

THE ECLIPSE OF THE SUN.

PROFESSOR GRANT SATISFIED.

Professor Kerr Grant on Thursday sent a radio message from Cordillo Downs to the Registrar of the Adelaide University, stating "Complete programme successfully carried out."

THE GOONDIWINDI OBSERVATIONS.

Goondiwindi, September 21.

The scientists of all the expeditions are delighted with the results of their efforts. The weather was perfect, and the spectacle during totality magnificent. The corona was a brilliant display, and the effects were impressive beyond measure. At five minutes past 4 the planet Venus was distinctly seen, and a few minutes later Jupiter put in an appearance. Then the ruddy planet Mars came in view. At ten minutes past 4 the western sky became perceptibly darker from the horizon to the sun. It was intensely interesting to watch the change of colors in the sky and on the landscape. Almost every second the tints changed. It was a study in shadows, and the effect of the changing lights was unearthly. The sun itself, with the moon now almost completely covering it, looked like a smudge on the opal sky. Swiftly the shadows swept across the landscape, and the spell seemed to have been broken. One seemed to hear the rush of the shadow. Then, with a mighty run, the shadow, which travels with a speed of 30 miles a second, swept over, amid cheers from the spectators. The last ray of sunlight was cut off, and darkness began. At the same instant there shone out from the sun the majestic corona with its silvery light, and the darkness of the setting of the faint light of the corona, contrasting with the dense blackness of the moon, made a striking spectacle.

The eclipse at last was focussed for mankind to see, and it stood in bold relief in the centre of the picture, with the whole western sky for a screen. It was sublime. Below the sun the corona extended in the form of horns, right and left, each extending about three solar diameters from the sun's edge, falling to about one diameter or even less midway between the two horns. In all cases the corona was brilliant, and as in the corona of 1878 the portions above and below the sun appeared to be related in some way, for one seemed incomplete without the other. During the whole period of the eclipse the moon presented a disc as black as coal.

THE SHADOW BANDS.

Goondiwindi, September 22.

A report which has attracted considerable attention in scientific circles came to hand this morning. Mr. F. Chisholm, of Collaroy, New South Wales, with his daughter and another young woman, was about 16 miles away from Goondiwindi when the total phase of the eclipse occurred. They prepared to watch for the shadow bands, and spread a sheet on the ground. What they saw was described by Mr. Chisholm this morning. He said the shadow bands were travelling at the rate of eight or ten miles an hour. He estimated that the bands were three feet wide and ten feet apart. He could see them thirty yards away.

The staff of the Goondiwindi post-office handled in three days 45,184 words of press messages.

FUTURE ECLIPSES.

Many people who were astonished at the accuracy with which the time of the partial eclipse of the sun, as seen in Adelaide on Thursday had been foretold, are also puzzled to know how scientists are able to say that the next total eclipse visible from the mainland of Australia will occur so far ahead as 1976. When asked to explain the matter, Mr. C. A. Maddern, who is in charge of the West-terrace Observatory during the absence of Mr. G. F. Dodwell (the Government Astronomer) at Cordillo Downs, stated on Friday that calculations were made of the movements of the sun and moon extending over a number of years, and their positions at any time could be worked out very minutely. To compute the exact time of an impending eclipse was a complicated mathematical problem, but with a knowledge of spherical geometry and trigonometry, it was possible to determine the projection of the shadow on the earth. These advance calculations, in regard to the relative positions of sun and moon, were made by the Nautical Almanac Office of the British Admiralty, working in conjunction with the Greenwich Observatory, and were adopted in all parts of the world, it being the practice of astronomers in other countries to avoid duplication of effort as far as possible in any field of research. Although the position of the moon at every hour of the day was computed to a fraction of a second for some years ahead, details in regard to the total eclipse predicted to be visible from Australian soil in 1976 would not be worked out until required for practical purposes, only the approximate time being fixed at present by a rough system of determining eclipses, known as the Saros period. The underlying principle was that each eclipse repeated itself every 182 years, a third of the way round the earth. The total eclipse seen at Wallal and elsewhere on Thursday would be repeated 182 years hence at approximately 120 degrees of longitude further away, and 1976 or thereabouts, being three Saros periods from now, would, therefore, bring it back to Australia again. In the meantime, there would be a number of partial eclipses. There would not be another visible in Adelaide prior to the end of 1924. Beyond that year no data were yet to hand.

THE ECLIPSE OF THE SUN

VIEWED UNDER FAVORABLE CONDITIONS

TOTAL PHASE SEEN IN CLEAR SKIES

IMPORTANT RESULTS EXPECTED

NO EXCITEMENT OVER PARTIAL PHASE

The eagerly-awaited day of the sun's eclipse has passed, and it is beyond question that never before in the history of Australia has such widespread interest been displayed in a phenomenon of the kind. From the scientific standpoint it is gratifying to learn that the spectacle of the total eclipse, the first visible from Australian soil since the country was colonised by white men, has been viewed by the principal astronomical expeditions under highly favorable conditions. The results of the observations made at Wallal, Cordillo Downs, and elsewhere on the track of totality may not be fully known for some days, but it is to be expected that the least possible delay will take place in announcing them to the world. Europe and America are specially interested in the confirmation or otherwise that has been obtained in relation to Einstein's general theory of relativity, particularly the effects of gravity on a beam of light, the contention of the author of the theory being that rays of light are attracted, in common with material bodies, towards a heavy gravitating body. The tests so carefully planned by the visiting and Australian scientists were applied during the period of the sun's obscuration on Thursday, and they have now to base measurements and calculations of a most intricate nature upon them after the photographic negatives taken with the huge cameras have been developed.

Partial Eclipse in Adelaide.

In Adelaide the public were on the qui vive for the first signs of the partial eclipse. The day was perfect. During the morning light cumulus clouds floated across the sky, occasionally screening the sun from view, but by mid-day they had mostly cleared away. At 2 p.m. the orb of day was sending forth his rays gallantly, and it was quite evident that there would be little or no interference with the spectacle. There were still a few scattered clouds about, but they were mostly low on the horizon. The people walking about the streets of the city, or standing along the kerbs awaiting developments had mostly provided themselves with pieces of darkened glass. Precisely at 2.22 p.m. many were able to declare that they could detect the first appearance of the shadow. "It looks like a little dent on the sun's edge," was the general description. What appeared to impress the public most was the wonderful accuracy, practically to a second, with which modern science had been able to foretell the occurrence of the eclipse many months beforehand. "It completely beats me how they are able to do it," was the comment of one citizen who was gazing intently skywards through a fragment of green glass in King William-street. When it became generally realised that the phenomenon was in progress shop assistants and office workers came periodically into the street to note what was taking place, but there was little or no excitement of diminution of business activity. Generally speaking, from the popular standpoint, the event was disappointing. Most people appeared to be under the impression that the afternoon would become much darker than it actually did. Gradually the black shadow of the moon encroached more, until at 3.32 p.m. the maximum phase was reached, and three-quarters of the sun's disc was hidden, and the remainder stood out like a gleaming crescent. Even then the light was as strong as would be noticed on a bright winter's afternoon under average conditions. There was nothing weird or uncanny about it, and if people had not been gazing intently at the sun, in full knowledge of what was occurring, the phenomenon would probably have passed over without the majority being any the wiser. Those who had read of what is experienced in the way of thrills in the regions of totality, and had counted upon all kinds of uncanny things happening during a partial eclipse, were quite out of it. The moments of most pronounced shadow came after the maximum phase, when the thinnest of clouds passed across the

crescent sun, but even then there was not a sufficient darkening to suggest to the birds that it was roosting time. Visitors to the Zoo, report that the partial eclipse had as much effect upon the animals as would a flea on the back of the rhinoceros. They were apparently in blissful ignorance of anything out of the ordinary occurring. There was a slight drop in the temperature, and photographers reported that the actinic light value was reduced to about half normal strength. Other observers noted that the reflection of the sun through foliage was in the form of a crescent. Otherwise there was nothing very remarkable about the affair. The barking of dogs was no more noticeable than on ordinary occasions, and no soursobs or dandebons folded up their petals for an early snooze. Neither is it reported that the fowls laid an extra round of eggs for the day, or that men engaged on night work turned up at their duties before the usual time.

At 3.15 p.m. the Legislative Council adjourned for 20 minutes while members watched the shadow during the most impressive period. The House of Assembly did not adjourn, but a number of members, including the Premier (Sir Henry Barwell), went out on to the steps of Parliament House to look at the sun for a while.

Many Sun Gazers.

In the streets the greatest attention was paid to the phenomenon during the maximum phase, but many people were still peering through their eye-pieces at 4.32, when the eclipse ended. For gazing purposes fairly opaque photographic negatives and the cards specially prepared by an enterprising city firm, with a small green disc in the centre, appeared to be in greatest favor and almost to have entirely displaced the old style piece of glass smoked in the flame of an oil lamp or candle. The story was told of a man who carried a piece of broken glass in his pocket all day, forgot it was there, and cut his hand on it. A well-known business man, who admitted afterwards that he had not had time to read up much about the eclipse beforehand, was seen peering intently at the southern sky, with his back towards the sun. "I can't see the bally thing at all," he remarked, but he did not appear to mind because the laugh was against him. There was a dear old lady in Rundle-street who forgot that it was September 21, and wanted to know what all the people were looking at.

Two ladies who were travelling into the city shortly after 3.30 p.m. were discussing the phenomenon when they noticed a few clouds approaching the sun. "Isn't it a pity," one remarked, "that all those men who have come from the other side of the world at such great expense should have the eclipse spoiled like that?" She was quite oblivious of the fact that the astronomers were at Wallal, thousands of miles from Adelaide, and had made their observations some hours before.

Looking Forward to 1976.

While coming into town on the car in the morning a passenger noticed in "The Advertiser" that the next total eclipse visible in Australia would occur in 1976. Said he to his friend, "You won't see the next eclipse." "No, nor you," was the reply, "and at the place where you will go to you will not need a smoked glass." Childish simplicity is expressed in the story of a little schoolgirl who, not knowing what an eclipse was, but having in mind concerts at school, which all the kiddies enjoy, asked her mother for sixpence. "What do you want that for?" the mother asked. "To pay to go in to see the eclipse," she replied. Another mother, in order that her little girl might not be frightened if it got very dark, told her that the sun would go to bed in the afternoon, and that she had better go too. Just as this lady was leaving for business in the city the little one handed her a parcel in which she was amazed to find her own night-gown. "What is this for?" she enquired,

and was promptly told that if the sun was going to bed she had better go to bed as well in the office. All the school displayed deep interest in the phenomenon. The children had been advised to provide themselves with smoked glass or over-developed photographic negatives, and they were taken into the open and allowed to observe the eclipse. Many of the children who had smoked glass rubbed the lamp black on their faces, with the result that they presented a very picturesque appearance.

Work at West-terrace Observatory.

Mr. C. A. Maddern, who is in charge of the Observatory during the absence of the Government Astronomer (Mr. G. F. Dodwell) at Cordillo Downs, had a busy afternoon. He was making diagrams and taking photographs, all of which, he said, were of little scientific value, being merely records in connection with the eclipse as seen from Adelaide. The big telescope at the Observatory was used, reflections of the sun magnified 80 times being thrown upon a white surface and diagrams made periodically. Seven diagrams were drawn and two photographs were also taken. First contact was noticed at 2.22-23 p.m., and the time of the last contact was 4.25-25 p.m.

Mr. Maddern said the partial eclipse of 1916 was a better sight for observers in Adelaide than the latest one. On that occasion the moon was further away from the sun, and as it travelled across the middle of the sun it obscured a greater amount of light than it did on Thursday. An interesting feature of yesterday's observations was the appearance of a sun spot, which is seen periodically as the sun rotates. This spot was covered by the moon at 2.52 p.m., and it came into view again during the closing stages of the eclipse.

Eclipse of 1861.

Mr. A. T. Saunders, of Adelaide, who remembers the partial eclipse on January 11, 1861, which he witnessed as a small boy, in the Port Adelaide district, stated on Thursday that there was an obscuration of four-fifths of the sun's disc on that occasion, but unfortunately at the maximum phase clouds spoiled the view. Even then the atmosphere did not become nearly so dark as people had anticipated.

Wallal, September 21.

Perfect weather favored the astronomers to-day at Wallal. The morning dawned with a gentle land breeze, which died away before 10 o'clock, and was replaced later by a feeble sea breeze. Many of the party had little sleep last night. Camera plates had to be standardised and placed in their holders, and this work could only be carried out successfully at night time. Between 8 o'clock and noon a few final adjustments were made to the instruments, but the work of the past fortnight had been so complete that little remained to be done.

After the partial phase began the scientists gathered round their instruments and awaited the advent of totality. About ten minutes before the total phase ceased activity started. Plate-holders were slipped into position, dark slides drawn, and in the case of spectroscopic investigations photographs were obtained on iron arcs or tubes for comparison purposes. Long before this time the whole appearance of the landscape had changed. The sky became a deeper blue, except near the horizon, where a peculiar yellow tinge was noticeable. The western sky was distinctly darker than the eastern, and this difference became more marked as totality drew near. The change in the character of light during the last two minutes before the total phase was remarkable. The landscape assumed in turn a yellowish, then a greenish blue, then a purple color, and the shadows cast by the narrow crescent of the sun were sharp and harsh.

Just as the moon covered the sun the phenomenon of Baily's Beads flashed up into a series of brilliant detached points like gems or a necklace, and at the same time the corona burst into view. It presented a beautiful appearance, being of the irregular type generally associated with periods of sunspot. Surrounding the black disc of the moon was a brilliant ring of light, and then several long streamers. One streamer which extended in a westerly direction was traceable to a distance of about three million miles from the sun. The color of the corona was not pure white, but tended rather to a creamy tinge. The great brilliancy of the inner portion of the corona to some extent detracted from the brightness of the streamer, but nevertheless the rayed corona was a wonderful sight.

With the advent of the totality the eclipse programme started, and was carried through with clockwork precision. All the parties at Wallal expressed themselves as thoroughly satisfied with their observations. As they were chiefly photographic, it is as yet too soon to speak of the scientific value of the records obtained, but there is every reason to believe that Wallal will be associated always with important advances made in astronomical science.

The main visual observations made to-day were in connection with the shadow bands—the dusky streaks sent fitting across the ground just before and after the totality. On this occasion the bands were very indistinct, and travelled faster than usual, their speed being about six miles per hour.