

The British Sundial Society

BULLETIN



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Folkard and Ward, Sundials Australia

a visit report by Douglas Bateman

This is the fourth of my personal 'encounters' with well known sundial makers and came about by a series of coincidences. In September 2008 I was planning a visit to New Zealand and Australia and when the editor heard that I would be in Adelaide, he said "I didn't know our roving reporter was travelling that far, but whilst I was there, could I write a report on Sundials Australia?"

Dates were arranged, but first some homework was required by re-reading their excellent publication.¹ The spiral bound book gives a comprehensive review of the historical background to sundials and their theory, and is very well illustrated together with 51 references. The 113 page book shows the wide range of their work and has a section on practical measurements of the optical geometry of sun, gnomon thickness and sharpness, or otherwise, of the shadow. But what caught my eye is a short section on the electromagnetic spectrum and the range of wavelengths covering the visible and two of the main infrared atmospheric 'windows'. This is somewhat unusual for any book on sundials and gave a clear hint to me that they have worked, rather like me, in the fields of infrared optics in government research. So it proved and gave extra depth to our lively discussions.

The story started in 1976 when Dr Margaret Folkard consulted her colleagues about a present for friends and John Ward suggested a sundial. The dial would obviously have to be made for the southern hemisphere and their background drove them to a thorough research on the topic consulting many of the traditional textbooks. They found these, by their standards, quite disappointing and naturally based on the northern hemisphere. (Such disappointment lingered, ultimately leading to their own book on the subject.)

Not having access to good workshop facilities, their very first dial was an etched horizontal which



became the forerunner of an all-consuming hobby. More commissions were accepted, still using etching in brass as the main method. By coincidence they met Andrew and Anne Somerville when they were visiting Anne's home town of Adelaide in 1982. John recalls having a discussion with Andrew about Andrew's idea for the formation of a British sundial society! It will be recalled that Andrew went on to become one of our founder members to form the Society in 1989.

A major change took place in 1984 when John prepared an application for a Churchill Fellowship grant to study the history and development of sundials. (The Churchill Trust is an Australian Trust established in 1965, the year in which Sir Winston Churchill died. The principal object of the Trust is to perpetuate and honour his memory by the award of Travelling Fellowships known as Churchill Fellowships. The awards can be substantial and between 50 and 120 awards are made each year.)

The grant enabled both to spend 5 months wandering around the USA; Eastern Europe (as it then was) – East Germany, Poland, Czechoslovakia, Hungary; Western Europe (Austria, Switzerland, Italy, France, West Germany, Holland) then England and Scotland. They met most of the significant sundial people in those countries including the Mayalls and Rene Rohr. During the 1984 tour John and Margaret visited the Somervilles and returned again in 1985 for a three week sundial study tour of Scottish-type sundials and their possible origins in Holland and parts of Germany, then to a sundial conference at Oberperfuss near Innsbruck with the German sundial group, then to another conference at Brugine (50 km west of Venice). There they met Christopher Daniel and Doreen Bowyer, and many other luminaries from the world of historical scientific and navigation instruments.

They had already decided to concentrate on dials with the hour markers and detail cast in relief despite having to learn the art of pattern making. Such a practice is contrary to European 18th century and later traditions of engraving, and their judgement is based on the poor long-term legibility of engraved dials. To 'prove' the point, they produced from an odds and ends box in their workshop an extreme example of a badly corroded 'British' sundial to compare with their legible and highly raised numerals. Inevitably such numerals and hour markers prevent very fine detail, or more pedantically, the fine resolution of engraving. On the other hand, a thicker hour line can still achieve the necessary *precision*, indeed Margaret assured me that, as designers, they are fanatical about accuracy.

The hobby grew rapidly in scale and a large workshop was gradually built up (since 1977) with a range of milling machines and adapted machine tools. Both Margaret and John have become skilled machinists and Margaret also specialises in the computer generated graphics. If we

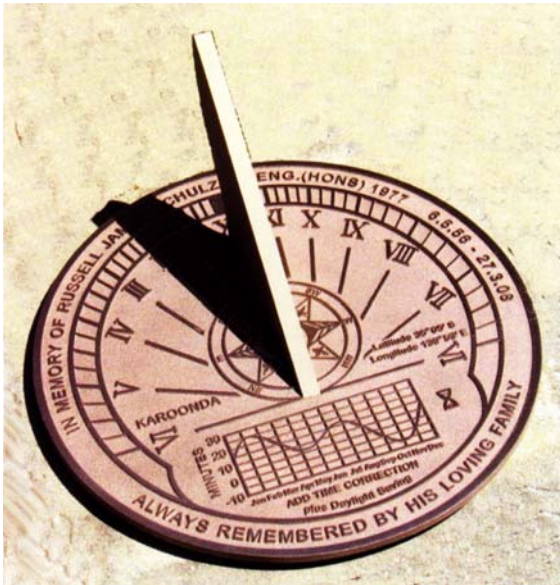
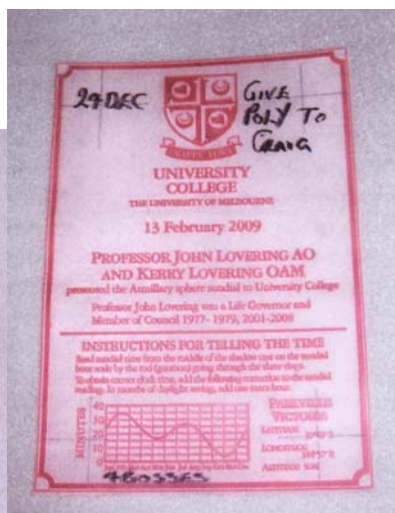
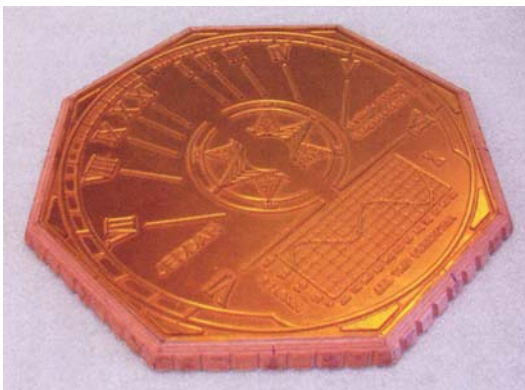


Fig. 1. A horizontal dial from their basic range, in this example the finished dial straight from the workshop.

Imagine a customer seeking a horizontal dial, the first steps are either by visits to the workshop, or sending photographs of examples from their 'standard' range (Fig. 1). Typically these are mainly octagonal 310 mm or 400 mm wide, circular or square. After the basic design is decided upon, dedications, mottoes, coats of arms or other artwork, latitude and longitude can be added very quickly with computer graphics. The hour lines are computed to suit the latitude. The design was printed in a dense black on paper then a litho film negative was produced and sent to the foundry. (Current methods use pdf files and the internet to send an electronic master from which the foundry produces the negative.) The negative is placed in contact with a shallow bath of a liquid *photopolymer* which is exposed to an ultraviolet light for a few minutes. The liquid is drained off and resultant hardened polymer gives a precise 3D replica of the desired dial to act as the pattern for a mould. The arrangement of the ultraviolet light is such that the details all have a slight chamfer or *draw*, thus enabling the pattern to be released from the sand. The resultant mould in the sand is claimed to give a precision of 1/4 mm. Fig. 2 shows a typical pattern after mounting and returned for inspection.

Casting is carried out in a specialist foundry in Melbourne that casts, on a daily basis, a large number of similar flat memorial, dedication and explanatory



panels, with the sundials a small percentage of their work. The preferred material is gunmetal bronze, an alloy of copper, tin and a small percentage of zinc. On return, the casting is fettled (casting marks and sprue removed); sand blasted to give the matt texture between the numerals, etc.; and the top surface fine-ground with a linisher. (A linisher is commonly a motor-driven belt sander ranging in size from a belt 25 mm wide with a 300 mm working belt length, to a large improvised version in their workshop with a belt 15 cm wide and 2 m long.) Any final touching up is done with a small dental burr.

Plain gnomons are machined from slab bronze, filigree gnomons are cut by water-jet from slab bronze, while 'sunflame' gnomons are cast from patterns made using photopolymer on both sides. In

Fig. 2. Far left: a photopolymer master mounted on a stiff board ready for impressing in the sand to create the moulded cavity for casting. The rectangular master (left) is in a different polymer and is a flexible sheet prior to mounting. The hand written notes will not be reproduced in the casting!

Fig. 3. The magnificent armillary sphere in the Royal Botanic Gardens, Sydney, installed in 1993.



Fig. 4. (below) A detail of the horizon ring showing 3 of the 38 herbs sculpted by South Australian Karin Rumpf.





Fig. 5. An earlier design of armillary that has a uniform equatorial ring. Attractive features are the banner on the top and signs of the zodiac on the horizon ring. Sadly the tip and fletching of the gnomon 'arrow' have recently been cut off for safety reasons, but it is said that the lawns are used for many social functions.

In addition, certain gnomons with ornate designs on both sides may be machined using a pantograph. With a thickness of 12 mm or 14 mm, depending on the dial plate size, the gnomon is securely bolted in place. Together with the bold numerals and hour markers, the longevity of the whole dial is assured.

Despite the apparent complexity of the process, all the manufacturing stages are quite rapid enabling the prices—in my estimation—to be relatively low, ranging from A\$500 to A\$650 in basic form (approximately £250 to £325).

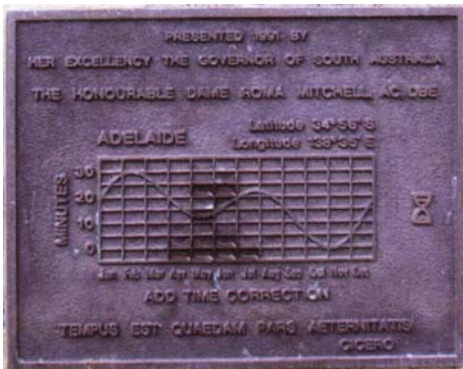


Fig. 6. A typical dedication plaque with equation of time. Note the high relief and the 'signature' sand timer logo of Sundials Australia.

Fig. 7. Machining the one of the flat surfaces of the meridian ring. Further work follows for the displaced circular outlines of the ring.



Fig. 8. An hour ring after rolling into shape.

Fig. 9. Margaret with a 500 mm armillary ready for fitting the gnomon.



Whilst horizontal dials may be in the majority, and within reach of the private purchaser, their armillary spheres are perhaps the most striking and well known of their sundials. Their best known is the wonderful sculptural dial in the herb garden of the Royal Botanic Gardens in Sydney. It is very large with a height of 2.4 m and a mass of 1.5 tonnes, see Figs. 3 & 4. On a personal note, I like the fact that it is not on a raised stone pedestal but is free-standing on its own sturdy base, aligned and marked with the directions of the compass. From a sundial designer's point of view, the hour ring is tapered to ensure that it does not eclipse the opposite side when the sun is in line with the ring at each equinox. Apart from the overall scale, the other purely sculptural detail is the casting of no less than 38 well known herbs in the horizon ring. Credit is given to Marion Westmacott of the Royal Botanic Gardens who selected and prepared the herbs, and to Karin Rumpf who sculpted the herbs in clay for each quarter of the ring, before they were transformed to

bronze using a modern variant of the ancient 'lost wax' process.

An earlier armillary of 1991 is in the grounds of Government House, Adelaide, Fig. 5. The dial is the gift of a very popular former Governor, Dame Roma Mitchell, and Fig. 6 is good example of an associated plaque.

Given the success of the Sydney dial it is not surprising that armillary spheres feature as one of the standard products. The design evolved into cast flat rings to give dials in two sizes, 500 mm high and 800 mm high. Quite a lot of machining is required, needing some decent equipment (Fig. 7).

Having machined all three rings, the next step is the apparently drastic action of chopping the equatorial ring in half. The polar ring is cut in one place, sprung apart to fit over the uncut meridian ring and then squeezed back to correct size and shape. The cuts, of course, are made with a precise space and angle to suit the latitude





Fig. 10. An analemmatic dial at Mount Annan Botanic Gardens, near Campbelltown, Sydney. A distinguishing feature is the basalt date plate marked with an analemma.

angle for the gnomon. The component parts are jiggled in place and bronze welding is contracted out to a local specialist. The completed joints are dressed to give an attractive smooth joint before fitting the hour ring (Fig. 8) and gnomon (Fig. 9).

As their reputation has grown, Sundials Australia has tackled a wide variety of designs in different materials and style to suit many different locations. The analemmatic

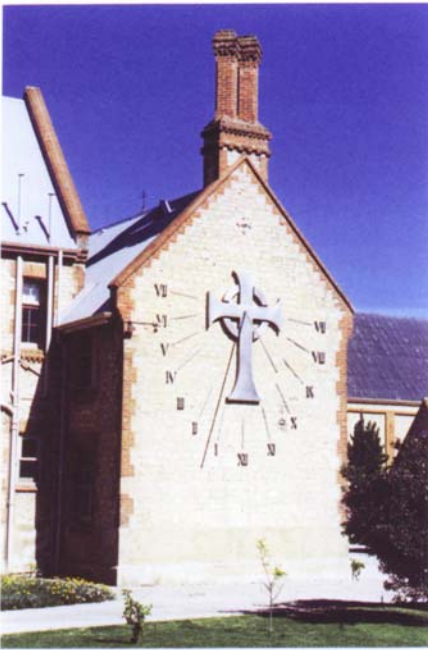


Fig. 11. Bishops Court - a dramatic dial in private grounds.

or 'sundial of human involvement' is popular, with the example in Fig. 10 being fairly typical.

Stainless steel has been used for a number of vertical dials, with a particularly striking example on the wall of Bishops Court, the Archbishop's residence, Adelaide (Fig. 11). The surfaces of the steel have been lightly etched to prevent them being too shiny.

Even stained glass has not escaped their technical capability, with a fine direct south facing dial for a college in Melbourne (Fig. 12). With such skills and experience, it is not surprising they are called upon to make a variety of plaques, dedication and other information panels.

Commissions for sundials have come from many different locations (widely scattered in the continent of Australia) and around the world, such as the Palace of the Dalai Lama, India; Carlisle and Yorkshire, England; Austin, Texas, USA; Sao Paulo, Brazil; Jeddah, Saudi Arabia; Suita, Japan; and several locations in New Zealand.

Although sundials cast in relief predominate, etching is still used where appropriate and, like all good businesses, Sundials Australia has diversified into instruments such as sun compasses, astrolabes, replicas



Fig. 12. An example of dial-making versatility in stained glass.

of navigation instruments and a repair service. A current major project that is dependent on sunshine is a water purification system with cascading sheets of 'solar' panels that support evaporation and condensation to give distilled water.

The company does not have accurate records of how many sundials they have made and in answer to the question, the reply was "probably more than a thousand". I would not challenge this number as it is quite consistent with a busy workshop producing about a dial a week. This makes them certainly the most prolific maker of quality dials in the Southern Hemisphere. All credit to their robust designs, combining an honesty of form and function.

REFERENCE

1. Margaret Folkard and John Ward: *Sundials Australia*, 2nd edition, 1996, ISBN 0 646 27581X. (Available from BSS Sales.)

