

# Introduction to the ESO Annual Report 1998 by Prof. Riccardo Giacconi, Director General of ESO

1998 has been a banner year for ESO. Success has crowned the dedicated effort of the entire staff in a number of endeavours of the highest significance for European astronomy.

The First Light obtained on May 25 at UT1 (the first of the VLT 8-metre telescopes on Paranal to be completed) represents the culmination and validation of years of engineering and technical development of the active thin meniscus telescope mirrors pioneered by ESO. The stunning results obtained in the very first few weeks of commissioning show that the essential technical issues have been mastered and this fact has allowed us to proceed quickly to science verification and scientific use of the telescope by the community. This is a great achievement for European research and European industry.

1998 also saw the commissioning of the first two focal plane VLT instruments intended for scientific use. FORS and ISAAC made a very successful debut. The first is an imager and multi-object spectrometer provided by a consortium of German Astronomical Institutes (Heidelberg State Observatory and the University Observatories of Göttingen and Munich), the second an infrared imager spectrometer built at ESO, the only instrument of its kind in service at any large telescope in the world. The co-operation with the European research community, which has taken primary responsibility for 9 out of 11 VLT instruments, is proving to be an important element in fully utilising the best instrumentation talents in Europe. The combination of academic creativity and ESO quality control seems to provide a good assurance of success of frontline instruments built at reasonable costs.

The development at ESO of advanced detectors for the optical and the infrared has succeeded in producing systems that are world class. These systems are incorporated in almost all ESO's instru-

ments. The instrumentation programme for second-generation instruments on the VLT is getting under way.

It is worth noting that the VLT programme has proceeded on schedule and within anticipated costs. We fully expect to complete it as planned.

The VLTI programme also saw very significant progress during the year. The construction of the delay lines, auxiliary telescopes and instruments for interferometry is well under way with first fringes expected in 2001.

Equally important for the European astronomical community are the achievements of the La Silla Observatory where the refurbishment and upgrading of all the telescopes is essentially complete. First Light was obtained with SOFI (an infrared imaging spectrometer similar to ISAAC) at the NTT, with FEROS (a broad-band spectrometer) at the 1.5-metre telescope and with the  $8k \times 8k$  wide field camera at the 2.2-metre MPG/ESO telescope. La Silla has, in the past few years, increased substantially its effectiveness, modernised its facilities and become the most scientifically productive observatory in the world in terms of publications in refereed journals.

Using observations of distant supernovae obtained with La Silla telescopes, as well as other telescopes available to their colleagues at other institutions, ESO astronomers have actively contributed to the work of the international team that obtained the most startling discovery of 1998, namely that the expansion of the Universe is accelerating.

The ESO methodology for providing facilities to the astronomical community has shifted more and more toward an end-to-end science approach. Software tools are furnished for proposal preparation, observations planning, calibration, pipeline data processing and archiving for essentially all major ESO facilities. An important achievement of 1998 has been the realisation of the unified HST/VLT archive.

Carried out as a collaboration between ESO and the ESA-ESO ECF, this development has resulted in a powerful and unique tool for astronomical research.

Finally the ESO Council and Executive have taken important steps in assuring the future of ESO contributions to European Astronomy. The Council unanimously endorsed the vision of ESO embodied in the Document "ESO's role in European Astronomy", which was published in *The Messenger* No. 91 of March 1998. The Council also approved the Executive's proposal for ESO involvement in the first phase of development of the LSA/MMA [now called ALMA, the editor] sub-millimetre wave array jointly with the USA. The LSA/MMA array will be the largest and most powerful submillimetre/millimetre-wave interferometer in the world, with the potential of unique and crucial contributions to the study of some of the astrophysical problems of greatest current interest.

A Memorandum of Understanding between ESO, PPARC, CNRS, MPG, NFRA/NOVA was signed on December 17, 1998. A European Co-ordinating Committee and a European Negotiating Team were created following the provision of this MoU enabling the European partnership to initiate detailed technical discussions and negotiations with NRAO, AUI and NSF. Joint discussions with Japanese astronomers are underway to extend this partnership to a worldwide project.

For a more distant future, the ESO-STC has endorsed the proposal for a study phase of the feasibility of a new 100-metre-diameter filled-aperture telescope that will represent the next step in ground-based optical astronomy. Technical and industrial studies are getting underway at the beginning of 1999.

These achievements are a matter of considerable pride for all of us at ESO. We recognise with gratitude the constant support of the ESO member state nations which made this possible.

## Inauguration Ceremony of Paranal Observatory – 5 March 1999

### Discourse of Prof. Riccardo Giacconi, Director General of ESO

President Frei, Minister Arellano, Ambassadors, Ministers, President of the ESO Council, Council members, Intendente of the II Region, Civilian and Military Authorities, Distinguished Guests, Ladies and Gentlemen,

It is a great joy for all of us at ESO to welcome you here for this ceremony

which represents the culmination of years of effort to build what will be the largest array of optical telescopes in the world.

April 1st will see the start of the science operations with the first 8-metre telescope. During this last week, astronomers from all over the world have been discussing in Antofagasta the optimum sci-

entific use of the very large telescope.

Tonight you will hear President Frei, and the President of the ESO Council, Mr. Grage, discuss the meaning they associate to this event, Prof. Carlo Rubbia will speak later of its meaning for science.

I will limit my remarks to the perspective of all of us at ESO, who have been

working for many years to bring this project to fruition. To be associated to such a historic undertaking during one's professional career is a rare and wonderful privilege, for which we are all grateful.

Many things can be said about such an adventure, but perhaps the most striking feature of the development of this great machine, which we carried out together with the astronomical and industrial communities of Europe and Chile, has been the striving for excellence in all its different aspects.

The European companies involved in the construction of the VLT include Schott, REOSC, GIAT, Ansaldo, Dornier, Zeiss, Soimi, Amos, Fokker, EIE, ETEL and many others too numerous to mention. They succeeded in developing advanced technology in the many disciplines required to meet our stringent specifications. They succeeded in doing so on time and within fixed budgets.

They have reached a level of performance in the execution of this project that has made them competitive in the field of large optics, world-wide.

In effect, we have done again what George Ellery Hale advocated when he built the 5-metre telescope on Mt. Palomar, that is, to use the best of the available industrial capacity at any one time to build the most refined scientific instrument for astronomy. How much better to use our industrial might to advance knowledge and the human spirit, rather than to produce machines for destruction.

Although the success in technology brings many important benefits, in terms of the acquired experience and know-how, and in terms of industrial competitiveness and image, yet the most important motivation for us to build these great machines is that by doing science with the VLT we will be able to explore the most remote epochs of the universe, when it was only a mere fraction of its present age and when the first structures were forming and beginning their slow evolution into galaxies, stars and planetary systems. To communicate what this means to an astronomer, I can find no better words than those of Milton: "Before (his) eyes, in sudden view appear the secrets of the hoary deep – a dark illimitable ocean, without bound, without dimension..."

We will join in friendly competition in the voyage of discovery initiated with the Hubble Space Telescope and Keck. When the full array of the four major telescopes, as well as the auxiliary outriggers are completed we will achieve, by use of adaptive optics and interferometry, the ability to study details of the cosmic sources, 30 times finer than hitherto achieved, even in space missions. We will be able to ask even more penetrating questions on the formation of stars and galaxies, on the dynamic processes within them, and on the existence of planetary systems capable of sustaining life.

The great telescopes and instruments you see before you are but a part of the science machine we have built. Sophisticated computer technology is used



*Prof. R. Giacconi with the 17-year old Jorssy Albanez Castilla from Chuquicamata near the city of Calama, winner of the essay competition, in which schoolchildren of the Chilean II Region were invited to write about the implications of the names given to the four VLT unit telescopes. She received the prize, an amateur telescope, during the Paranal Inauguration.*

through the system. Software tools are provided to the astronomers for the formulation of the observing programmes, the planning of the observations, the accumulation and calibration of the data and, finally, their quality control and archiving. In these aspects of our work pure technology is transcended, to become the scientific methodology necessary to address the sophisticated questions of greatest current astrophysical interest and to achieve excellence in science.

As we carry out this challenging work we gain experience, self-confidence and pride in doing an interesting and difficult job as well as we can. It is satisfying to achieve maximum scientific results within the available means. It is wonderful to design new systems and see them come about and work as desired. As we do these things we change, and our organisation also changes.

The degree of professionalism shown by the engineering, technical and scientific staff at ESO, both international and Chilean in this project, has few precedents in the history of astronomy.

In carrying out the VLT project, ESO as an organisation has had to change and mature. While we were able to capitalise on technical ideas and experience accumulated over many years, the sheer size of the project demanded that we develop new management approaches and new methodology to cope with its complexity. Having successfully overcome these challenges we feel quite confident that we will complete the current tasks while already planning for the next generation of telescopes.

We feel a deep desire to share our knowledge and achievement with the public at large and, in particular, with the young people. It is, after all, they who will

use the VLT for years to come and will experience the thrill of new discoveries.

As in the time of Copernicus, Galileo and Kepler, it may take decades, or even centuries, for the profound implications of scientific discoveries to become translated in our vision of the world and of our place in it, as part of the general culture.

For now, we can only start this long-range process, which is sure to occur, by undertaking educational programmes in Europe and Chile.

Here, in Chile, the Comité mixto Chile-ESO has initiated last year. Its mission to support astronomy development at the university level.

In the local communities, we helped teachers involved in science education and we would like to engage the imagination of the children of the II Region, and make them happy to have the VLT here.

We have recently fulfilled our promise to President Frei, to let the school children of the II Region name the telescopes. We have carried out a competition which has resulted in very poetic and appropriate names for the four 8-metres. The names in Mapuche are:

Antu (the Sun), Kueyen (the Moon), Melipal (the Southern Cross) and Yepun (Sirius).

I was particularly struck by a sentence used by the school student to explain why the choice:

*Todas estas palabras están relacionadas con la luz y para mí la luz significa paz y vida. Seguida de la idea de que todo tiene relación con el universo.\**

\*(Note from the Editor: Quote from the student: All these words are related to light, and for me light means peace and life. This follows the idea that everything is related to the universe.)