



Dr. W. Campbell,

Chant, Dr. R. K. Young, Dr. C. E. Adams and Mrs. Adams, Mr. J. B. O. Hosking (Melbourne Observatory) and Lieutenant-Commander Quick (in charge of transportation). Among those to see them off were Professor Kerr Grant and members of the Adelaide Observatory staff. At Perth the expedition will be joined by Dr. R. J. Trumpler (Lick Observatory), Professor A. D. Ross (Perth University), Messrs. Nossiter, Dwyer, Nunn, Matthews, and Yeates (Perth Observatory), and by the British astronomers, Messrs. J. Hargreaves and G. S. Clerk-Maxwell. They will leave Fremantle on August 20 by the coastal steamer Charon for Broome and from there will proceed to Wallal in a small schooner. At Broome Dr. J. Evershed, of the Madras Observatory, and Mrs. Evershed will join the party.

the philosophy of these appearances, their origin, and the laws which regulate their visibility are unknown, perhaps because amid the multitude of other things to think about sufficient attention has hitherto not been paid to the study of them. The shadow bands seem to vary both in breadth and distance apart at different eclipses, and also in the speed with which they pass along. Though, as already stated, little is known of their origin, they may be conceived to be due to irregularities in the atmospheric refraction of the slender beam of light coming from the waning or the waxing crescent of the sun, for they may be visible after totality as well as before it. It is to be remarked that they have never been photographed.

The proposed experiment with the cinema cameras will be carried out by means of two aluminium sheets, each 5 ft. square. These will be laid on the ground. A stop watch will be started immediately they appear and the handle of the camera is started, and the actual time of taking will thus be checked. The time and the length of film used will be compared, and it is hoped by this means to gain data to work on. The bands are visible only for 15 or 20 seconds. It is also hoped that their general direction can be detected.

Arrangements have been made for all the motion pictures taken at Wallal to be forwarded to Adelaide for developing. They will leave Wallal by the aerial mail each week, and the whole story of the scientists' work and the eclipse itself (of which a motion picture is to be made, using a 6-in. lens and two special color screens) will be ready to be shown at a private screening by the time the party reach here again. Copies of the film are being sent to every observatory in the world.

LECTURE BY DR. CAMPBELL. SPLENDID PHOTOGRAPHS.

A large and appreciative audience filled the Prince of Wales Theatre, Adelaide University, on Saturday evening, when Dr. Campbell, Director of the Lick Observatory, U.S.A., lectured under the auspices of the Graduates' Association, on "Total Solar Eclipses." Professor Brailsford Robertson, president of the association, was in the chair, and amongst those present were the Lieutenant-Governor (Sir George Murray), who is Chancellor of the University, Miss Murray, and most of the professors.

Dr. Campbell screened a splendid series of photographic views, beginning with a map showing the course of the eclipse across the earth. He indicated the various places at which land observations might be taken, and explained the advantages and disadvantages of each. He had selected Wallal, in Western Australia, as the spot for his expedition, partly because at that place the eclipse would be of longer duration than at almost any other available point of observation, and partly because the records showed that during September, in past years, there had been clear skies and an almost entire absence of rain. A British expedition would observe the phenomena at Christmas Island. The total eclipse there would not last quite as long as at Wallal, but the place possessed some features which would make it particularly suitable to the work they proposed to do. At a later stage in his lecture, Dr. Campbell mentioned that the British expedition would pay special attention to work which it was expected would either confirm or disprove certain propositions of the Einstein theory. In 1913 Einstein stated that if certain groups of stars were photographed during an eclipse of the sun it would be found that the rays of light would be displaced on the plates about 7-8ths of a second of an arc as compared with similar photographs taken at night time when the stars were in approximately the same relative positions to the earth. For the eclipse of August, 1914, Dr. Campbell's expedition went to Russia with the intention, amongst other things, of testing this theory. They were unfortunate, however, in the conditions they met with. The sky was so clouded that they got no results at all. Later they made plans to test the theory in the United States. They fully expected to have the use of the instruments which they had taken to Russia, but owing to conditions consequent upon the war, they were unable to obtain them in America, and five weeks before the date of the eclipse of May, 1919, they began to improvise apparatus for their work. The lenses they got, however, were not suitable, and although some evidence was secured which, in their opinion, tended to confirm Einstein's theory, it was not regarded as conclusive. For that eclipse British expeditions went to Africa and Brazil. The African expedition was only partly successful, owing to cloudy conditions, but better results were obtained at Brazil, and British astronomers thought that these results were in the direction of the confirmation of Einstein's theory, but they were the first to suggest that the observation

should be repeated at the forthcoming eclipse. The lecturer explained that these displacements of rays of light would be very minute, if they existed at all, on the photographic plate, and to make sure of the accuracy of their calculations they had to supplement the photographs taken during the eclipse with other photographs of the same group of stars taken in the night time, in order to get plates with the images unaffected by the presence of the sun in the midst of the group of stars under consideration. Several of these plates had already been secured. He hoped the Adelaide expedition under Professor Diddwell, and of which Professor Kerr Grant was a member, were also securing similar plates. If they had not done so already, it would, of course, be possible for them to get the pictures at a later date, when the groups of stars were again in a similar position.

A number of views showing photographs which had been taken at previous eclipses were shown, and Dr. Campbell pointed out the variations in the sun's corona. He did, from a scientific point of view, a partial eclipse was not worth looking at. Total eclipses occurred somewhere in the world about once in two years, and these had been observed for the last 60 years, but as the totality lasted on an average for only about 3 minutes it made the aggregate time of observation under the conditions of total eclipse only approximately 90 minutes for that period. There were no phenomena in nature more interesting than those of a total eclipse. On September 21 next they need not expect midnight darkness during the time that

the sun was obscured. They would probably get a condition in regard to light such as existed about midway between the setting of the sun and the darkest hour of night. When the eclipse was nearing its full, the darkness would increase rapidly, but it would never be complete. It would be interesting for astronomers to watch how the corona would flash into view when the body of the sun was obscured. Until about 60 years ago the corona had attracted little attention, although its existence was well known, but prior to that time it was not believed to be part of the sun itself. The discovery was first made by a British astronomer. In placing on the screen views illustrating the different phases of the corona, Dr. Campbell mentioned that some of these were decidedly irregular, and showed streamers running out from the body of the sun for a distance of 2,000,000 miles. He would not trouble the audience with astronomical figures generally, as no one could comprehend them, not even astronomers. They were simply matters to be set down on paper, but the astronomer no more than the man in the street, was able to grasp these distances. The Adelaide expedition at Cordillo Downs would have a six-inch telescope, and his expedition at Wallal a five-inch instrument. It was expected that the condition of the sun would be a little brighter at Wallal than at the point of view of the Adelaide expedition, and consequently a five-inch telescope would be sufficient. It was important for scientific purposes to endeavor to ascertain some knowledge of the motion of the corona's structure. Already they knew that there was such motion, because the form of the corona was continually changing. There appeared to be some connection between the sunspot and this motion. When the sunspots were at their maximum, which occurred once in 11 years, the general form of the corona was approximately circular. When the sunspots were at their minimum the corona was elongated east and west, and was shorter in the polar regions. The lecturer dealt in an interesting way with the outer and inner corona and described the method which had been applied in the study of the chemical component parts of the sun. A generation ago it had been suggested that the coronal materials surrounding the sun were thrown into their varying shapes by magnetic force. An American astronomer had proved that the sun was a great magnet. After dealing with the chemical composition of the sun, Dr. Campbell placed on the screen interesting views of the Lick Observatory and the giant instruments in use there, and explained the advantage of the moving floor, which was the first of its kind ever used, and was a British invention. The reflecting telescope, which was the gift of an Englishman to the observatory, was the godfather of a number of others, some of them of larger proportions than that now in use.

The Lieutenant-Governor said they could not allow Dr. Campbell to leave without expressing their thanks to him for his informative, interesting, and enlightening lecture. They had never had a more distinguished astronomer than Dr. Campbell in Adelaide. Besides being a distinguished person, he was a man of extremely good nature, and he had consented to deliver the lecture at once when asked to do so. They also extended a welcome to the other members of the party, Dr. Chant and Mrs. Chant, and Drs. Adams, Moore, and Young. Profes-

61
sor Chant and Dr. Adams were members of their own family. Drs. Campbell and Moore, he was sorry to say, were not. (Laughter.) But he must confess that although he had been trying to discover the difference between these gentlemen and members of the family, he had failed. (Laughter.) They were just as welcome however, as members of the family. They had come a long way and taken a great risk, and it would be extremely disappointing, if the weather conditions should prove unfavorable. He trusted that the observations would be all that the party would desire, and that they would be able to confirm or shatter the Einstein theory. (Laughter and applause.)

Professor Mitchell (Vice-Chancellor of the University), supported the motion of thanks, which was carried with acclamation.

Dr. Campbell, in responding, said the party had received every assistance from the Commonwealth Government, and had received an unexpected welcome, which was beyond their imagination. He and some others were not of the British family, but they had no objection to their being called consins. (Laughter.) He could assure them that they did not feel aliens while in Australia. (Applause.)

Address of Cathedral by Dr. H. Heaton

A second address on "Business morality" was delivered by Dr. H. Heaton. After defining business morality as the duty of the business man towards his rivals, his customers, and his employees, as judged by some—presumably Christian—standard of ethical principles, Dr. Heaton quoted complaints, drawn from almost every century—from the eighth to the twentieth—concerning sharp unfair practices in the world of production and exchange. These were manifestations revealing the existence of a general problem, namely the commonly accepted view that "Business is business," something, in the words of Professor Clay, "outside morality, a department of life in which the ordinary rules of morality have no validity." How did that view arise? The aim of all economic activity was to produce the goods required to satisfy the wants of man, but the initiative in undertaking production and sale was left to free private enterprise. The motive of such enterprise was profit, and the services rendered to the community were only means to that end. Hence stress was placed in business activity on the acquisitive impulses in man, and these, if unregulated by society, or influenced by a general ethical view of life, tended to give play to selfishness and greed. Selfishness and the desire for wealth and power were probably as old as man, but in many periods they had been held in check by the limited area open for their operation or by religion or the State. The aim of self-interest was almost solely the accumulation of wealth, often regardless of the way in which it was obtained. That frequently meant the exploitation of the employe and the fleecing of the consumer, especially when the development of trusts limited the effect of competition. But the divorce between the economic life of society and its religion, art, moral traditions, and kindly feelings eventually provoked a revolt. Dreamers, such as Morris and Ruskin, had attacked the "reckless waste of life in the pursuit of the means of life," and declared that real wealth lay in happiness, affection, and spiritual well-being. Economists urged that the "immutable laws of political economy" were possibly neither laws nor immutable, and "that a morality which admitted so large an exception as business to its rules would be no morality." Meanwhile, a new type of business man began to be more common. Right through the 19th century there had been captains of industry who had obeyed the golden rule in their business affairs, and had treated their employes as more than "hands," and their customers as more than pockets. In England and America a growing army of employers and managers in recent years had attempted to break down the non-humanity of business relationships, and were regarding themselves as members of a profession whose aim was social service just as much as was that of the teacher or doctor. Yet, strange to say, these advocates of welfare work and of a high ethical code in business affairs had discovered that the new methods were not merely better than the old ones, but that they paid better. To them "Business is business" was bad economy as well as bad morality. As J. D. Rockefeller, jun., said in his "Industrial Creed," "I believe that the purpose of industry is quite as much to advance social well-being as material prosperity. I believe that that man renders the greatest social service who so cooperates in the organization of industry as to afford to the greatest number of men the greatest opportunity for self-development and the enjoyment of those benefits which their united efforts add to the wealth of civilization." The day had passed when the conception of industry as chiefly a revenue-producing process could be maintained. The nineteenth century had built up our complicated economic world; it was the task of the twentieth century to moralize it. Such a task was one of the many which lay before the church.

THE SOLAR ECLIPSE THE MYSTERIOUS SHADOW BANDS. MOTION PICTURE EXPERIMENTS.

Apart from the ordinary scientific interest attached to the observations to be made at Wallal during September by the visiting American and Canadian scientists, particularly interesting experiments are to be carried out by the aid of a motion picture camera.

When the party left Adelaide on Sunday there accompanied them two official cinematographers, Messrs. E. Brandon Cremer and J. C. Sharpe. Mr. Cremer, who is an Australian, went right through the war with his camera and saw work on all the fronts, doing a special six months' trip after the armistice through Russia for the American Red Cross. Later he enlisted in the Spanish Legion and on his return to London in a penniless condition gave a graphic account of the trials he and his fellow-adventurers went through. Afterwards he was in South Africa, and during his stay there accompanied a scientific expedition and obtained the first pictures of the pigmy race. He is a son of Mr. Brandon Cremer, who will be remembered in connection with the old Tivoli Theatre in Adelaide. Mr. Sharpe is an Adelaide boy, being a son of Mr. Sharpe, the locomotive foreman at Mile-End. He has just returned from Los Angeles, where he made a close study of the motion picture industry. He was chief draughtsman at Keswick during the war.

The operators will not only take motion pictures of the general incidents connected with the expedition, but will also attempt to photograph what are known as the shadow bands. So far no photograph has ever been obtained of this remarkable phenomenon. The bands appear about five minutes before totality and are in the form of singular wavy lines of light and shade that dance across the landscape. Mr. George F. Chambers, F.R.A.S., in "The Story of Eclipses," says:—"These are the 'shadow bands,' as they are called. The phase is curiously inexplicit, but seemingly cannot be improved on at present because