

Keele Observatory Annual Report

2024

Table of Contents

<i>From the Director</i>	2
<i>Administrative report</i>	2
Personnel	2
Equality, Diversity and Inclusion	2
Sustainability	3
Finances	3
<i>Infrastructure and equipment</i>	4
Engineering work on the Thornton	4
Maintenance of the Grubb and its dome	4
<i>Research activities</i>	5
Undergraduate laboratory work.....	6
Publications	6
<i>Outreach activities</i>	6
Public viewings.....	8
Schools and teachers	9
Community group visits	9

From the Director

We ended the year celebrating the 150th anniversary of our 12" Grubb refractor, and having decided to refurbish the 1939 Hindle 17" reflector since Keele University refused to act against Orion Optics for not delivering the purchased 20" telescope.

The pandemic and lockdowns are still fresh in our memories, but the activity at the Observatory shows no signs of any such thing having happened. It continues to develop and modernise, yet with a strong commitment to preserving - or indeed resurrecting - historic scientific equipment, in partnership with communities on and off the university campus. I thank you all.

Jacco van Loon

Administrative report

Personnel

The Keele Observatory is operated and maintained through a partnership of the School of Chemical and Physical Sciences and a group of volunteers and students.

In 2024 the team composition was: James Albinson, Alan Bagnall, Dave Caisley, Ian Johnson, Paul Klimczak, Richard and son Patrick Oppenheimer, Matthew Stretch (dormant) and John Webb, with Honorary Member Stephen Doody following from a distance, and Ray Rutter rejoined the team.



Figure 1 (Left to right:) team members Alan Bagnall, Dave Caisley, Jaffa Cakes and Patrick Oppenheimer.

The title of Honorary Associate has been discontinued by the university, and they will be migrated to Volunteer status with Guest IT accounts next year.

Of the Keele students, Dan Pearson proved the most committed, with further assistance from George Abraham, Layal Muhammad, Muskaan Mandil and Hasib Mehmood. Two work experience students, Jay Boulton and Rhys Powell kept coming long after their formal agreement ended.

New collaborations include the local artist John Field, whose work is on display, and the people of Newchapel Observatory, who are working to renovate their facility.



Figure 2 Martian and circum-terrestrial spacescapes painted by John Field, on display at the Observatory.

Equality, Diversity and Inclusion

We embrace diversity and inclusion. We promote these values on our noticeboard and embed them into our culture. We seek to improve representation on our team.

We organised a fifth edition of a multi-disciplinary event celebrating United Nations International Women and Girls in Science Day, on the 11th of February, again in a venue on the High Street of Newcastle-under-Lyme in collaboration with local Arts charity Appetite.

We hosted visits of underprivileged pupils for the local Higher Horizons team (including the National Saturday Club) and



Figure 3 Set up for Women and Girls in Science Day in Newcastle-under-Lyme town centre.

the Kinetic Academy for children with special needs, we welcomed back a local Islamic school and we reached pupils not necessarily interested in science through arts collaborations such as Lisa Blower's creative writing workshop.

Sustainability

As beneficiaries of dark skies and very aware of the precariousness of life in space, we cherish nature and sustainable living.



Figure 4 Wasp calling the Observatory its new home.

We support the Nurture project and its woodland meadow and keep an eye out for interesting wildlife and welcome them into our facility (if harmless) - such as Oscar the campus cat, to which we dedicate a picture gallery at the end of this report.



Figure 5 Dave Caisley and Alan Bagnall resuscitating a robotic care dog in the Observatory's "surgery".

Managing the heaters and lighting remains a challenge because of the variety of users and usages. Too often they are on when they don't need to be.

We also repair and recycle, from robotic care dogs (figure 5) to an entire telescope (the 17" Hindle from 1939).

For the third time we ran a Dark Skies event for Scouts at Cannock Chase, and we partook in planning and delivering Keele University's splash out science-art event "What on Earth?!" (Earth Day - see further on for a visual impression).

Finances

Observatory's income enters the accounts of the university, being allocated a cost code, reset at the end of a financial year.

Table 1 Financial account for 2024.

1. Balance brought forward	£8229
Income	
School activities	£439
Community group events	£551
Other	£120
Donations	£62
2. Total income	£1172
Expenditure	
12" dome control upgrade	£78
Printing annual report	£23
3. Total expenditure	£101
Surplus (items 1 + 2 - 3)	£9300

Income, from bespoke events for schools, community groups or university activity and the contents of the donations box vastly exceeded near-zero expenditure this year. This was due to the changes in financial management but also because engineering projects were completed (12" dome and 24" telescope upgrades) or yet to start (the 17" Hindle telescope). While £52 worth of expenses were not claimed back, a new visitors book and a frame for a photograph of our meteorite (stolen by the William Stanier school in 2022) came out of the School's stationary budget.

Margaret Maddison donated items from the late Ron Maddison collection, including historical letters, photographs, a portrait of Herschel and books. Phil Parker (who hosted an Apollo exhibit at Keele Observatory's 50th Anniversary in 2012) left vintage books. The new computer for the weather station running Windows 10 was sourced from IT for free.

We are often asked how much the 12" refractor is worth. Now we can answer that question, as Paul Klimczak discovered an 1888 Grubb catalogue in which it was on sale for £1200, which in today's monies amounts to well over £200,000. Of course, the historical value bears no price tag.

The budget for 2025 is set based on a conservative estimate of income but with a generous allocation to resurrect the 17" Hindle telescope back into operation.

Table 2 Budget for 2025.

<i>1. Balance brought forward</i>	£9300
Income	
Hospitality	£1000
Donations	£100
<i>2. Total income</i>	£1100
Expenditure	
17" Hindle resurrection	£1000
General maintenance	£100
<i>3. Total expenditure</i>	£1100
<i>Surplus (items 1 + 2 – 3)</i>	£9300

Infrastructure and equipment

Computers were changed to DHCP and assigned new IP addresses. The weather station computer was updated to a small PC running Windows 10, after repeated fails of the link to the web site. Links kept failing at the end of the year, but a more stable solution was being worked on. Additional internal memory cards for the CCD24 computer were obtained by Barry Smalley from scrapped PCs.

The Lunt solar telescope's blocking filter surfaces were cleaned, as was the 12mm TeleVue eyepiece often used with it. The external baffle lock was improved also.

In future reports we may see a separate subsection for the Hindle project, which has now started in earnest.

Engineering work on the Thornton

Telescope run-aways were suspected to be caused by a dodgy upstairs handset button. Both handsets were refurbished. Internal power failures required restoring of the telescope settings. And the QSI camera fans failed but were revived after removing a dozen trapped dead flies.

Other than that, the 24" telescope works! Tests on an image of star cluster M36 suggest good optical performance. Matt Goodwin 3D-printed a second bracket for the new finder / guiding scope, though tracking seems accurate without guiding.

Maintenance of the Grubb and its dome

The 12" refractor's dome control project was installed after finally a mains socket was added. However, the wheel motor blocked causing the fuse to blow. The problem was traced back to a power surge upsetting the soft start device, and putting a resistor in place solved the issue. While the "dead spots" on the rail were traced back to worn brass shoes.

The interior of the dome and base of the pier were repainted in egg white and black, in time for the anniversary, and the 60+ year old objective lens cover fabric was also replaced.



Figure 6 New 12" dome control. (Top:) Alan Bagnall putting the finishing touches; (Bottom:) the final product with the black mains socket at the top right.

Research activities

The area around Keele witnessed arguably the most spectacular Northern Lights since

many years, not just once (10/11 May) but again five months later (10/11 October). Solar maximum in combination with social media alerts and good phone cameras meant many ordinary people witnessed it.



Figure 7 Northern Lights, photographed on 10 May by Hannah Reidy at Keele Observatory (top) and on 10 October by Jacco van Loon near Audlem (bottom).

Later in Autumn, the bright, long-tailed comet Tsuchinshan-ATLAS stole the early-evening show... but so did Starlink launches and many attempts to photograph the comet were marred by satellite trails.

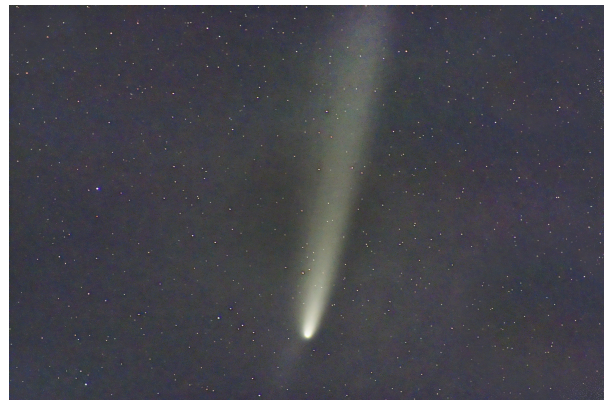


Figure 8 Comet Tsuchinshan-ATLAS, photographed by Jacco van Loon on 21 October just outside Audlem, with a Nikon DSLR, 300mm lens at f/6.3, 30 seconds. The original file was reprocessed by Stephen Doody, bringing out a faint "anti" tail (effect of perspective).

Undergraduate laboratory work

The weather was reasonably cooperative during the six evening sessions. An image of the near-Full Moon was taken with the ATIK-11002 camera at the 12" refractor, requiring the use of an H α filter so that a 0.1s exposure did not saturate. Instead, we show here results obtained with the same camera on the 8" Schmidt-Cassegrain, of the crescent Moon and Jupiter, and spectra of red supergiant Betelgeuse (dominated by titanium-oxide absorption bands), Sirius (dominated by hydrogen lines) and Jupiter (exhibiting absorption from methane!).

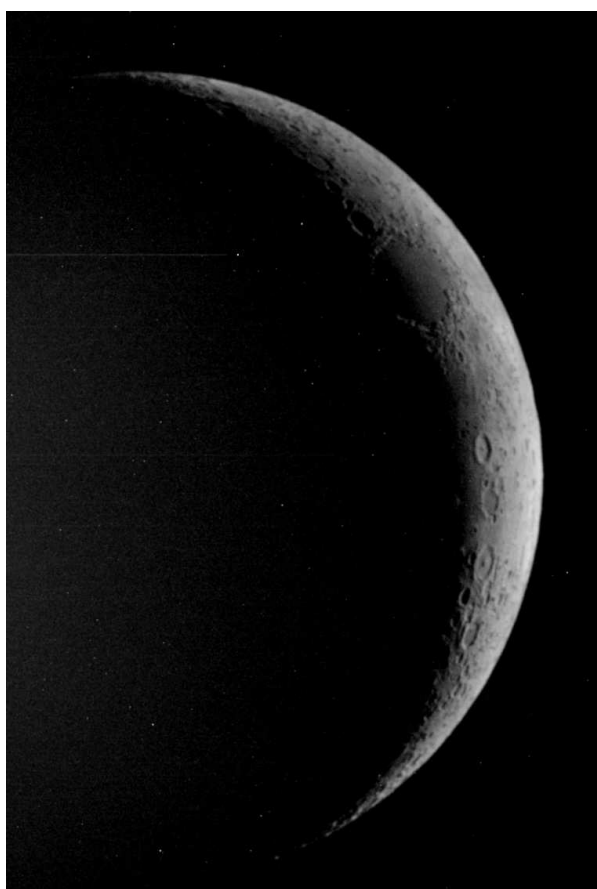


Figure 9 Crescent Moon on the 12th of February, with the ATIK-11002 on the 8" SCT, 1s through cloud.

An experiment was performed to characterise the étalon of the 6" Lunt H α solar telescope. A spectrum was obtained with the filter tuned to one extreme end, and again at the other extreme end, and then their difference was calculated. This proved to be an effective way of showing the interference pattern generated by the étalon, from which the blocking filter then selects one order.

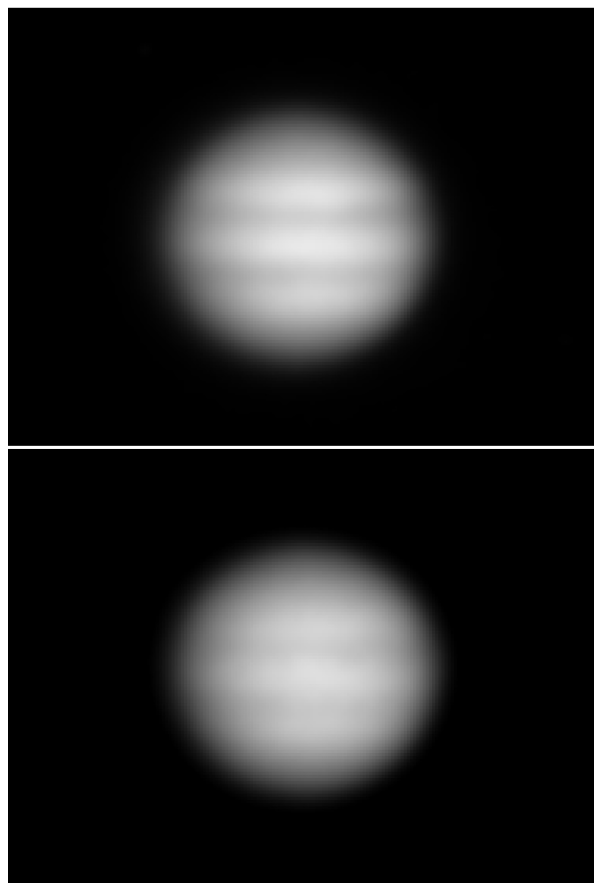


Figure 10 Jupiter on the 26th of February with the ATIK-11002 on the 8" SCT, 0.6s (top); 0.03s (bottom).

Publications

In 2024 we published the annual report:

"Keele Observatory Annual Report 2023", J.Th. van Loon (ed.). KOP 14

Annual reports record the history of the observatory and its associated activities.

Outreach activities

We welcomed 4134 people, all but 279 of whom visited the Observatory. This large number of visitors was mainly due to two campus events: Earth Day and Keele Day (with a combined total of 1464).

For the fifth time we organised Women and Girls in Science Day, on the 11th of February, for the second time in the Newcastle Common venue of Arts charity Appetite (which had moved more centrally into town). About 113 visitors enjoyed the work of both visual artists and scientists.

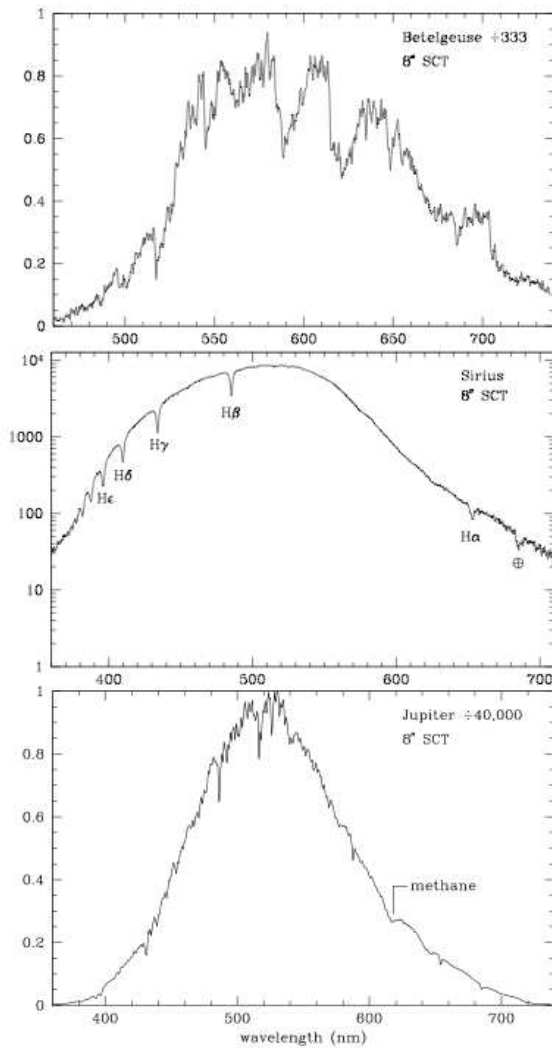


Figure 12 Spectra recorded on the 26th of February with the ATIK-314E on the 8" SCT, all 10s exposures.

Ten days later we were back at Cannock Chase for a third edition of Dark Skies for 60 scouts, in collaboration with CPRE countryside promotion, lucky to be viewing Jupiter and some Moon.

Earth Day was celebrated in a big way across the campus, ten hours over two days and evening between (20, 21 April), offering an estimated 654 visitors views of the Sun and the Moon but also an amazing sound and moving picture show projected onto the inside of the 12" dome by local artist MOAL.



Figure 13 Earth Day setup before the crowds arrived.

Keele Day too was splashed out on, given the University's 75th anniversary (since it was established as a college). In

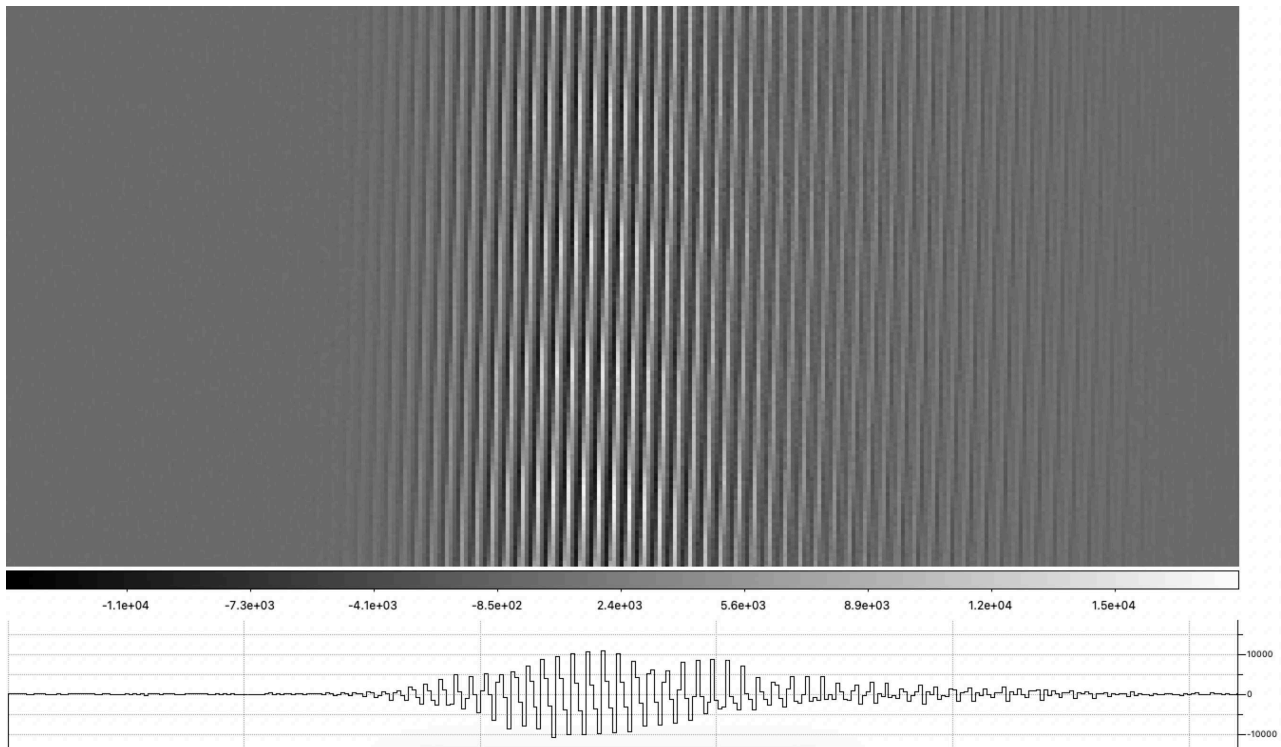


Figure 11 Difference of spectra taken between the two extreme tunings of the etalon of the Lunt solar telescope.

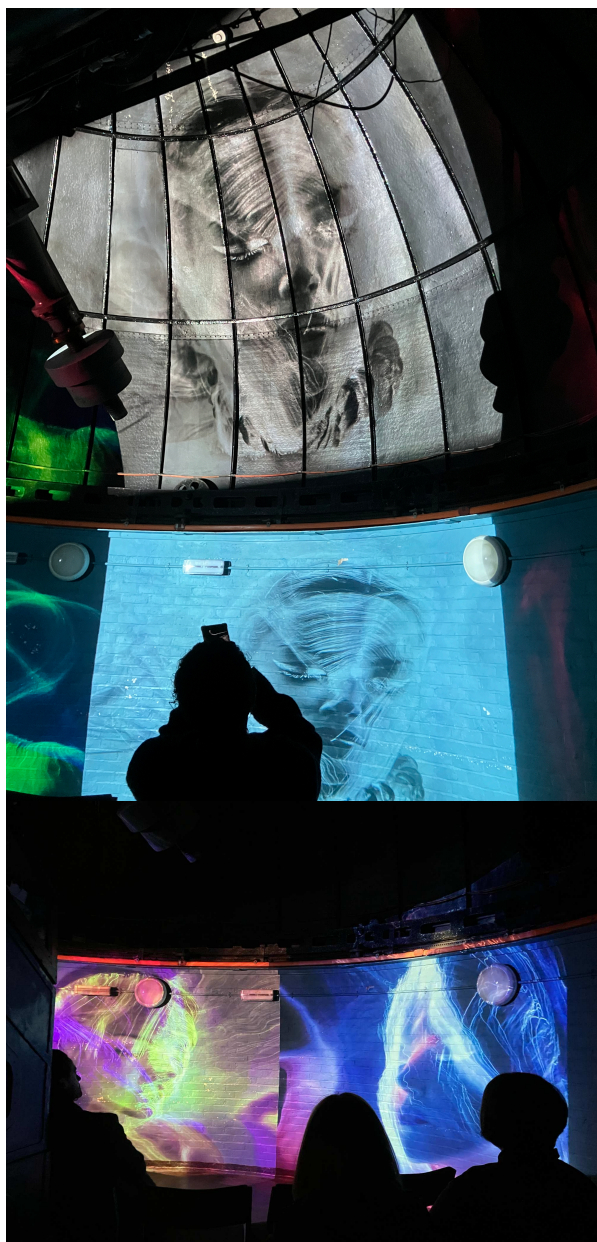


Figure 14 Sound and moving picture show by MOAL.

five hours we welcomed over 810 visitors, but unfortunately only a few lucky ones got to watch the Sun.

It got murkier still when in early November we set up at The Glebe pub in Stoke for a science fair. About a hundred visitors were entertained.

Public viewings

About 911 people visited the Observatory this year on its free Tuesday evening and Saturday afternoon public viewings. Depending on the time of year and day, and the weather, we typically show them the Sun, Moon, Jupiter, Saturn, Orion Nebula, Ring Nebula, star clusters like the Pleiades,



Figure 15 People of all ages and the odd dog flocked to the Observatory for a sunny Earth Day.

h and χ Persei, M37, M35, M13, double stars like Albireo, ϵ Lyrae, Castor, Alcor & Mizar, and occasionally something a little more challenging like the Eskimo Nebula or such things as the International Space Station.

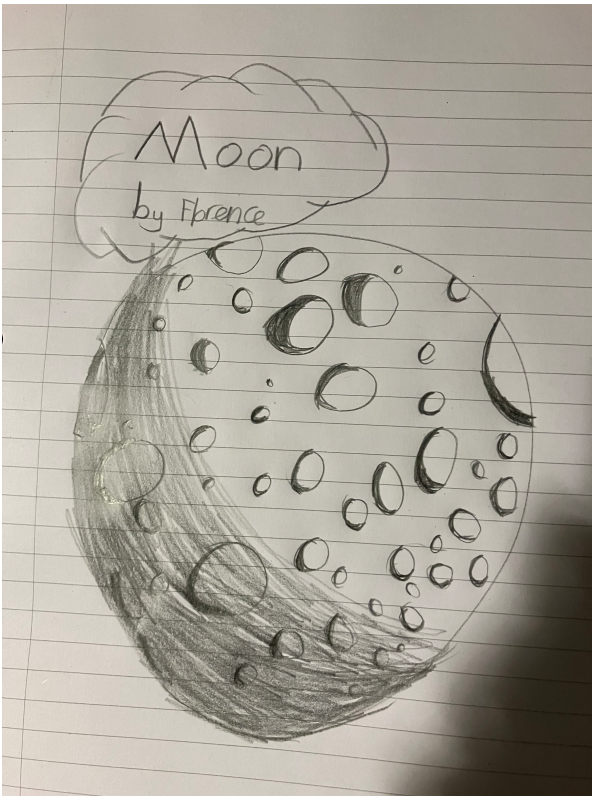


Figure 16 Pencil drawing of the Moon by local artist Florence, on Earth Day (the Moon was part of Earth).

Schools and teachers

We hosted 9 visits by schools, reaching some 309 learners and about 33 teachers.

Open days for prospective students, some teaching activities, and sessions with students from the Astrofiz society attracted nearly 500 visitors, and an Italian summer school added another 150 young learners.

Community group visits

We entertained 20 community groups on bespoke occasions – mainly scouts but also a Church Youth club from Stafford and the Uttoxeter Rotary Club. This resulted in interactions with nearly 327 children and 141 adults, slightly down from last year.



Figure 17 Science at The Glebe, with PhD student Lina Gerlach explaining her research with the JWST.

Next page: campus cat Oscar on an exploration of the Observatory.



Keele Observatory Publications 15

Copyright © 2026, Keele University

Printed by: Keele Print House – <https://www.keeleprinthouse.co.uk>

Keele Observatory – <https://www.keele.ac.uk/observatory>

Front cover: Aurora Borealis seen in the Keele area on 11 May 2024 (Jacco van Loon)