# Einstein cross in supernovae

**SUPERNOVA** A rare "Einstein cross" comprising four images of the same distant supernova offers the chance to map matter distribution as the supernova signal evolves.

The light forming each of the four images follows a different path and encounters different combinations of dark and visible matter. As the supernova fades and its light curve evolves, researchers will be able to track the arrival of different stages of the supernova in the four images.

The supernova was found in a survey of data from the Grism Lens Amplified Survey from Space (GLASS) collaboration. The supernova has been nicknamed Refsdal in honour of Norwegian astronomer Sjur Refsdal who, in 1964, proposed using time-delayed images from a lensed supernova to study the expansion of the universe. The research was published in *Science* by Kelly *et al.*

http://glass.physics.ucsb.edu
http://bit.ly/1Bwef3p

The four yellow spots are lensed images of the same supernova. (NASA, ESA)

# Happy birthday, Phil. Trans.!

**JOURNAL** The world's oldest science journal, *Philosophical Transactions of the Royal Society*, was first published 350 years ago, in March 1665. This publication pioneered the concepts of scientific priority and peer review, making it a model for later scientific journals.

As part of the celebrations of this anniversary, RAS Fellow Paul Williams was asked to take part in a short film (available on YouTube) about controversy in science. Geoffrey Boulton of the University of Edinburgh also took part. Williams focused on the longstanding debate on the origin of geomorphological features in Scotland: the Parallel Roads of Glen Roy. While their origin as the shorelines of ice-dammed lakes during the Younger Dryas stadial is no longer in dispute, they retain significance as evidence that the climate has changed on geological timescales.

The Parallel Roads of Glen Roy, once a cause of geological controversy. (P Williams)

http://bit.ly/1AhZtJn
https://royalsociety.org/publishing350

# Black hole in early universe is a massive problem

**QUASAR** A newly discovered quasar and black hole at 12.8 billion light years from Earth has a mass 12 billion times that of the Sun – and that's a problem.

This quasar, SDSS J0100+2802, is the brightest in the early universe, with a luminosity equivalent to 420 trillion Suns, and dates from the end of the epoch of reionization. Its black hole is also surprisingly massive: the Milky Way has a 4 million solar-mass black hole at its centre. "How can a quasar so luminous, and a black hole so massive, form so early in the history of the universe, at an era soon after the earliest stars and galaxies have just emerged?" said Xiaohui Fan, Regents' Professor of Astronomy at the University of Arizona's Steward Observatory. "And what is the relationship between this monster black hole and its surrounding environment, including its host galaxy?"

This discovery poses problems for our understanding of the growth of galaxies and how galaxies and black holes co-evolve – a black hole this size should not have had time to form when the universe itself was less than 1 billion years old.

The record-breaking quasar was discovered at China's 2.4 m Lijiang Telescope (the only quasar to be found with such a small instrument). The 8.4 m Large Binocular Telescope and the 6.5 m Multiple Mirror Telescope, among others, were used to determine the object's distance and mass.

This research was published by Wu *et al.* in *Nature*.

http://bit.ly/1FfpfU6

## NEW FELLOWS

The following were elected to fellowship in February 2015:

**Kélig Aujogue**, Coventry
**Shaun Badmin**, Northampton
**Deborah Baker**, University College London–Mullard Space Science Laboratory
**Nicole Becks**, Uccle, Belgium
**Carolina Bergfors**, University College London
**Giovanni Bernardi**, Teddington
**Rachana Bhatawdekar**, University of Nottingham
**Rene Breton**, University of Manchester
**Richard Brewer**, Peterborough
**Rhian Chapman**, Bedford
**Balraj Chauhan**, London
**Chris Collins**, Liverpool John Moores University
**Ciarán Conneely**, Imperial College London
**Steven Cowley**, London
**Andreea Dumitru**, Brighton
**Daniel Evans**, Telford
**Richard Field**, Kirkby-In-Ashfield
**Stewart Fishwick**, University of Leicester
**Amelia Fraser-McKelvie**, University of Hull
**Jonathan Frazer**, Forest Row
**Kingsley Gale-Sides**, Newcastle-Under-Lyme
**Brad Gibson**, University Of Central Lancashire
**Paul Gisborne**, Harrogate
**Silvia Giuliatti Winter**, Dept de Matematica, UNESP, Brazil
**Robert Goutte**, CREATIS – INSA de Lyon
**Luke Hart**, Manchester
**Ross Hart**, Nottingham
**Carole Haswell**, Open University
**Sebastian Hoenig**, University of Southampton
**Katherine Hollyhead**, Liverpool
**Helen Jermak**, Liverpool John Moores University
**Sarah Kendrew**, Oxford
**Zachary Kenton**, Queen Mary University of London
**Petra Kohutova**, Coventry
**Margaret Koval**, London
**Guillaume Laibe**, University of St Andrews
**Gavin Lamb**, Wallasey
**Louis Le Breuilly**, Cheltenham
**Emma Lofthouse**, Hatfield
**David Marshall**, Somerville
**Pamela Martin**, Armagh Observatory
**Peter Meadows**, Chelmsford
**Bruno Moraes**, University College London
**Neil Morrison**, Crawley
**Louis Neophytou**, London
**Maria Niculescu-Duvaz**, Sutton
**Stuart Nippress**, AWE Blacknest
**Olugbenga Ogunmodimu**, Manchester
**Joanna Papaj**, London
**Anandteerth Parvatikar**, Brighton
**David Perez-Suarez**, Mullard Space Science Laboratory
**Ramon Rey-Raposo**, University of Exeter
**Alan Rooney**, Ballogie
**Laurence Routledge**, Brighton
**Jamie Ryan**, Horsham
**Alexander Sheardown**, Hull
**Starling Rhaana**, University of Leicester
**Nigel Sutton**, St Davids
**Francisco Suzuki-Vidal**, Imperial College London
**Markos Trichas**, Stevenage
**Daniel Walker**, Liverpool John Moores University
**Jacob Ward**, Newcastle
**Christopher Webb**, Caterham
**Christopher Welch**, International Space University
**Richard Williams**, Liverpool John Moores University
**James Wilson**, Brecon
**Toby Wood**, Newcastle University
**David Woodford**, Prudhoe
**Peter Woolman**, Open University
**Yaling Xie**, London