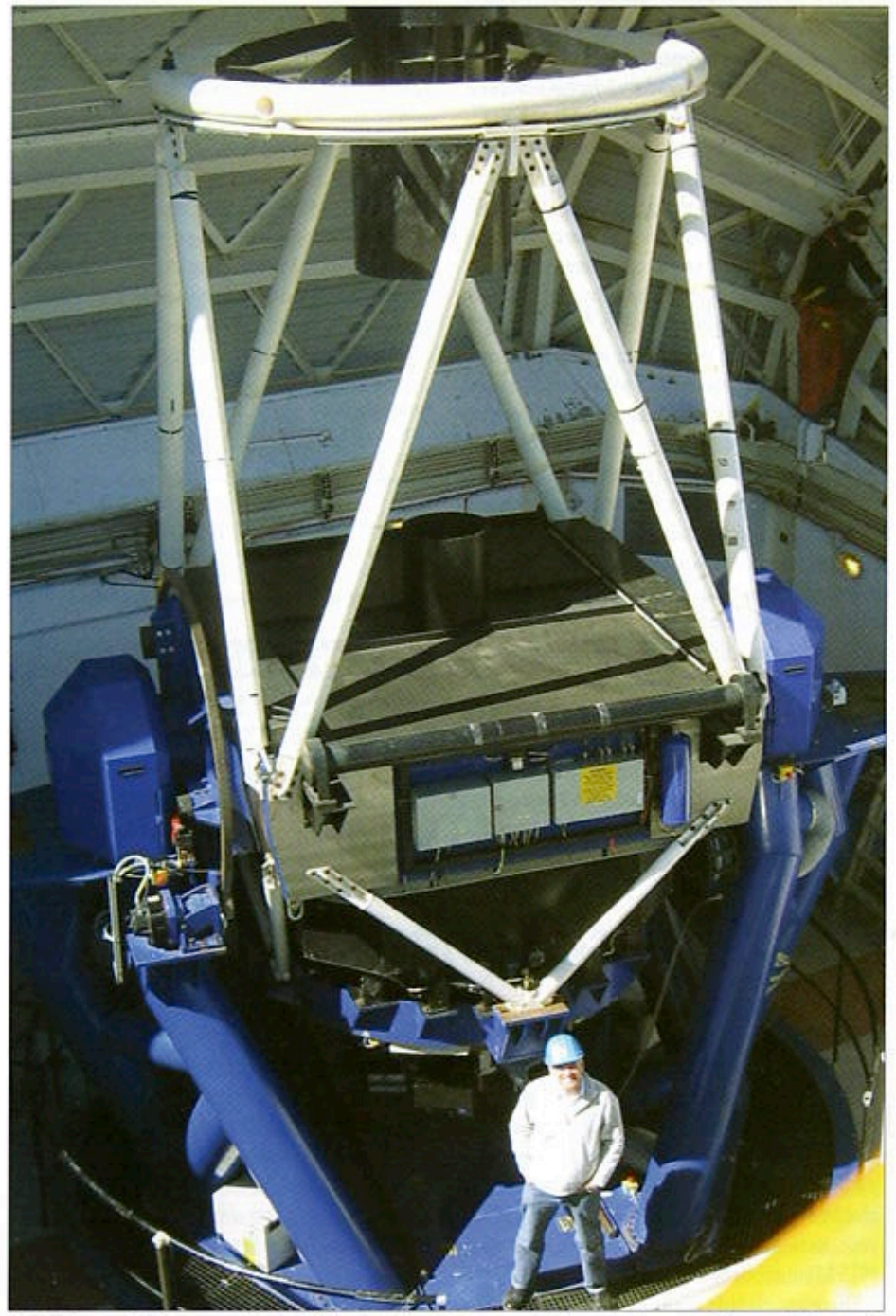
The National Schools' Observatory

Andrew Newsam, NSO Director, describes the rationale and running of the National Schools' Observatory, designed to inspire and inform schoolchildren by asking them to make the same sort of observing decisions as professional astronomers.



1: The Liverpool Telescope with Prof. Mike Bode in the foreground. (Jon Marchant and Liverpool Telescope)

What first inspired you about science? A common question for scientists, but one that is difficult to answer. For many it is a single source – an inspirational teacher, a chemistry set for Christmas, the sight of the Milky Way spread across the night sky, or a particular television programme. For others the influence is more subtle – perhaps they simply found that they were good at it when their classmates were not, or they found the challenge stimulating. Whatever that inspiration is, there is always the corollary: what would you be doing now without it?

Many people would perhaps be doing much the same, their inspiration fired by a different source, but others might never have been bitten by the science bug – the loss to science being accountancy's gain perhaps? But if we are to attract more students into science, and indeed raise the level of scientific literacy in our society as a whole, we must always be on the lookout for *inspiration*.

This is a strong motivation behind the National Schools' Observatory (NSO) project: providing inspiration by letting schoolchildren work alongside professional astronomers on a multimillion pound research telescope. This is a worthwhile ambition, as I hope you will agree, but first you need a suitable telescope.

The Liverpool Telescope

This was one of the ideas that led to the Liverpool Telescope project. Foremost, however, was a need for a large, fully robotic telescope that could lead the way in "time-domain astrophysics" by monitoring variable objects and reacting rapidly to sudden events such as supernovae or gamma-ray bursts. This is a difficult task and one that requires dedicated telescopes that were simply not available a decade ago. This led Mike Bode, head of the Astrophysics Research Institute at Liverpool John Moores University (LJMU), to the radical step of setting up a company to design and build such an instrument. Backed by the university and some European Union funding, the company – Telescope Technologies Ltd (TTL) – was set up and work begun on a "technology demonstrator" telescope, eventually to be the Liverpool Telescope (LT).

After a frustrating series of delays and teething problems, the LT is now on site at the world-class Observatorio del Roque de los Muchachos in La Palma and fully operational with a growing suite of instruments. With its 2 m diameter primary mirror and sophisticated control system, it is already involved in cutting-edge science from near-Earth object follow-up and extrasolar planet detection, right through to the most extreme objects with GRBs and active galaxies. The LT is already producing the scientific payback it was designed for, but it is its potential for involvement by non-professionals that is perhaps the most exciting aspect of its operation.

2: Part of a mosaic of the Moon taken by the LT. This section contains about 50 images which have been combined to produce a seamless image. The complete mosaic (or "moonsaic") is then cut up into 25 pieces and released day-by-day to schools who can print them out and build up a giant image of the Moon on the classroom wall over the course of a month. This will be repeated for a range of different lunar phases over the coming years. (Liverpool Telescope and the National Schools' Observatory)

Doing astronomy in your sleep

This all comes down to that seemingly simple phrase "fully robotic". What this means as far as the LT is concerned is that there is *no human intervention* during normal operation. Given a database of requests for observations and their associated criteria, the telescope itself decides from minute-to-minute what to do next. Taking into account a range of factors, including weather, scientific priorities, timing constraints and information from other telescopes (often in space), the telescope can work efficiently and, most importantly, carry out a wide range of different tasks for several different astronomers every night.

Of course, since you do not actually need to be at the telescope (or indeed conscious) for it to observe for you, anyone with suitable software and permissions can send their own requests for observations, not just professional astronomers. This opportunity was realized in the early stages of the project and, from the start, a portion of the observing time on the LT was set aside by LJMU for schools.

Of course, having time on a telescope and actually being able to make good use of it are two very different things. Modern telescopes are complicated, even for professional astronomers (I'm sure some telescope operators would say *especially* for professional astronomers!) so how do we make it possible for a primary-school pupil? What are the educational needs in schools? What, basically, do we need to do? The obvious answer was, and is, to talk to those who know the classroom – teachers.

Through a series of teacher working groups, online discussions, visits to schools, workshops and much more, we have been able to develop a system that is at an appropriate level for schools, and flexible enough to adapt to changes in the education system – which come thick and fast!

How to 'Go Observing'

At the core of system is a web-based interface that we call "Go Observing". This is a dynamic, flexible system that guides teachers or pupils through the maze of possible observations to arrive at an observing programme that suits their needs. One important aspect of Go Observing is that it is not entirely open ended. The range