they use in manufacturing proteins; or else, contrary to the current opinion, they must be able to transform carbohydrates into proteins." He was unable to demonstrate fixation of atmospheric nitrogen, and, as the other alternative is obviously impossible, the question of the source of nitrogen was left unanswered. Cook and Scott (1933)[2] have questioned the ability of termites to survive on a diet of cellulose, and presented data to show that termites require a diet including carbohydrates, proteins, salts and vitamins A, B, D and G. These authors used as criteria viability and group weight of non-reproductive colonies over a relatively short period of time, and also placed considerable weight on the presence or absence of cannibalism. These criteria are subject to some criticism because, as pointed out by Hendee (1935),[3] cannibalism often occurs in normal colonies on a natural diet of rotten wood. This might account for a decrease in weight and numbers during the first few months which could not be attributed to a deficient diet. Even though the termites may not be able to survive indefinitely on a diet of pure cellulose, as claimed by Cleveland, his data indicate that the colony lived and thrived for a surprisingly long time on a diet of pure cellulose.

Although the writers have never worked with termites they have been interested in the general subject of symbiosis between insects and microorganisms. While reviewing the work on termites and protozoa there occurred to them a possible explanation of the apparent ability of termites to thrive on a nitrogen-deficient diet. Because the writers probably will never have an opportunity of testing the hypothesis experimentally it is presented here for what value it may have.

The hypothesis is based on a possible nitrogen cycle within the termite colony. The symbiotic microorganisms, including protozoa, bacteria and spirochetes, are localized in an enlargement of the hind-gut *behind* the point where the Malpighian tubules enter the intestinal tract. The urates and other nitrogenous waste products excreted by the Malpighian tubules are probably utilized as food by the microorganisms and elaborated into protoplasm. Since anal feeding (the feeding on excreta of other individuals) is common among termites, the bacteria and protozoa or their dead bodies obviously are consumed by some individuals of the colony. Refaunation has been considered the principal function of anal feeding. It may also play a part in the nitrogen economy within the termite colony. The synthesis of protoplasm from urates by the protozoa and the utilization of the dead protozoa as food by the termites would permit the same nitrogen supply to be used over and over. In this way the metabolic processes of the termite colony could continue indefinitely as long as carbohydrates are available. The maximum size of the colony would of course be limited by the amount of nitrogen originally available in the bodies of the founders of the colony. Within this limit such a nitrogen cycle within the termite colony would permit the colony to live for a very long time on a diet apparently consisting of cellulose only.

It is also possible that some nitrogenous matter derived from dead protozoa within the digestive canal is absorbed directly through the anterior region of the hind-gut, especially since one of the functions of the ileum is absorption. If this occurs the nitrogen would be used over and over by a single individual, increasing still more the efficiency of the insect's nitrogen economy.

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QUOTATIONS

JUBILEE MEETING OF THE INDIAN SCIENCE CONGRESS

THIS week, the twenty-fifth meeting of the Indian Science Congress Association opens in Calcutta, the jubilee being marked by the attendance of a strong delegation from the British Association; Lord Rutherford was to have presided at the meeting, but fate decided otherwise, and the association has been fortunate enough to persuade Sir James Jeans to take his place. It may be hoped that this meeting will confirm the growing appreciation in India of the value of modern science.

In the address prepared for the meeting by Lord Rutherford before his death, he pointed out that prior to the first decade of this century scientific research in India was, with a few notable exceptions, confined to the great scientific services, initiated and maintained on a generous scale by the government, such as the Survey of India, the Geological Survey, the Botanical Survey, the Departments of Agriculture and Meteorology, and others. To the work of members of the Trigonometrical Survey we owe the principle of isostasy, while the development of the mineral resources of the country has been due largely to the activities of the Geological Survey. In forestry, the fine research institute at Dehra Dun is a monument

[2] S. F. Cook and K. G. Scott, "The Nutritional Requirements of *Zootermopsis* (*Termopsis*) *angusticollis*," *Jour. Cellular and Comp. Physiol.*, 4: 95–110, 1933.

[3] Esther C. Hendee, "The Rôle of Fungi in the Diet of the Common Damp-wood Termite, *Zootermopsis angusticollis*," *Hilgardia*, 9: 499–525, 1935.

to the enthusiasm of past members of the Indian Forest Service. The Indian Medical Service has been the means of giving the world, not India alone, new weapons for the attack on tropical diseases such as malaria, cholera and leprosy.

While this work was going on steadily, the Indian universities were being founded, and at first attention was mainly directed to the instruction and examination of students. There were always a few, however, who realized the rôle the universities must eventually take in the promotion of research, and, as a result of the Curzon Commission on Education in 1904, many of the universities introduced honors courses, and by new appointments and improvements in laboratories stimulated research in science. Amongst the pioneer men of science in India who distinguished themselves by original investigations, Lord Rutherford mentioned in his address Sir Alexander Pedler, Sir J. Chandra Bose, Sir Alfred Bourne and Sir Prafulla Rây.

For geographical reasons, personal contact between scientific workers in India is difficult. Occasional meetings of specialists may be arranged by the Board of Scientific Advice, but these meetings do not affect the university teachers, and in the autumn of 1911 two newly appointed professors, P. S. MacMahon in Lucknow and J. L. Simonsen in Madras, feeling the isolation in which they worked, considered that the time was ripe for the organization in India of a body having the same aims and functions as the British Association for the Advancement of Science. After considerable discussion, and acting on the advice of Sir Thomas Holland, a small committee was constituted to consider the formation of such a body. This committee met on November 2, 1912, and it was decided to ask the Asiatic Society of Bengal (now the Royal Asiatic Society of Bengal) to arrange for the holding of a science Congress in Calcutta in January, 1913. Various difficulties, however, necessitated the postponement of this meeting until January, 1914. The arrangements for the meeting were in the hands of the Royal Asiatic Society of Bengal, and thus commenced an association to which the Congress undoubtedly owes much of its success. The organization of the Congress has followed closely that of the British Association, although, in view of their special importance in India, sections of medicine and veterinary science were included.

The numbers attending the first meeting, when the late Sir Asutosh Mukherjee, vice-chancellor of the University of Calcutta, was president, were small; some thirty scientific communications were read, mainly by authors resident in Calcutta or its vicinity. This appeared to justify the critics of the scheme who had suggested that geographical difficulties would preclude its success. However, the Government of India early recognized the potential value of the Congress and authorized the payment of expenses to selected government servants. As a result, the second meeting, in Madras in 1915, was more largely attended and communications were received from authors as far distant as the Punjab and Ceylon. Since these early days, the Congress has grown very greatly, as shown by the size of the *Proceedings,* which in 1914 filled six pages and in 1928 four hundred and twenty.

Whilst this increase in the number of communications read to the various sections provides evidence of the growth of scientific inquiry in India, the main success of the Congress has been, as the original promoters had hoped, in the social contacts which it has provided and the public interest in science which it has aroused in the various centers it has visited. It has stimulated also the formation of such specialist societies as the Indian Botanical Society and the Indian Chemical Society.

While substantial progress in both teaching and research has been made by the universities of India, their responsibilities—and with them those of the Indian Science Congress Association—must inevitably increase. In this present scientific age, efforts are everywhere being made to develop natural resources to the utmost, to improve industrial processes and to increase our knowledge in pure science. It is to the universities and technical institutions that we must look for men to carry out this work. The universities must be able, not only to give instruction, but also to select those who are to be trained in the methods of research. From the latter we may expect to obtain future leaders of research, on whom the prosperity of the country will largely depend.

The utilization of science implies, moreover, a planned scheme of research. Here the experience of some of the Overseas Dominions may prove of service to India. In Canada and in Australia, there are State or Provincial Governments as well as a Federal Government, and in both cases it has been found expedient that the research organization of the country should be truly national and responsible to the federal government alone. Even in an empire the size of India, where the resources and needs of various provinces are widely different, it would seem that centralized organization of research is the only way of avoiding waste of money and effort. The detailed planning of research must be in the hands of those with the necessary specialized knowledge, and they must be able to act without suspicion of political or racial influence. Here the Indian Science Congress Association has shown, over a long period of political turbulence, what can be accomplished, for a marked feature of the congress has been the complete absence of racial and communal strife; it has remained quite unaffected by these tragic influences, doubtless due in part to the tact of the various general officers and to the very valuable services of the secretary of the Royal Asiatic Society of Bengal, Mr. J. van Manen.

Since the foundation of the Indian Science Congress Association, it had always been hoped that it might prove possible to arrange for an over-seas visit of the British Association to India. The necessity, for climatic reasons, of holding such a meeting during the cold weather (November to February), the middle of the academic year, offered serious difficulties. However, they have now been overcome, and, moreover, the precedent has been established of sending a delegation to a joint meeting with another organization. This is undoubtedly of great significance. Valuable as are personal contacts within a country, such contacts with workers in other countries and the opportunity of seeing the conditions under which they work are of even greater value, while the presence of a body of distinguished scientific visitors in India can not fail to be a source of inspiration to students and scientific investigators in that country.—*Nature*.

SCIENTIFIC BOOKS

MADAME CURIE

Madame Curie. A biography by EVE CURIE. Translated by VINCENT SHEEAN. Doubleday, Doran and Company, 1937.

THIS book is a reverent tribute to a gifted person and a sterling human being. Eve Curie, one of Madame Curie's two daughters, has put her soul into the work, and the well-known author of "Personal History" has done a fine job in translating it. Since the book is for the million and not for the select few, the emphasis is very properly on the personality of the heroine (and on *her* hero, Pierre Curie) This is as it should be; for the technical details involved in the discovery of radium have been described many times.

Much as one admires the scientist, the temptation here is to admire the woman as woman even more. In a world so distracted as the present, where the outlook of the caveman is applauded, the story of Marie Curie (and Pierre Curie, for the two are indissolubly bound) is the story of a noble spirit whose activity is, in a sense, a challenge to utter pessimism. Alas! We know only too well that great scientists do not always make fine men. What is called "truth" seems often a laboratory, but not a life necessity. But then, once in a while a Curie, a Rutherford, an Einstein appear if only to emphasize the absurdity of such a separation. All honor to the memory of a Marie Curie, who was a great scientist and a noble woman. All the more honor to her these days, when the tendency is for fanaticism to impose a goose-step rigidity of utterance; when tyrants seek to establish intellectual sterility.

The story starts with the child and the young woman in Poland. As Marie Sklodowska, the future Mme. Curie studies mathematics and physics in school and joins the rebellious Polish youth in their plan for an independent Poland. She lived to see a Poland reborn which set about persecuting its own minorities. But that was to come. In the meantime, we meet her again, this time in Paris. She lives in a garret six flights up. The room is cold, the food is scarce and the physics with Lippmann at the Sorbonne is absorbing. In 1894, when 27 years old, comes the touch of romance. She meets Pierre Curie. Somewhat later, Pierre discloses his love and his philosophy:

> It would be a lovely thing, in which I hardly dare to believe, to pass through life together hypnotized in our dreams: your dream for your country; our dream for humanity; our dream for science. Of all these dreams, I believe the last alone is legitimate. I mean to say by this that we are powerless to change the social order. Even if this were not true, we should not know what to do. And in working without understanding, we should never be sure that we were not doing more harm than good, by retarding some inevitable evolution. From the point of view of science, on the contrary, we can pretend to accomplish something. The territory here is more obvious and solid, and, however small it is, it is truly in our possession.

And so they marry, and work together and struggle together—on a salary of 300 francs a month, "comparable to that of a day laborer." Not until 1906, a few months before his death (he was run down by a truck and instantly killed), did Pierre get a chair of importance at the Sorbonne. In the meantime, they gave radium to the world. They took out no patents; they withheld nothing. "It would be contrary to the scientific spirit," said Marie; and Pierre agreed. They were carrying out their pact, to serve humanity; and humanity took what they gave, and thanked them very largely in polite speeches and empty honors.

Apparatus and equipment for the laboratory ate up the money obtained with the Nobel prize. The "laboratory" was an abandoned shed, with a leaky roof, and devoid of hoods to carry away poisonous gases. In bitterness does Marie write ("Pierre Curie," by Marie Curie): "Our society, in which there reigns an eager desire for riches and luxury, does not understand the value of science. It does not realize that