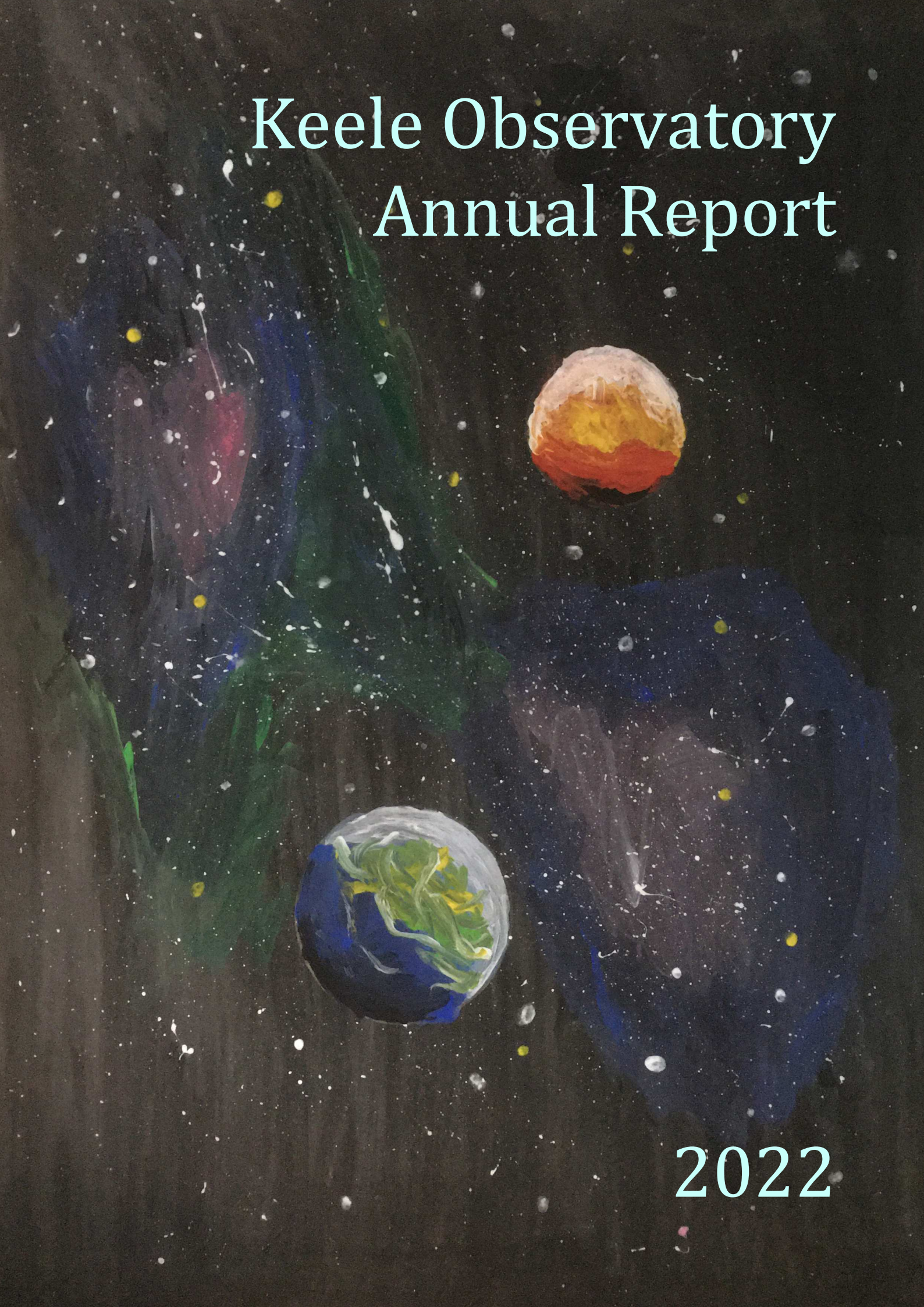
Keele Observatory Annual Report



2022

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Figure 1 Observatory Hill meadow in bloom.

From the Director

In the first year of the post-pandemic era, we saw a revived Observatory, as popular as ever with visitors, scouts, schools and others. In the usual stop-start fashion we made progress bringing the 24" research telescope back into our control and moved full steam ahead with the 12" dome control upgrade. And we were ready and looking forward to receive the new 20" telescope…

…which Orion Optics claims to have already delivered. Besides being a surprise as well as a mystery, this has done nothing for our relations with the local firm.

The single biggest thing to happen to us though happened in February, when we lost our dear friend Andrew Shepherd whilst undergoing overdue, highly risky surgery on the heart. In the few years since he joined us, he had become instrumental in the 24" project, but more than that he was a funny and erudite person who was popular with people of all ages, a reliable team player. He will be missed.

Jacco van Loon

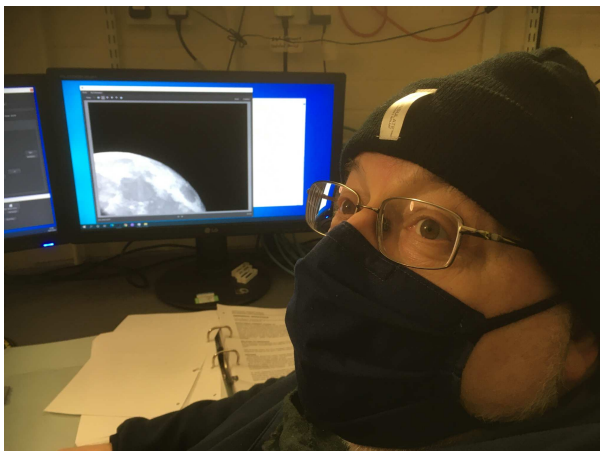

Figure 2 Andrew Shepherd after having taken one of the first images, of the Moon, with the upgraded 24".

Administrative report

Personnel

The Keele Observatory is operated and maintained through a unique partnership between the School of Chemical and Physical Sciences at Keele University and a group of skilled and dedicated volunteers and the coming and going of students.

In 2022 the team composition was: James Albinson, Alan Bagnall, Dave Caisley, Ian Johnson, Paul Klimczak, Ian Knight (rejoining us in September), Richard and son Patrick Oppenheimer, StJohn Robinson, Matthew Stretch, Andrew Shepherd and John Webb, with veteran Stephen Doody remaining affiliated at a distance.

Several undergraduate students expressed interest, among whom George Abraham proved the most persistent. Sixth form student Livvy Purcell completed her Duke of Edinburgh award. Matthew Baker remained affiliated as an astrophotography expert, moving from Science Foundation Year onto a Computer Science course.

Equality, Diversity and Inclusion

Our team embraces diversity and inclusion, and we actively promote these values and seek to embed them into our culture.

After the interruption in 2021 due to covid, we organized a third edition of a multi-disciplinary event celebrating United Nations International Women and Girls in Science Day, on the 11th of February. Over a hundred visitors came to the Observatory. We've kept giving away Rachel Ignotofsky's Women in Science postcards but will need to manage demand as their price increases.

The five work experience students we have hosted this year include four girls, one from a non-white background. We mounted two more paintings by Indian school children from Clara Pennock's Royal Astronomical Society sponsored project while she was on a British Council Bhabha scheme research stay in Bengaluru in 2019. Aside from working with the local Higher Horizons team to reach underprivileged schools in our region, we also established links with an Islamic school in Cobridge, whose pupils were keen and open minded.

Neurodiversity too is close to our heart and reflected in our team. We have worked with three schools for pupils with special needs, which is challenging but also enriching. And we tweeted again a poem for World Mental Health Day.

Sustainability

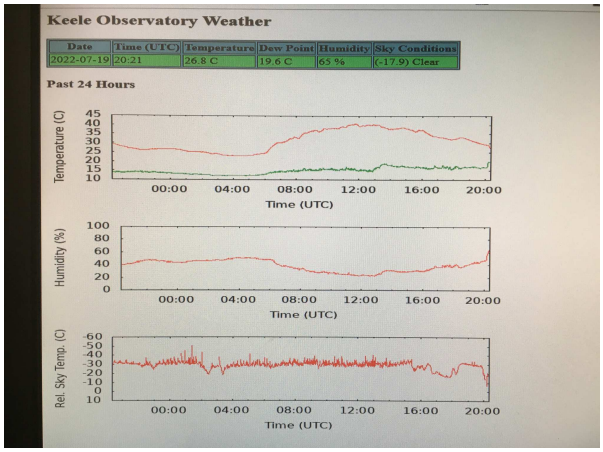

Figure 3 Keele Observatory's own weather station's recording of the hottest UK day on record.

The more one studies what's out there in space, the more one learns about oneself and planet Earth. Not quite Venusian yet, 19 July 2022 saw the hottest day in the UK on record: 40 °C! While the Observatory was unaffected, we do want to play our part in setting an example of sustainable operation and raising awareness of the way in which we affect the environment.

Figure 4 The meadow in front of the Observatory.

The Nurture project carried on, maintaining the wildflower meadow in front of the Observatory. We remain highly supportive by making our external storage facility available to their team.

The Friends of the Earth youth club visited us. The timing of Earth Hour still makes it challenging to participate, as is the lack of University support for a blackout. On the other hand, we were approached by Ash Hulme to explore the potential impact on University operations following a severe space weather event, but our attempts to engage with this were left unanswered.

Figure 5 Moss feeling at home on the entrance wall.

Finances

Aside from four cancellations due to covid, two due to industrial action, two for other reasons as well as two no-shows, 2022 was largely a "normal" year. We hosted a large number of visits, especially by schools. As a result, we made a small surplus despite the upgrade of the 12" dome control placing a heavy burden on the budget.

There seems to have been changes of culture and procedures though. Groups now often request bank transfers rather than donating in cash or via cheque, and some have not been forthcoming with their agreed donations at all. At the same time, internal transfers within the University have been problematic. This poses serious operational challenges to the Observatory.

The old PC in the lecture room was replaced from Faculty funds, along with a spare projector from AVS since the old one was not compatible with the new PC.

Table 1 Financial account for 2022.

1. Balance brought forward	£7809
Income	
School activities	£757
Community group visits	£422
Donations	£50
2. Total income	£1229
Expenditure	
General maintenance	£154
12” dome control upgrade	£897
3. Total expenditure	£1051
Surplus (items 1 + 2 – 3)	£7987

Table 2 Budget for 2023.

1. Balance brought forward	£7987
Income	
Hospitality	£1000
Donations	£100
2. Total income	£1100
Expenditure	
General maintenance	£100
12” dome control upgrade	£400
Printing Annual Reports	£100
Ron Maddison memorial	£500
3. Total expenditure	£1100
Surplus (items 1 + 2 – 3)	£7987

Based on the most recent accounts and projections for upcoming activity, we set a budget for 20223, aiming to break even. We anticipate some further costs pertaining to the upgrade of the 12” dome control, catching up with the production of annual reports, and the organisation of a memorial event for the late Ron Maddison.

Infrastructure and equipment

Not surprisingly, this first post-pandemic year saw a hive of activity, from ourselves and around us. While the roll-off enclosure

Figure 6 Roll-off enclosure ready for new occupancy.

refurbishment was completed, there was substantial maintenance work taking place related to the waterworks on top of Observatory Hill, with frequent road

closures and diggers hitting what turned out to be a legacy cable to the erstwhile radio telescope site. Unfortunately, when we approached Orion Optics to collect the new 20" telescope they claimed to have already delivered it just after the first lockdown, in early June of the year 2020. Despite a lengthy train of correspondence and searches across the University campus, as of writing this unsatisfactory situation remains unresolved.

A new computer was installed in the lecture room; however, a new projector was required (and provided) too and this needed some tuning. More importantly, stricter IT security protocols meant that access is now restricted to individual University staff account holders, ending the Observatory group account arrangement. This impedes hosting visits by anyone other than the Director, for instance at Saturday sessions. On a related note, the Team's mailing list required transferring, limiting the ability to share files via e-mail. Progress?

The drive mechanisms of both the 10" and 8" Schmidt–Cassegrain telescopes were repaired (again). The two Dobsonian (Newtonian) telescopes were also seen to, adding grab handles to the 12" and a dolly for ease of mobility of the 13". Meanwhile, the 3" Negretti & Zambra refractor is being renovated by James Albinson, while StJohn Robinson donated his 3" Cook refractor. We are also indebted to Mrs. Jean Wood for her generous bequest of a 9cm "desktop" Meade – dubbed the `Woodscope' – as well as a (heavy!) 10" primary mirror. Finally, we acquired a copy of the magnificent "Apollo remastered" picture book, as well as two historical spectral atlases from the late Roger Griffin in response to an offer by Elisabeth and Richard Griffin.

While relatively uncommon, given our trusting and welcoming attitude it is not surprising that criminality hit us again. During a visit by the William Stanier school from Crewe, marred already by unexpected challenging behaviour we were left with to manage, our prized iron–nickel meteorite with Widmanstätten pattern was stolen. There will be no more children holding this heavy, ancient space rock in their hands.

Engineering work on the Thornton

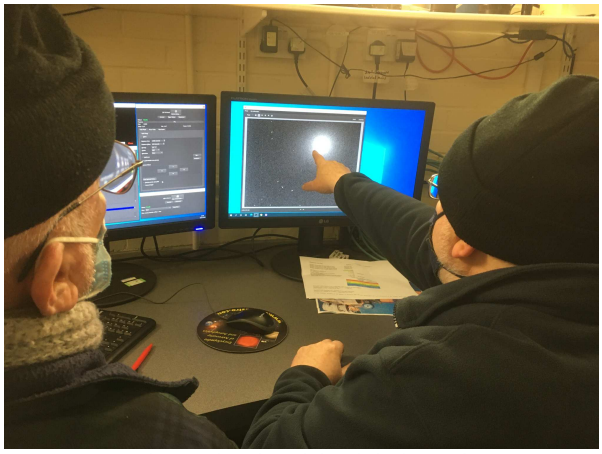

Figure 7 Andrew Shepherd (right) describing a test image of a (very) bright star to StJohn Robinson (left).

Early in the year focus was achieved, and test pictures were taken that looked quite promising – it was great that Andrew was there to see it. However, further progress was hampered by confusion about the functioning of the electromagnetic brake and problems with the handsets and limit switches. These were eventually resolved. The tripping of power by the dome rotation was traced back to a malfunctioning motor; all motors were refurbished by Potteries Power Transmission, facilitated by Estates, though one of them had to be sent back for further repairs. All three fans on the back of the primary were replaced and the year was ended with cautious optimism.

Maintenance of the Grubb and its dome

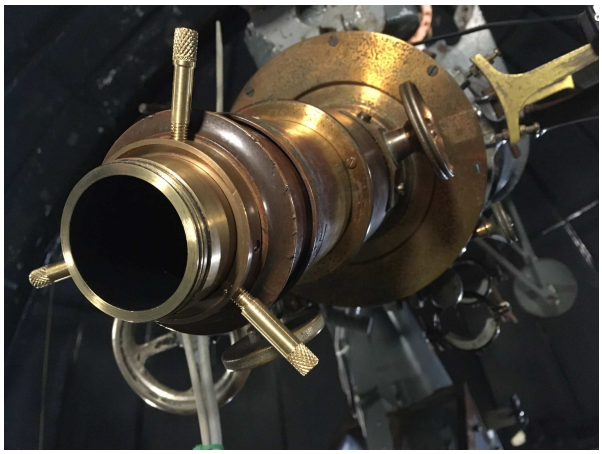

Figure 8 2" eyepiece holder with 3-point fastenings.

The 12” refractor’s dome control project got a big boost, with the polished design and purchasing spree. The dome rotation was inspected, provisionally removing a “dead spot”. The telescope tracking, which had become very stiff, was serviced by James Albinson, the wooden door at the bottom of the pier was renovated by Richard Oppenheimer, and the 2” eyepiece holder was retrofitted by StJohn Robinson so it could securely take heavy cameras.

Research activities

Figure 9 The Iris Nebula (top) and Fireworks Galaxy NGC 6949 (bottom, 2hr exposure) using a 132mm refractor and ATIK-460ex (credit: Steve Doody).

Steve Doody obtained some magnificent images and so did Matthew Baker, which inspire and inform others. While the Observatory’s prime objective is to acquire and publish scientific data, team members are encouraged to use its equipment to produce exquisite photographs, too.

Figure 10 The Pleiades using a 90mm refractor and ZWO ASI1600MM-PRO (credit: Matthew Baker).

The Sun has become a prime target of interest, what with the partial eclipse in October and the approach of the peak of the next activity cycle. It offered work experience student Eva Holdcroft an unforgettable experience and did well on Twitter with plenty of likes and retweets.

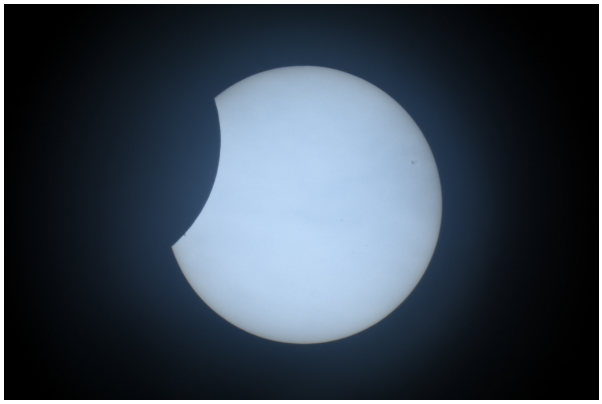

Figure 11 The partial solar eclipse on the morning of the 25th of October (credit: Jacco van Loon).

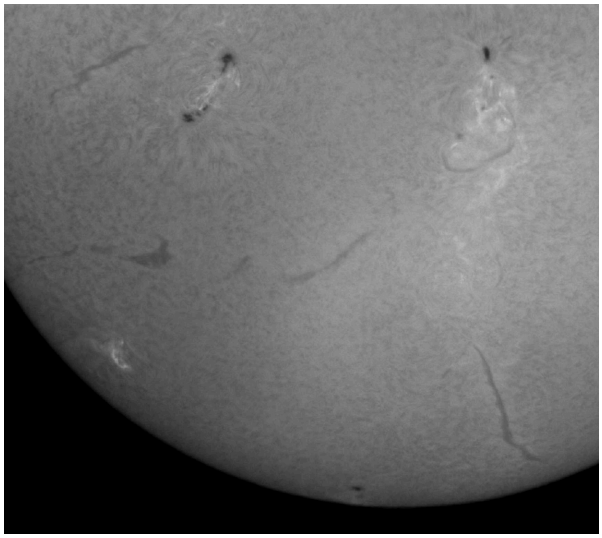

Figure 12 Sun in H-alpha with the 6” Lunt, on the 11th of July (credit: Eva Holdcroft & Jacco van Loon).

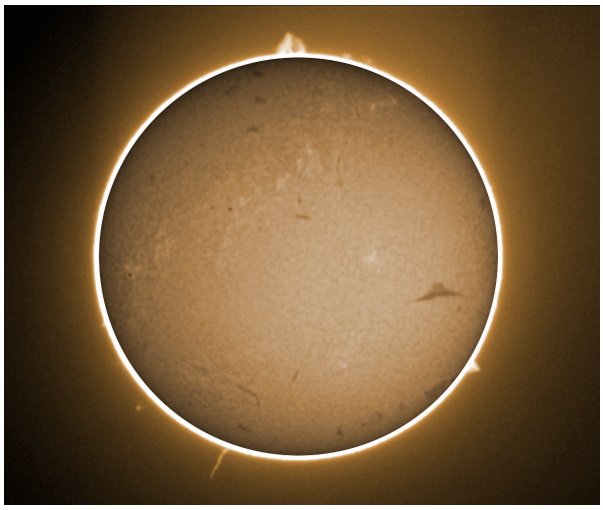

Figure 13 Sun in H-alpha with the small Coronado, on the 3rd of November (credit: Jacco van Loon).

Undergraduate laboratory work

The Year One laboratory classes in observational astronomy returned to Keele, however industrial action and the late contraction of covid by the instructor meant relatively little observing was done.

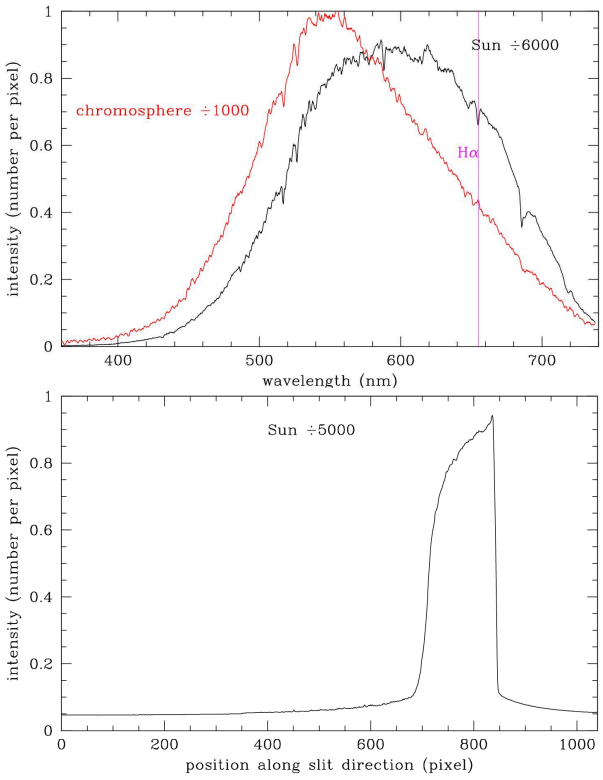

Figure 14 Spectra through the 8" SCT of the Sun's photosphere and chromosphere (top) and a trace of the light intensity across the limb of the Sun (bottom).

An attempt was made on the 23rd of March to take a spectrum of a sunspot with the 8" SCT and neutral density filter, but the spot was – unsurprisingly – too faint.

However, we may have detected the Hα line turning into emission in the (hotter) chromosphere along the outer edge of the Sun, and limb darkening and scattered light along the slit. Imaging through the Lunt Hα telescope with the ATIK-11002 requires use of an additional filter as its minimum exposure time of 0.03 s is too long.

Outreach activities

We bounced back from the pandemic and reached nearly 2900 people, of which about 2500 visited the Observatory. About half of these are children.

Figure 15 Women and Girls in Science Day.

For the third time we hosted United Nations International Women and Girls in Science Day, on the 11th of February from 4–9pm. Despite the more restricted times we got a record attendance of over 100 visitors, most of whom observed the Moon and interacted with the Geology exhibits of Pauline Weston and Ralf Halama and the Chemical and Material Sciences exhibits presented enthusiastically by Physics Masters student Menna Morgan.

We also went to town, in November (also 4–9pm!) to join `Science at Night' at The Potteries Museum, a similar concept to European Researchers Night in September 2019. This was attended by an estimated 300 people, many of whom got fine views of Saturn and Jupiter through the 10" Newtonian on the C-GEM mount, from the terrace outside the Spitfire exhibition. We learnt to be careful picking eyepieces and diagonals as the focus travel of Newtonians is less than that of a Schmidt–Cassegrain, making the latter more versatile.

Figure 16 Science at Night at The Potteries Museum.

Media activities

Aside from general visibility during radio and television interviews, the Observatory got good publicity around the Women and Girls in Science event, thanks not in small part to amateur astronomer Chris Steers at BBC Radio Stoke.

We continued to sporadically tweet – you may follow us on @KeeleObs – but we decided to close our Facebook page as we could no longer commit to managing it.

Public viewings

Some 940 people visited the Observatory this year on its free Tuesday evenings' and (to a lesser extent) Saturday afternoons' public viewings, and well over 40 visitors did so at other times.

On about one in three occasions views of the Sun or night-time celestial objects were possible, which is average.

Schools and teachers

We hosted 15 visits by schools, and visited an additional 2 schools ourselves, reaching no less than 616 learners and 64 teachers. These covered a very broad range in school types, including those not usually on the radar of Higher Education recruitment teams such as primary schools or special needs schools.

Open Days for prospective students, some teaching activities and other visits by Keele students attracted over 440 visitors, not limited to those reading Astrophysics.

Community group visits

We entertained 17 community groups, as usual mostly of the scouting variety but also some adult societies. We thus reached 262 children and 128 adults, having meaningful interactions with most of them.

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Front cover: collaborative painting by Ruksar Banu F., Kanaya N., Roopa G. and Gowthami N., year-10 pupils of a school in Bengaluru, India (courtesy Clara Pennock 2019)