happy competition between radium and X-rays and the surgeon's knife. These radiations represent so many *bistouris,* or rather invisible arrows, wonderfully sharp and piercing, which riddle the whole diseased region and, without bleeding or mutilation, without injuring the skin, they kill in a deep-seated organ the cancer cells, leaving the neighboring normal cells intact.

(9) *President Millerand called on Madame Curie to talk.* She arose amid enthusiastic applause, and was evidently deeply moved. In a very low voice she spoke of her work, paying tribute to the genius of Pierre Curie. Speaking of the discovery of radium she said:

> It was a most modest enterprise undertaken by two humble beings anxious to serve. Started in the old school of physics where we could not find proper facilities, we were worried with difficulties which at times seemed insurmountable. We continued in spite of difficulties in order to realize an ideal which made us slaves to science. The discovery of radium was made under the most precarious conditions in a humble building that has since become legendary. Of the benefits which resulted therefrom one of us did not profit. Pierre Curie left us several years before the creation of the laboratory which bears his name. But we know that the rule of his life was to go on with his work no matter what happened, and according to his own fine expression "to make of life a dream and of a dream a reality" It is gratifying to know that by an unhoped-for good fortune, our discovery has helped to relieve human suffering.

(10) *Address by M. Léon Bérard,* minister of public instruction. M. Bérard said he could not speak of the discovery of radium as a scientist, but he was happy to bring to Madame Curie the enthusiastic homage of the French Parliament. He spoke of the philosophical aspects of the great discovery, and paid tribute to science and the unselfish devotion to the search for truth of scientists such as Madame Curie.

(11) *Allocution by President Millerand.* President Millerand recalled the visit which he, in the capacity of minister of commerce, paid to the poorly equipped laboratory in which the Curies were carrying out their pioneer work, soon after the announcement of the discovery of radium. He mentioned the profound impression which M. and Mme. Curie made upon him. In conclusion he said:

> The Government of the Republic, and Parliament as faithful interpreters of the people's thoughts, have already offered Madame Curie a concrete national recompense.[1] May she receive it with the solemn homage which we pay her to-day as a sincere token of the universal sentiments of enthusiasm, respect and gratitude in which she is held.

(12) *A march played by the band of the Republican Guard* ended the ceremony.

One of the touching episodes of the afternoon was the presentation to Madame Curie of a winged Victory in bronze, by a representative of the student body of France. Also the Belgian students were represented by a delegation of 120 who arrived in Paris unexpectedly. They offered their tribute in flowers.

It is hardly necessary to say that the *élite* of the intellectual aristocracy of France were present *en masse.* Seats had been reserved on the stage for them and the representatives of foreign learned societies and institutions. From America, in addition to the writer, there were Professor Noyes, representing the American Chemical Society, and Dr. Gendreau, representing the Université de Montréal (Canada).

OFFICIAL INAUGURATION OF THE CURIE FOUNDATION

Since the Curie Foundation is practically unknown in this country, it is perhaps well to give a brief outline of its historical development. In 1922 the University of Paris and the Pasteur Institute in close cooperation founded the Radium Institute. In the years 1912–1914 two modern laboratories were built,

[1] This refers to the yearly allowance of 40,000 francs which Parliament had voted to Madame Curie a few days previously.

to be devoted separately to chemical and physical researches and to biological studies of radiation. The former is an intrinsic part of the University of Paris and is directed by Madame Curie. The latter bears an analogous relation to the Pasteur Institute and is under the directorship of Dr. Cl. Regaud. The war came before the laboratories were even fully equipped and their work came to a standstill until the end of 1918. At this time, however, the work was taken up with renewed zeal, and rapid progress has been made.

Since the Pasteur Pavillion is devoted to purely scientific investigations, the need soon arose for a suitable place in proximity to the laboratory where patients could be treated properly. It was to supply this need that the Curie Foundation came into existence. It is a private organization which has undertaken to supply means to the Radium Institute for scientific research, and particularly for the therapeutic applications of radium and X-rays. The foundation was recognized of public utility by official decree in May, 1921, and has enjoyed since the support of the government.

The president of the Board of Directors is M. Appell, rector of the University of Paris; the vice-presidents are Dr. Roux, director of the Pasteur Institute, and Madame Curie; the treasurer is Dr. Henry de Rothschild, one of the founders; the secretary is Dr. Regaud, director of the laboratory of radiophysiology of the Radium Institute.

The foundation has at the present time a dispensary adjoining the Radium Institute, a department at the Pasteur Hospital, and a department at the Medico-Surgical Clinic. The dispensary consists of two two-story buildings. One, the Rothschild Pavillion, is devoted to radium therapy, and the other to X-ray therapy and diagnosis. No wards or rooms for the hospitalization of patients are available here, so that patients needing hospital care must be taken by ambulance to the two above-mentioned departments in other institutions. This is a serious disadvantage, which is felt keenly by the staff, and steps are being taken to correct it. The two buildings are very well arranged and equipped. For radium therapy 2,700 milligrams of radium element are available. A considerable part of this is in solution for the preparation of emanation; the rest is used in fixed needles or tubes. The X-ray equipment consists of six high voltage machines of the latest design, from which a total of eight X-ray tubes can be run simultaneously.

It will be of interest to American women who donated one gram of radium to Madame Curie to know that this radium is kept in the Curie Laboratory and used exclusively for experimental work by Madame Curie and her co-workers. Before she received this gift she had practically no radium, because in 1918 she had given the Curie Foundation the gram which she had prepared herself from Bohemian ores. This was in accordance with her husband's wishes, for they had agreed that they should get no personal material advantage from their discovery.

Other contributions to the supply of radium at the Curie Foundation were made by Dr. Henri de Rothschild and by the French Government.

A number of fellowships, of the value of 12,000 francs each, are available annually. They are awarded to properly qualified research workers to carry out in the laboratories of the institute investigations relative to the biological actions of the radiations or to the radio-treatment of cancer.

Indigent patients are examined and treated gratis; to others a reasonable charge is made, payable to the foundation. The medical staff can not collect fees from patients treated as private patients.

The Curie Foundation had functioned for a considerable time, but the formal inauguration was reserved for the morning of December 26. M. Paul Strauss, Minister of Hygiene, presided over the meeting. M. Appell spoke first. He praised particularly the minister of hygiene for his efforts in organizing in France a systematic fight against cancer by the establishment of regional centers, of which the Curie Foundation is the most conspicuous one. He thanked Madame Curie for her generous gift of one gram of radium, and all those who had made financial contributions. Finally, he praised Dr. Regaud, whose disinterested devotion to the work has made its rapid development possible. Dr. Regaud then explained the practical functioning of the foundation.

Professor Bergonié, one of the pioneers of radiation therapy, paid a tribute to Madame Curie and recalled with emotion that it was in his laboratory in Bordeaux that she deposited her radium in September, 1914, at the time when it was feared Paris would be captured by the Germans.

M. Strauss took this occasion to thank all those who had cooperated with him in his efforts on behalf of the cancer patient. He announced then that Parliament had voted unanimously five million francs for the purchase of radium.

A tour of inspection through the two buildings concluded the program.

DINNER GIVEN BY DR. HENRI DE ROTHSCHILD IN HONOR OF MADAME CURIE

The Rothschild family have been interested in radium since the beginning of the work. In the early days they were influential in securing some of the Bohemian ores needed by the Curies. Dr. de Rothschild has established a fund of 200,000 francs for the Curie Foundation and has contributed 400,000 francs for the purchase of radium. The celebration of the twenty-fifth anniversary of the discovery of radium was completed in the evening by a dinner at his

house, given in honor of Madame Curie. There were probably more than one hundred guests, including high government officials and the leading men of science in France. Madame Curie was very happy and cheerful the whole evening. In spite of the strenuous day she had had, she remained until a late hour.

G. FAILLA

MEMORIAL HOSPITAL,
NEW YORK CITY

THE SUBMERGED COASTAL PLAIN AND OLDLAND OF NEW ENGLAND

THE coastal plain of New Jersey presents the normal features of a maturely dissected landform of its type: a cuesta with strongly contrasted gentle backslope towards the sea, and a steep inface towards an oldland of crystalline rocks from which it is separated by a broad inner lowland. In the Long Island region the inner lowland is largely submerged to form Long Island Sound; and very little of the coastal plain cuesta projects above sea level, much of the island consisting of overlying glacial débris. It would seem, therefore, that there was a progressively greater submergence of the coastal plain topography towards the northeast, and that we should explore the bottom of the Gulf of Maine and adjacent waters for a possible continuation of the topographic elements so well developed in the New Jersey region.

With this end in view the junior author prepared a series of 25 projected profiles extending from north to south and from east to west across the Gulf of Maine, and prolonged them to include adjacent land areas on the north and west, and on the south the region of the Banks to the edge of the continental shelf. For each north-south profile all the soundings shown within a belt of longitude 10 minutes wide on the U. S. Coast and Geodetic Survey charts Nos. 1106 and 1107 were projected upon a single vertical plane. This gave a much better idea of the submarine topography than could be derived from simple linear profiles based on a wholly inadequate number of soundings, but avoided the too great generalization of the topography which results from projecting belts of very great width. For the east-west profiles belts of latitude five minutes broad were similarly treated. The results obtained were checked at a large number of points by projected and linear profiles based on large-scale charts, and drawn both parallel to and normal to the general trend of the coast. For this latter series of profiles we are largely indebted to H. G. Bray, research assistant in physiography at Columbia University. Both series of profiles have been analyzed by the senior author, and compared with submarine profiles of regions to the north and south, in connection with a detailed study of the physiography of the Atlantic shoreline. Some of the results seem of sufficient general interest to deserve record here.

The profiles show that the Banks, extending from Nantucket Shoals past Georges Bank and Brown Bank, and on to the northeast, have in the region under investigation the typical form of a cuesta with gentle backslope towards the southeast and steep inface toward the oldland of Maine. The inface is in places an imposing submarine escarpment rising steeply from 700 to 800 feet or more above the floor of the deeply submerged inner lowland. The lowland floor is trenched by what appear to be normal river valleys, while the gentle backslope of the cuesta shows linear depressions, parallel with the inclination of the surface, which may represent traces of the consequent drainage system incompletely obscured through the deposition of débris by wave and current action. Both the gentle backslope of the cuesta and its steeper escarpment show minor cuestas such as are common to mature coastal plains comprising alternate layers of resistant and non-resistant strata. Two subordinate cuestas appear to extend some distance out across the floor of the lowland and to curve roughly in sympathy with the changes in direction of the main escarpment. The major cuesta may appropriately be called the "Banks Cuesta," and its general correspondence in form to the New Jersey cuesta is clearly established.

The analogy with New Jersey conditions extends farther. In New Jersey the oldland consists of crystalline rocks into which there has been down-faulted a great block of weak Triassic sandstones. Erosion of the sandstones in a new cycle following peneplanation has produced a lowland of faint relief, which merges with the inner lowland of the New Jersey coastal plain to give a very broad belt of low-lying land of subdued topographic expression. On the northwest the Triassic Lowland is bounded by a rectilinear fault-line scarp leading up to the relatively high and rugged crystalline upland which better resisted the agents of subaerial denudation.

The submarine profiles reveal all these topographic elements under the waters of the Gulf of Maine. On the northwest the crystalline oldland of New England slopes gradually downward toward the southeast to pass under the sea. For some distance seaward the rugged hill-and-valley topography can be traced in many of the profiles, until cut off by an escarpment, sometimes subdivided into two or possibly three branch scarps, beyond and below which the seafloor is usually less irregular. The escarpment has in one place a total height of nearly 1,000 feet, counting the combined elevations of two branches; but from one or two hundred feet to double that