Linking Education and Research

Fraser Lewis

Faulkes Telescope Project

National Schools' Observatory

Liverpool John Moores University

The Open University

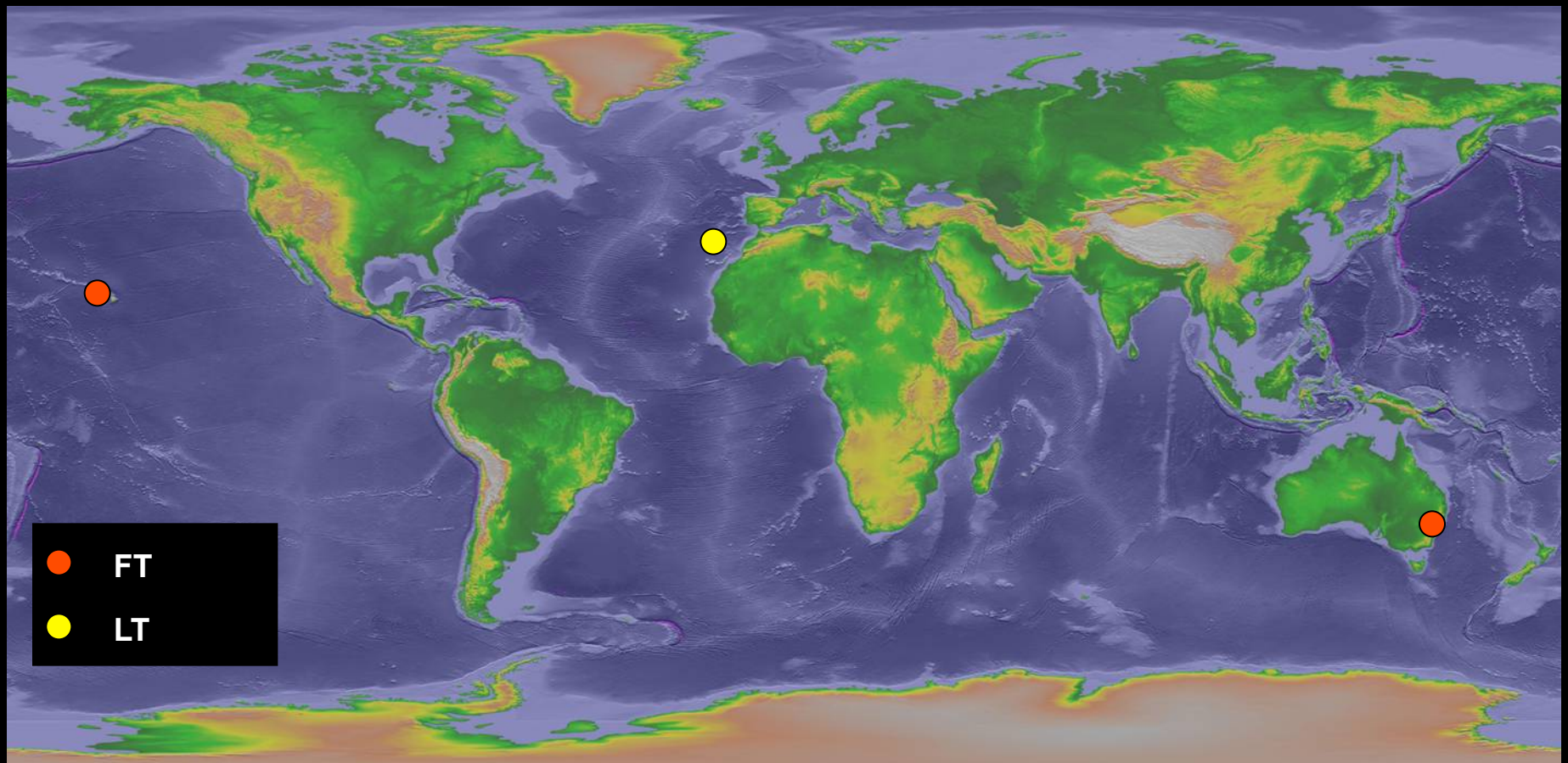
GO-LAB

GLOBAL ONLINE SCIENCE LABS
INQUIRY LEARNING AT SCHOOL

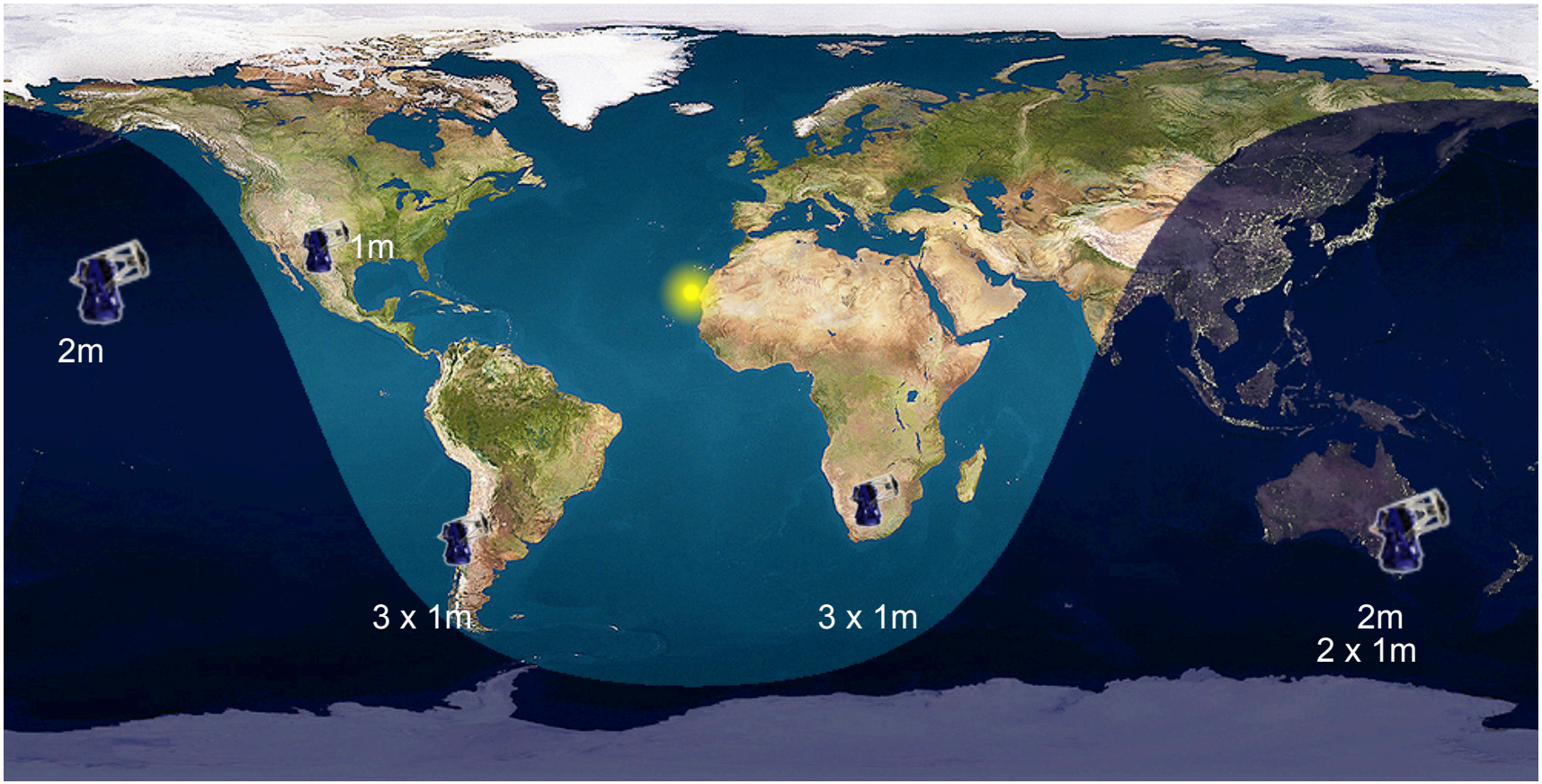
Galileo Teacher Training Program
A LEGACY OF THE INTERNATIONAL YEAR OF ASTRONOMY 2009

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

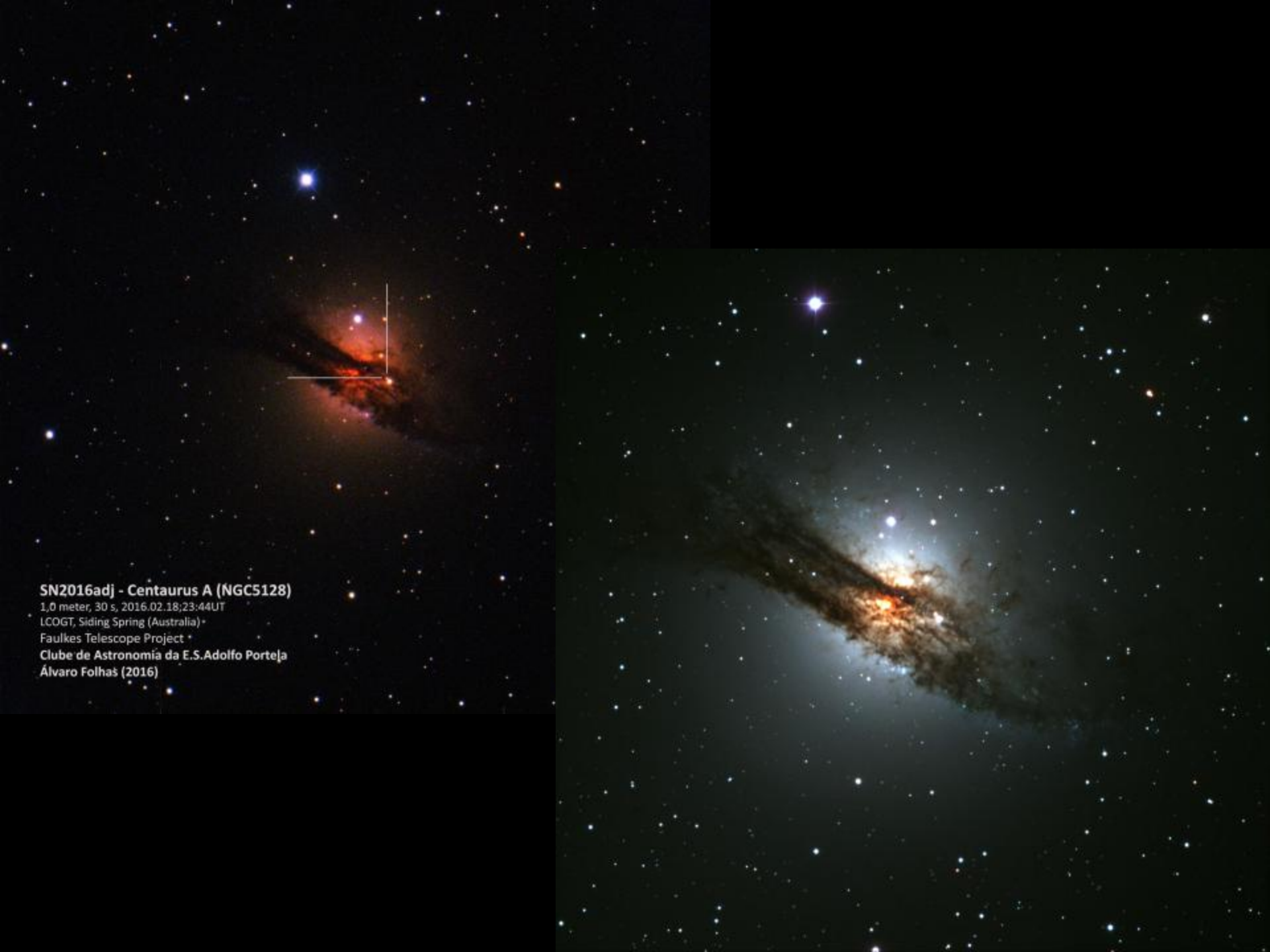
Only 3 * 2-metre telescopes that do this for education



Also 10 * 1-metre and several 40-cm telescopes



Las Cumbres Observatory


SN2016adj - Centaurus A (NGC5128)
1,0 meter, 30 s, 2016.02.18;23:44UT
LCOGT, Siding Spring (Australia)
Faulkes Telescope Project
Clube de Astronomia da E.S.Adolfo Portela
Álvaro Folhas (2016)

Spotting a Supernova

Background Material

Gaia Science Alerts

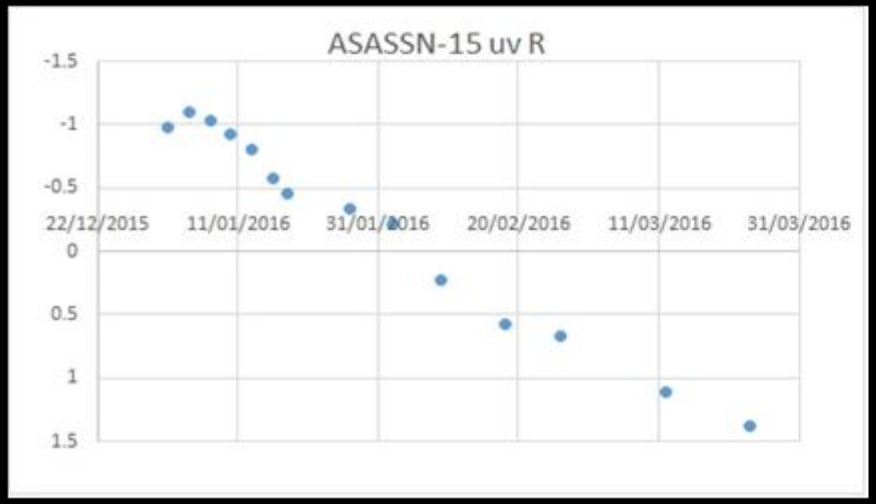
The detection of transient astronomical objects in real-time

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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1
1.5
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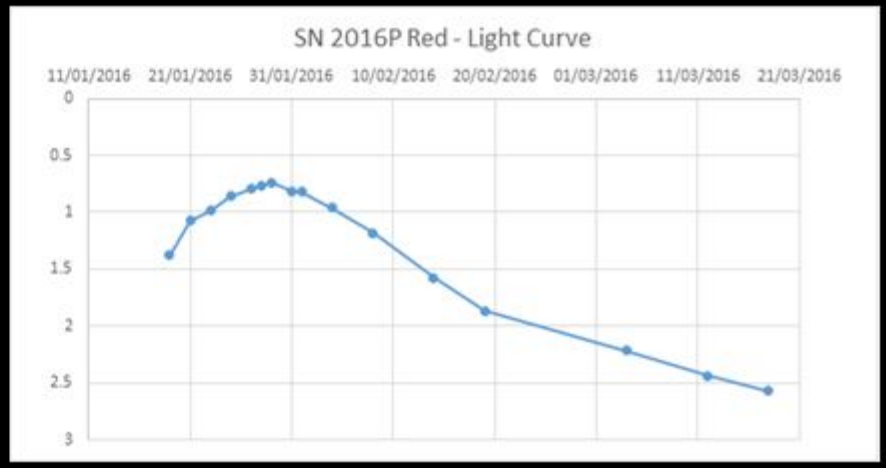
11/01/2016
31/01/2016
20/02/2016
11/03/2016
31/03/2016


SN 2016P Red - Light Curve
11/01/2016
21/01/2016
31/01/2016
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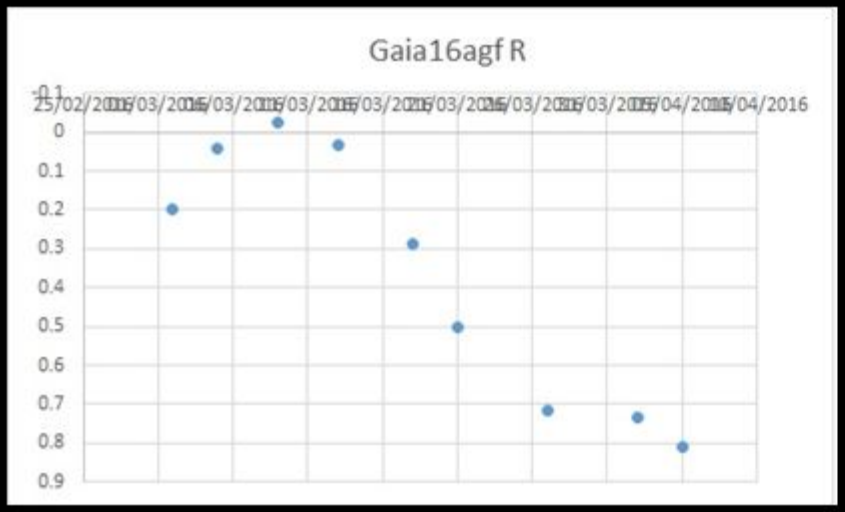
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0.4
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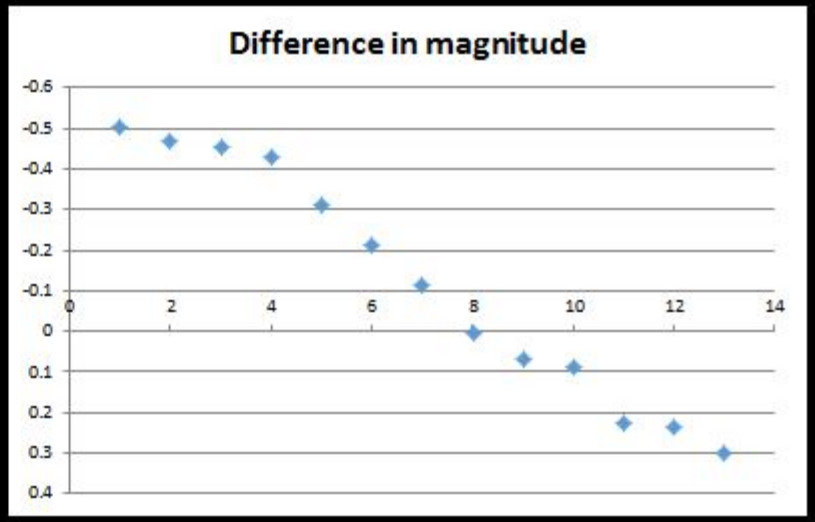
05/03/2016
15/03/2016
25/03/2016
05/04/2016


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

The Expansion and Age of the Universe

Using type Ia supernovae to calculate the expansion and age of our Universe

We can use type Ia supernovae to help us determine how quickly our Universe is expanding and also, how old it is! This activity involves combining you own data with other scientific data to calculate these values.

If you have completed the Spotting a Supernova activity, you can use your results to **contribute to the data** in this activity.

If you haven't, you can still complete this activity with the data provided.

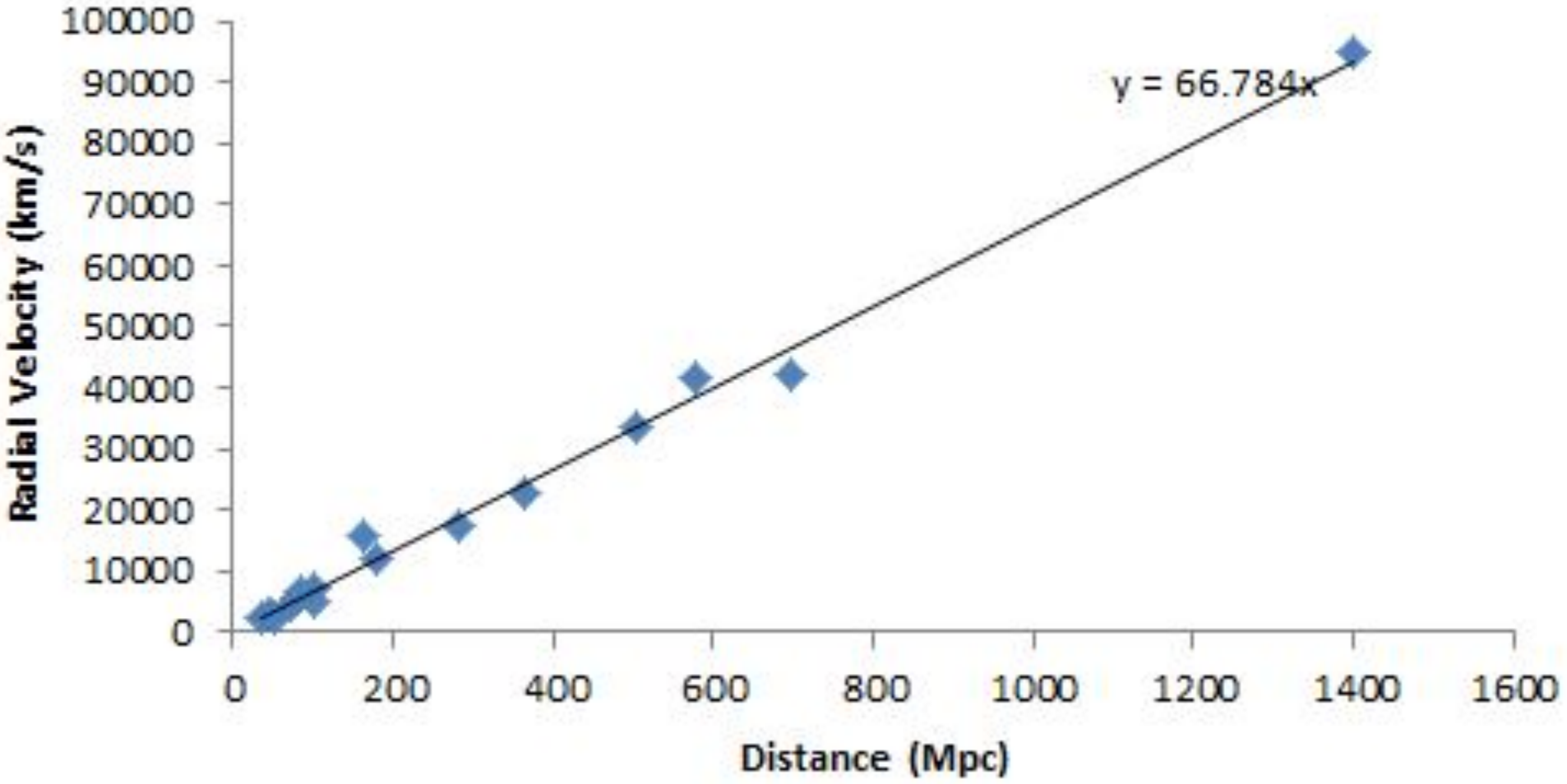
Measuring Peak Magnitudes of Type Ia Supernovae

Now that you are familiar with carrying out photometry, let's take a look at some data from some other type Ia supernova targets.

Step 1: First of all, you will need a table to record your results in. Use the space below to design a table that you can use to record the parameters listed below. When you are happy with it, copy it

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

Hubble Diagram



Stop Press

In conjunction with PI Andy Newsam (NSO, LJMU) we have been successful in UKRI bid to develop a pilot project in Citizen Science

“Developing opportunities for in-depth citizen science using robotic telescopes”

Our intention is to develop these resources based on Gaia supernovae (especially Type !a) as imaged by Faulkes Telescopes/LCO/Liverpool Telescope

What Is Citizen Science ?

Best and most successful example is Galaxy Zoo

https://www.zooniverse.org/

However, Galaxy Zoo relies on thousands of users and perhaps does not offer lots of opportunities for them to analyse and learn

So our approach will be to work with fewer users (perhaps tens) but provide them with the chance to learn and contribute

What Will Our Users Do

Photometry of Archive Datasets ~ 30 Type Ia Sne

Use of Excel

Upload their finished light-curves

Use the Gaia Alerts stream to suggest and observe new targets

Learn about supernovae

Learn about the expansion of the Universe

Learn about Gaia !

Difficulties

Remit of Citizen Science is to do as much as or as little as you choose

So we must make this modular

And each module must encourage the user to find out more

What Next

This is a pilot project so if we are successful, we may be able to chase more funding

Would our users be interested in other Gaia targets ?

Can we feed this forward to LSST, etc. ?

PLEASE HELP ! If you have teachers or schools that you believe would be interested, please let me know ?!

Please e-mail me any ideas

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faulkes-telescope.com

http://faulkes-telescope.com

http://resources.faulkes-telescope.com

http://www.schoolsobservatory.org.uk/