# Tracing the Sun at the South Pole

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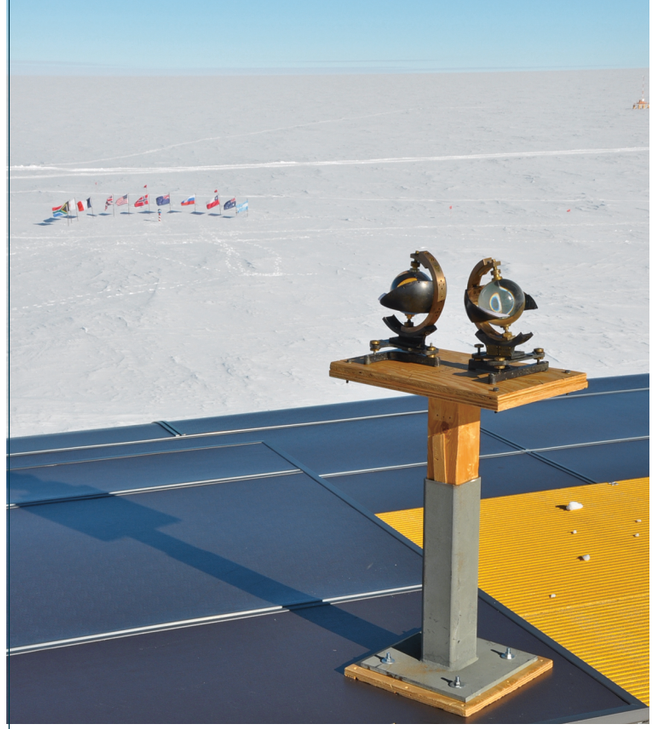
In this age of remote sensing and digital instruments, it's surprising to find a pair of bronze and glass instruments on top of the Amundsen-Scott South Pole Station that track the movement of the Sun. Their spherical lenses focus the Sun onto stiff paper strips and burn a line that traces the path of the Sun and the intensity of its light as it moves across the sky. These anachronistic, analogue instruments are called Campbell-Stokes recorders. What are they doing there, and who are they for?

The twin instruments first arrived at the South Pole on Sept. 14, 1964, and have remained there ever since. They first lived on the snow's surface, close to the geodesic dome that served as the polar base. In 2008, they rose high above the snow's surface to the roof of the newly operational, state-of-the-art Amundsen-Scott South Pole Station. Antarctic Support Contract meteorologists maintain and use the Campbell-Stokes recorders to produce official climate and weather records at the South Pole. The meteorologists gather the physical cards daily, and send them to the National Centers for Environmental Information (NCEI) in Asheville, North Carolina, once a year. Here they are added to one of the world's largest active archives of geophysical, climate, and weather data — the archive contains more than 37 petabytes of data.

Jeff DeRosa, one of this year's overwintering meteorologists, told me that 'before we mail the cards out, we simply add up the amount of "burn time" on a card. That time is divided by the possible amount of sunshine minutes per day (24 hours on all days except for the annual sunrise and sunset) and entered into the daily climate summary that eventually gets processed into the monthly and annual climate records. Consequently, these old instruments still serve as the official source of climate information from the South Pole.' [1] The data from the recorders is one of the longest continuous scientific records from the pole, which is one reason they are still operational.
These analogue recorders intrigued me with their indexicality — the way they are physically linked to their creations.[2] Drawing inspiration from Campbell's original prototype in the collection of the Royal Observatory in Greenwich, London, I created my own version of the recorders to take with me to the Pole during my U.S. National Science Foundation-sponsored residency in the austral summer of 2016-17. These instruments, which I called heliographs, allowed me to transcribe the Sun's passage over a single day.

The resulting body of work, *Heliographs*, follows a long tradition of contemporary art that features marks burnt by the Sun. Early





The twinned Campbell-Stokes recorders sit atop Amundsen-Scott South Pole Station.

The Heliographs deployed at the South Pole

proponents of this approach include the British artist Robert Ackling, who used a magnifying glass to burn abstract patterns into driftwood panels. He controlled the movement of the lens by hand, but the vagaries of the British sunshine determined the pace of his work and intensity of each mark. Richard Long recalled that Ackling 'made these works like a meditation, with a zen-like calm and concentration'.[3] Ackling used the lens as a tool, but it was still under the control of the artist, and the resulting artwork was largely subjective.

Others have used the lens in a more instrumental fashion. For the work 'Solar Burn' (1971-1972), the American land artist Charles Ross recorded the Sun's passage every day for a year. Ross set up a Fresnel lens over a new piece of wood each day. At the end of the year, all the pieces laid end-to-end formed a spiralling S, transcribing not only the changing local weather patterns but also the Earth's orbit.[4] The character of the shape was an artefact of the instrument created by Ross and the geometry of the Sun's passage in the sky, not a subjective, representational line drawn in space by the artist.

Californian photographer Chris McCaw has constructed unique cameras that hold paper photo stock and allow for very long exposures. These cameras allow McCaw to employ parts of the electromagnetic spectrum that extend into the infrared, where the heat of the Sun is focused — a much wider range of the spectrum than regular photography. The resulting photographs directly record the passage of the Sun both as an image and as the mark the Sun burns through the photographic paper. This work highlights the particular case of the camera as an instrument and the photographic image as a form of transcription.

William Lamson took the instrumentisation of the solar burn to the next level in his work *A Line Describing the Sun* (2010). Lamson constructed a wheeled instrument with a large Fresnel lens which focuses the Sun's rays onto a tiny patch of desert sand. The instrument uses the Sun's heat to fuse the sand into a line of rough, glass-like silicate. Lamson's final piece consisted of a two-channel video documenting his multi-day performance, the instrument itself, and a portion of the 111-metre-long line of fused sand. The sand was carefully removed from the Mojave desert and displayed in its original geometry — a long curve of the Sun's movement.[5] Art critic Katie Kitamura has noted how the work refers to 'the weighty anthropological and art-historical lineage of mark-making' and proposes that


The sun recorder made by J. F. Campbell was in use at Greenwich 1876-1886. (Royal Museums Greenwich)

'the purpose of Lamson's apparatus is to transform the immaterial into the material, through the process of alchemy'.[6] I understand this work less as alchemy and more as an instrumental process transcribing the Sun's movement and directly manifesting the Sun's role as the foundation of the Earth's geochemical processes.

Each individual heliograph I created at the South Pole transcribes the Sun's passage over a single day. Because the Sun doesn't rise or set during Antacrtica's summer, it burns a closed circular path inside the heliograph over a 24-hour period. The heliographs are wooden, bowl-like shapes made of 24 segments which conform to a precise geometry. A spherical glass lens inside the heliograph focuses the Sun's light and heat to a point, much like a camera body does for its attached lens.[7] It takes one hour for the Sun to cross each of the instrument's 24 segments, and the resulting burn is an artefact of the lens's operation with its own unique characteristics. Each heliograph is at once a camera, a timepiece, a photographic plate, and an inverted model of the sky.

*Heliographs* shares indexicality with the records from the Campbell Stokes recorders and the photographic records created at the Pole, which stretch back to the first images recorded by Roald Amundsen and his team in 1911. The British photographer Fiona Crisp cites indexicality as an important goal for contemporary art practice, enabling a 'haptic relation to fundamental physics' when carried out in conjunction with particle and astrophysics.[8] The science performed in these remote locations, Crisp says, is 'abstract, imperceptible and often lies beyond the lay public's cognitive and imaginative grasp. The scales, distances, and time-frames that fundamental physics and cosmology trade in, from the sub-atomic to the multiverse, cause a kind of vertigo when we try and scale them against the measure of our bodies or the range of our perceptual senses.'[9]

Crisp questions if we can make science more intimate. Her solution of photo-documenting these remote and inaccessible scientific sites seeks to engender a physical connection for audiences through the indexicality of her images. I am not convinced by Crisp's analysis. Traditional photographs are indexical by their nature, and even digitally rendered images have inherited this capacity to help viewers feel they were present at the image's creation. However, the widespread use of digitally modified imagery has eroded our inherent trust in the veracity of images.

I feel more sculptural approaches can reinvigorate the indexical to present viewers with fresh avenues for embodied experience. In *Heliographs*, I strove to achieve a more direct experience of the unique conditions and energies permeating the polar environment. The perpetual rotation of the Sun above the South Pole in summer transcribed in the heliographs through the heat of burning feels freshly rendered. The warmth of the wooden forms and the residual smell of burning add a sensory experience to the indexicality of *Heliographs*. Holding them in your hands, you feel as though you have just picked them up from the roof of the South Pole station yourself.

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The mahogany heliographs display the burn lines from the sun's path.

Endnotes

1. — Jeffrey DeRosa, August 7, 2022.
2. — Indexicality refers to an object's direct link to what it represents. For example, pre-digital photographs are not just depictions of something but are physical traces of them — the light from the surface of the object directly affects the photographic plate at the moment the image is recorded and the negative becomes a unique physical embodiment of that moment.
3. — Richard Long, Roger Ackling: Artist Who Concentrated the Sun's Rays on Driftwood with a Magnifying Glass to Make Works of Zen-like Calm', *Independent*, June 18, 2014.
4. — Janet Saad-Cook et al., 'Touching the Sky: Artworks Using Natural Phenomena, Earth, Sky and Connections to Astronomy', Leonardo 21, no. 2 (April 1988): 123-34, 123.
5. — Silke Optiz, ed., William Lamson: On Earth. (Bielerfeld: Kerber Verlag, 2011).
6. — Katie Kitamura, 'William Lamson', Frieze, May 1, 2011, www.frieze.com/article/william-lamson.
7. — The diameter of the spherical glass lens determines the focal distance between the lens and the inner surface of the heliograph. The anticipated strength of the Sun's heat at the Pole combined with the burning properties of the laminated mahogany of the heliograph determined their optimal wall thickness.
8. — Nicola Triscott and Fiona Crisp, 'Material Sight', essay, in *The Live Creature and Ethereal Things: Physics in Culture* (London: Arts Catalyst, 2018).
9. — Crisp, 'Material Sight', 25.