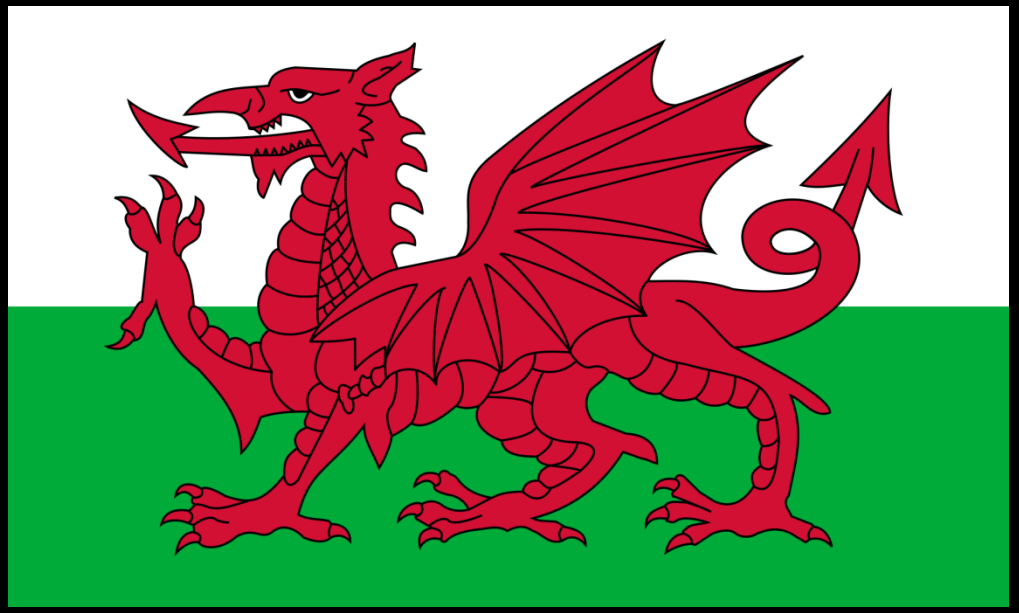
Linking Gaia Alerts, supernovae and education

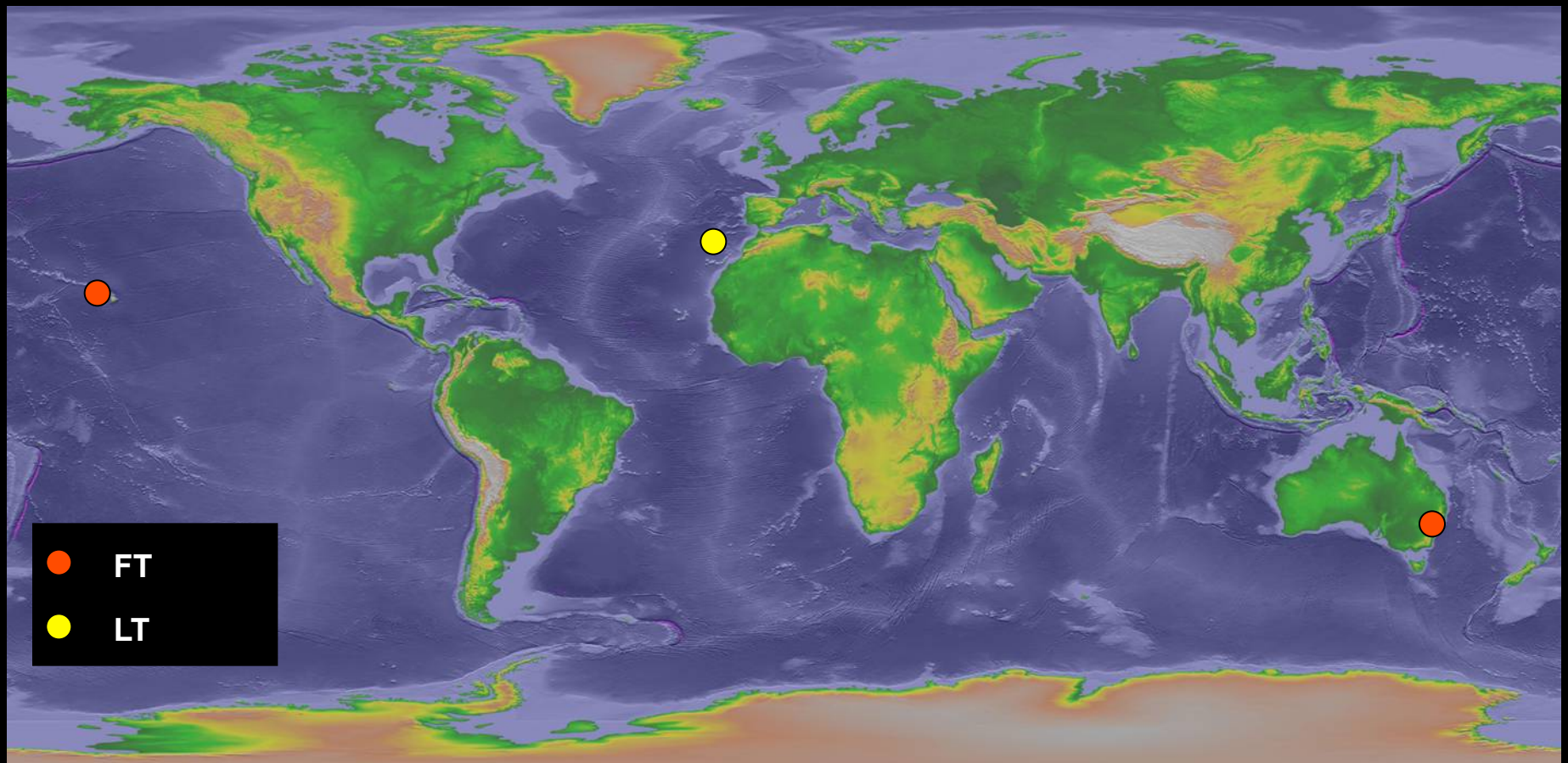
Fraser Lewis
Faulkes Telescope Project
National Schools' Observatory
Liverpool John Moores University
The Open University

Based in Cardiff, Wales

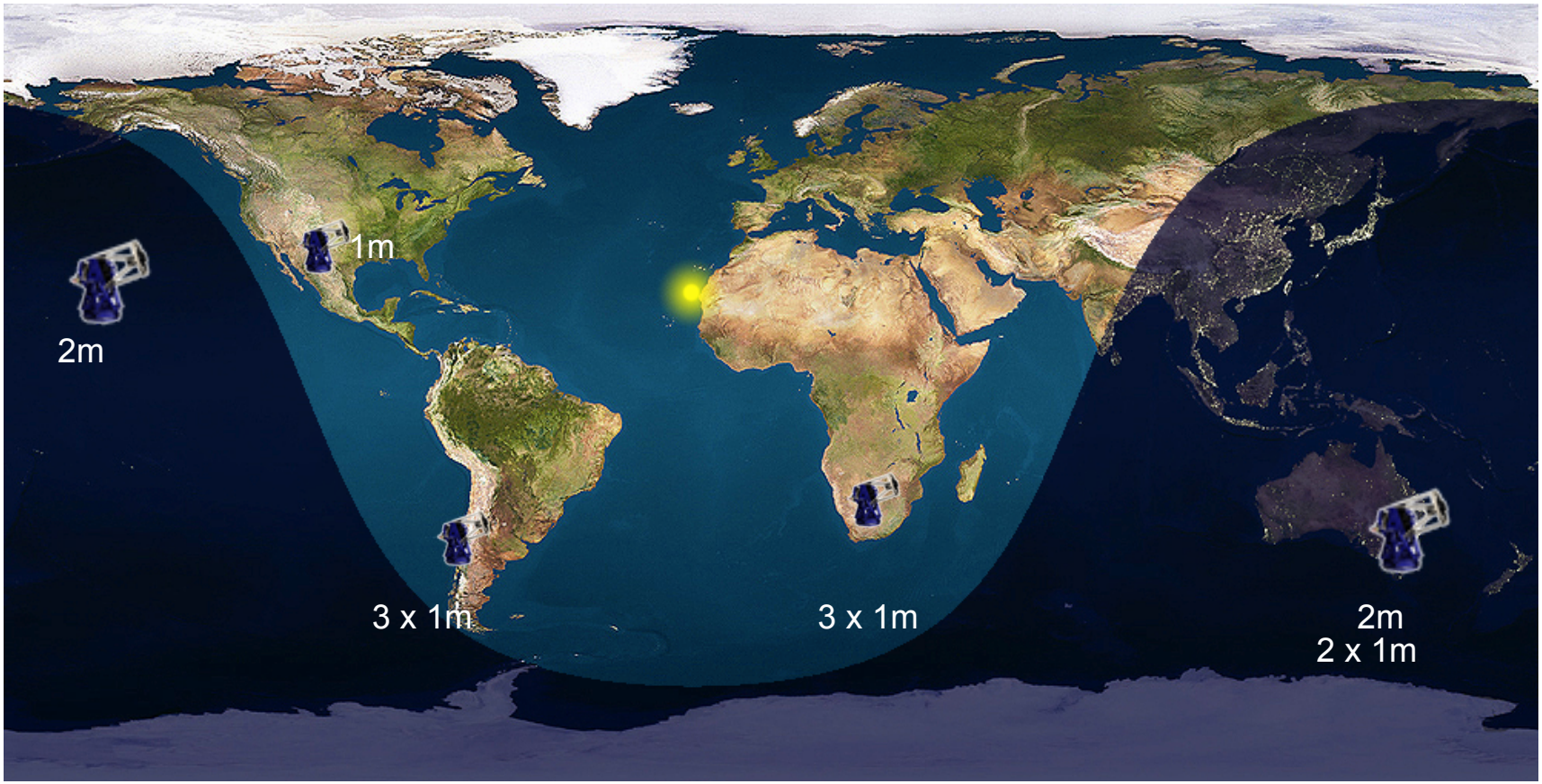


Robotic telescopes allow us to obtain images from (several) distant good quality sites

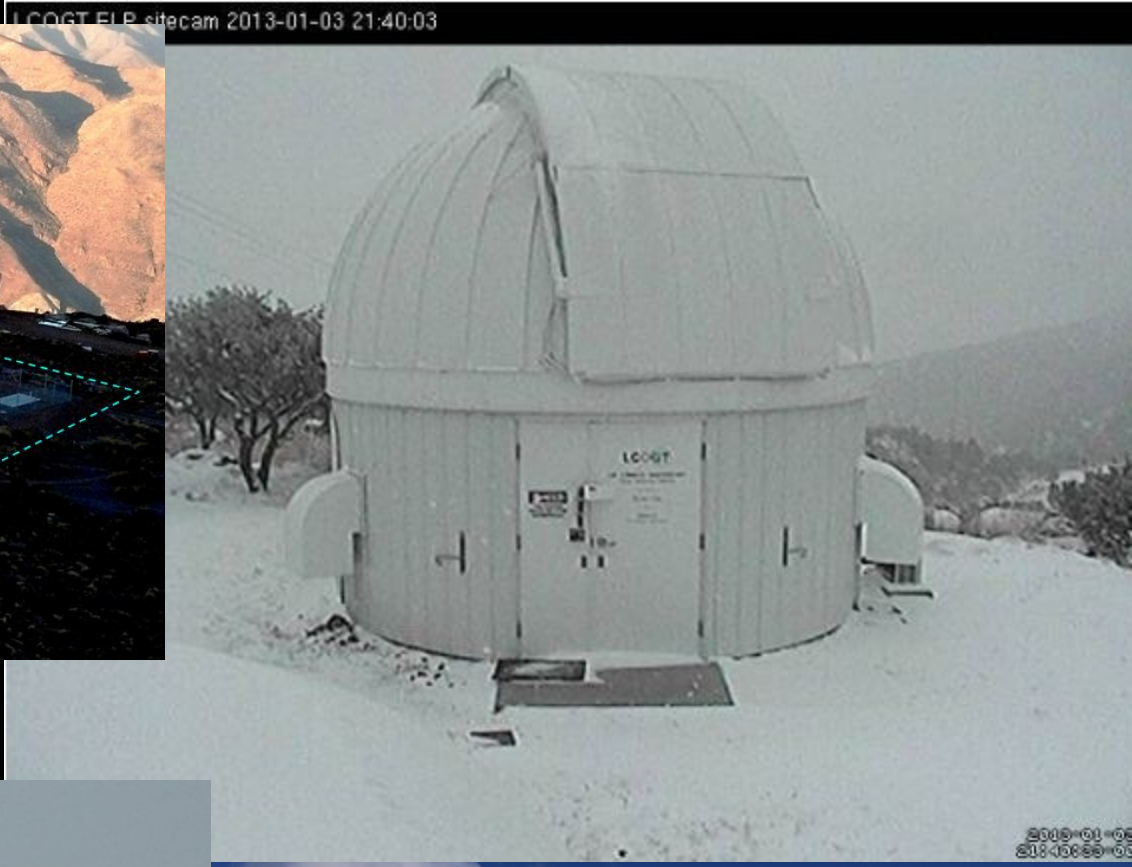
Only 3 * 2-metre telescopes that do this for education



Also 9 * 1-metre telescopes (5 more soon)



Las Cumbres Observatory


LCOGT FLP sitecam 2013-01-03 21:40:03
LCOGT


14/09/2012 12:40

Also 7 * 0.4 metres

Hawaii, Australia and Tenerife

Tarantula
Nebula

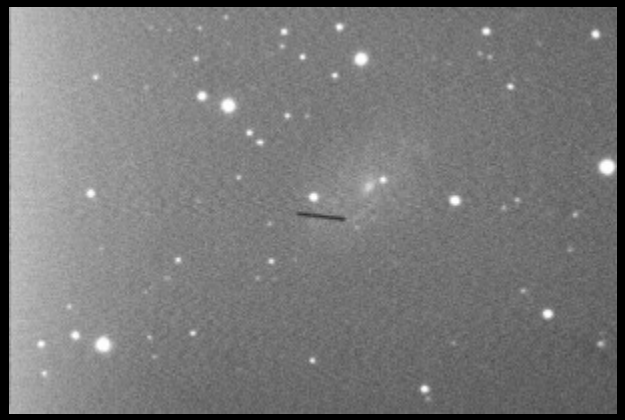
Astronomy is easy to inspire people with

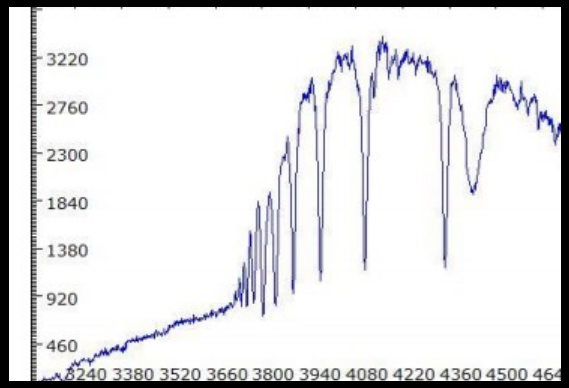
But it's usually a small part of the school curriculum

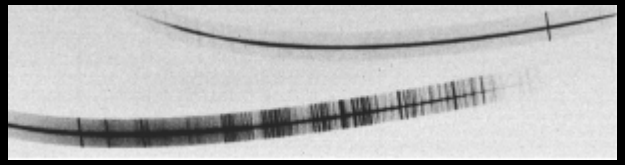
So we need to introduce STEM subjects (maths, IT, chemistry, biology) … and we encourage schools to collaborate, especially internationally

FLOYDS Spectrograph

Both 2-metre telescopes have a low-resolution spectrograph so as well as imaging objects, spectra can be taken (320 – 1000 nm; R 400 – 700)







AN EVOLVING SYNCHROTRON JET SPECTRUM IN SWIFT J1357.2–0933 IN QUIESCENCE PRECEDES THE 2017 OUTBURST

David M. Russell,[1] Ahlam Al Qasim,[1] Fraser Lewis,[2,3] Federico Bernardini,[1] and Richard M. Plotkin[4]

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[2]*Faulkes Telescope Project, School of Physics, and Astronomy, Cardiff University, The Parade, Cardiff, CF24 3AA, Wales, UK*
[3]*Astrophysics Research Institute, Liverpool John Moores University, 146 Brownlow Hill, Liverpool L3 5RF, UK*
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Optical brightening of Swift J1753.5-0127 observed with the Faulkes Telescope North

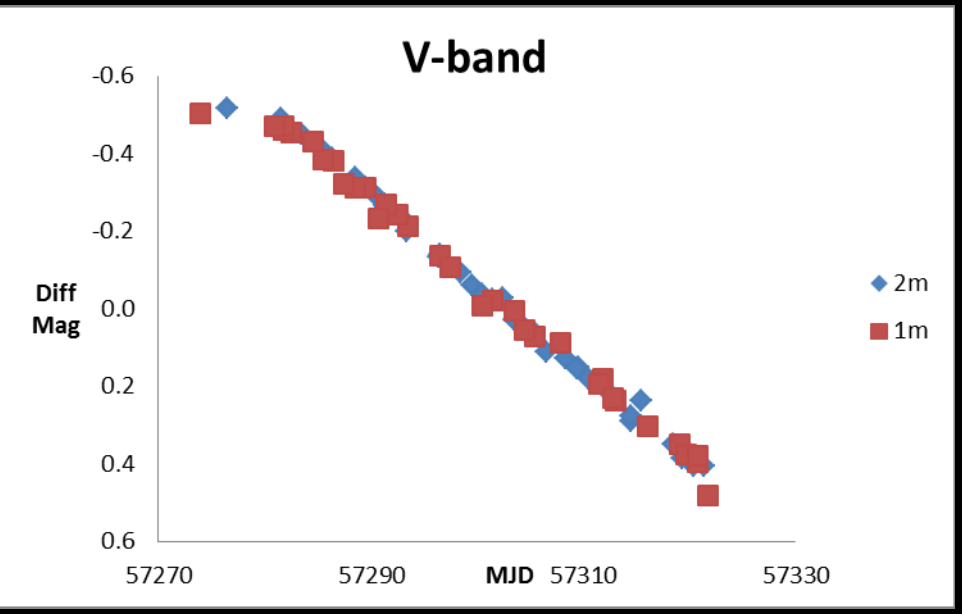
ATel #10075; *Ahlam Al Qasim, Aisha AlMannaei, David M. Russell (NYU Abu Dhabi), Fraser Lewis (Faulkes Telescope Project & Astrophysics Research Institute, LJMU), Guobao Zhang, Joseph D. Gelfand (NYU Abu Dhabi)*
*on **14 Feb 2017; 14:39 UT***
Credential Certification: David M. Russell (dave.russell5@gmail.com)

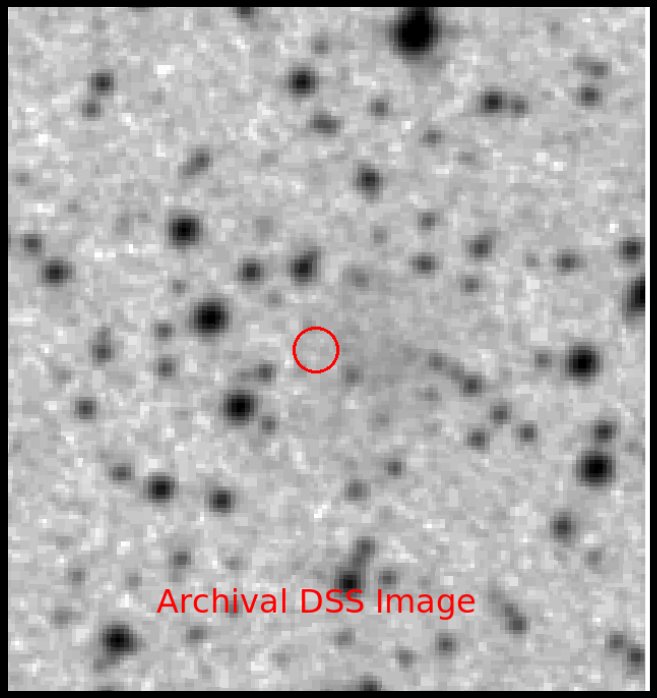
Subjects: Optical, X-ray, Binary, Black Hole, Transient

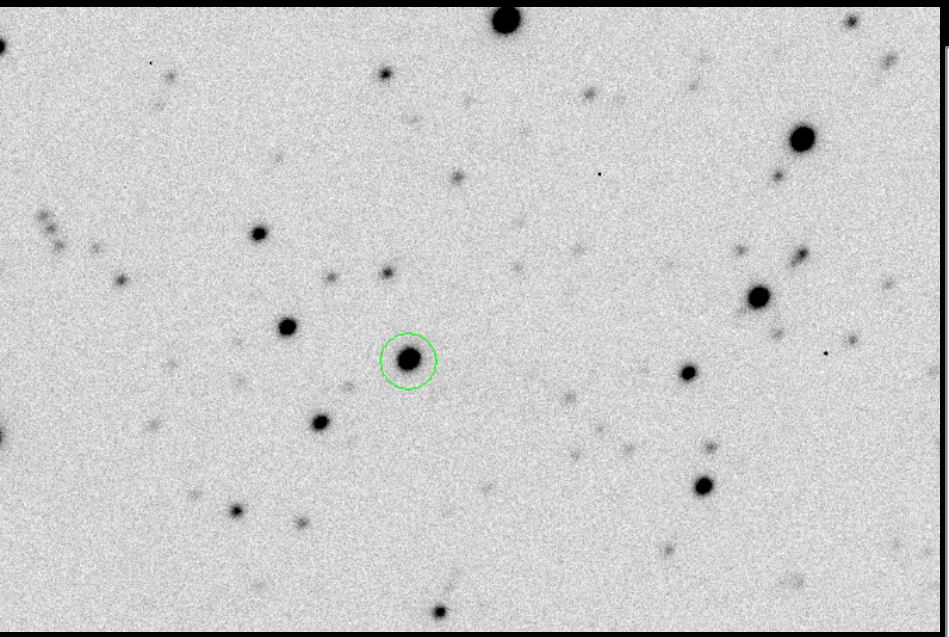
Referred to by ATel #: 10081, 10097, 10110, 10114, 10118, 10288, 10325

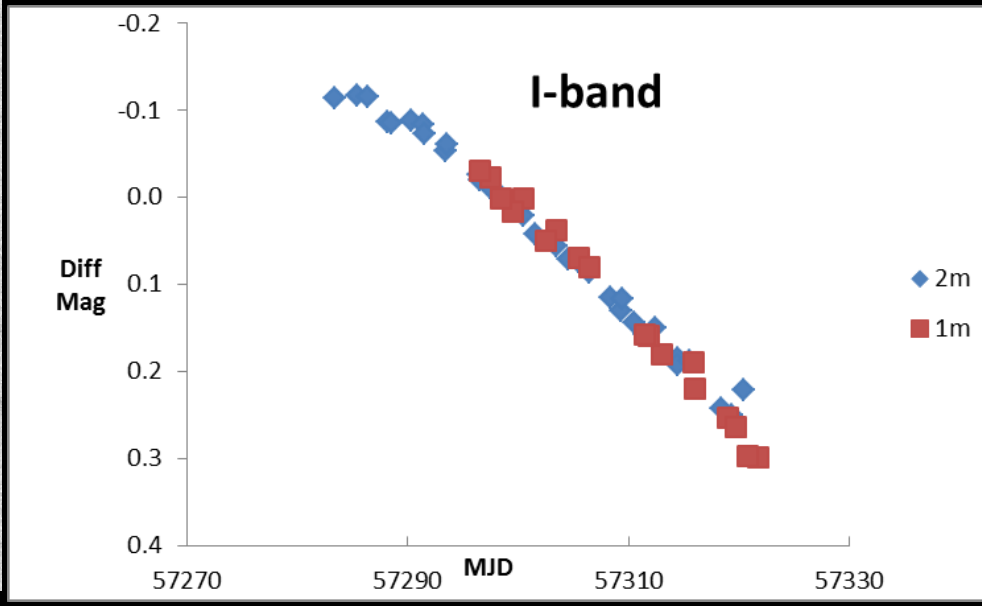
We have continued monitoring Swift J1753.5-0127, the black hole candidate X-ray binary, with the 2-m Faulkes Telescope North after it became once again visible from the ground. Last year, we reported an optical fading of the source towards quiescence (ATel #9708, #9739). Follow-up radio (ATel #9765), X-ray (ATel #9735) and optical (ATel #9741, #9758) observations confirmed the source was very faint compared to the last 11 years.

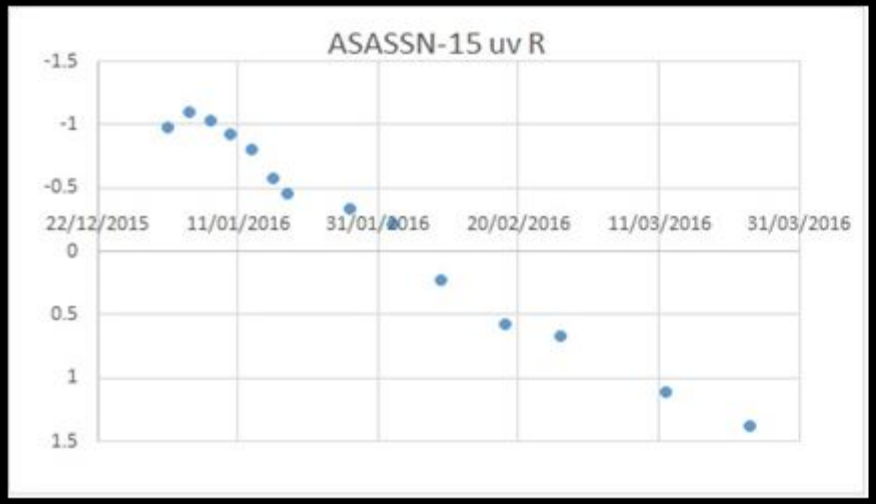
ASASSN-15oz (~250 images in 4 filters over 7 telescopes on 5 sites)

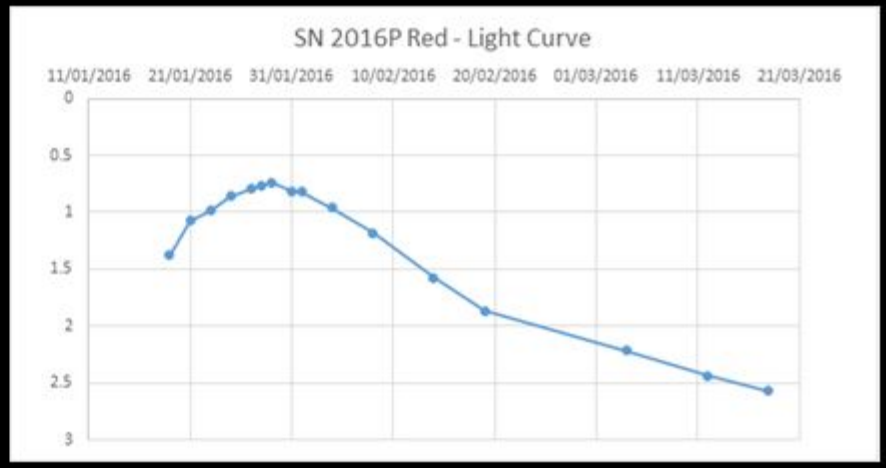


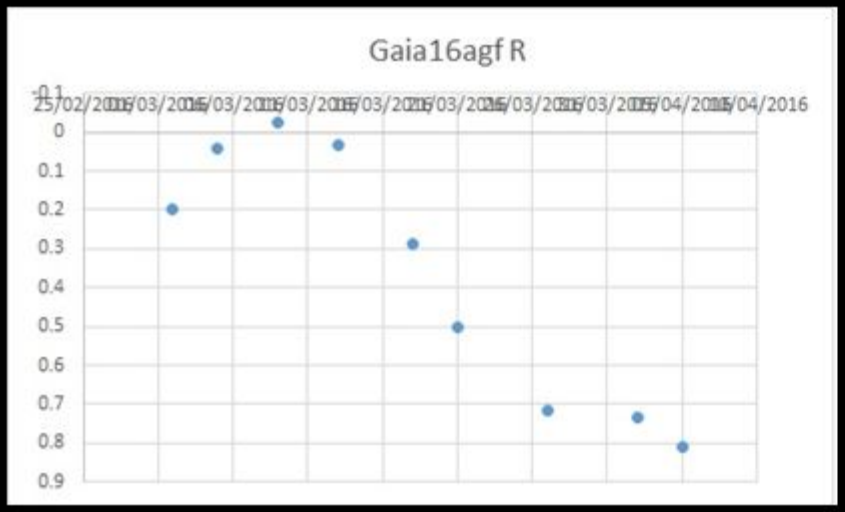







ASASSN-15 uv R
-1.5
-1
-0.5
0
0.5
1
1.5
22/12/2015
11/01/2016
31/01/2016
20/02/2016
11/03/2016
31/03/2016


SN 2016P Red - Light Curve
11/01/2016
21/01/2016
31/01/2016
10/02/2016
20/02/2016
01/03/2016
11/03/2016
21/03/2016
0
0.5
1
1.5
2
2.5
3


Gaia16agf R
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
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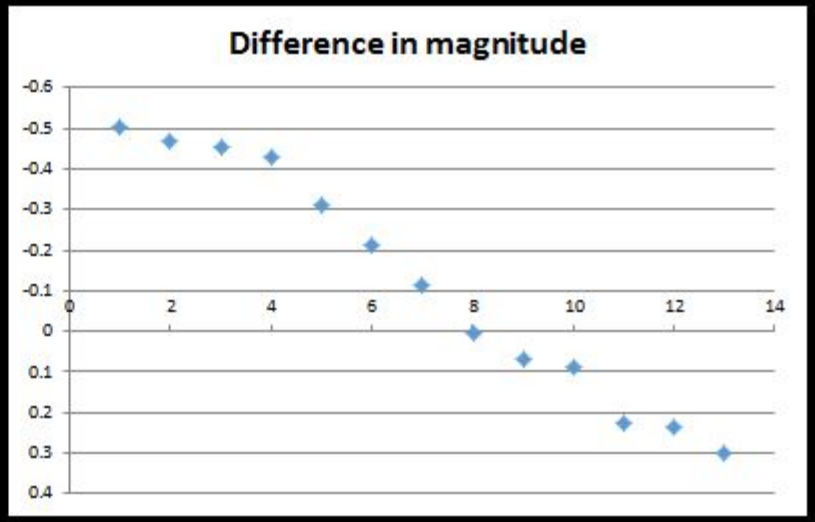
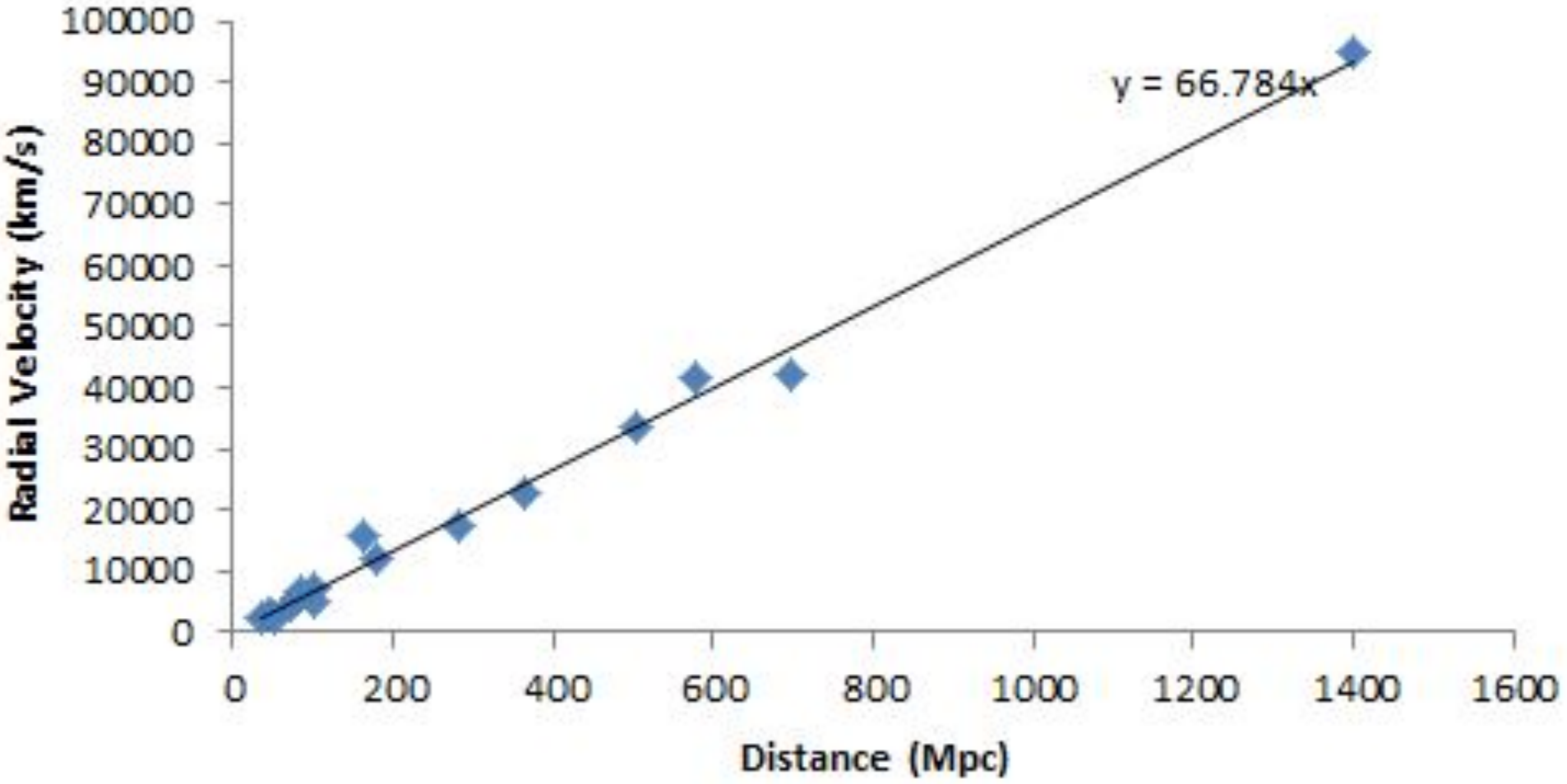
05/03/2016
15/03/2016
25/03/2016
05/04/2016


Difference in magnitude
-0.6
-0.5
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0
2
4
6
8
10
12
14

Hubble Diagram



Spotting a Supernova

Background Material

Gaia Science Alerts

The detection of transient astronomical objects in real-time

Not all stars emit light with a constant brightness and radiation output, many of them **change in brightness very suddenly** and often unexpectedly, over a variety of timescales. We call these objects **transients**.

Every day, the Gaia team announces several **science alerts** which indicate new discoveries of transient objects. The discoveries themselves are made in Cambridge University at the data processing centre at the Institute of Astronomy. Here, they lead the UK's involvement within the Gaia Data Processing and Analysis Consortium (DPAC).

As most transients – and indeed stars – that Gaia sees are so far away from us and appear so faint, we are unable to see them with the naked eye alone. Gaia is mapping one billion stars, whereas fewer than ten thousand stars are bright enough to be seen with just the naked eye – and most of those only with very dark sky conditions!) However, these objects can be seen from the ground by harnessing the power of **robotic telescopes** such as the Faulkes Telescopes. Gaia's science alerts (GSA) provide accessible data that **schools** and amateurs can use to make their own follow-up observations to confirm these transient objects and gather more information about their **properties and characteristics.**

http://resources.faulkes-telescope.com/course/view.php?id=144

Getting to know Gaia

- CCDs
- Signalling
- Launch
- Orbit Location
- Scientific Instruments
- Precision
- Power Systems

New in 2017

The return of real-time observing

USP for 2-metre telescope

Schools get exclusive control of telescopes for 30 minute blocks

NRES (Network of Robotic Echelle Spectrographs)

High resolution (R ~ 50,000) spectrographs on 1-metre telescopes

IRIS
(Institute for Research In Schools)

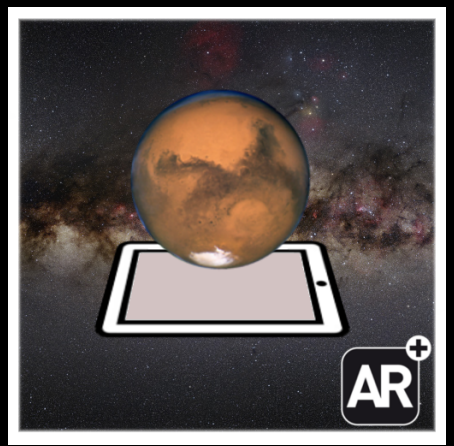
Gaia Alerts – Supernovae follow-up

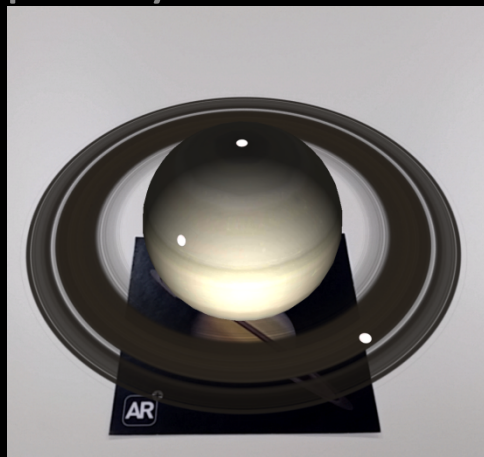
Twinkle (UC London) exoplanet mission

THE INSTITUTE
for RESEARCH
in Schools

Our Universe AR

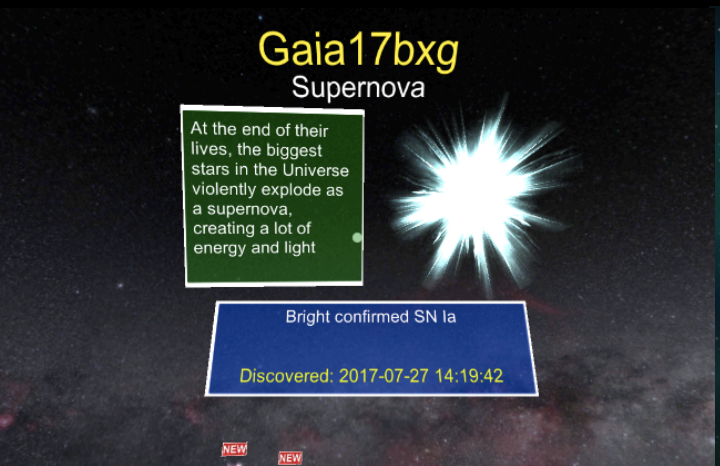
- Augmented reality, imposes 3D models of objects in the real world
- Uses a set of 10 ‘postcards’, one for each planet, the Sun and minor planets.
- When looked at with smartphone or tablet, 3D model of planet pops up.
- You can click on parts of the planets to find out more about them
- App and postcards are free for schools. Can also print yourself





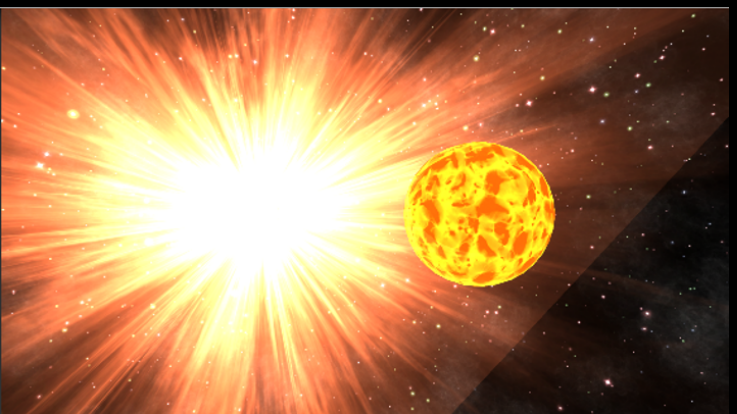
Gaia Alerts VR

- Virtual Reality, available as an app on your phone and works with Google Cardboard/VR Headsets.
- Shows the positions of the latest Gaia Alerts in the sky.
- Clicking on an alert gives more information about it.
- Updates automatically, always showing the latest alerts.
- App is free to download from Google Play Store



Supernova Simulator

- Smart phone and tablet app that lets you design your own supernova
- Can choose SN type, Mass, Radius, etc.
- Shows model of your SN
- Gives resulting information on the supernova, such as energy, brightness, etc.
- App is free to download from Google Play Store



Please come find me or
e-mail me your ideas

fraser.lewis@
faulkes-telescope.com

http://faulkes-telescope.com

http://resources.faulkes-telescope.com

http://education.down2earth.eu

http://schoolsobservatory.org.uk

Google Play Store “Faulkes Telescope Proect”