A Story of Astronomical Importance
(from "Across the Universe: A Guide to the Past, Present and Future of the Cosmos," the NY Times astronomy blog)
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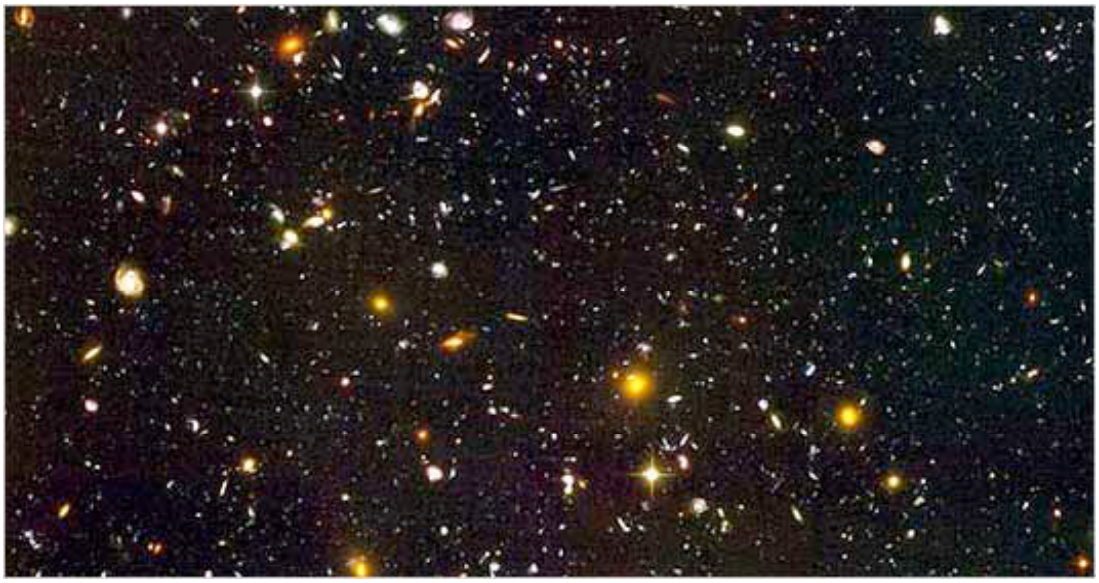
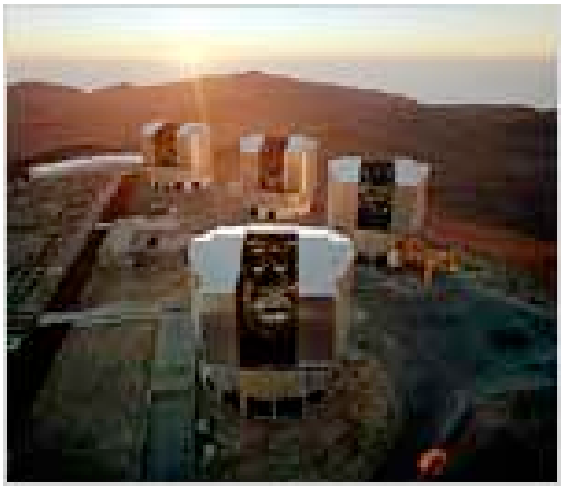
By Chris Lintott, Brian May, Sir Patrick Moore


The most distant galaxies ever seen, from the Hubble telescope. (Photo: NASA, ESA, S. Beckwith – STScI, HUDF team)

This is an incredible time to be an astronomer. Actually, it's an incredible time for anybodywho is interested in our place in the universe. The last few decades have seen the advent of technologies that have allowed us to see further into space than ever before.

One of the advantages of looking further away is that in astronomy, this also means looking further back in time. Light travels extremely quickly from point to point, but the distances between celestial objects are so vast that the time their light takes to reach us is significant. Start close to home, with the Sun, for example. Its light takes eight minutes to reach us here on Earth. Spacecraft operating in the distant reaches of the outer solar system – like NASA's Cassini probe, currently exploring Saturn and its amazing family of moons – must be autonomous, because signals from Earth can take more than an hour to reach them. The nearest star is four light years away, and so we see it as it was in 2003. The center of the Milky Way is 25,000 light years away, and the nearest large galaxy,

Andromeda, is 2.2 million light years away, and this immense distance takes us no further than our local neighbourhood.



Instruments like the Very Large Telescope at the Paranal Observatory in Chile have been responsible for many cosmic discoveries. (Photo: European Southern Observatory)

Looking back in time in this way, we see a universe that looks different from the one around us. Galaxies, for example, tend to look smaller than they are now, because when the light we see left them, they were still in the process of assembling. Star formation was more rapid back then; the universe of today is, perhaps depressingly, past its peak, and the rate at which new stars are being born is declining. This evolving universe provides the most straightforward evidence that there really is a cosmic story, with a beginning many billions of years ago.

View of Earth from Saturn, from Cassini spacecraft. (Photo: NASA/JPL/Space Science Institute)

In fact, analysis of this early universe, together with a lot of work and many other observations besides, has allowed us to conclude that our universe began in an almost unimaginably hot, dense state some 13.7 billion years ago. The sophistication of modern cosmological measurements can be breathtaking; we know the age of the universe more accurately than we know the age of the Earth.

We also know what the major constituents of the universe are, but this raises more questions. Ordinary matter, made of atoms of carbon, oxygen, nitrogen and all the rest, turns out to account for only a sixth of the mass in the universe, the rest being a mysterious substance which we call ”dark matter.” The expansion of the universe is not, as once was expected, slowing down under the pull of gravity, but rather accelerating under the influence of an antigravity force that remained undetected until just 10 years ago.

We have made progress in other areas too. The search for life beyond our own planet, and beyond our own solar system, is something that has inspired scientists, artists and authors for centuries. There is still no sign of little green men, bug-eyed monsters or bacteria on Mars, but we are getting somewhere. The detection of planets beyond our solar system is now routine; more than 200 of these extra-solar planets, or exoplanets, are now known. All are large – probably because large planets are easy to detect – but it would not be surprising if the first Earth-sized worlds known to orbit another star were detected in the next year or two. The first measurement of the composition of the atmosphere of two of these planets was announced just a few weeks ago, and the pace of discovery is rapid.

With so much going on – we haven’t mentioned the exploration of Mars, or the grandstand view we have of merging galaxies and much, much else – it is difficult to know where to look next. In this column, we hope to show you around our universe. After all, the story belongs to all of us, insignificant though our place in it must be.

About the Authors

Sir Patrick Moore has been the host of “The Sky at Night,” a monthly television show about astronomy on the BBC, for 50 years. He is the author of more than 60 books on astronomy, and his own studies have focused on the Moon. Moore is also an accomplished xylophone player and composer. He is a coauthor, with Chris Lintott and Brian May, of “Bang!: The Complete History of the Universe,” which will be published in the United States this fall.

* Read more about Sir Patrick Moore at http://www.bbc.co.uk/science/space/spaceguide/skyatnight/patrickmoore.shtml

Brian May, best known as a guitarist, songwriter and performer for Queen, began his doctoral studies on the subject of interplanetary dust before the band hit it big in the early 1970s. Through the years, he retained a strong interest in astronomy, appearing regularly on Moore's TV show, "The Sky at Night." May has recently returned to his studies in astrophysics. He is a coauthor of "Bang!"

* Read more about Brian May at http://www.brianmay.com/
* Queen Online

Chris Lintott, has been a co-host (with Sir Patrick Moore) of "The Sky at Night" since 2000. He recently completed his doctorate and is now studying star formation at the University of Oxford. He is a coauthor of "Bang!"

* Read more about Chris Lintott at http://www.banguniverse.com/chris-lintott