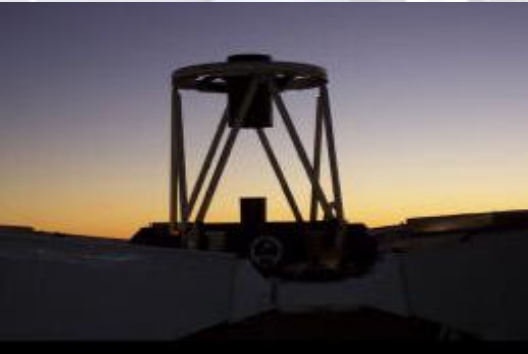


Monitoring LMXBs with the Faulkes Telescopes

Fraser Lewis
LCOGT,
Open University,
Cardiff University,
University of Glamorgan



May 23, 2009

Workshop on Robotic Autonomous

Thesis Title

Temporal Fluctuations in Accretion Around X-ray Binaries

Also to blame (a bit)

David Russell (Amsterdam)

Rob Fender (Southampton)

Paul Roche (LCOGTN/Cardiff)

Simon Clark (Open University)

Rachel Street (LCOGTN/UC Santa Barbara)

Tolis Christou (Armagh Observatory)

Alan Fitzsimmons (Queen's University, Belfast)

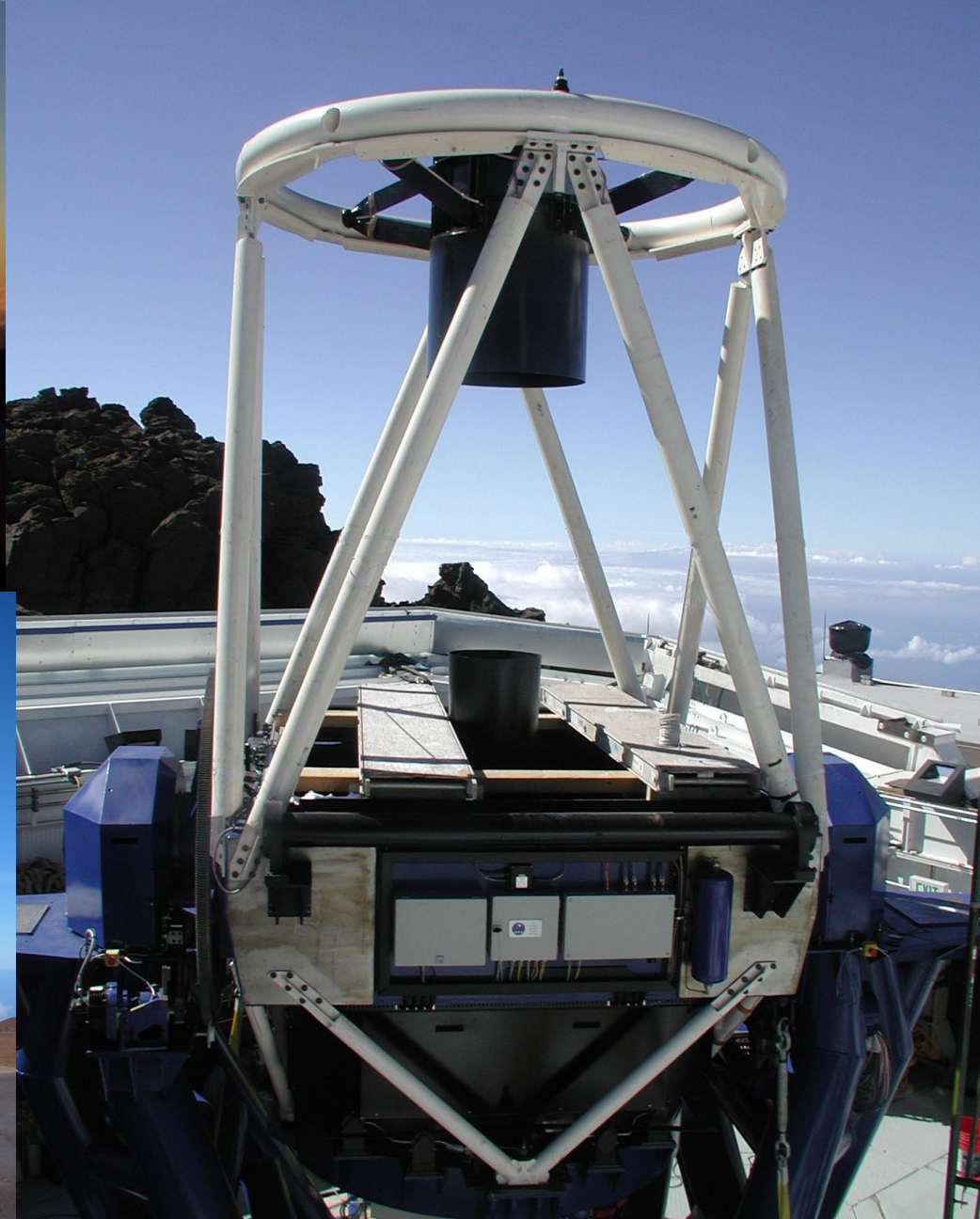
Richard Miles (British Astronomical Association)

Paul Hickson (UBC)

Vanessa Stroud (LCOGTN/Cardiff/Open University)

The Telescope Sites

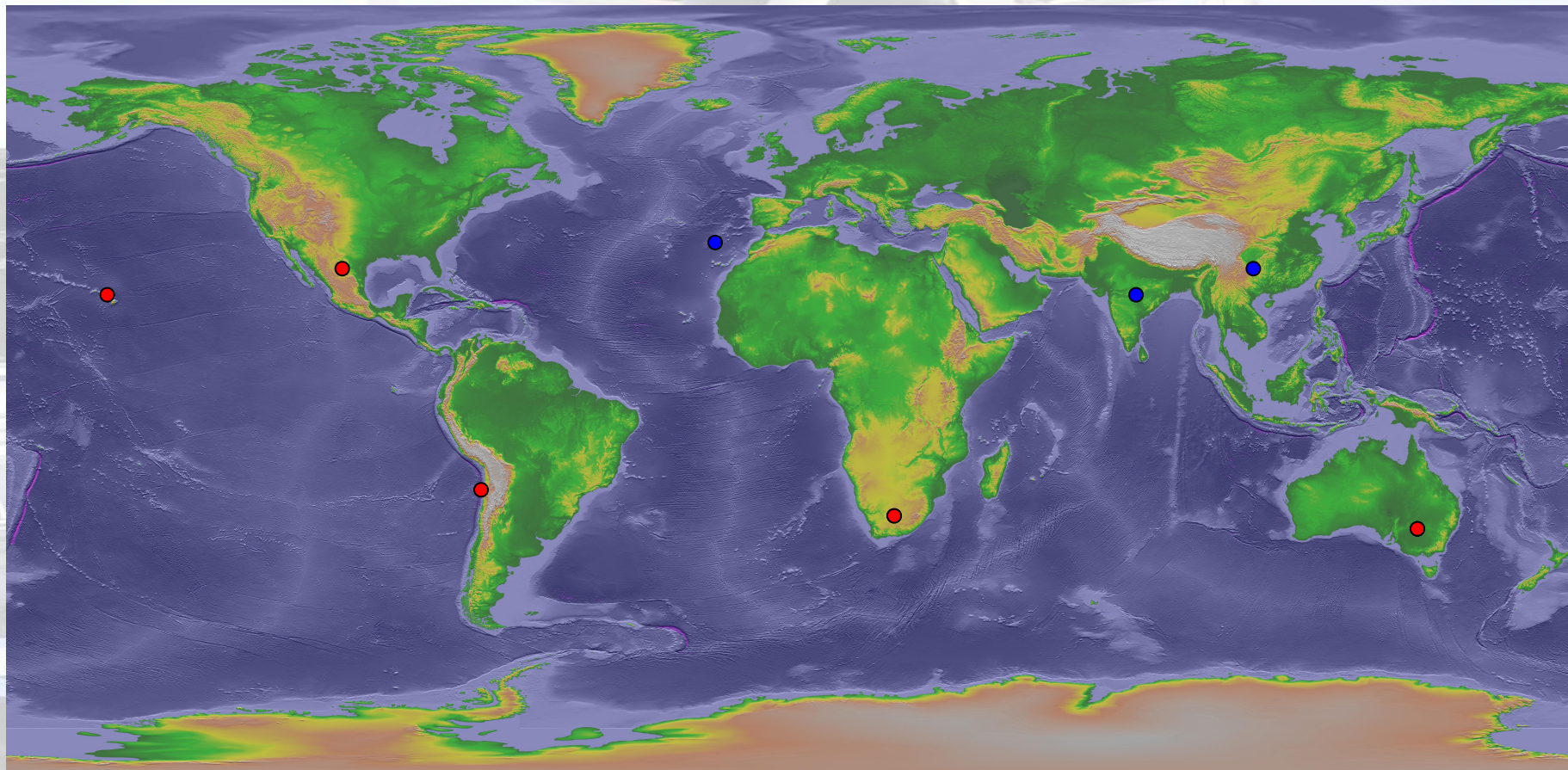




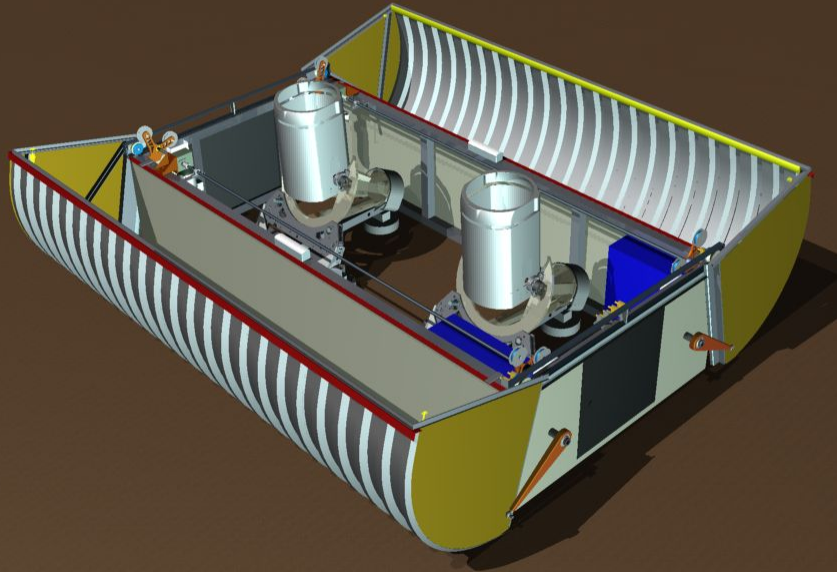
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Plans for Global Domination



0.4 Metre 'Scopes



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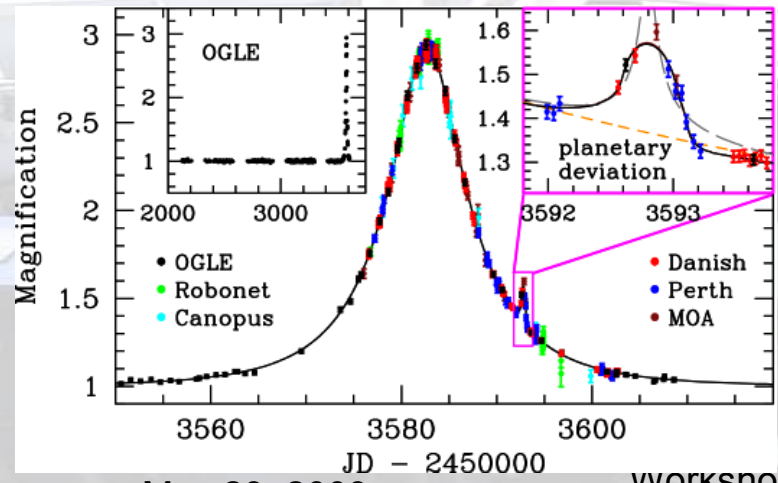
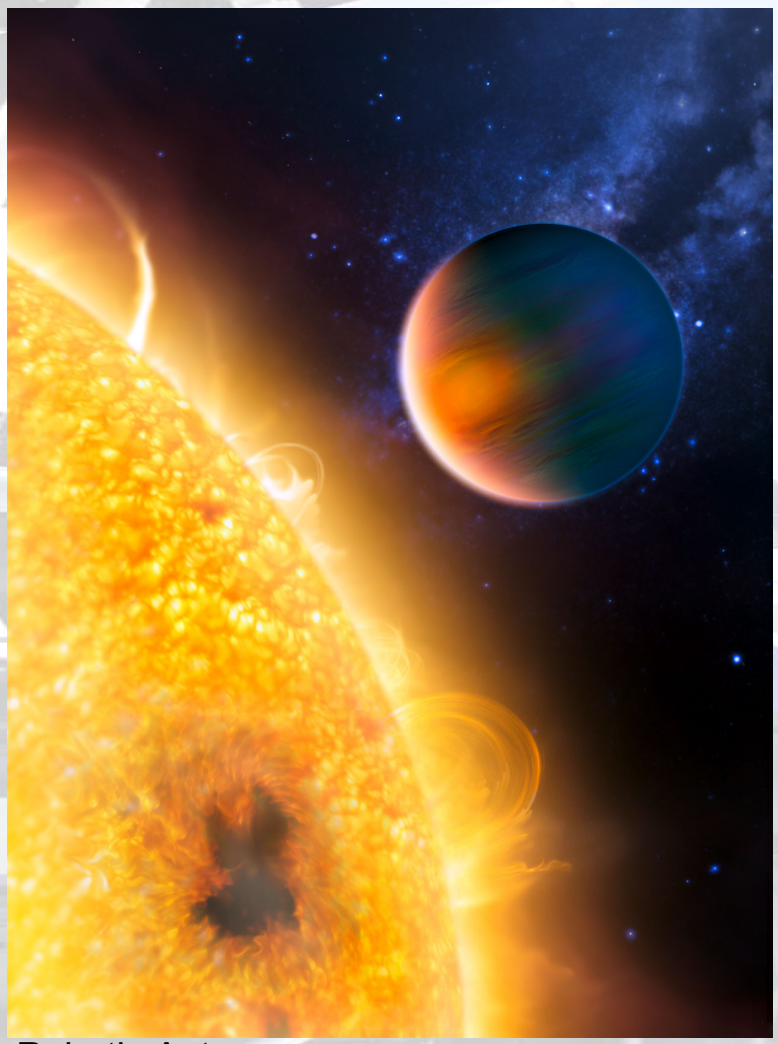
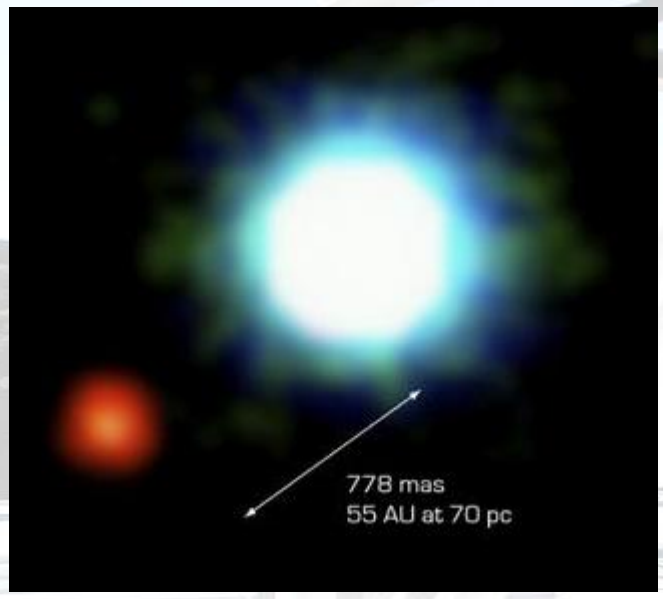


Our Aims

Genuine scientific investigations
Contribute to scientific knowledge
Link schools with professional scientists

We provide specially designed online
educational materials and teacher training

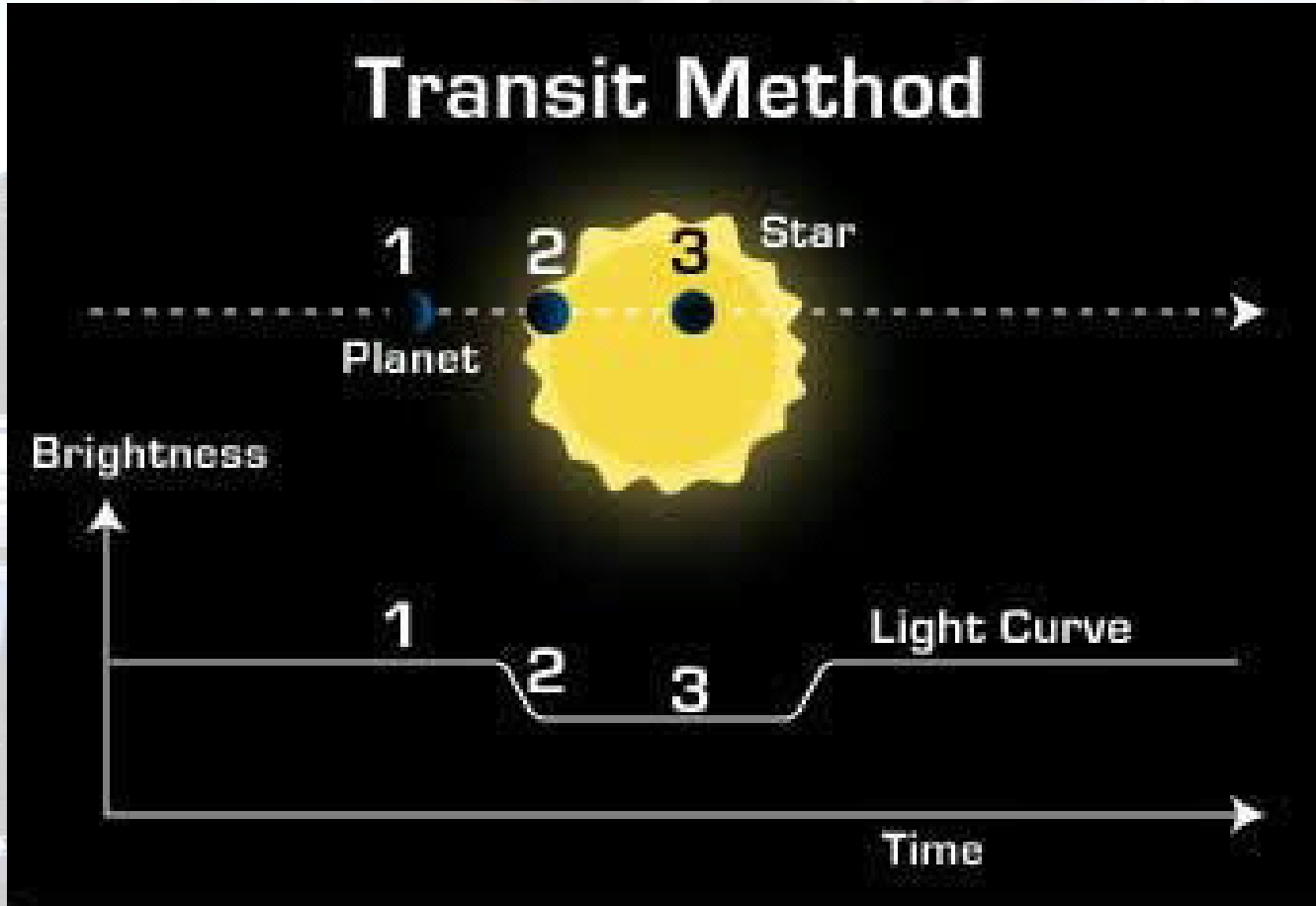
Exoplanets



May 23, 2009

workshop on Robotic Autonomous

Exoplanet Transit



Microlensing

Gravitational Microlensing

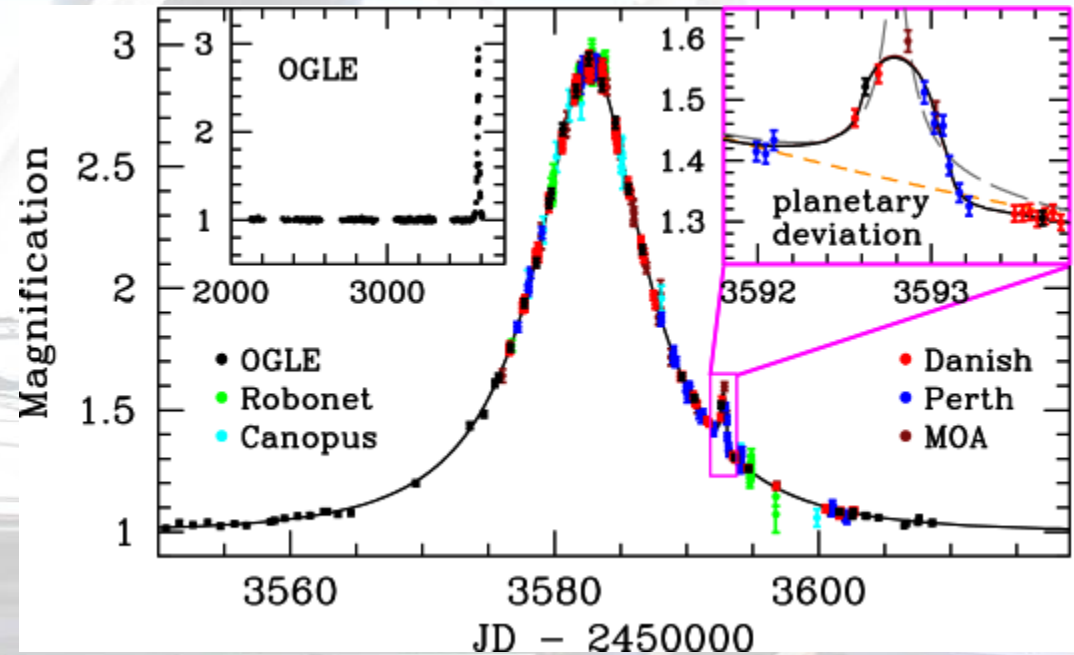


Extra Solar Planets

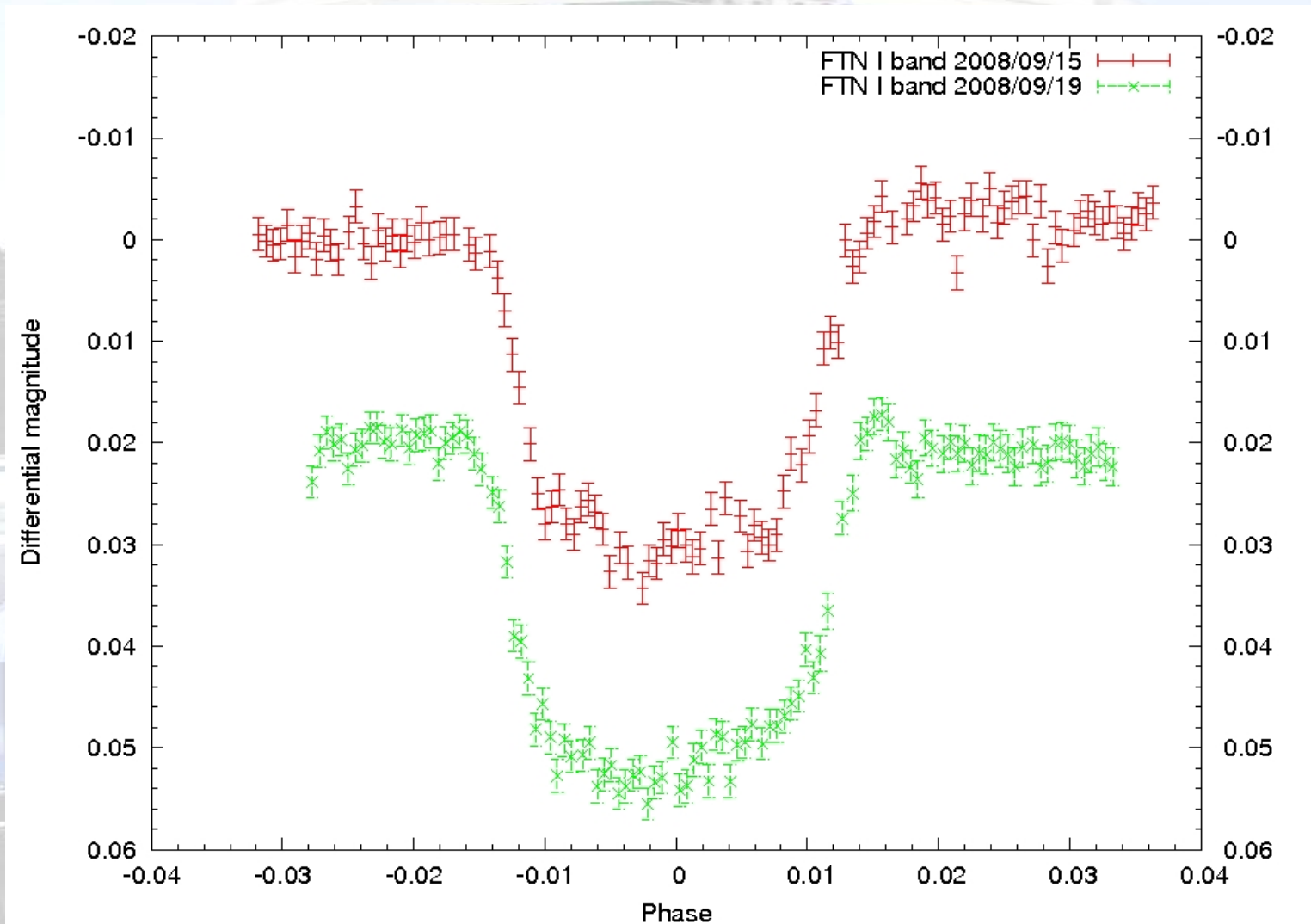
Nature, Jan. 26th
2006

Discovery of a cool,
5.5 Earth mass ESP

FTN data obtained
by RoboNet



WASP-10 (Transit)



Occultations of Uranian Moons

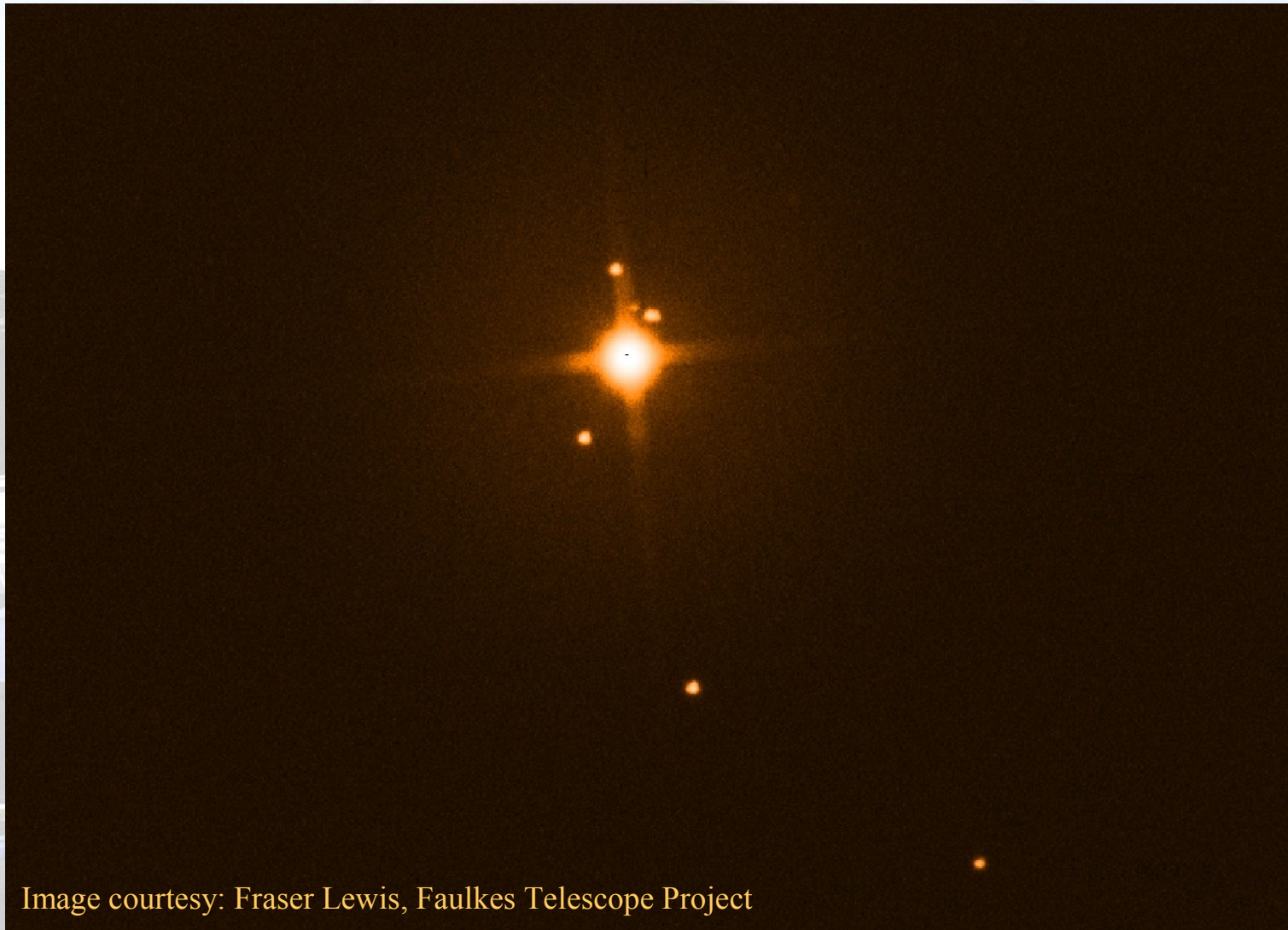
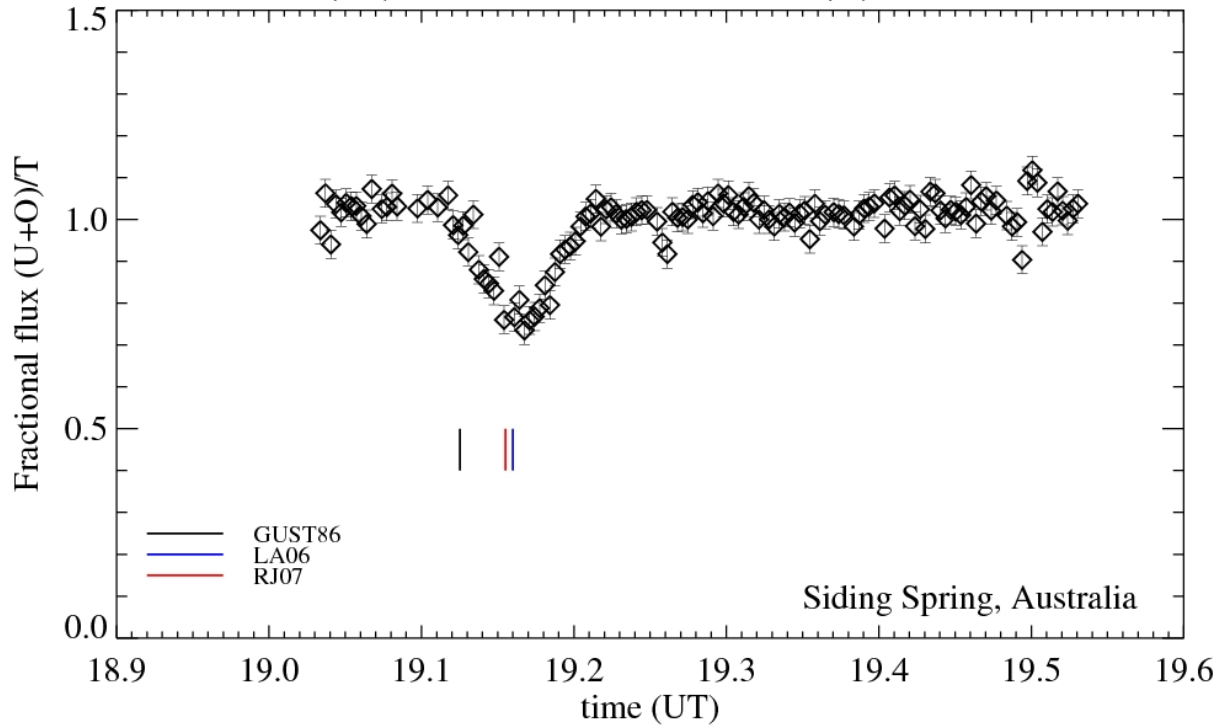


Image courtesy: Fraser Lewis, Faulkes Telescope Project

Uranian Moons

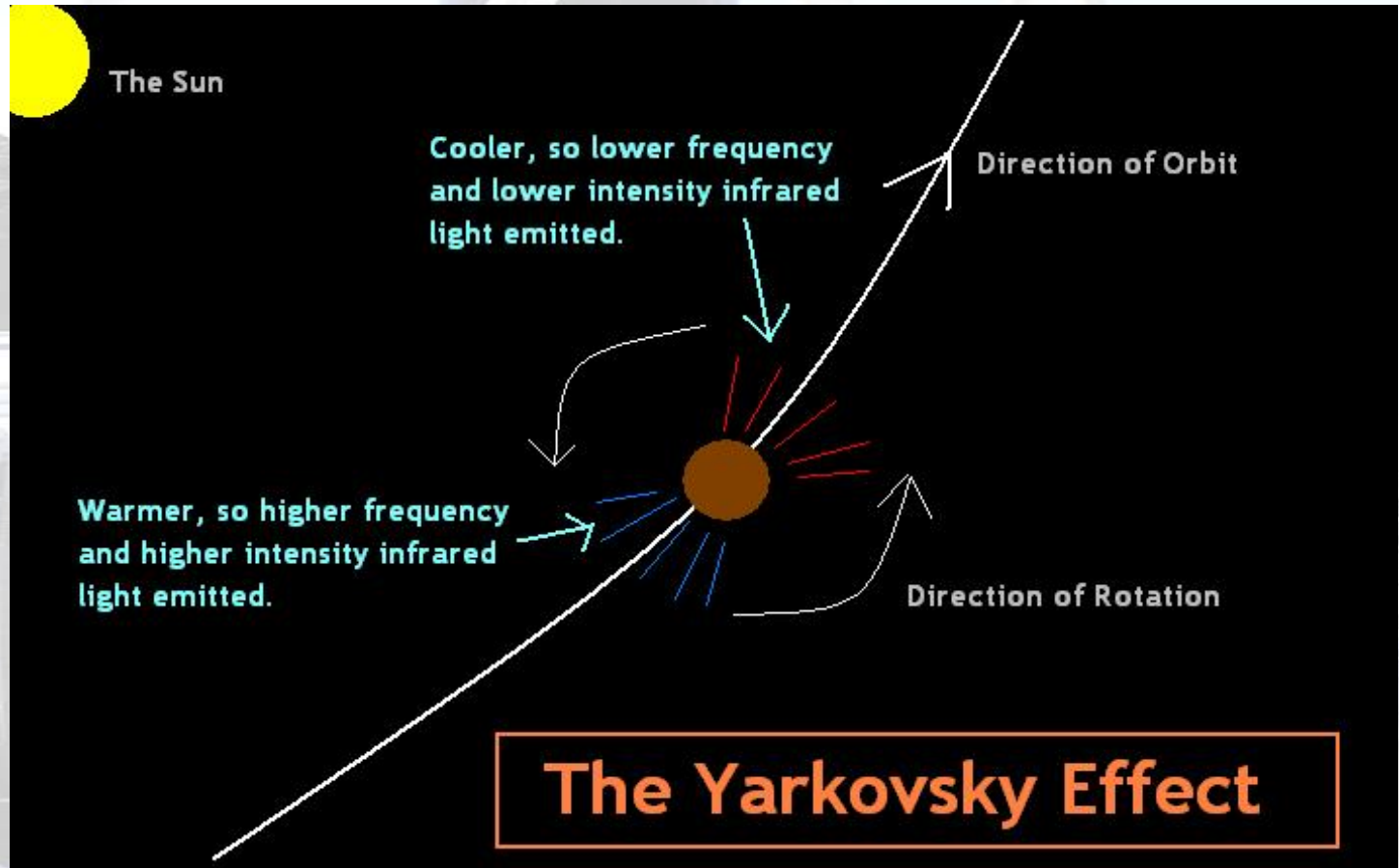
OBERON (IV) OCCULTS UMBRIEL (II) - 04 MAY 2007



(54509) 2000 PH5



(54509) 2000 PH5 (The YORP effect)



The YORP effect

Irregular shape



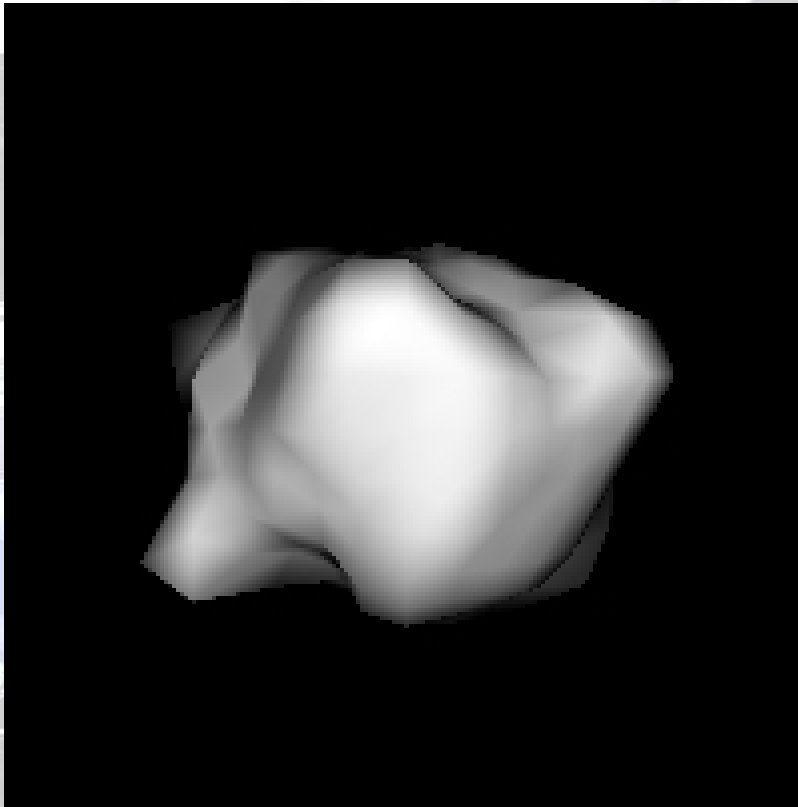
spin-up



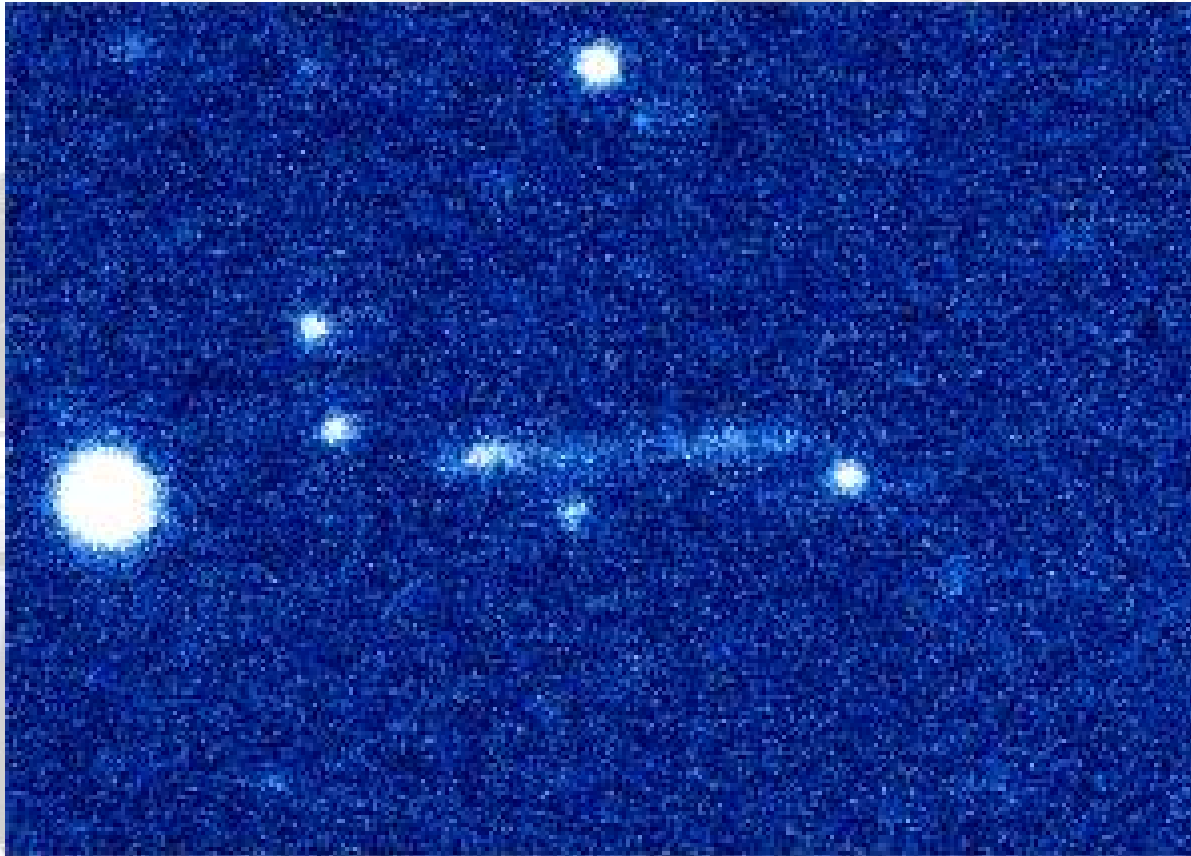
break-up



binary asteroids



Asteroid 2008 HJ



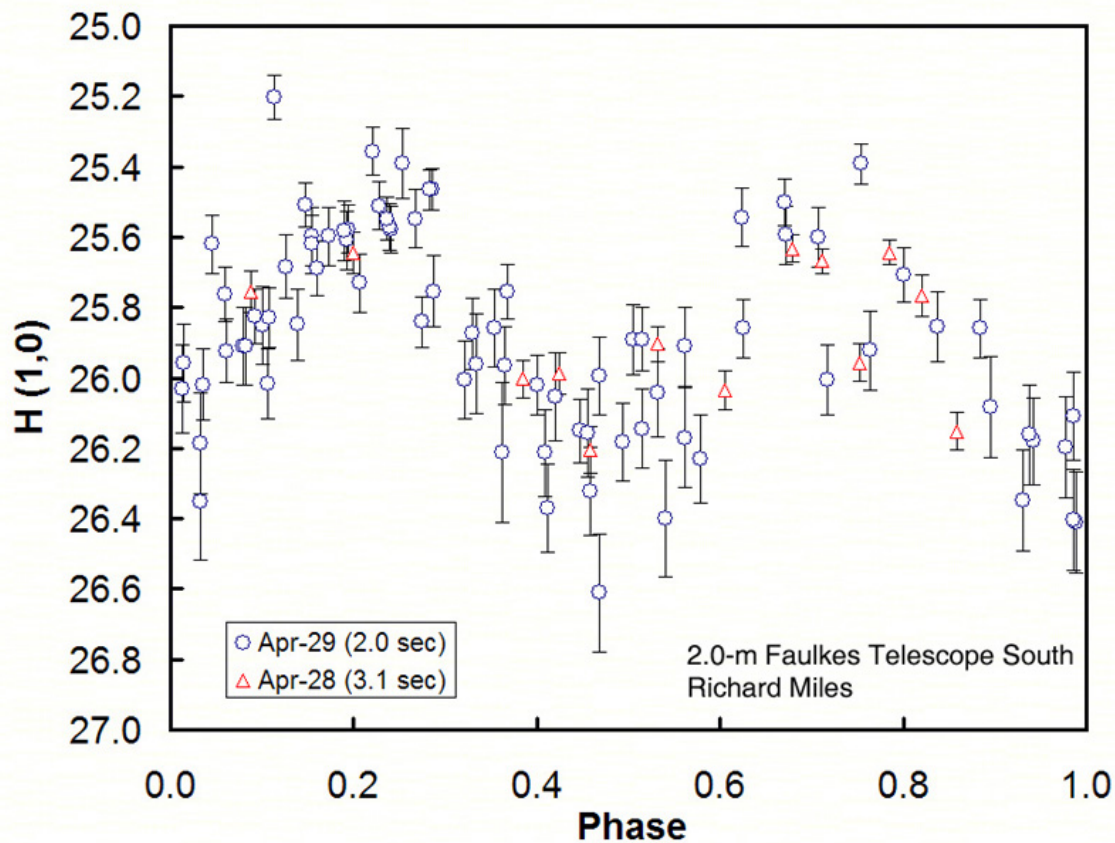
May 23, 2009

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Fastest Asteroid Rotation

2008 HJ Composite Lightcurve

Rotation Period = 42.668 ± 0.040 sec



Rotates every
42 seconds

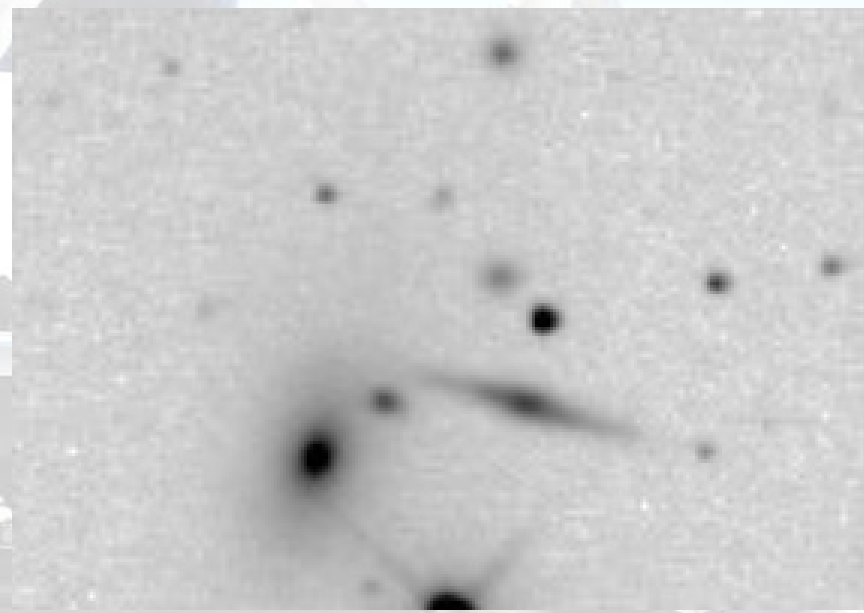
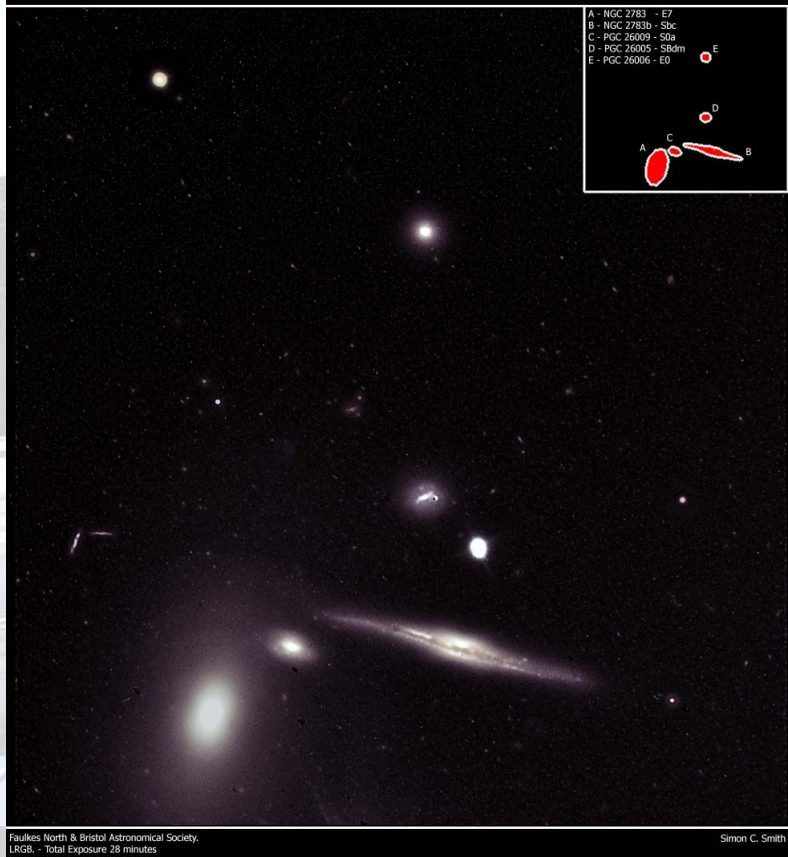
Mass ~ 5000
tonnes

Stony
composition

Around 15 –
20 metres
across

Imaging Interacting Galaxies

Hickson 37



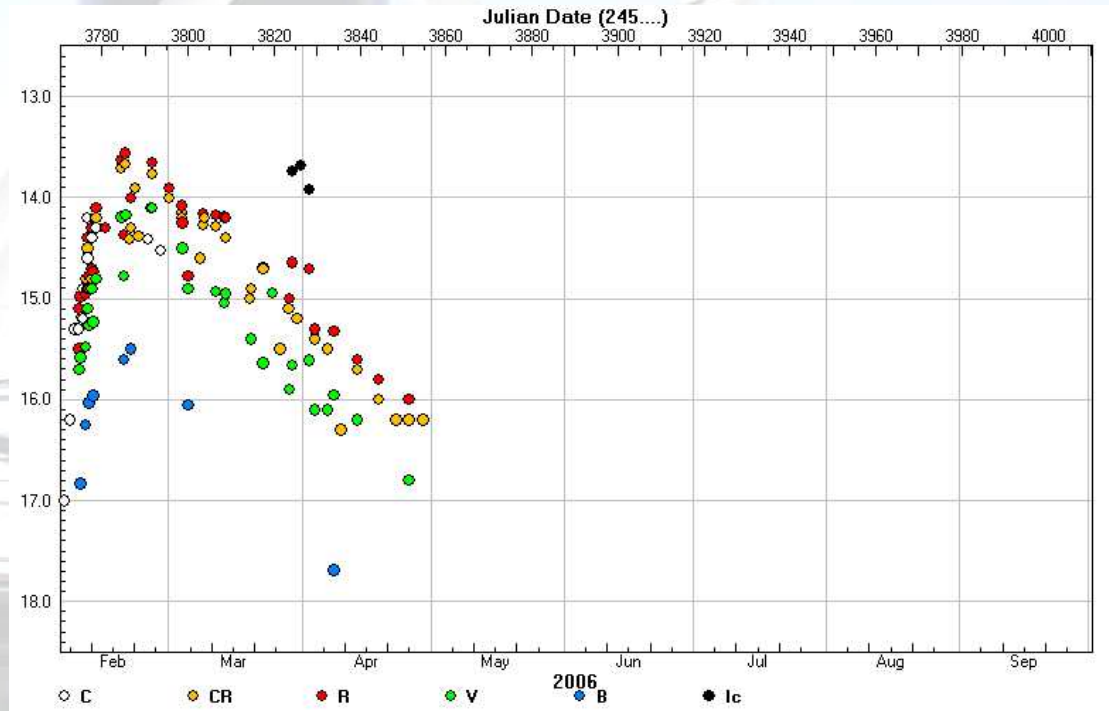
12" telescope image

FT image of HCG37

Supernova Monitoring

Observing programme
established by Polish
astronomers/schools

Monitor and report
brightness of recent
supernovae – fainter
than any other system

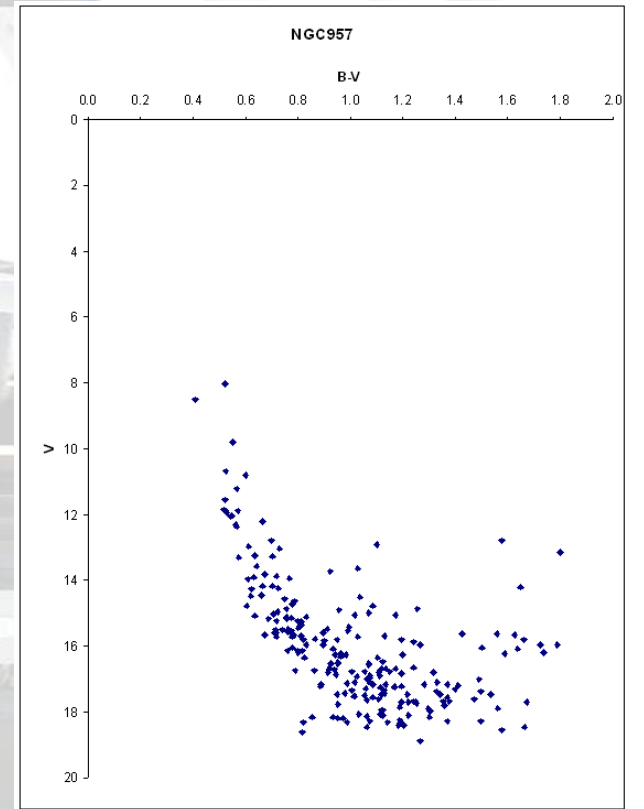


Observing Open Clusters with the Faulkes Telescope and the William Herschel Telescope

- 1 Faulkes Telescope Project
- 2 LCOGT
- 3 Open University
- 4 Cardiff University
- 5 University of Alicante

Fraser Lewis¹²³, Vanessa Stroud¹²³, Sadie Jones⁴,
Paul Roche¹²³, Ignacio Negueruela⁵

Contact lewisf@cf.ac.uk



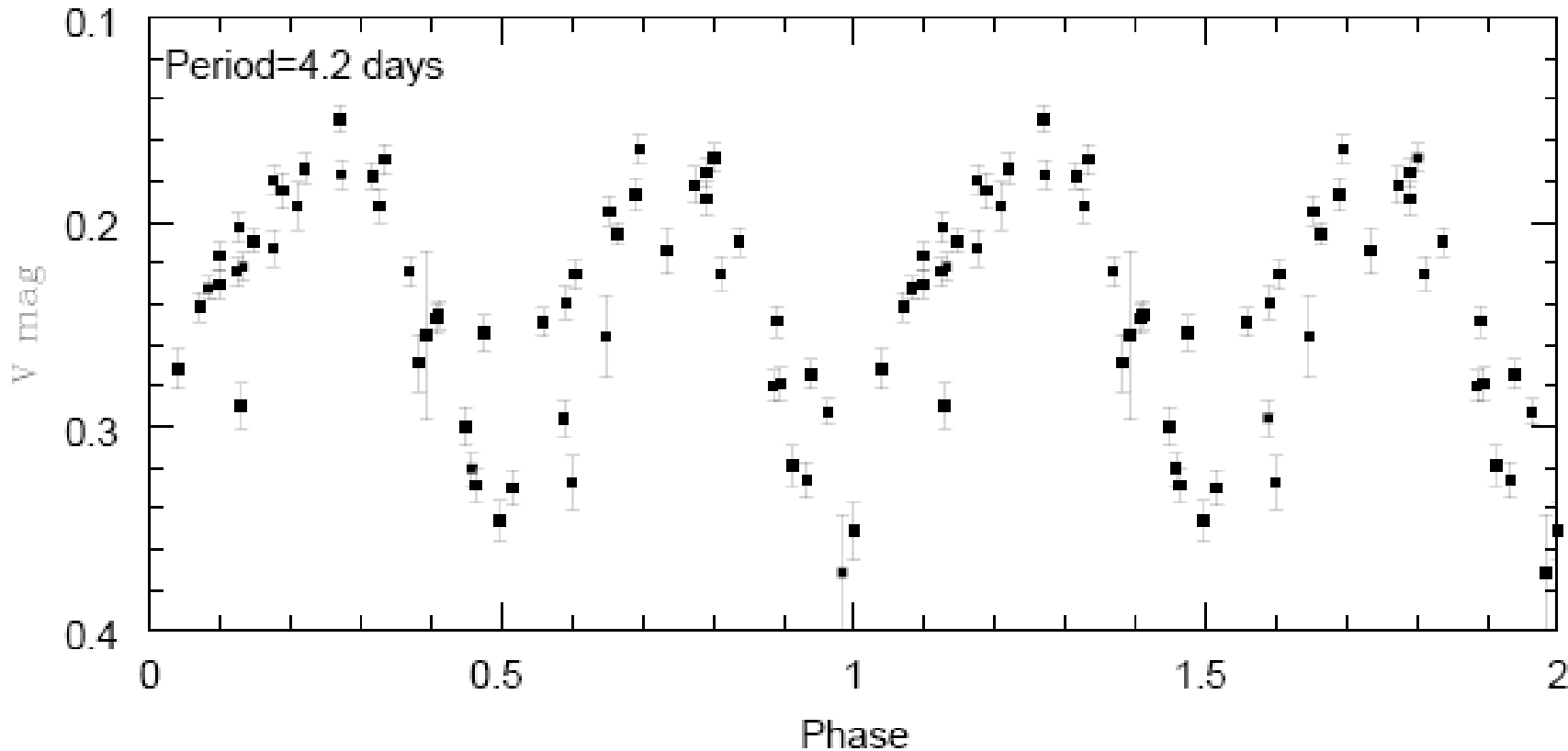
Workshop on Robotic Autonomous

We will always be able to keep you in the dark

Massive Star Binaries



Massive Star Binaries



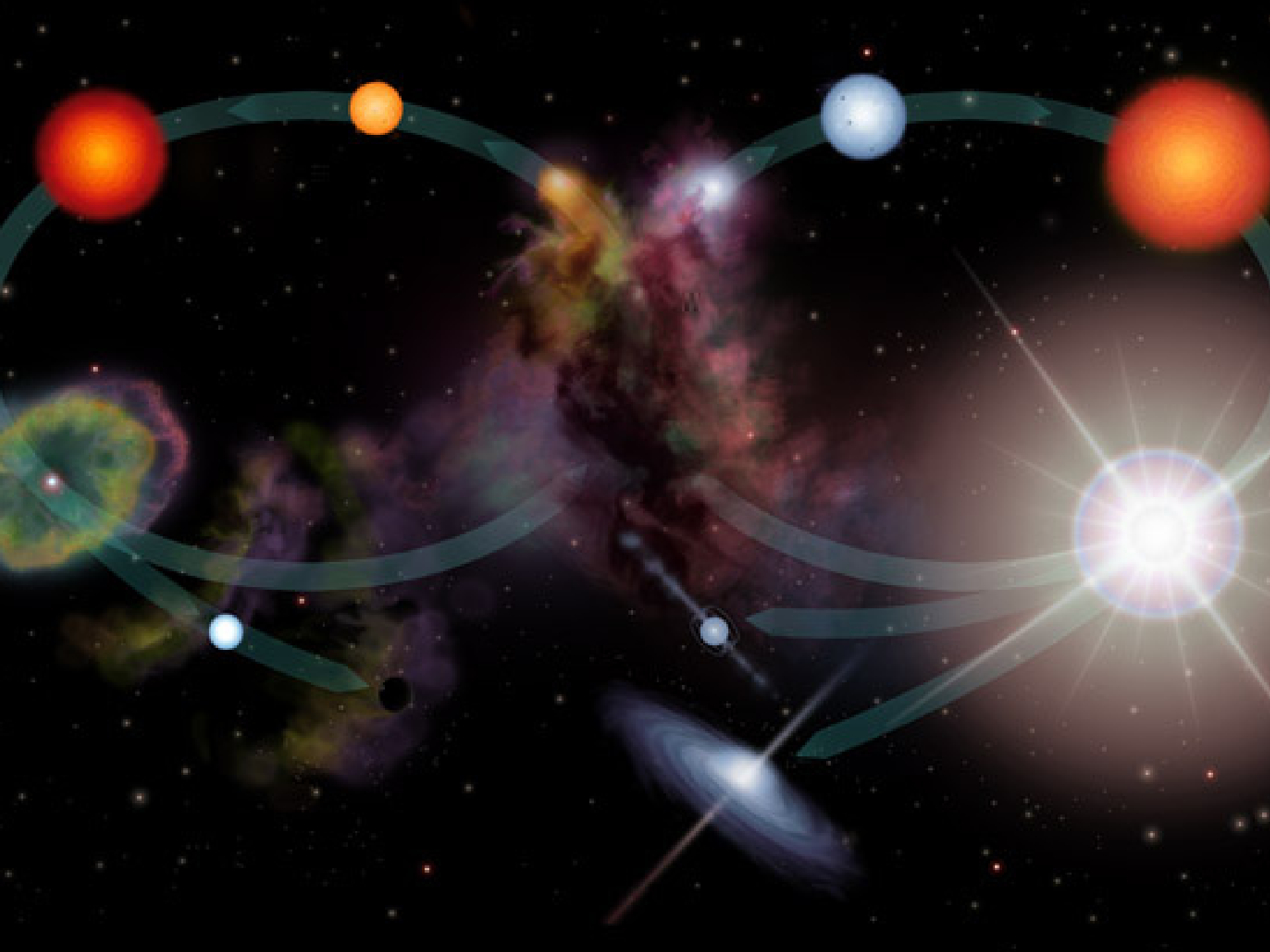
X-ray Binaries

Bright X-ray sources where material flows onto a compact object (neutron star or black hole) from its binary companion

X-ray luminosity of 10^{34} - 10^{38} erg s⁻¹ (cf. the Sun's 10^{28} erg s⁻¹)

Temperature $\sim 10,000,000$ K

Around 300 known XRBs in our Galaxy

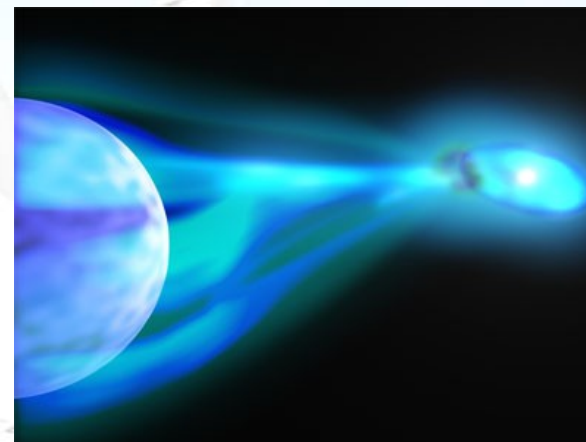


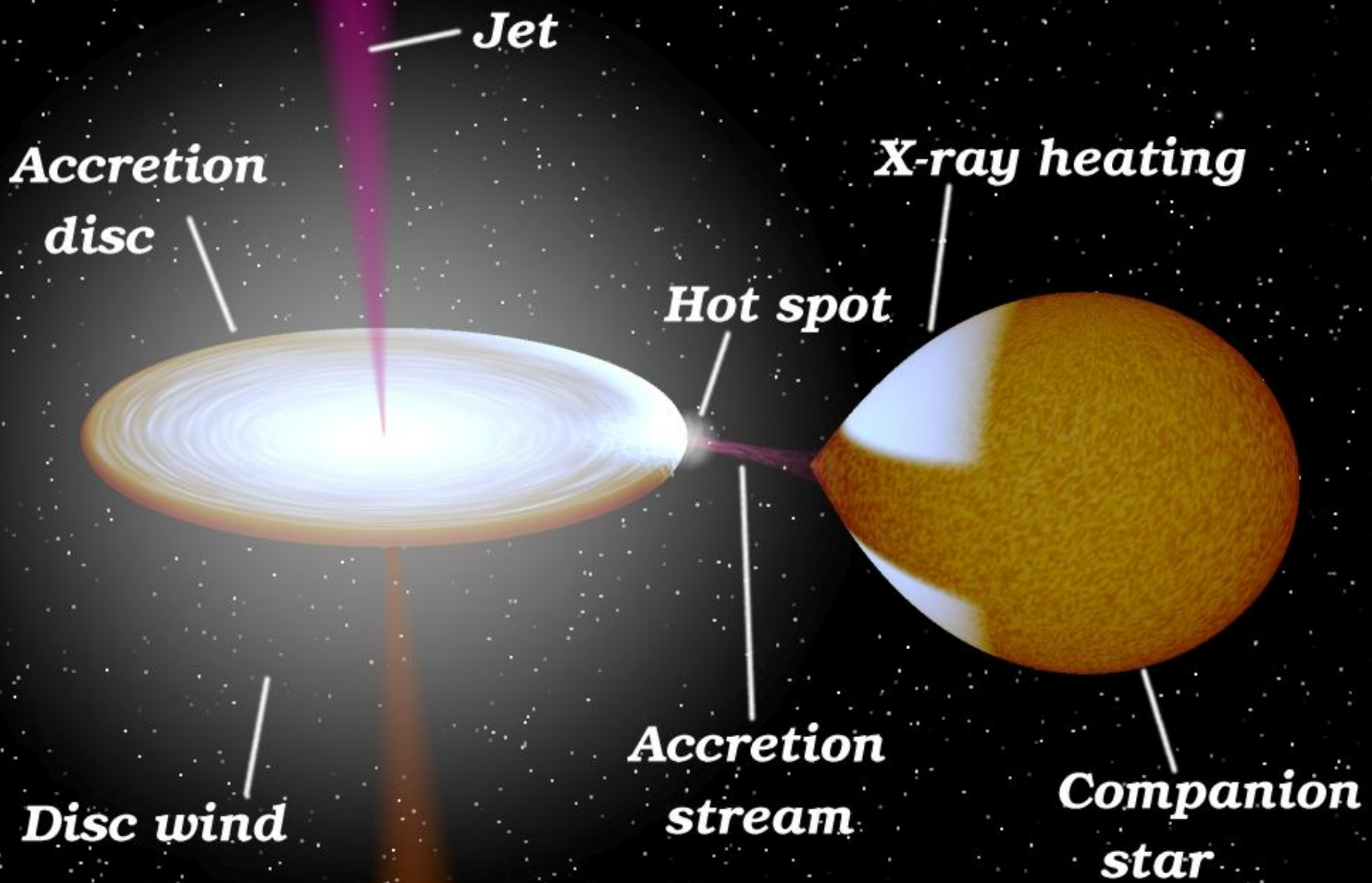
Low-Mass X-ray Binaries (LMXBs)

Donor usually K or M star
(small, red, faint, long-lived,
low-mass)

Long-lived ($\sim 10^7 - 10^9$ years)

System's brightness dominated by disc





LMXBs

For once, big isn't better

Star doesn't dominate overall brightness

Great testbeds for gravitation/space-time theories

Does what a quasar does (assuming you don't have the time or funding to wait for a quasar !)

LMXB Monitoring

30 sources split between FTN & FTS (NS & BH)

Monitored once per week since 2006

Frequency increased after alert or if we see interesting activity

Future plans include infra-red, more telescopes, spectroscopy

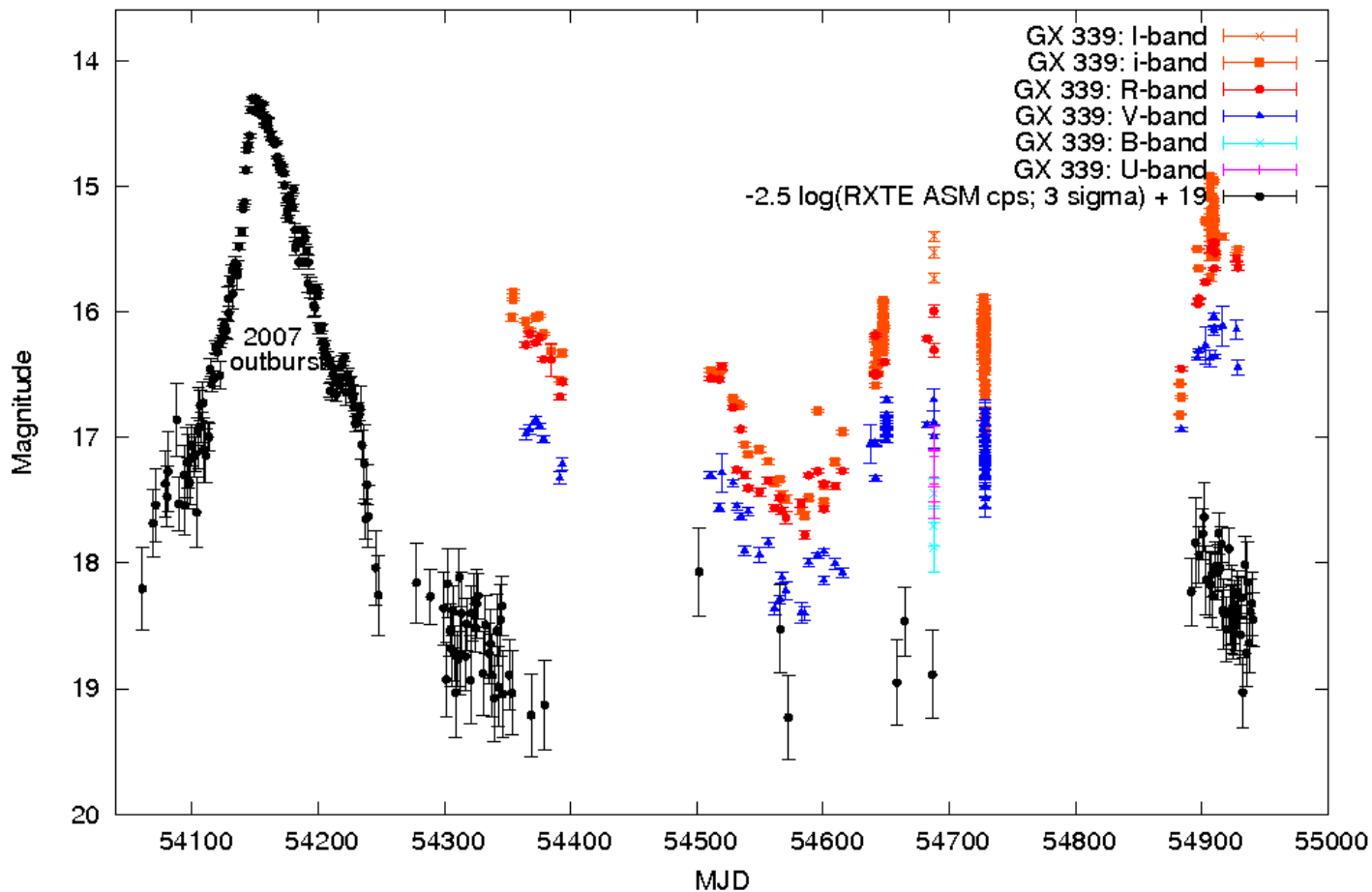
Aims of the Project

To identify and monitor transient outbursts in LMXBs (LMXBs can brighten in the optical / near infrared up to a month before X-ray detection)

To study their variability in quiescence

GX339-4

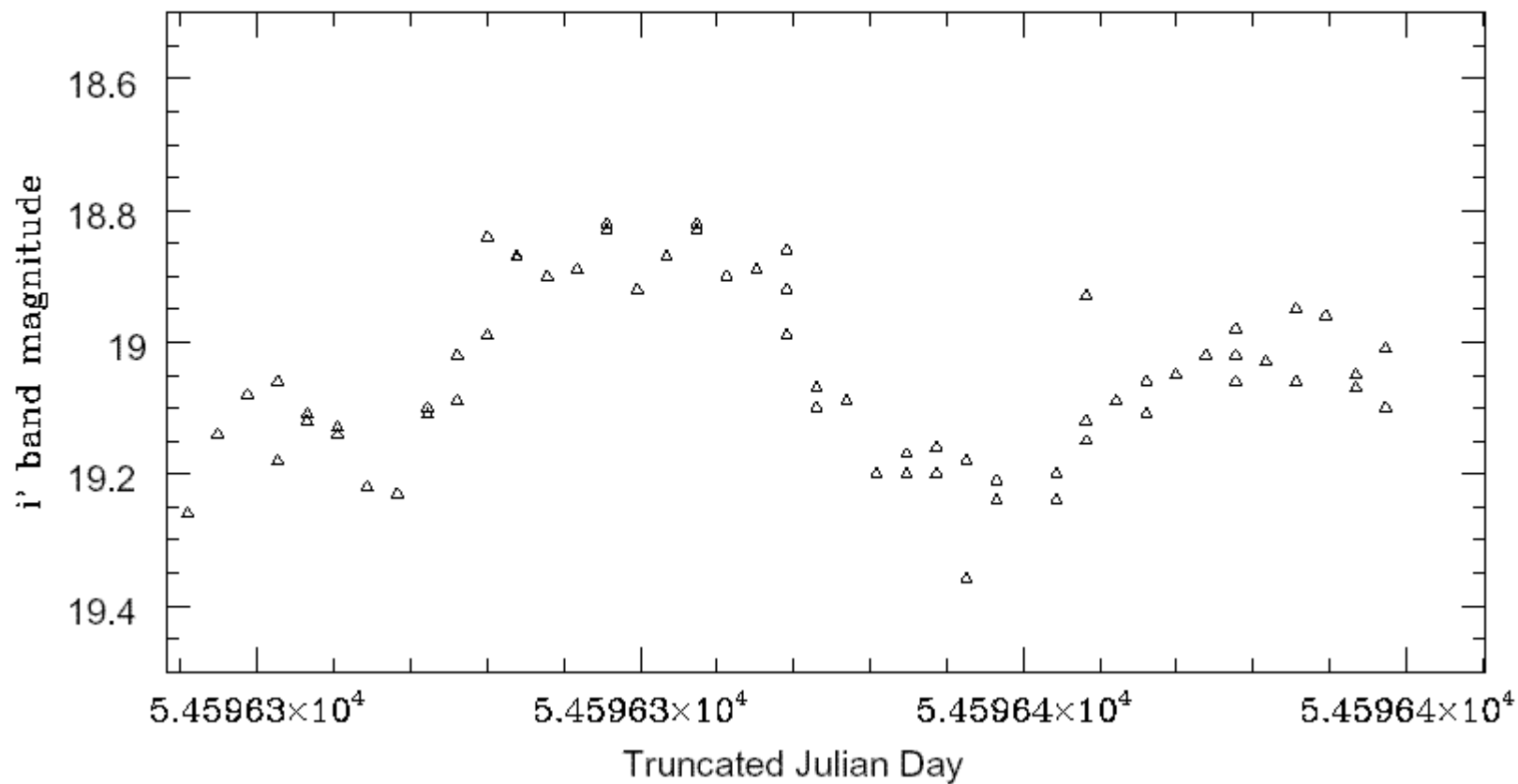
Lightcurve for GX 339-4 (Faulkes Telescope South, UVOT on Swift, SAO 0.75-m Telescope)



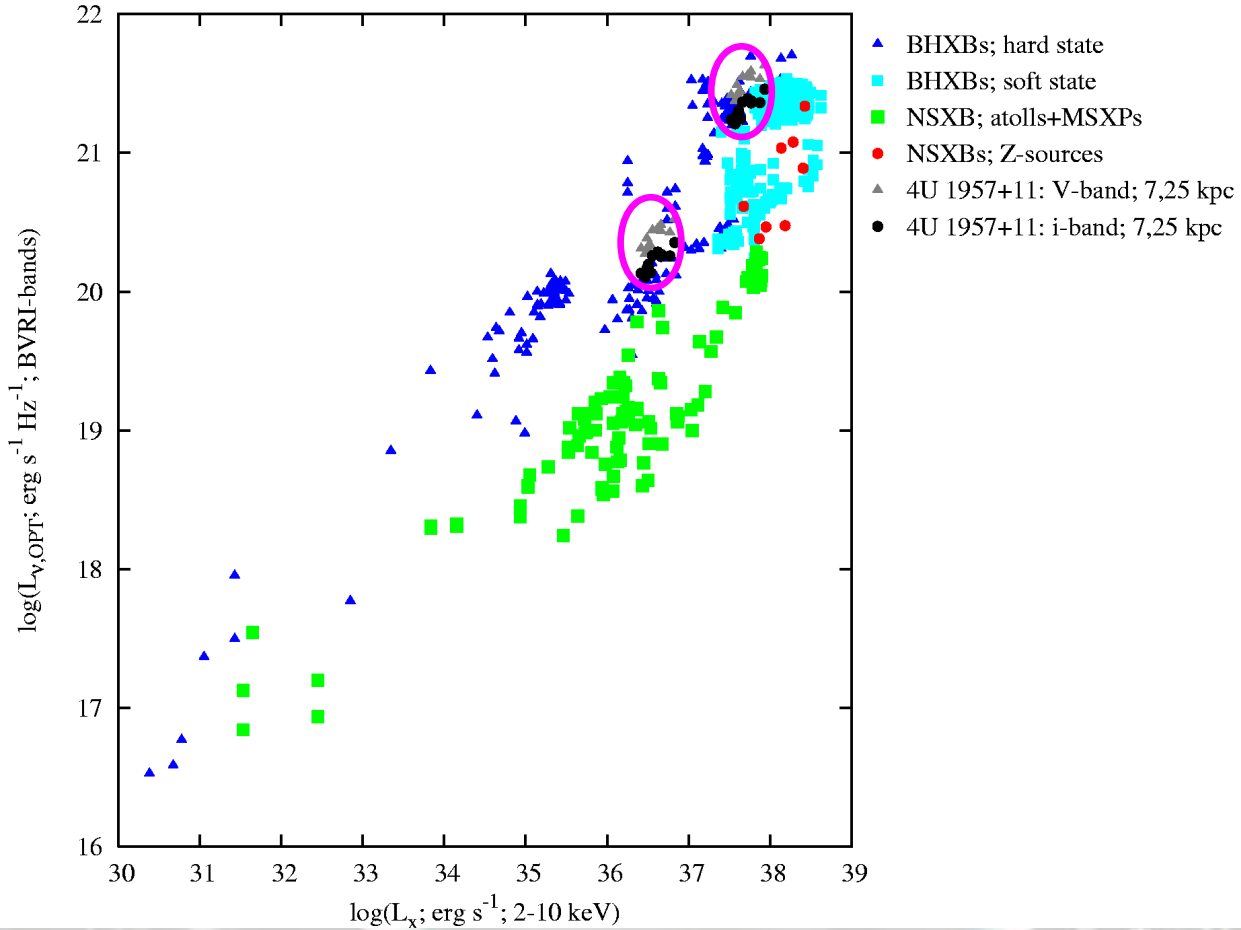
XTE J1118+480



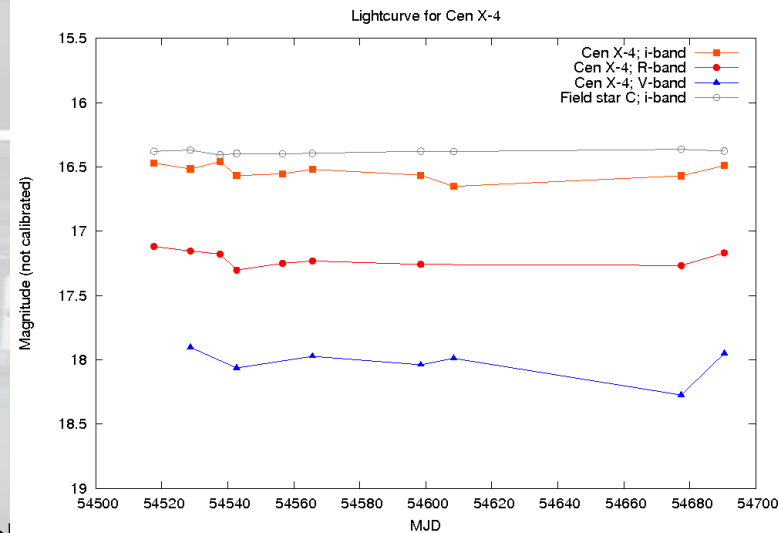
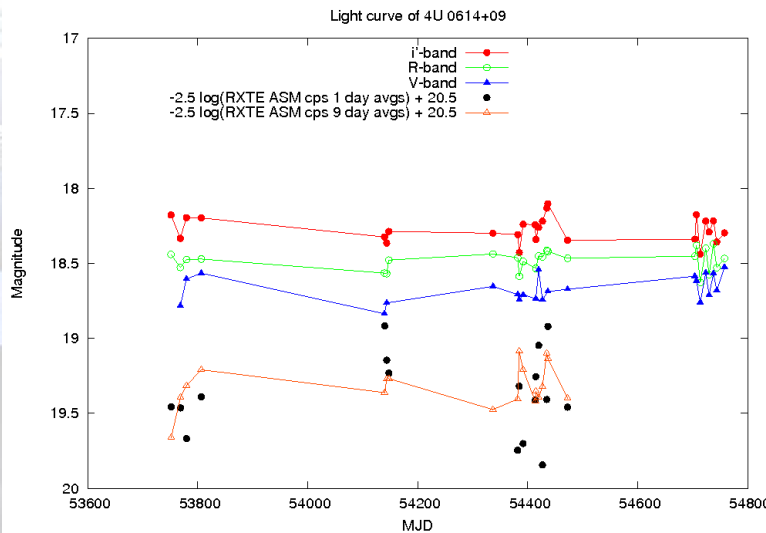
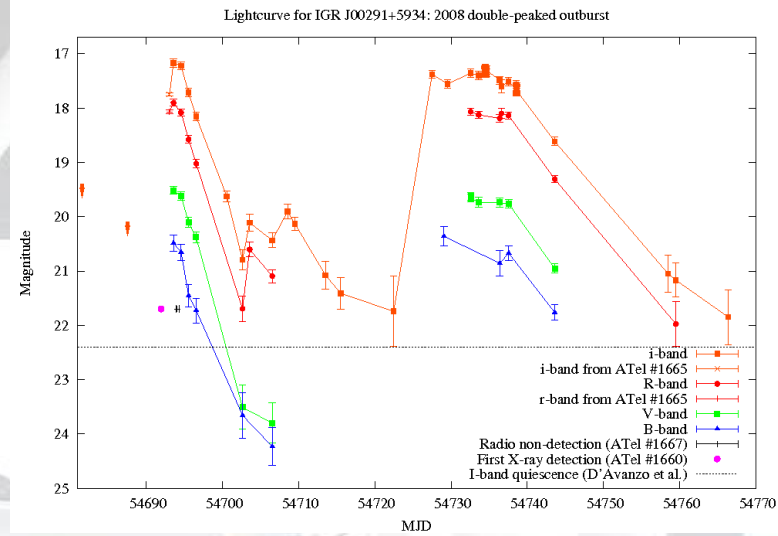
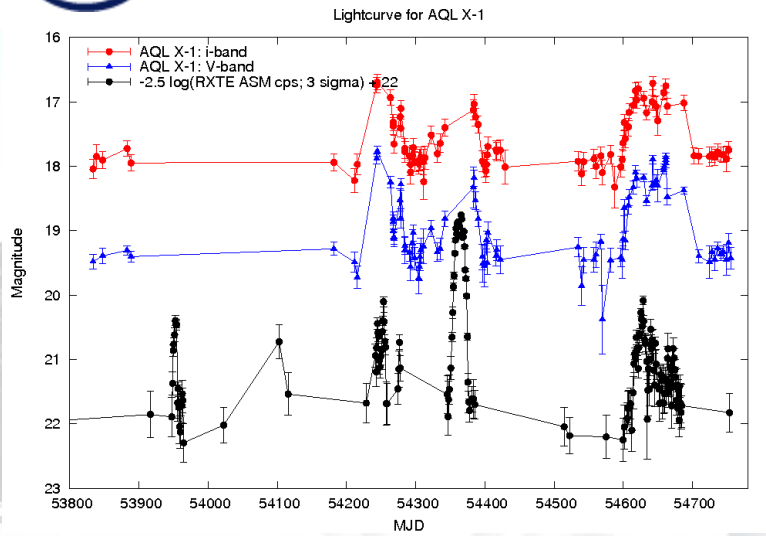
XTE J1118+480 - i' band data (de-reddened)



4U 1957+11



4 Types of Behaviour



Summary of FT Science

Fastest asteroid rotator

Evidence for the YORP effect

Light curves from 30 LMXBs

49 MPC reports (comets / asteroids)

8 Astronomers Telegrams (transient events)

51 GCN circulars (GRBs)

Exoplanet follow-ups

Uranian moons lightcurves

More information....

- FT Operations Centre based at Cardiff University, School of Physics & Astronomy
- info@faulkes-telescope.com
- www.faulkes-telescope.com
- www.lcogt.net