Looking at the sun

Author : Tim Sherratt

Tagged as : Bureau of Meteorology, Commonwealth Solar Observatory, Geoffrey Duffield, Griffith Taylor, Henry Ambrose Hunt, long-range forecasting, solar eclipse, solar radiation, weather cycles, weather forecasting

Date : August 1, 2008

From Wallal, in Australia's far north-west, to Goondiwindi, near the New South Wales-Queensland border, local and international scientists watched the sun and waited.

A total solar eclipse was due on 21 September 1922. An eclipse always held scientific interest, but this one offered the chance to confirm one of the most revolutionary theories in science. Albert Einstein's general theory of relativity predicted that light passing near an object such as the sun would be bent by gravity. In 1919, Arthur Eddington's observations of a total solar eclipse lent support to Einstein's theory, but some challenged his results. The 1922 eclipse, best observed in Australia, promised to decide the matter.

'The occasion is unique', noted the Commonwealth Meteorologist, Henry Ambrose Hunt, 'and the observations are likely to be of much scientific value, and in the interests of and for the credit of the Commonwealth.' The Australian Government proudly played its part, with Hunt coordinating support for visiting scientists. Since 1920 he had been collecting data on possible observation sites and communicating with scientific institutions around the world. On his advice, the Lick Observatory in the United States mounted a major expedition to isolated Wallal. Transport was difficult and Hunt considered possibilities ranging from pearl-luggers to motor cars before recommending that the Navy provide the necessary logistical support.

As the big day neared, Prime Minister Billy Hughes cabled the scientists his 'best wishes for a fine day and successful observations.' While the research seemed mainly of scientific interest, an eager public followed preparations for the eclipse. There were also hints that the study of the sun might have more practical consequences.

A brutal climate

For many European settlers the Australian sun seemed alien and unyielding. Others embraced it as a symbol of optimism and pride. At the turn of the 20th century, Federation abounded in references to the dawn – the sun which rose over the new nation symbolised something fresh, full of energy and life. Yet Federation was also a time of severe drought, when the sun was a daily reminder of the rains that would not come. But what if the sun could tell us when it would rain?

While the sun appeared to be eternal and unchanging, research in the early 20th century revealed much about its moods and inconsistencies. At the Smithsonian Astrophysical Observatory, the eminent astronomer Charles Greely Abbot embarked on a lifelong quest to chart variations in solar activity. His observations suggested that the sun's output varied by up to 10 per cent. Abbot believed that detailed knowledge of such variations would fuel the development of long-range weather forecasting.

Afflicted with a brutal climate that seemed to defy prediction, the possibilities of such research offered hope to beleaguered Australian farmers. 'Anything we can do to help us to forecast our weather is of extreme urgency and moment to the people who are building up our primary industries,' commented Prime Minister Joseph Cook to a delegation of scientists in August 1914. Did the sun hold the key? Records in the National Archives of Australia reveal how, in the early

decades of the 20th century, Australians looked to the sun for deliverance.

Watching the sun

A number of the world's top astronomers, including Abbot, visited Australia in 1914 for a meeting of the British Association for the Advancement of Science. They took the opportunity to pressure Prime Minister Cook for the establishment of a solar physics observatory in Australia. This would complete a worldwide chain of observatories enabling the sun to be kept under constant surveillance.

The idea was not new. Expatriate physicist Walter Geoffrey Duffield had lobbied the Australian Government for a number of years, winning the support of Prime Minister Alfred Deakin. In 1909, Deakin pronounced that the Commonwealth would maintain such an institution 'for the sake of science and Australian meteorology.' Deakin and his successor, Andrew Fisher, set the plan in motion, but by 1914 a firm commitment was needed. Deakin, his enthusiasm undimmed by retirement, accompanied the delegation to persuade his former deputy to act.

A solar observatory appealed both to national pride and practical ambitions. Australia could contribute to the international research effort, while perhaps bringing within its grasp the means to tame its capricious climate. Sir Frank Dyson, the Astronomer Royal, stressed the scientific significance of the research while admitting that they all hoped the study of the sun 'might enable forecasts of the weather to be made.' Herbert Hall Turner, from Oxford, and CG Abbot emphasised the reality of solar variation. 'Sometimes a very small variation might be of immense value to agriculture,' Turner noted.

Confronted with this parade of scientific worthies, Prime Minister Cook glumly admitted the merits of their case: 'I am inclined to think we cannot over-estimate the value of the enquiry you are suggesting today.' But while the scientists' arguments were sound, their timing was inopportune – war had been declared only a few weeks before. Cook could make few assurances, but he promised to do what he could. Finally, in 1923, the government formally announced the establishment of the Commonwealth Solar Observatory, atop Mount Stromlo in the new Federal Capital Territory.

In the meantime, a group of influential Sydneysiders had also set their sights on the sun. Impressed by the possibilities of CG Abbot's research, in 1921 businessmen and scientists formed a Solar Radiation Committee. Their aim was to establish an observing station at the Riverview Observatory. Abbot provided advice and instruments, but the committee sought further government funding.

They won the support of the Commonwealth Board of Trade, and a submission was presented to Cabinet arguing that the connection between changes in the weather and solar radiation had been 'scientifically determined.' What remained, it was stated, was to find 'the laws expressing the relationship between weather variations and solar changes in radiation.' Under a program of research such as that proposed by the committee, results were 'sure to follow in the long run.'

A beguiling prospect

Long-range forecasts were a beguiling prospect, offering those who made their living on the land relief from the cruel vagaries of nature. The Graziers Association of New South Wales embraced the promise of solar research, 'convinced of the enormous advantages which would be gained … through accurate forecasts of weather being made for periods considerably longer than those which are at present possible.' The graziers joined a deputation to the New South Wales government in 1923, when geographer and meteorologist Thomas Griffith Taylor argued that a weather forecast six months ahead 'would be of more value than the many thousands spent on research in the hope of getting something out of irrigation.'

Government advisers urged caution, but the sober voice of scepticism was sometimes hard to hear

amidst the exciting buzz of possibilities. Commonwealth meteorologist HA Hunt bluntly pointed out that the claims for improved weather forecasting were based on a small number of questionable studies. While it seemed likely that variations in solar activity did have some impact on the weather, much more research was needed to understand and quantify this connection. 'To make promises of direct practical advantages,' he warned, was 'both a pernicious and dangerous practice.'

Nonetheless, in its announcement of the creation of the Commonwealth Solar Observatory, the government proclaimed its hope that solar research would yield 'a better knowledge of the causes of weather changes' and ultimately 'more accurate and longer range weather forecasting.'

As expected, the Commonwealth Solar Observatory made careful observations of solar activity, even maintaining a plot of trees on Mount Stromlo to pursue correlations between radiation and plant growth. But while the observatory's research blossomed on many fronts, the radiation studies lost impetus. At Riverview, the Solar Radiation Committee pushed ahead to initiate observations even without government funding.

But the laws governing the weather failed to materialise as hoped. While CG Abbot remained steadfast, other scientists began to admit that the degree of solar variation was much smaller than had been presumed. The connections between climate and solar activity are complex, and remain subject to debate.

The observations of the 1922 solar eclipse confirmed Einstein's prediction. The old order of physics was overthrown – space, time and gravity followed laws that seemed counter to our everyday experience. But the commonsense assumption that the sun's moods would be reflected in the patterns of the Earth's weather resisted all attempts at proof.

In the early 20th century the sun seemed to offer a glimpse of enlightenment, but only thwarted once more the desperate hopes of farmers and embarrassed the confidence of scientists. The dream of long-range weather forecasting remained as elusive as ever.

DOWNLOAD PDF »