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15 May 2008 10:35



## Astronomers find that Universe shines twice as bright

Astronomers from UK Universities working with colleagues from Germany and Australia have calculated that the Universe is actually twice as bright as previously thought. In the latest *Astrophysical Journal Letters* (10th May), the astronomers describe how dust is obscuring approximately half of the light that the Universe is currently generating.

Lead author Dr Simon Driver from the University of St Andrews said, "For nearly two decades we've argued about whether the light that we see from distant galaxies tells the whole story or not. It doesn't; in fact only half the energy produced by stars actually reaches our telescopes directly, the rest is blocked by dust grains."

While astronomers have known for some time that the Universe contains small grains of dust, they had not realised the extent to which this is restricting the amount of light that we can see. The dust absorbs starlight and re-emits it, making it glow. They knew that existing models were flawed, because the energy output from glowing dust appeared to be greater than the total energy produced by the stars!

Dr Driver said, "You can't get more energy out than you put in so we knew something was very wrong. Even so, the scale of the dust problem has come as a shock appears that galaxies generate twice as much starlight as previously thought."

The team combined an innovative new model of the dust distribution in galaxies developed by Dr Cristina Popescu of the University of Central Lancashire and Prof Richard Tuffs of the Max Planck Institute for Nuclear Physics, with data from the Millennium Galaxy Catalogue, a state-of-the-art high resolution catalogue of 10,000 galaxies assembled by Driver and his team using the Isaac Newton Telescope on La Palma among others.

Using the new model, the astronomers could calculate precisely the fraction of starlight blocked by the dust. The key test that the new model passed was whether the energy of the absorbed starlight equated to that detected from the glowing dust.

"The equation balanced perfectly", said Dr Cristina Popescu, "and for the first time we have a total understanding of the energy output of the Universe over a monumental wavelength range."

"The results demonstrate very clearly that interstellar dust grains have a devastating effect on our measurements of the energy output from even nearby galaxies" says Prof Richard Tuffs, "with the new calibrated model in hand we can now calculate precisely the fraction of starlight blocked by the dust."

The Universe is currently generating energy, via nuclear fusion in the cores of stars, at a whopping rate of 5 quadrillion Watts per cubic light year – about 300 times the average energy consumption of the Earth's population.

"For over 70 years an accurate description of how galaxies, the locations where matter is churned into energy, form and evolve

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- Kelly 16 May

has eluded us. Balancing the cosmic energy budget is an important step forward," said Dr Driver.

After carefully measuring the brightness of thousands of disc-shaped galaxies with different orientations, the astronomers matched their observations to computer models of dusty galaxies. From this they were able to calibrate the models and, for the first time, determine how much light is obscured when a galaxy has a face-on orientation. This then allowed them to determine the absolute fraction of light that escapes in each direction from a galaxy.

While modern instruments allow astronomers to see further into space, they can't eliminate the obscuring effect from these tiny dust grains. "It is somewhat poetic that in order to discover the full glory of our Universe we first had to appreciate the very small" said Dr Alister Graham from the Swinburne University of Technology.

The work is set to continue but with a change of focus from the study of the Universe as a whole, to the study of individual galaxies. This requires two new facilities which are coming online this year. The first is the VISTA telescope, which will soon commence operations in Chile and the second is the Herschel satellite due for launch later in the year.

"VISTA will enable us to see right through the dust while Herschel will directly detect the dust glow" says Dr Liske of the European Southern Observatory.

UK astronomers enjoy full access to both of these facilities through the UK's membership, paid by the Science and Technology Facilities Council, of the European Southern Observatory and the European Space Agency which are responsible for operating these facilities.

"Although the Universe appears to be squandering its resources twice as fast as we previously thought, there's still plenty of juice in the tank; for now" says Dr Ivan Baldry of Liverpool John Moores University.

This research has been funded by the Science and Technology Facilities Council (STFC), the Australian Research Council, the Max-Planck Society and a Livesey award from the University of Central Lancashire.

### Note to Editors

The Millennium Galaxy Catalogue consists of data from the Anglo-Australian Telescope, The Australian National University's 2.3 m telescope at Siding Spring Observatory, the Isaac Newton Telescope and the Telescopio Nazionale Galileo at the Spanish Observatorio del Roque de Los Muchachos, La Palma, of the Instituto de Astrofísica de Canarias, and also from the Gemini and ESO New Technology Telescopes in Chile.

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### Images

High resolution images showing galaxies known to contain dust obscuring the stars are available from <http://astronomy.swin.edu.au/~agraham/dust/dust.html>

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announces £244m for Manchester tram extensions	2008 09:20
Record number of offices attends INTA 2008	16 May 2008 07:01
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Government seeks views on creating a safe and prosperous future	15 May 2008 15:56
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£35m for parents	15 May 2008 15:04

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#### Science and Technology Facilities Council

The Science and Technology Facilities Council ensures the UK retains its leading place on the world stage by delivering world-class science; accessing and hosting international facilities; developing innovative technologies; and increasing the socio-economic impact of its research through effective knowledge exchange partnerships.

The Council has a broad science portfolio including Astronomy, Particle Physics, Particle Astrophysics, Nuclear Physics, Space Science, Synchrotron Radiation, Neutron Sources and High Power Lasers. In addition the Council manages and operates three internationally renowned laboratories:

- The Rutherford Appleton Laboratory, Oxfordshire
- The Daresbury Laboratory, Cheshire
- The UK Astronomy Technology Centre, Edinburgh

The Council gives researchers access to world-class facilities and funds the UK membership of international bodies such as the European Laboratory for Particle Physics (CERN), the Institute Laue Langevin (ILL), European Synchrotron Radiation Facility (ESRF), the European organisation for Astronomical Research in the Southern Hemisphere (ESO) and the European Space Agency (ESA). It also contributes money for the UK telescopes overseas on La Palma, Hawaii, Australia and in Chile, and the MERLIN/VLBI National Facility, which includes the Lovell Telescope at Jodrell Bank Observatory.

with disabled children to get easier access to childcare

15 May  
2008 14:38

Interested in Acquiring Social Research Skills? Unable to attend classes?

15 May  
2008 12:17

Parks and public gardens to be at the heart of the Thames Gateway

15 May  
2008 12:14

Ship-to-ship transfer regulations consultation launched today

15 May  
2008 12:01

Announcement of the appointment of Non-Executive Directors of the Personal Accounts Delivery Authority

15 May  
2008 11:52

Tackling serious organised crime in new and different ways

15 May  
2008 11:44

£103million wingvestment in Airbus

15 May  
2008 11:34

TA heroes of Iraq and Afghanistan lead parade through City of London

15 May  
2008 11:27

A winning wavelength

15 May  
2008 11:03

Phoenix probe due to touch down on Martian surface.

15 May  
2008 11:01

Three new rights to right local wrongs - New Community Empowerment Bill to harness petition power

15 May  
2008 10:56

Dying patients and the bereaved to benefit from Department of Health investment in hospital environments

15 May  
2008 10:45

Care Quality Commission Chair announced

15 May  
2008 10:40

MoD announces NATO force move to Gloucestershire

The Council distributes public money from the Government to support scientific research. Between 2007 and 2008 we will invest approximately £678 million.

15 May  
2008 10:35

Astronomers find that  
Universe shines twice  
as bright

15 May  
2008 10:32

Parole Board  
publishes business  
plan for 2008/09

15 May  
2008 10:01

Extra  
funding for  
rural stations

15 May  
2008 08:38

Flexible  
working to help  
4.5 million more  
parents

15 May  
2008 00:02

British  
crime survey  
extended to under-16s  
as design experts meet  
to tackle youth crime

14 May  
2008 23:10

Fatality  
in River  
Dart  
after car drives off  
jetty

14 May  
2008 17:08

More  
patients say  
they receive excellent  
care from NHS  
hospitals in major  
national survey

14 May  
2008 16:37

ISIS  
scientist puts neutrons  
on the crystallography  
map

14 May  
2008 16:22

UK  
Government to give £1  
million for China  
earthquake relief

14 May  
2008 16:14

Top  
Guns  
Slash  
Carbon Dioxide  
Emissions at Police  
Firing Range

14 May  
2008 15:51

John  
Hutton  
MP  
visits innovative  
London 2012 business  
service

14 May  
2008 15:16

Mod  
announces Baha  
Mousa Public Inquiry

14 May  
2008 14:45

First  
ever  
campaign to get Wales  
talking about organ  
donation

14 May  
2008 14:42

Tackling Anti-social  
Behaviour on Buses

14 May  
2008 14:40

BEST  
FOOT  
FORWARD FOR  
FUNDRAISING  
OFFICERS.

	14 May 2008 14:39	Innovative aviation research and development to be co-funded by Technology Strategy Board
West	14 May 2008 14:33	Edinburgh Planning Framework
Illegal driving	14 May 2008 14:33	instructors operating in your area
Fuel help for fishing industry	14 May 2008 14:30	
Purnell: time for the public to tell us what they want from the welfare and benefits system	14 May 2008 14:28	
	14 May 2008 14:13	Legislative programme to strengthen local democracy and give power to the people
	14 May 2008 13:55	Treasury legislation to ensure financial stability and a fair society
New	14 May 2008 13:32	proposals to empower the individual
Change of Her Majesty's Ambassador to the Ukraine	14 May 2008 13:31	
Draft	14 May 2008 13:29	legislative programme - Home Office bills
	14 May 2008 13:05	Legislative programme promises a better trained workforce, greater opportunity for young people and adults
New	14 May 2008 13:01	legislation to support Next Stage Review
Helping first time buyers onto the property ladder	14 May 2008 12:58	
OFGEM	14 May 2008 11:34	RECRUITS ADVISORS FROM BRITAIN'S HOUSEHOLDS
French fashion	14 May 2008 11:16	

queen Nicole Farhi awarded honorary CBE	
Celtic	14 May 2008 11:11
countries connect with contemporary Cymru	
£36m to support Welsh entrepreneurs	14 May 2008 11:08
OFT	14 May 2008 10:40
launches market study into sale and rent back	
	14 May 2008 10:39
Dramatic improvement in waiting times for tests	
	14 May 2008 10:28
Ministers meet key players across London to tackle child poverty	
Purnell:	14 May 2008 09:54
Employment rising as more people come off benefits and move into work	
	14 May 2008 09:31
Statistical press notice: Diagnostics waiting times and activity data - Monthly update	
Yacht	14 May 2008 07:55
Rescued from Goodwin Sands in Rough Seas	
Ministry of Defence releases X-files	14 May 2008 00:02
	14 May 2008 00:02
Companies say 'Breast Wishes' to mums for National Breastfeeding Awareness Week 11-17th May 2008	
Foreign	13 May 2008 19:21
Secretary on Jaipur bombings	
	13 May 2008 17:22
Transport for London begins online sponsorship trial	
Better access to learning resources	13 May 2008 17:20
	13 May 2008 17:07
Planetarium Plays Host to Pope's Astronomer	
	13 May 2008 16:45
Charlotte Church launches breastfeeding drive	

New	13 May 2008 16:40	Chairman appointed to the Standards Board for England
FSA fines Land of Leather and its Chief Executive for PPI fallings	13 May 2008 16:15	
OFT	13 May 2008 15:19	statement regarding the recognition of Ice Clear Europe
	13 May 2008 13:57	Department for Business appoints new Chief Scientific Adviser
	13 May 2008 13:50	Department for Business appoints new Director General, finance
	13 May 2008 13:33	CLOSING THE PRODUCTIVITY GAP IN NORTHERN IRELAND
First Chair of Office for Tenants and Social Landlords announced	13 May 2008 13:01	
Dhanda -	13 May 2008 12:05	Government committed to tackling antisemitism
	13 May 2008 12:02	Responding to Our NHS, our future's report 'Leading Local Change'
	13 May 2008 11:14	Delivering skills that work for Wales
Free rail travel extended	13 May 2008 10:39	
'Good progress' on Environmental Stewardship	13 May 2008 10:28	
Future of crofting	13 May 2008 10:20	
	13 May 2008 10:16	Financial penalties for utility companies which fail to give proper notice of street works introduced
Action to help red squirrels	13 May 2008 10:15	



	13 May 2008 00:02	Department of Health launches campaign to address inequalities in breastfeeding
Cliff rescue of girls at Muchalls	12 May 2008 22:33	
The Foreign Secretary, David Miliband, on the Chinese earthquake	12 May 2008 21:10	
China Earthquake: British Geological Survey data	12 May 2008 18:13	
PE in schools	12 May 2008 17:21	
OFGEM APPOINTS NEW DIRECTOR	12 May 2008 17:12	
Major works to Aldgate East gyratory begin today	12 May 2008 17:06	
Midge Ure Tells Yorkshires Businesses to 'Get Involved' with Community Partnerships	12 May 2008 17:01	
	12 May 2008 16:58	Yorkshire Region Welcomes Tour of Britain for a Fifth Consecutive Year
MPA London Assembly members announced	12 May 2008 16:53	
Sport England relaunches Sportsmatch	12 May 2008 16:51	
First UK aid flight leaves for Burma	12 May 2008 16:22	
Name, Shame and Claim - in the Fight Against Forecourt Criminals	12 May 2008 15:52	
	12 May 2008 15:40	Batteries power ahead
Dhanda - Government committed to tackling antisemitism	12 May 2008 15:10	
Dorset firefighters win 2012 funding boost	12 May 2008 14:37	
Safety	12 May	



	2008 13:27	questions move up a gear
Taser	12 May 2008 12:14	discharges increase as more trained officers have the authority to use them
	12 May 2008 12:01	Harman: Women opting to be their own boss
RISKY RAINY DAYS WHO PLANS FOR THEIR FINANCIAL FUTURE?	12 May 2008 11:53	
Military and Civilian Health Partnership Awards launched	12 May 2008 11:51	
£3 MILLION INVESTMENT FOR FUTURE OF SCIENCE AND MATHEMATICS EDUCATION	12 May 2008 11:46	
Parents urged to get online for online safety tips	12 May 2008 11:07	
Skills shortages in UK construction set to worsen	12 May 2008 10:53	
Appointments to the Zoos Forum	12 May 2008 10:45	
MATHS PLUS 'GEEKY' IMAGES EQUALS DETERRED STUDENTS	12 May 2008 10:21	
Independent Transport: The key to independent living	12 May 2008 10:18	
Blears - community cohesion	12 May 2008 10:16	
IS DIVORCE BAD FOR THE PARENTS?	12 May 2008 10:14	
Farepak investigation complete	12 May 2008 10:13	
GOVERNMENT LAUNCHES NATIONAL DEBATE ON THE FUTURE OF CARE AND SUPPORT £31 million hi-tech home healthcare scheme begins	12 May 2008 00:02	

Drink and stupidity lead to two in the water at Studland	11 May 2008 07:44
Sudan travel advice	10 May 2008 20:14
Joint Search and Rescue games - 2008	10 May 2008 14:47

