a number of lectures on the use of metric weights and measures.

Through the cooperation of the department mentioned, a schedule of the lectures was arranged and it was made known in various centers throughout Canada that my services in connection with the metric campaign would be available on certain dates for the various local societies interested in this subject.

In carrying out this rather strenuous schedule, lectures were given in Montreal, Ottawa, Toronto, Winnipeg, Regina, Vancouver and in over thirty other Canadian cities. In some places the idea of the simple metric system corresponding to decimal currency was then new to many people. Our meetings were well attended; in some cases as many as six hundred people being present. At the close of each address all present were invited to take part in the discussion of the subject. The pros and cons were propounded with the utmost frankness and in some cases with considerable vigor. Never during this lecture tour or at any other time have I heard, in so far as I can judge, a really valid argument against the general use of metric weights and measures. On the other hand the many valid reasons for their use increase as time passes.

It is highly desirable that this preliminary educational work, conducted entirely at the expense of our government, should be effectively followed up. It is chiefly for the purpose of encouraging others to do their part in securing for Canada the advantages of the use of the metric system that on April 28, 1922, I accepted the chairmanship of the Toronto Section of the Metric Association. At that time Mr. W. P. Dobson, of the Hydro-Electric Power Commission, was elected secretary, and Mr. L. Burpee, of the Canadian General Electric Company, Ltd., was elected treasurer. Our section is composed of volunteer workers who desire to see the metric campaign progress as it should. We believe that everybody can do something to help. We hope that a great many people will let Mr. Dobson know that they will help the metric movement in their own industry or line of work.

The Metric Association has a local section and a good group of members in Toronto. In the French-speaking portions of Canada the public opinion in favor of the metric system is almost unanimous.

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QUOTATIONS

SCIENTIFIC RESEARCH

THE patient technique of laboratory research does not seek the limelight of sensational discovery. For this reason the public mind does not grasp completely the significance of the work carried on by hundreds of students, up and down the country, whose investigations are bringing greater worth and purpose to the conditions of national life. The Report of the Committee of the Privy Council for Scientific and Industrial Research for the year 1923–24 serves to remind us of the ever-increasing dependence of health, commerce and industry on the adequate opportunities afforded for scientific inquiry and accomplishment. The problem is, however, less a financial than an educational one. Money for research is there—over half a million was spent during 1923–24—but often the speed at which work can be carried out is limited—as in the case of the Fuel Research Board—"by the number of competent and trained workers available." It is to the university that we must look to give us the trained student, patient though adventurous, imaginative though cautious, cooperating without self-seeking to increase the sum of human knowledge. We have to ensure, also, that no alert and creative mind is barred from that training through lack of means to rise through the secondary school to the university. There is still too much reason to fear that reserves of ability are untapped owing to the failure of certain local education authorities to make careful provision for the poorer scholars. Last year 291 grants were made by the council to research workers and students in training, of which 244 were allowances enabling them to take advantage of facilities for training in research afforded by various universities. The grants made during the academic year 1923–24 amounted to £41,000 as compared with £49,000 during 1922–23. The transfer to university and college authorities of the responsibility for recommending rates of allowance in accordance with the needs of individual students has led to more generous help from local funds and greater local interest in these activities. Nevertheless, the powers of local authorities under section 74 of the Education Act, 1921, are not so fully utilized as they might be.

There are, however, other considerations beyond the financial which need to be taken into account in the training of students for research. Sir William McCormick, the administrative chairman of the Advisory Council, warns against too easy specialization. "Experience has taught us," he says, "to attach great importance to the student's school history, and our conviction grows that in the last two years of school life science must not be allowed to absorb the whole of the students' attention, to the exclusion of the humanities and to the detriment of his general education"; and Sir William urges further that "at a later stage, when the student has graduated and is serving his apprenticeship to research, we should like to see him encouraged to devote attention as part of his training to the historical and cultural aspects of the subject in which he is specializing." Inability to interpret contemporary social phenomena by the light of the past has been one of the causes which have often prevented expansion of method and the acceptance of

new ideas by leaders of industry. The war destroyed much of the crippling conservatism which had hitherto hampered development. The outcome is to be seen in more scientific organization and production in factory and workshop. Probably no movement has been of greater value to industry than the setting up of research associations in 1918, 1919 and 1920 under the government's scheme for industrial research and the consequent growth of cooperation and team work in dealing with problems common to the methods and processes of the various trades. The report shows that many of these problems are incapable of solution by one branch of science alone, and consequently it is essential that there should be increasing cooperation between chemists and physicists, biologists and engineers. An interesting instance of cooperation with medical research is seen in the financial help given to the Medical Research Council, accompanied by expert assistance from the Engineering Research Board, to enable the council to investigate problems of machine design in relation to the comfort and efficiency of the operator. Employers are only now beginning to understand how greatly industrial contentment, efficiency and output can be increased by comfort in manipulation and adequate light and ventilation in the factory.

There is need also to educate public opinion in regard to the value of research in the domain of national health, and the work of the Fuel Research Board in this direction should receive more general recognition. The Gas Regulation Act of 1920, which was based on the work of the board, has already led to substantial savings. The physical and chemical survey of the national coal resources, the research in carbonization and in by-products, the possible modification of the blast furnace are all likely to have important bearing on the prevention of waste and the diminution of the smoke evil. Public opinion, however, must press for proper fuel control in industrial works; "without it," says the report, "the advantages of better fuel which research may provide would be largely nugatory."—*Educational Supplement of the London Times.*

SCIENTIFIC BOOKS

The Physiology of Photosynthesis. By SIR JAGADIS CHUNDER BOSE. Longmans, Green and Co., New York, 1924; VII—287 pp., with 60 illustrations.

THE work under review comprises twenty-eight short chapters on about as many separate problems of the phenomenon of photosynthesis. The author confines himself largely to a description of apparatus and experiments of his own design and the results he has obtained therewith. The experiments were carried out with the water plant, *Hydrilla verticilla,* and the evolution of oxygen from the plant during illumination was taken as a measure of the rate of photosynthesis. As has been known for a long time, the gas which is emitted from an illuminated plant is not composed of pure oxygen but contains varying amounts of nitrogen and carbon dioxide. In order to avoid this source of error in the determination of photosynthetic activity by the volume of oxygen emitted, the author, in one of the methods described, removes the nitrogen from the water and the plant by placing these under a vacuum at the beginning of the experiment. It is stated that under these conditions pure oxygen is evolved in the light. Another familiar error in the bubble-counting method is due to the variation in the volume of the bubbles. This error the author has endeavored to remove by the use of a device which collects a definite volume of gas; a slight increase in the pressure of the gas causes its release, which is recorded on a revolving drum. By means of this apparatus, which was also elaborated into an automatic recorder of photosynthesis, a variety of factors which influence the rate of photosynthesis were studied.

In the results obtained on the relation between light intensity and photosynthetic activity no new contributions are made. Thus it is concluded (p. 48) that "Taking all factors into account, we find that *the activity of photosynthesis is proportional to the quantity of incident light.*" It is most unfortunate that absolutely no regard should have been taken of the mass of valuable information which has accumulated during the past twenty-five years on this and many other phases of the photosynthesis problem. In the arrangement of the experiments and in the interpretation of the results obtained the facts which led to the formulation of the theory of limiting factors are entirely disregarded, nor is there any consideration of the conclusions of other recent workers in the field, such as Harder and Lubimenko. The result of this general neglect in endeavoring to coordinate the observations recorded with the body of existing knowledge in photosynthesis is a most unsatisfactory one. Many of the phases of the photosynthesis problems are touched upon; none of them have been subjected to a thorough investigation. There are many interesting observations recorded, but their bearing is not certain because either they are purely unconnected or incomplete.

Interesting are the results of traces of iodine, formaldehyde and nitric acid on the photosynthetic activity. It was found that minute traces of these substances accelerate the activity enormously. Less fortunate are the author's conceptions of the "period of photosynthetic induction" and "photic stress"; the phenomena observed have been fully discussed some