

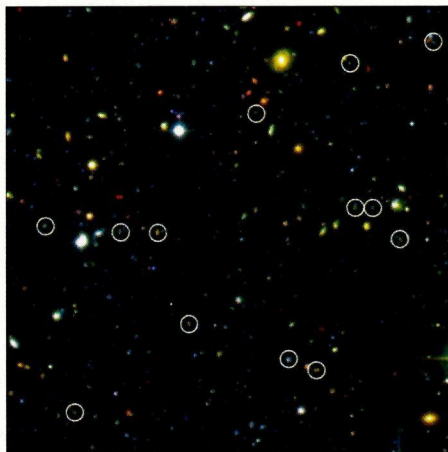
VLT astronomers discover new population of distant galaxies

A team using the Very Large Telescope (VLT) of the European Southern Observatory (ESO) has identified a much larger population of distant galaxies than previously estimated. The new population mainly consists of galaxies forming stars at a very high rate.

The determination of the number of galaxies in the universe at different epochs is crucial for constraining models of the formation and evolution of galaxies. Counting galaxies in deep astronomical images is relatively simple, but measuring their redshift – hence, their distance and the epoch in the history of the universe when we see them – requires taking a spectrum of each galaxy.

Until now, measuring the spectrum of distant and therefore faint galaxies needed a great deal of observing time on the largest telescopes. Astronomers therefore had to select carefully the candidate high-redshift galaxies based on their brightness and colour. However, it now seems that they have been too restrictive in their criteria, thus missing a large population of distant galaxies with strong ultraviolet emission.

The discovery of this population of bright and distant galaxies was made possible by the Visible Multi-Object Spectrograph (VIMOS) on Melipal, one of the four 8.2 m telescopes of the VLT. Instead of measuring the spectrum



This image from the Canada–France–Hawaii Telescope shows a small patch of the sky (3×3 arcmin) in the Cetus (the Whale) constellation. Circles indicate the 13 distant galaxies present in this small field out of the 970 identified in total by the VIMOS survey team. (Courtesy LAM-OAMP/CFHT.)

of one galaxy at a time, VIMOS can measure simultaneously the spectra of about 1000 galaxies in a single field.

The unique capabilities of VIMOS allowed a team of French and Italian astronomers to determine systematically the redshift of all the galaxies in a given sky area and a given range

of brightness. From a total of about 8000 galaxies, almost 1000 were measured at a redshift between 1.4 and 5, corresponding to looking back 9–12 billion years.

The results published by O Le Fèvre and collaborators show that the number density of galaxies at a redshift of around 3 exceeds previous estimates by a factor of 1.6 for the faintest galaxies and of 6.2 for the brightest ones. Around a redshift of 4 the number of galaxies was underestimated by a factor of 2–3.5. It seems therefore that a large population of bright galaxies at high-redshift was completely overlooked.

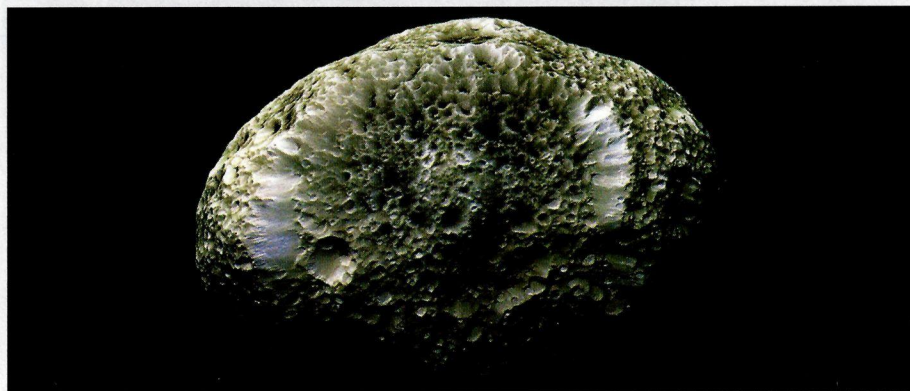
The newly identified population escaped previous studies mainly because of relatively high ultraviolet emission, which is emitted by massive young stars. The ultraviolet luminosity of these galaxies allows the estimate that their star-formation rate is in the region of 10–100 solar masses per year; currently in the Milky Way only a few solar masses of gas and dust are converted into stars every year. This discovery has profound implications for the history of star formation in the universe and for current theories of the formation and evolution of galaxies.

Further reading

O Le Fèvre *et al.* 2005 *Nature* **437** 519.

Picture of the month

This surprising view of Saturn's moon Hyperion was taken on 26 September when the Cassini spacecraft flew by at a distance of only 500 km. This small moon has a surface dotted with craters and modified by some unknown process creating a strange "spongy" appearance, unlike any other moon pictured so far. Hyperion is 266 km across, about the size of the moon Gabrielle found to be orbiting the newly discovered 10th planet, which has been dubbed Xena by its discoverers (*CERN Courier* September 2005 p12). (Courtesy NASA/JPL/SSI.)



MILMEGA

Solid State Microwave Amplifiers

- Pulsed or CW to 12GHz Solid State Microwave Amplifiers
- Complete load mismatch tolerance
- Unbeatable power densities
(eg 1kW Broadband CW in 12u rack,
4kW/1kW at 1.3GHz/2.998GHz
pulsed in 4u rack)
- Pulse Width to
200 microseconds
- Full Built-In Test
- Water Cooled Option



MILMEGA

WHERE GOOD IDEAS ARE

BORN



Our Customers include:

CERN

SLAC

INFN

BESSY

GANIL

POSTECH

BERKELEY

www.milmega.co.uk

DESIGNERS AND MANUFACTURERS OF HIGH POWER MICROWAVE AMPLIFIERS AND SYSTEMS

Milmega Ltd, Ryde Business Park, Nicholson Road, Ryde, Isle of Wight PO33 1BQ UK

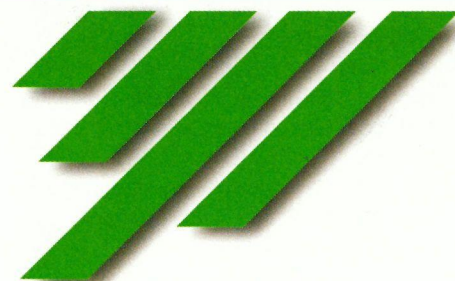
Tel: +44(0) 1983 618005 Fax: +44(0) 1983 811521 sales@milmega.co.uk

...on your wavelength

VAT

«Easy close» All-metal Angle Valves

Series 54 for UHV applications



**No torque wrench
needed**

- Low price
- 300°C bakeable
- Maintenance-free

Swiss Headquarters
Tel ++41 81 771 61 61
reception@vat.ch

VAT Japan
Tel (045) 333 11 44
sales@vatvalve.co.jp

VAT Taiwan
Tel 03 516 90 88
taiwan@vatvalve.com

VAT France
Tel 01 69 20 69 11
france@vatvalve.com

VAT U.K.
Tel 01926 452 753
uk@vatvalve.com

VAT USA
Tel (781) 935 1446
usa@vatvalve.com

VAT Korea
Tel 031 704 68 57
korea@vatvalve.com

VAT Benelux
Tel ++31 30 6018251
benelux@vatvalve.com

VAT Germany
Tel (089) 46 50 15
deutschland@vatvalve.com

www.vatvalve.com

VAT