European Astronomical Society

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Message from the President

When the European Astronomical Society was founded in the early nineties, there was great hope that our countries, long separated by the Iron Courtain, would cooperate to build a friendly Europe, and that they would share their skills and their ressources to ensure a decent standard of living for all, instead of developing new weaponry. We are far from reaching this goal. In most Eastern countries, the economical situation has worsened: salaries have dropped below poverty level - when they are paid at all - forcing many colleagues to leave or to take a better remunerated job. Their best students see no future in academic careers, and turn away from them.

And now much worse has come: warfare as ultimate resort against a country which does repeatedly violate the basic rights of its ethnic minorities. If one accepts this as a valid reason for intervening in Yugoslavia, how can one justify closing the eyes on similar situations which occur in many other places around the world? Who can be insensitive to those widely broadcast pictures of bombing and of refugees? What shall I answer to this colleague from Belgrade who in an e-mail appeals to EAS to stop what he calls 'the barbarian act of agression' on his country and who fears that his astronomical observatory might become a target?

We cannot just sit and watch this happen, or seek oblivion in our scientific work. The role of our Society, as defined in its constitution, is 'to contribute to and to promote the advancement of astronomy, in its broadest sense, in Europe by all suitable means'. It makes us a duty to not accept that Europe is being torn apart for economical or nationalistic reasons. More than ever, we must encourage all forms of solidarity between astronomers from West and East, through collaborative programs, exchange of visitors, etc. But we must also act as citizens of our countries. Let us use whatever influence we have on our policymakers to convince them that, to solve its economical problems, Eastern Europe needs an ambitious scheme, akin to the Marshall plan implemented after the second world war. Such plan could favour the truly democratic countries, and thereby put pressure on those which do not respect their minorities. Would not the taxpayers' money be better employed than building sophisticated airplanes, whose cost per unit is comparable to the gross income of the small countries involved in the present conflict? Wouldn't that be preferable to shedding blood and fostering even more hatred?

Jean-Paul Zahn

Editorial

The role of the editor of any journal is delicate and often embarrasing. One has to seek the appropriate articles to make it interesting, different from similar of its kind and informative. In this new era, where INTERNET dominates the information and news spread very easily and fast.

I therefore find that the role of our Newsletter is to promote and point out important achievements of the European Astronomical Community. However this time I am very sceptical, since we started a series of articles to present the technological centers in Europe involved with astronomical projects, when a war has broken out and when technology's misuse is killing people. Such events are continuously happening around the world, but this is happening in Europe and apart from that it seems that this particular war illustartes our vulnerability and diversity at its worst. The long history of the European nations does not seem to be instructive and the threat of an instability era is revealed. Under these circumstances we feel that we cannot close our eyes and pretend that all is fine.

Astronomers do not only care about the universe and remote stars, they also care about their home planet and should join their voice with all those who are against any violent action. European astronomers, just some months ago, were dreaming of an ambitious strategic plan for their future research activities. Is this completely utopic now?

We started at a very low pace, thinking about a plan to help young atsronomers in Europe. Shall we stop it. I hope and I wish not!!

The Secretary of our Society before the war started has sent the following article. I am afraid that her worries are not irrelevant to what is now happening in Europe.

Mary Kontizas

Opinion

The role of the European Astronomical Society

Seen from this far corner of Europe the role of the EAS is quite obvious. A privileged forum for debate of opportunities and problems of Astronomy in a place and a time where national borders begin to have a different role and less meaning.

By nature and by need Astronomy has always been a discipline of excellence for transnational programs and collaborations. Besides the national societies and their irreplaceable role within each country, another wider body may constitute the chain between the various societies and between astronomers, as well as the paneuropean link to other existing European Institutions of Astronomy, namely the European Space Agency and the European Southern Observatory. These have other roles to play, at her well- established aims and objectives.

There are several ways I envisage the EAS activity and initiatives:

- As the unique astronomical society interacting through a wider Europe and in close collaboration with the various national astronomical societies.
- As a privileged contact for the European programs, for example those involving training and mobility, or those where the exchange of astronomers may be the main objective.
- As the transnational entity while identifying the high level quality infrastructures for Astronomy with open access to European astronomers, namely observational facilities, data banks and archives, training programs, etc. And trying to fabricate schemes to make them more widely accessible.
- As the forum for discussion of the future global aims of the Europe an Astronomy.
- As the instrument for surveying the comparative position of Astronomy with other sciences, within

Europe, in terms of national investment, infrastructures, human resources, opportunities, etc.

Further to that the EAS should also be the natural focus for meetings of scientific nature, as well as for planning and shaping science policy. Since EAS affiliates the national societies within Europe the global updated knowledge of the European diversities is fully guaranteed.

After these considerations, there are however some worrying questions for which I have not been able to find answers: Why then such unbalanced national representation at the EAS General Meetings?

Looking back over the years I find it hard to say that the attendance and participation has been a realistic image of the relevance and dimension of the astronomical community in Europe. The justification cannot be the science content of those meetings. Of course the scientific sessions and speakers involved should be the best and able to attract participation. Even the General Meeting and the discussions taking place should be alive, innovative and stimulating. Europe is after all wide and rich in diversity. The EAS is the forum of excellence for Astronomy in Europe.

Why are young astronomers so absent from the EAS Meetings and discussions? Of course the current days are probably of more uncertainty in jobs for younger people. Yet, present day youth is certainly still enthusiastic, motivated and dreamer. And Astronomy, I believe, is not a past success for intellectual stimulation and passion.

I hope these few lines will provoke discussion, reaction, suggestions, whatever. That will fulfill the objectives.

Teresa Lago

Astronomical Technology in Europe

The International 4-m Liquid Mirror Telescope Project(+)

A non exhaustive list of institutes being members, or member candidates, of the International 4-m LMT consortium includes: Athens National Observatory (Greece), Belgium Royal Observatory (Belgium), Bordeaux Observatory (France), Centre Spatial de Liege (Belgium), Durham University (England), Edinburgh Royal Observatory (Scotland), Laval University (Canada), Liege Institute of Astrophysics and Geophysics (Belgium), Maastricht University (The Netherlands), Pontificia Universidad Catolica (Chile). Ermanno Borra is the project scientist and Nathalie Ninane is the project manager of the 4-m LMT.

Introduction: The surface of a spinning liquid takes the shape of a paraboloid that can be used as the primary mirror of a telescope. Following the suggestion that modern technology gives us tracking techniques that render liquid mirrors useful to astronomy (Borra 1982), research and development programs were begun to assess the feasibility of the concept. Mirrors up to 2.5 m diameter were extensively tested and showed the high surface quality of such mirrors (Borra & al. 1992; Ninane & Jamar 1996). Thanks to the very good quality and low cost of Liquid Mirror Telescopes (hereafter LMTs), it is now possible for small consortia of astronomical institutions to fully dedicate a large survey telescope to well defined and targeted scientific programs. Considering a 4-m class telescope, equipped at the prime focus with a semi-conventional glass corrector capable of subarcsecond images over a field of approximately 30×30 arcminutes, members of the International 4-m LMT consortium (see the above list) have concluded that it should be possible to obtain every night very precise photometric and astrometric data for all objects contained in a strip of sky of approximately 140 square degrees, at constant declination, down to the limiting magnitude $B = 23.6$.

Construction of such a 4-m LMT equipped with a thinned high quantum efficiency 4096×4096 pixels CCD is under way. The possible construction of an array of several (2 or 4?) LMTs, working at different wavelengths, is also being considered. Possible sites to erect the 4-m LMT, characterized by very good photometric transparency and image quality, no too strong winds, etc. have already been idenfied in the north of Chile. The total cost of this project is of the order of 1.5 million Euros, including operation of the telescope during a period of 5 years. Technological arguments and examples of scientific programmes justifying the construction of such a telescope are given hereafter.

Technological and scientific motivation: LMTs cannot be tilted and hence cannot track like conventional telescopes do. To track with imagery, narrow-band filter spectrophotometry or slitless spectroscopy, one uses the technique of time delayed integration (TDI), also known as drift scan, based on a CCD detector that tracks by electronically stepping its pixels. The information is stored on disk and the night observations can be coadded with a computer to give long integration times. The technique has been demonstrated (Hickson & al. 1994, Hickson and Mulrooney 1997) with a 2.7-m diameter LMT, showing that these telescopes are sufficiently robust for high quality astronomical observations.

Why are we interested in liquid mirror telescopes, considering their limitations? The main reason comes from the size and cost advantages. The low cost (2 orders of magnitude less than an equivalent classical telescope) makes it possible for a small team of astronomers to have their own large telescope working full-time on a specific project. This is in practice not realistic with expensive classical telescopes. Some research projects (e.g. time consuming surveys, long term photometric monitoring programs) simply cannot be envisioned with classical telescopes but are possible with LMTs. This is particularly true for the types of research where the region of sky observed is not particularly important (e.g. cosmology).

A short list of science drivers justifying the construction and operation of the 4-m LMT includes:

- statistical determination of the cosmological parameters H_0, q_0 and λ_0 based upon surveys for multiple imaged quasars. Surdej and Claeskens (1997) have shown that the proposed multi-color and variable photometric survey would lead to the detection of at least 50 new multiple imaged quasars for which nearly daily photometric information will become available. From the statistical identification and study of these lenses, it will be possible to independently infer the most likely values for the cosmological parameters Ω_0 and λ_0 and to precise the relation for the number counts of quasars at faint magnitudes,
- statistical determination of the cosmological parameters H_0, q_0 and λ_0 based upon surveys for supernovae (more than 1000 supernovae will be detected every year),
- search for quasars and observational studies of large scale structures (more than 20,000 quasars should be found in the proposed survey),
- trigonometric parallaxes of faint nearby objects (e.g. brown dwarfs, ...),
- detection of high stellar proper motions to probe a new range of small scale kinematics (stars, trans-neptunian objects, ...),
- astrometry of multiple star systems,
- a wide range of photometric variability studies (cf. photometry of stars, RR Lyrae, micro-lensing effects, of variable AGN over day to year time scales, ...)
- search for low surface brightness and star-forming galaxies, and other faint extended objects (galactic nebulae, supernovae remnants, ...)
- galaxy clustering and evolution,
- serendipitous phenomena,
- and, finally, production of a unique database for follow up studies with the VLT, Gemini and other 8m class telescopes.

For a more detailed account of the main science drivers that could justify building an LMT as an astronomical research instrument, we refer the reader to the proceedings of the workshop entitled 'Science with Liquid Mirror Telescopes' that was organized on April 14-15, 1997, at the Observatory of Marseille. These proceedings are available at the URL http://wood.phy.ulaval.ca/lmt/home.html.

The telescope: Figure 1 shows the entire telescope system. Comparing the LMT to a conventional telescope, we see that they are similar with the exception of the mount. The top parts are identical, consisting of a focusing system and a detector. There is some cost saving in the upper end structure since it does not have to be tilted. The largest cost savings obviously come from the mount which consists of a simple tripod.

A semi-classical on-axis glass corrector capable of correcting a field of at least half a degree with images having a FWHM ($\sim 0.4''$ will be used. It will remove the TDI distortion. With a classical corrector, the TDI technique degrades the images. This comes from the fact that the TDI technique moves the pixels on the CCD at a constant speed on a straight line while the images in the sky move at different speeds on distinct curved trajectories. The deformation depends on the latitude of the observatory (it is zero at the equator and increases with latitude). Optical design shows that it is possible to eliminate the effect by introducing the adverse deformation on the field with such a corrector.

The dome structure of an LMT is much more simple than that of a conventional telescope. Its main function is to protect the mirror from the winds since a liquid surface is very sensitive to turbulent winds. The shape of the dome will simply be rectangular and the roof and the folding platform needed to service the upper end will be the only movable parts.

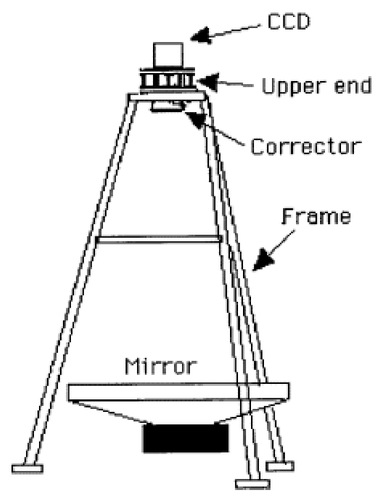

Figure 1: The LMT system

To all previous hardware components, we must still add the computers and disks for data reduction, analysis and archiving, and for the operation of the LMT. Several LMT working groups are presently addressing the final issues of hardware and software specifications. More general and detailed information on the International 4-m LMT project may be found at the URL: http://vela.astro.ulg.ac.be/lmt/; see also the numerous links to the individual pages of each participating institutions as well as to other existing LMT projects.

Last but not least, research centers in Liege investigate the possibility of manufacturing in series totally equipped 2-4m Liquid Mirror Telescopes which could be used by small teams of professional or amateur astronomers.

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Jean Surdej
on behalf of the International 4-m LMT consortium

The UK Astronomy Technology Centre

1. Introduction

In the UK Astronomy is funded through and organised by the Particle Physics and Astronomy Research Council (PPARC). On the first of April 1998 a new PPARC establishment was formed. The new UK Astronomy Technology Centre is located on Blackford Hill at the Royal Observatory Edinburgh. This means that the ROE is no longer a legal entity, but is now the address of both the UK ATC and the University of Edinburgh's Institute for Astronomy. In fact this is in many ways, a welcome simplification: Over the years many people outside the UK have been confused about the fact the University of Edinburgh's Astronomy Institute was inside ROE, but was not part of it. Now both the University and the UK ATC are at the ROE.

The formation of the UK ATC is the culmination of the most radical re-organisation of UK astronomy in decades. This has resulted in the island sites having a much greater autonomy and a customer-contractor relationship being set up between them and the new UK ATC. The UK ATC itself inherits the technology activities of both the Royal Greenwich Observatory and the Royal Observatory Edinburgh. It is important to realise however that we are not merely the ROE or RGO with a new name. Major parts of the old ROE/RGO programme (Research, Public Understanding of Science, Wide-Field Astronomy and support of users on telescopes) have all been relocated to other organisations. This leaves the UK ATC free to focused purely on the technology activity.

2. Mission and Programme

The UK ATC is the flagship of PPARC's ground based astronomy instrumentation programme. We are undertaking a wide range of activities from ground based to space based instrumentation projects. Our mission is to be the UK's National Centre for the design and production of state of the art astronomical instrumentation and associated technology, in collaboration with UK organisations and/or overseas partners. In addition we are equipped to provide consultancy and support to UK University groups who wish to participate in instrumentation.

Our primary customers are the major ground-based telescopes that the UK is a stakeholder in: Gemini, the Joint Astronomy Centre (UKIRT and JCMT) and the ING (WHT, INT & JKT). In addition we are part of the SPIRE project for FIRST. We also have another important customer; the UK instrumentation community. We collaborate with UK Universities and Establishments in order to carry out the UK programme. We are also equipped to provide consultancy to the UK community and provide test and acceptance facilities if they are needed.

The Programme of the UK ATC is quite large with some 20 projects in total. Some of the highlights are briefly discussed below:

2.1 Gemini

GMOS is a pair of Optical Multi-Object spectrographs for Gemini (one for each telescope). They will provide a versatile low/medium resolution spectroscopic capability which will exploit the excellent image quality delivered by the telescopes at optical and near-infrared wavelengths. This project is collaboration with the University of Durham and the Dominion Astrophysical Observatory in Canada. GMOS has a field of view of 5.5×5.5 arcmin and covers a wavelength range of 0.36 to 1.1 microns with a spectral resolution of up to 10,000. The multi-Object capability is provided by up to 24 custom masks. In addition to the MOS capability, GMOS-North will have an integral field unit.

2.2 UKIRT

MICHELLE is a Mid IR imager and spectrometer and will be shared between UKIRT and Gemini North. It operates between 8 and 28 microns and provides long slit spectroscopy with a spectral resolution of 100 to 30,000.

UIST is a 1 to 5 micron imager and spectrometer for UKIRT. UIST is designed to exploit the superb image quality of the upgraded UKIRT. It will provide spectral resolutions of $R = 1500$ to $R = 3500$. It will employ an image slicing IFU as well as long slit and cross-dispersed spectroscopy. Imaging is over a 2×2 arcmin field.

2.3 ING

NAOMI is the Natural guide star AO system for Multiple purpose Instrumentation on the WHT. It is a Common User Adaptive Optics system (facility) optimised for 2.2 microns. Naomi will have delivered a Strehl ratio of 0.65 for 8m guide star on axis when the v-band seeing is 0.5 arcsec. Under the same conditions it will have a 25% sky cover with a K Strehl of 0.25 or better. The system will perform well into the optical and is capable of being upgraded to accommodate a laser guide star. Naomi is collaboration with the University of Durham.

2.4 JCMT

Following the outstanding success of SCUBA, the JCMT has now embarked on a Heterodyne Array Programme. The first instrument in the programme, HARP-B operates in the 325-375 GHz window (B-band). HARP-B will have sixteen highly optimised pixels, each with an SSB noise temperature of better than 150K. HARP-B is a collaboration with the University of Cambridge MRAO group, the Herzberg Institute of Astrophysics in Canada and the Joint Astronomy Centre in Hawaii.

2.5 SPACE

The Spectral and Photometric Imaging REceiver (SPIRE) instrument is one of three instruments that will be used with ESA's Far IR & Sub-mm Telescope. The ATC is part of a consortium of 15 institutes in the UK, France, Spain, Italy, Sweden and the USA which was formed to build SPIRE and which is lead by Dr M. Griffin of Queen Mary and Westfield College in London. In collaboration with other institutes the ATC participated in starting the project up and developing the overall instrument design, and made major contributions to the initial opto-mechanical design of the photometer channels (i.e. the camera optics and layout), for the layout of the FTS and the concepts for the chopper. We are responsible for the design, testing and manufacture of the chopper mechanism and are leading the focal plane systems engineering, a key role in ensuring that the final instrument performance will meet the astronomical requirements.

3. Organisation and Ethos

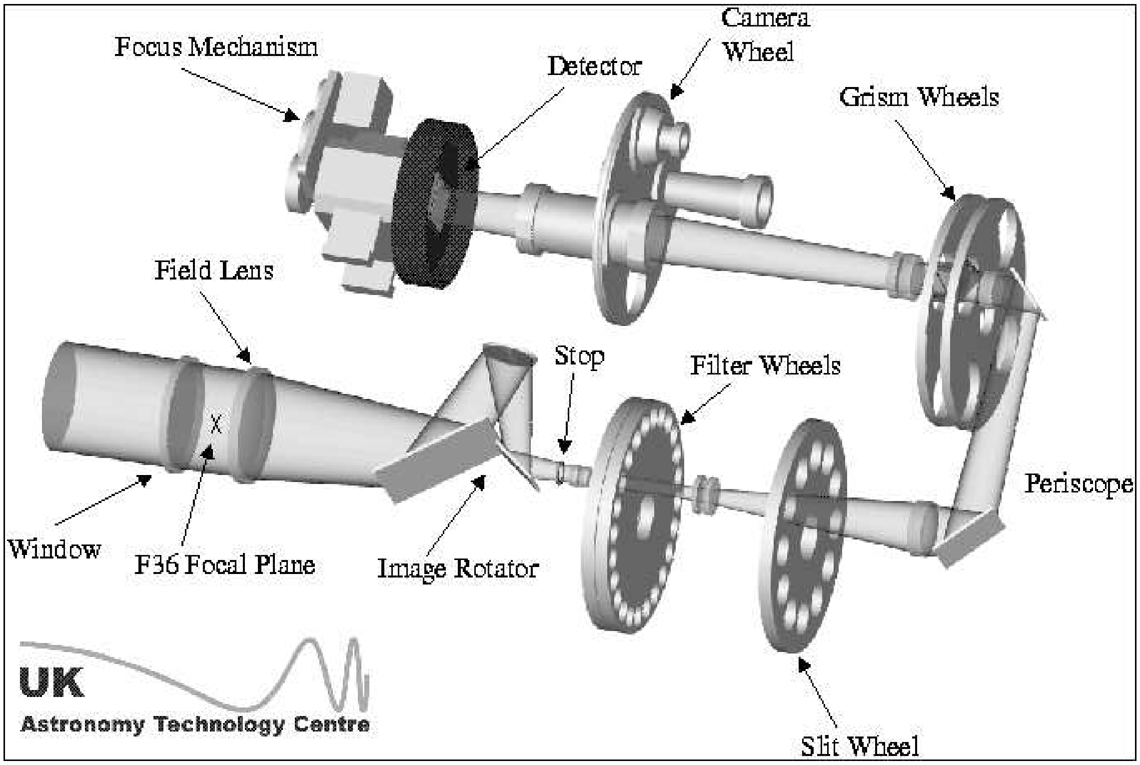

Figure 2: Optical Layout of the UKIRT Imager Spectrometer UIST.

The ATC employs some sixty staff working on projects. The majority of the organisation comprises professional engineers, physicists and technicians. In essence we are a science driven professional engineering organisation employing state of the art technology in the fields of cryogenics, mechanical engineering, optics, computing and electronic engineering. Our skill base includes the legacy of some of the most successful UK instruments ever, such as IRCAM and CGS4 on UKIRT and UKT14 and SCUBA on the JCMT.

The work of the UK ATC is organised into project teams within a matrix-managed structure. Strong project management is essential for the delivery of projects to budget and schedule, all so important in these days of ever decreasing resources.

Although most of the scientific research carried out by the old RGO and ROE has been moved to other organisations, the UK ATC does have a team of six astronomers within it. They are Project Scientists for the work of the UK ATC and are key to ensuring that the work of the ATC is led scientifically. Indeed we will not take on a new project without assigning a Project Scientist to it. Our scientific cultural well being benefits from our close interaction with the University of Edinburgh Institute for Astronomy. This means that it is possible for the ATC project scientists to be part of a much larger world class research programme. Without this scientific relationship, we would become a purely Engineering Organisation and would rapidly become mediocre, seeking to innovate for the sake of the engineering, rather than the science.

More information on the UK ATC and the projects we are carrying out can be found at http://www.roe.ac.uk/atc

Adrian Russell

Computer-controlled manufacture of astronomical ground and aerospace-based optics

JSC Lytkarino Optical Glass Factory (LZOS) is the leading plant in Russia in the field of optical glass melting and manufacturing of high-precision large-size optical components for ground and aerospace-based systems.

LZOS was founded in 1933. By development of the plant and expansion of its sphere of activity LZOS has reached high products quality of the world standards and supplies its products to more than 70 countries around the world.

In 1966 technical equipment to manufacture large-size optical components was established at LZOS. The leading specialists of our country have been recruited for creating this equipment. During 60s and 70s we produced the 6m diameter primary mirror of Great Azimuthal Telescope for Special Astrophysical Observatory and mirrors of 2.6m in diameter for Crimean and Burokansky Astronomical Observatories. In the intervening years a qualified engineer team, able to solve complicated tasks of optical engineering, has been formed at our factory.

At the moment LZOS has the unique production base of the following:

- facilities for melting Sitall (CO-115M) blanks up to 6000mm of overall dimensions;
- equipment providing measurement of geometrical dimensions with accuracy up to 10μm at blanks up to 4000mm in diameter.
- equipment to make computer-controlled grinding of large-size, light-weighted optical components of arbitrary shape up to 4000mm in diameter, which is a closed complex with special software to process test results and results of technological grinding cycle.

In view of our extensive experience in the manufacture of large-size mirrors, the work on fabricating multilayer light-weighted mirrors based on the technology of electro-adhesive connection, as well as using non-traditional material "self-tied" silicone carbide (SiC), is in progress.

The technology of electro-adhesive connection allows to obtain multilayer mirrors up to 2000mm in diameter, which consist of weight-reduced body and covering plates. Such a design increases mirror's stiffness considerably. On the light-weighted components an error of about 0.01- 0.02λ rms ($\lambda = 0.6328\mu$m) was obtained.

The computer-controlled complex for large-size optical components grinding includes:

- a thermostatic hall for grinding optical surfaces up to 6000mm in diameter.
- automatic machines of AD series, which are controlled by a computer, to grind optical systems of 100mm to 4000mm using small-scale oscillating tools.
- a vacuum stand of vertical testing for components up to 6000mm in diameter and of a curvature radius up to 70000mm.
- a set of interferometers to test a surface shape at all manufacturing stages, which includes an automatic photoelectrical system for recording and processing surface interferograms.
- vibration-isolated test stands and technological supporting mounts of membrane- pneumatic type to support and stabilize a surface shape of optical components during the stage of their treatment and testing, including automatic maintenance of adjustment parameters when measuring external influence (atmospheric pressure, temperature).
- a system of technological software KCPM and AD2 used for processing a wave-front interferogram of a tested component on a real time basis, calculating technological parameters of computer-controlled grinding, automatic correction of grinding process according to the results of a computerized treatment session, forecasting a surface shape to be reached.

To test a surface shape in real time, a system of computer-based interferogram signal processing is used. The system includes a unit of photoelectric recording, on CCD of 1024×1024 pixels. A period for accumulation is about 0.4 msec.

The software system contains a number of subroutines of various applications. They provide computer-controlled technological process, calculation of optical surface topography on the results of interference testing, calculation of material removal with a prescribed set of polishers, calculation of mechanical trajectory of the polishers along a component, calculation of corrective technological parameters, optimization of grinding process, control programs to drive polishing tools.

The accumulated production potential enabled our factory to take part in realization of many large projects. So far, using the above complex, light-weight optical components with plane and aspherical working surface up to 2m in diameter with an accuracy up to 0.015λ rms ($\lambda = 0.6328\mu$m) were manufactured, such as light-weighted (weight reduction up to 80%) and thin optical components both axial and off-axial with arbitrary shape of the outer perimeter. A series of light-weighted mirrors of diameter up to 1600mm with aspherical surfaces, a series of telescope optics for some European countries of diameter up to 700mm, a flat mirror of 1060mm in diameter for Germany, and the secondary mirror for Kottamia Telescope in Egypt were manufactured at LZOS.

During 1997-98 we manufactured a hyperbolic mirror for MPI Heildelberg of 1250mm in diameter and two mirrors for the Royal Greenwich Observatory (RGO) of 2050mm in diameter. On the RGO mirrors a light concentration of 80% in a point of 0.2" was achieved, that is close to the theoretical diffraction limit.

At the moment we are manufacturing the mirror of the 2280mm telescope for the National Observatory in Athens (NOA), Greece, and the optics of the VST telescope (VLT Survey Telescope) with 2650mm primary mirror for the Kapodimonte Astronomical Observatory, Naples, Italy.

M.A. Abdulkadyrov, S.P. Belousov, A.P. Semenov & A.N. Ignatov

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Telescope Technologies Ltd.

The region around Liverpool has a great tradition of astronomical endeavour. This started in the early 17th century with the young Jeremiah Horrocks, a man born in Toxteth who made the first telescopic observations of a transit of Venus across the Suns disk and also correctly determined the elliptical shape of the orbit of the Moon around the Earth. All this and more before his untimely death at the age of 24. In the early 19th century, the Liverpool observatory was founded to aid in navigation for the city's burgeoning sea trade. Later, the observatory transferred to the other bank of the Mersey at Bidston, and has now transformed itself into the Proudman Oceanographic Institute of the Natural Environment Research Council.

Meanwhile, a local brewer, William Lassell was building the first large equatorially mounted reflecting telescopes and using them to discover several of the moons of planets in the outer solar system right from the heart of Liverpool. Another gentleman astronomer, Isaac Roberts (a builder by trade whose company built the Northwestern Hotel, now a hall of residence of John Moores University) was a pioneer of astronomical photography, while the physicist Oliver Lodge was the first to suggest that radio waves might be detectable from a celestial body (the Sun). At the centre of much of the activity locally in the 19th century was the Liverpool Astronomical Society, one of the oldest such societies in the world and the forerunner of the British Astronomical Association. It was against this background that what is now the Astrophysics Research Institute of Liverpool JMU was founded in 1992. The ARI now comprises 30 staff and postgraduate students drawn from all over the UK and abroad.

In 1995, Liverpool JMU received a grant through the European Regional Development Fund to re-establish the UKs ability to manufacture large astronomical telescopes, and to base the enterprise on Merseyside where Lassells pioneering work on large reflecting telescopes had been carried out. The project is a partnership of JMU, the Particle Physics and Astronomy Research Council, National Museums and Galleries on Merseyside and Merseyside Industry. Design work was to be undertaken largely by PPARCs Royal Greenwich Observatory, with JMU supplying additional expertise and establishing the assembly and test base, and NMGM assisting with the public understanding of science effort associated with the project. As much manufacture as possible was to be subcontracted to regional companies.

Thus it was that in 1996 Telescope Technologies Ltd (TTL) was founded and work began in earnest on the first instrument, the 2 metre Liverpool Telescope. The basic design is in essence a scaled-down version of the 4.2 metre William Herschel Telescope which has been operating successfully on La Palma since the mid-1980s. However, a great deal of effort has gone into updating the design with an emphasis on industry-standards and reliability of systems. TTL has also aimed to design a telescope with a high natural frequency in its structure. This means that it is far less susceptible to wind-shake and more amenable to siting in an astronomically preferable open enclosure than older designs. Indeed, the enclosure for the LT, also designed by TTL, is of an eyelid fully-opening variety.

The major departure in operational philosophy of the Liverpool Telescope and its progeny is that they can be fully robotic, hence the concentration on very high levels of reliability. The robotic layer of software, developed at JMU, replaces human decision-making about target selection and telescope and instrument configurations throughout the night. The CCD camera for the LT is being built as part of a PPARC grant and again is specifically designed for robotic operation. It uses closed-cycle cooling for example. In return for grant aid to the telescope and camera, the PPARC community will receive 40from its first light on La Palma which is scheduled for September 2000.

The last two years have been difficult ones for the project. This was a time of great uncertainty over the future of the RGO, and then the decision to close the

Cambridge site. However, JMU, TTL and PPARC have worked together to help to ensure the survival of the core telescope design team. In fact all of these key individuals are now directly employed by TTL, or are retained as consultants. On January 7th this year PPARC formally signed an agreement with TTL on the subcontracting of another 2 metre telescope destined for the Inter-Universities Centre for Astronomy and Astrophysics in Pune, India, and the transfer of Intellectual Property Rights and assets to allow TTL to proceed with final design and manufacture. In return, PPARC will receive a royalty on future telescope sales which it will be free to reinvest in its science programmes, to the benefit of the wider UK community.

The first week of February saw TTL take over their new purpose-built offices, and assembly and test facility on Twelve Quays Birkenhead, next door to the JMU Astrophysics Research Institute building, which was itself occupied for the first time only last October. The TTL building is unique in that there are four pods on which four 2 to 3 metre class telescopes can simultaneously be built. Each pod sits under a shutter which can roll back to allow the fully constructed telescope to be tested on the sky, before dismantling and shipping.

Just the week before moving into its new building, TTL signed a contract for the Faulkes Telescope, its enclosure and CCD camera. This telescope is paid for from the Faulkes Educational Trust and is destined to be the worlds largest telescope dedicated to educational use once it is operational on the Hawaian island of Maui in 2001. This project is managed by the University of Leicester and the control centre for the telescope will be at the National Maritime Museum, Greenwich.

Although TTL ultimately has to pay its way commercially to survive, it is being underpinned by the university mainly for its wider benefits, both to the academic community it serves, and to the region which it is helping to regenerate. In the case of the former aspiration, TTL staff have already provided assistance to the Isaac Newton Group on La Palma and projects of the Instituto de Astrofisicas de Canarias on Tenerife. As well as working closely with astronomers at JMU, TTL is also pursuing projects with other UK universities and would hope to foster these relationships to mutual benefit into the future. The company has also provided assistance in the formulation of several Joint Infrastructure Fund bids by consortia of universities including those for ROBONET (a global network of 2 metre telescopes, led by St Andrews) and VISTA (4 metre wide field telescope project, led by Queen Mary and Westfield College).

For the Merseyside region, the telescopes project has so far directly provided 34 permanent jobs and assisted 12 small to medium-sized enterprises locally. Once it reaches steady-state around 2001, it is envisaged that 60 new permanent jobs will have been created and the UK will once again be the world leader in telescope design and manufacture.

Michael Bode

Carl Zeiss Jena GmbH

Astronomical Instruments Division.

Actual major projects, running in 1999:

- **8m Gemini Telescope project**
  Acquisition and Guidance Unit for the UK Technology Centre / Great Britain. Unit 1 completed (1998), unit 2 due in 1999.
- **Optical Ground Station Tenerife**
  (Canary Islands) for DARA / ESTECESOC (German Space Agency / European Space Agencies). 12.5m dome (1995), 1m telescope (1996), 1m Autocollimation system (1997). Space Debris Camera and Focal Plane Optical Bench due in 1999.
- **New Optical system for the 1.88m Telescope of Kottamia Astronomical Observatory** / Egypt, due in 1999.
- **CCD camera for the Helwan Institute**, Egypt, due to 1999
- **Study for the 10m Grantecan Telescope**, Gran Telescopio de Canaris/ Spain, due in 1999.
- **2 pcs. of 2m primary mirrors** for the Particle Physics Council / Great Britain, due in 1999.
- **(2.3m Telescope and peripheral equipment for the National Observatory of Athens / Greece, due in 2001.**
- **2.6m Optics system for the VLT Survey Telescope, Osservatorio Astronomio di Capodimente Naples/ Italy, due in 2001.**

H.-J. Teske & H. Naumann

X-ray surveys and the history of accretion in the Univers

The small (about 70 people) workshop on X-ray surveys and the history of accretion in the Universe was held in the Osservatorio Astronomico di Roma in Monterporzio, Italy, on February 8-10 1999. During the 2.5 days 40 talks and 12 posters were presented.

X-ray surveys, and particularly hard X-ray ones, are the most efficient way to select sources powered by accretion against sources dominated by starlight emission, which enter optical and IR surveys. Ultimately, X-ray surveys, coordinated with surveys in Radio, mm, IR, and OUV, can address the basic question of how much of the total radiative energy budget of the universe is dominated by release of gravitational energy rather than by atomic reactions. The main goal of the workshop was to discuss how to gain information on the history of accretion in the Universe, with its wide astrophysical and cosmological implications. In particular, the focus has been on:

1. how to use and interpret the information derived from recent X-ray surveys obtained using ROSAT, ASCA and BeppoSAX, together with follow-ups and correlations with surveys at other wavelengths, to study a) the galactic nuclei and their environment, their evolution with redshift and luminosity; b) the connection between unified schemes and the origin of the X-ray background; c) the connection between AGN and galaxy evolution and between the history of accretion and the history of the star formation rate.

2. To the same purpose, we discussed the best possible way to exploit the huge amount of data which will be produced by the forthcoming X-ray observatories (Chandra, XMM, ABRIXAS etc.) in conjunction with surveys done in UV, optical, IR and mm by HST, ISO, and ground based telescopes, as well as by the next generation missions like Constellation-X and XEUS, programmed for the second decade of 2000.

A summary of the highlight of the workshop is given below. This is inevitably subjective and may have inadvertently left out some important result reported at the workshop. We apologize to everyone whose results may not be adequately covered, or presented incorrectly.

The soft X-ray (0.1-2 keV) sky revealed by ROSAT contains over 100,000 sources, most of which spread over at least 4 decades of flux. As a result the soft 1-2 keV X-ray background (XRB) is 70% resolved into discrete sources most of which (75-85%) are AGN (Lehmann). This wealth of data sharply contrasts with the situation at higher energies (2-10 keV). Only recently the availability of imaging X-ray telescopes in the 2-10 keV band allowed a systematic investigation of the hard X-ray sky. Ueda, Georgantopoulos and Giommi presented the state of the art on surveys performed in the 2-10 and 5-10 by ASCA and BeppoSAX (ASCA Large Sky Survey and serendipity survey, BeppoSAX deep survey and HELLAS serendipity survey). These surveys cover an interval in flux from roughly 5×10^{-14} cgs to 1×10^{-11} cgs. At the fainter flux ASCA and BeppoSAX reveal 40-50 sources per square degree in the 2-10 keV band, 15-20 sources per square degree in the 5-10 keV band. At a flux of 2-5×10^{-13}, high enough to allow spectroscopic follow-ups with XMM and Chandra, the number of sources per square degree is small, about 1 per square degree. Since the field of view of these forthcoming missions is rather small (10-15 arcmin radius), the number of relatively bright sources detected in the first 1-2 years by these missions will be small, and the ASCA and BeppoSAX samples will remain unique for a few years even after the launch of the new powerful missions.

Analysis of the BeppoSAX (Giommi) and ASCA (Ueda, Della Ceca) hardness ratios (a rough spectral indicator), indicates an elegant solution for a longstanding "spectral paradox", that is: the spectrum of the AGN dominating the number counts below 2 keV is too steep to explain the shape of the hard XRB (roughly a $kT \sim 40\ keV$ thermal–like spectrum) and the hard X-ray number counts. The ASCA and BeppoSAX hardness ratios indicates that most of the hard X-ray selected sources are absorbed by columns of the order 10^{22}-$10^{2}4$ cm^{-2}, but often possess a softer component, below the energy of the photoelectric cutoff. Even if the nuclear emission is completely blocked by the nuclear absorbing gas, different components, like starburts, optically thin gas or scattering of the nuclear radiation, may still be detectable below a few keV. The soft X-ray counterparts of BeppoSAX and ASCA hard source could therefore be qualitatively different from normal soft X-ray selected sources. Indications that this is the case are found cross-correlating the BeppoSAX HELLAS catalog with ROSAT source catalogs (Capalbi, Fiore).

The large number of AGN found in ROSAT surveys allows us to strongly constrain the soft X-ray AGN luminosity function and its evolution. Pure luminosity evolution seems rejected by the data, which favours forms of luminosity dependent density evolution (Mijayi). This analysis, however, has been done considering both type 1, intermediate and type 2 AGN. Since the soft X-ray emission of the latter sources may be dominated by non-nuclear components, analysis of a sample of pure type 1 AGN seems necessary to confirm this result.

The ASCA and BeppoSAX hardness ratios of these faint X-ray sources indicate a level of absorption in line with the prediction of AGN synthesis models for the XRB (Comastri). Therefore, not suprisingly, the number of absorbed sources in hard X-ray surveys is higher than in soft X-ray surveys. Optical identification of ASCA (Akiyama) and BeppoSAX (La Franca) hard X-ray selected sources found a mix of normal "blue" continuum, broad line type 1 quasars, broad line "red" quasars ($B-R >\sim 2$, $\alpha(5000-8000\mathring{A}) \sim -3$), intermediate type 1.8-1.9 AGN, and type 2 AGN. This rich diversity contrasts with the uniformity of spectra found in optically selected surveys like the MZZ, PG, HBQS, LBQS, which are dominated by "blue" continuum broad line QSOs, i.e. not surprisingly optical selection is biased against obscured objects. Interestingly, also some of the hard X-ray selected "blue" quasars seems to have significant absorption (Akiyama), in addition to "red" quasars and type 1.8-2 AGN (La Franca).

"Red" quasars are rare in optical and soft X-ray surveys but may be common in hard X-ray (La Franca) and IR (Cutri) surveys. In fact, Cutri reported the discovery of a large population of "red" quasars in a preliminary identification campaign of NIR selected sources from the 2MASS (2 Micron All Sky Survey). This bright survey covers the whole sky down to K=15 and therefore it probes mostly the local Universe. Deeper and relatively wide area IR surveys have been done with ISO. La Franca presented identification of about one hundred of the 15 micron sources in the ELAIS survey south fields. About 30% of these are AGN (30% type 2 and the remaining 70% type 1), 50% are starburst galaxies and the remaining sources are normal galaxies or fields without a clear identification. This breakdown looks different from that found in soft or hard X-ray surveys, unless many of the MIR starburst galaxies do not hide an X-ray loud AGN nucleus. Combined MIR and X-ray surveys on selected fields seem therefore necessary to quantitatively compare the contribution of star formation to that of accretion in faint MIR and X-ray sources.

15 micron sources number counts from shallow and deep ISO surveys show that above about 1 mJy the counts are in agrement with no-evolution models, while below this flux, down to the ISOCAM limit of 0.1 mJy, a strong evolution is observed (proportional to $(1+z)$ to the sixth power!, Elbaz, Franceschini). The same strong evolution is seen in faint ISOPHOT 175 micron sources (FIRBACK, Lagache). This evolution seems to be due to a population of star-forming or post-starburts galaxies, whose optical properties are similar to that of field galaxies. The optical-UV light produced in these star forming regions is absorbed by dust and reradiated in the MIR and FIR, implying that most of the star-formation is hidden by dust. AGN contribution in these fast evolving IR galaxies is not clear. Some of the IR light could be direcly due to an active nucleus or could be dust re-processing of a nuclear continuum. In principle Starburst galaxies and AGN could be separed using MIR spectroscopy (Lutz), since Starburst galaxies usually show strong PAH features and low excitation emission lines while AGN show no PAH features and high excitation lines (Lutz). However the strongly evolving MIR sources are too faint for spectroscopy and in any case an AGN component could well be mixed to a starburst one. It is interesting to note that hard X-ray source counts also implies a population of rapidly evolving objects (Gilli, Maiolino, Comastri). Again, combined IR and hard X-ray deep imaging of selected fields seems promising to study the origin of the X-ray and IR backgrounds and the AGN contribution to them.

Dusty galaxies are found also at sub-mm wavelengths (850 micron, Hughes, Cimatti). Here the dust temperature is of a few tens of degrees and the rapidly rising (with wavelength) black body spectrum produces a "positive" K correction. This allows, in principle, the detection of high z objects at the same observed flux level of lower z objects. Pointed observation of red galaxies (Cimatti) and deep surveys (Hughes) in fact detected galaxies at $z=1-3$, whose sub-mm luminosity equals or exceeds that of low redshift ULIRGS (Ultra Luminous IR galaxies) like Arp220. If the sub-mm flux is interpreted in terms of dust–enshrouded star-formation then the star-formation rate at $z>2$ maybe similar to that found at $z=1-1.5$ (the star-formation rate, as measured from the integrated UV light as a function of the redshift, increases by about 10 times from $z=0$ to $z=1$. The shape of the so called "Madau plot" above $z=1$ is still matter of debate, see below). Again the AGN contribution to the sub-mm emission is unknown calling for coordinate sub-mm X-ray surveys.

The same result on the evolution of the star-formation rate is obtained also by NIR surveys done with HST-NICMOS (Thompson) and by ground based multicolor optical-NIR surveys (Fontana). Once dust extinction is taken in to account in deriving the redshift of the faint galaxies found in these surveys by comparing their optical-IR colors to that in template galaxy spectra, no evidence for a decreasing of the star-formation rate is found up to $z \sim 3-4$. The AGN contribution in the Hubble Deep Field (HDF) images has been studied by MacAlpine, who found that about 10% of the nuclei of $V < 27$ galaxies have colors consistent with that of AGNs. Chandra and XMM deep observations of the HDF and other deep fields taken by the ESO Very Large Telescope (VLT) could allow the study of the AGN versus galaxy emission in X-rays at $z = 0.5-1$ (the redshift of the majority of the galaxies in these deep optical-NIR surveys) and therefore tackle the problem of the evolution of the star-formation versus the evolution of accretion. Richstone pointed out that care should be taken when comparing the evolution of the star-formation as a function of the redshift to the evolution of the number density of luminous AGN. At a first sight the shape of the two distributions is similar, but the first is a rate and the second a number density, and therefore the latter has to be differentiated to allow a proper comparison.

Black holes formed at a redshift typically higher than 2, during the assemblage of the host galaxy, giving rise to the luminous high redshift quasars. Less dramatic accretion events occurred later, giving rise to low redshift low luminosity AGN activity. These short (in comparison to the age of the universe) accretion events, are probably connected to interaction with companion galaxies in a group (Cavaliere). The two scenarios for accretion are both connected with the availability of mass supply due to the break of the axisymmetric gravitational potential (which held at bay the gas on scales $>$ 10 parsecs), following asymmetric events of merging occuring either in the galaxy formation, or during galaxy interactions (Cavaliere). The mass-equivalent energy density in quasar light, most of which produced in the so called "quasar era" at redshifts between 1 and 3, is 5-10 times smaller than the the total mass density in black holes in present-day galaxies (these supermassive black holes are probably quasar remnants, Richstone). This black hole mass density is only a factor of 2 (or even less) higher than the mass density estimated from the intensity of the XRB at 30 keV, assuming that radiation has been produced by accretion at an efficiency of 10%, a typical AGN redshift of 2 and an IR to X-ray Spectral Energy Distribution (SED) similar to that of nearby radio-quiet quasars (Fabian). This implies that there is no need for a radiatively inefficient mode of accretion for building the masses of the present-day black holes. If this is the case, black holes did not grow up much after formation. The present-day black hole mass density and the intensity and shape of the XRB seems to imply powerful but highly obscured objects at redshift of about 2 (Fabian). From the intensity of the 30 keV XRB and a typical AGN SED it is possible to estimate the integrated AGN IR emission and then compare it with the FIR and MIR cosmic backgroud (Lagache). It turns out that the intergrated AGN power is about one fourth of the integrated power from stars. Accretion therefore represents a non-negligible fraction of the total radiative energy budget of the Universe (Fabian).

The above estimates assume that about 80% of the total accretion power is actually hidden by gas and dust. The origin and distribution of this gas is still matter of debate. In many sources obscuration occurs at a 100 pc scale but in others clearly occurs on much smaller scales (1pc, Maiolino). It is interesting to note that type 2 AGN, which show the strongest obscuration, also show larger starburst regions than type 1 (usually unobscured) AGN. The connection between starburst activity and type 2 AGN could be of al least three kinds: 1) the effect of bars and galaxy interactions; 2) an evolutionary link (from starburst to type 2 AGN to type 1 AGN, Maiolino) 3) strong circumnuclear star-formation could provide through supernovae explosions the energy to inflate the disk, which could obscure the nucleus (Fabian). X-ray absorption is indeed common in nearby type 2 AGN. However, only a few high redshift high luminosity quasars show strong absorption. This contrast with the results of AGN synthesis models for the XRB, which are unable to explain simultaneously the intensity and spectrum of the XRB and the hard X-ray source counts without a large population of high luminosity highly obscured "quasar 2" (Maiolino, Comastri Gilli). At the flux limits of the present surveys the expected number density of these objects is small (Comastri) and therefore they could have been missed. Furtheremore, due to the strong extintion they should be faint in optical, making difficult their optical spectroscopic identification. Sensitive X-ray surveys performed with Chandra and XMM should be able to find quasar 2 and therefore provide a stringent test to AGN synthesis models for the XRB. The bulk of the XRB could be made by a population of rapidly evolving AGN, maybe related to the rapidly evolving faint MIR sources (Maiolino).

In addition to obscured AGNs (of high or low intrinsic luminosity) deep hard X-ray surveys should start to find other interesting X-ray "minority" populations, such as high redshift clusters of galaxies, possibly connected with radio haloes and radio galaxies (Rottgering), thermal haloes of galaxies and groups (Menci), integrated contribution of binaries in galaxies (Griffiths). At a redshift of 1, where the star-formation reaches a maximum (Fontana, Thompson), Low Mass X-ray Binaries should be the largest contributors to the integrated X-ray emission of galaxies. This component should start to emerge at fluxes around 1-2$\times10^{-16}$ cgs, reachable by deep Chandra pointings (Griffiths, Garmire).

Chandra and XMM will perform also a number of shallow surveys in addition to deep "pencil beam" surveys. Examples are the Chandra and XMM serendipity surveys (Wilkes, Watson), which should reach fluxes as small as 1×10^{-15} cgs over several degrees or tens of degrees of sky, or the coordinated XMM-VLT/VIRMOS survey, which should cover at the begininnig about 2 degrees of sky (Maccagni). Optical spectra of practically every X-ray source in the this area should be obtained by VIRMOS. Unfortunatelly the optical followup of many of the other Chandra and XMM surveys will not be so straightforward. This is due to the very large number of sources that will be detected (from tens to hundreds of thousands to millions of sources) and to the intrinsic faintness of most of them, which would require long exposure times on 8m class telescopes to acquire spectra with sufficient signal to noise. This situation implies a preselection of the candidates for optical followup (Wilkes, Watson, Padovani). Padovani suggested a multifrequency approach to the definition of interesting "areas" (in this multifrequency space) to be investigated adding at least optical and radio photometric information to the X-ray data. The followup may be of three types: a) optical identification of all X-ray sources in a sample (not feasible for the huge source samples that will be produced by Chandra and XMM), b) identification of subsamples lying in astrophysically interesting areas of the multifrequency space (Padovani, Wolter); c) extraction of statistical information (logN-logS, V/Vmax) directly from the subsamples (the so called "Sedentary Survey", Padovani, Giommi).

Programs are already going beyond the missions to be launched during 1999 (Chandra) and 2000 (XMM). NASA is studying a mission to followup Chandra: Constellation-X. The main purpose of this "square meter" class mission is to allow high resolution X-ray spectroscopy for all classes of X-ray sources in a wide range of luminosities (White). It also foresees the use of sensitive imaging hard X-ray (from 10 keV up to at least 50 keV) telescopes, which will shed light on the practically unexplored hard X-ray Universe, which, as we discussed in some detail above, holds the keys to solve a large number of still controversial cosmological problems. The NASA is also funding the a feasibility study of a medium size mission (Swift, White). Its main purpose is Gamma Ray Bursts observations. However, as a by-products it will also provide a relatively sensitive (down to 0.5-1 mCrab) survey of the whole sky in hard X-rays (up to about 100 keV) using a coded mask camera, and a deeper survey of a smaller area using an imaging X-ray telescopes up to 10 keV.

The European Space Agency is studying for the years 2010-2030 a "ten square meter" class mission (XEUS, Parmar) which takes advantage of the International Space Station for mirror growing and instrument refurbishment. XEUS may be able to get spectra of the faint objects that Chandra should start to detect at $z = 0.5 - 1$ (faint normal galaxies and active/starburst galaxies). This will open up the possibility to study at cosmological distances the connection between starformation and accretion from a physical point of view.

F. Fiore, G. Matt & M. Guainazzi

The EAS Affiliated Societies

The French Astronomical Society

The french astronomical society SFSA (Société Française des Spécialistes d'Astronomie) is a young twenty-years-oldassociation, whose father was Evry Schatzman. It was first declared as a national association on November 18, 1978. The number of its member is presently about 500 but its journal (*"Journal des Astronomes Français"*, trimestrial) and its electronic messages are sent to more than 800 persons.

The society organises every year a scientific meeting where modern topics are presented. Young researchers have then the opportunity of presenting their own work in front of established scientists. Every year a scientific price, sponsored by the Digital society, is given to a young astronomer whose work is internationally known for its quality and originality, and whose work for the astronomical community is acknoledged. A scientific school is also held each year in Goutelas, near Lyon.

The SFSA is proud and happy to organise this year the JENAM99 in Toulouse, the french City of Space.

For more informations on SFSA, please visit our WEB site http://www.iap.fr./sfsa/

Sylvie Vauclair

Announcements

A New Telescope Site in Europe

The New 2.3-m Telescope of the National Observatory of Athens

The National Observatory of Athens (N.O.A.), which is the primary observational astronomical establishment in Greece, is moving towards the installation of a new advanced technology 2.3-m telescope in Greece. The project is funded from E.U. funds through the General Secretariat of Research and Technology of the Ministry of Development. The total budget of the project, including the building and the dome, is 5 millions E.C.U. The telescope construction was awarded to the company CARL ZEISS JENA GmbH, following an international tender which took place at the premises of N.O.A. on the 18th of February 1998. The contracts between N.O.A. and ZEISS were signed on the 31st of July 1998. According to the time schedule, the first light of the new telescope is expected in the year 2001.
The 2.3-m telescope will be of altazimuth type and will have Ritchey -Chretien optics which will give a corrected field of view of 1.04 degrees. It will also be automated, advance programmed, and remotely controlled through the network. The initial instrumentation of the telescope will consist of a high efficiency CCD camera, a CCD spectrograph, and a CCD mosaic. This equipment will support a great variety of observational programmes based on direct imaging and photometry of faint objects up to 24th mag, and spectroscopy up to 19th mag. The wide field of the telescope will make it suitable for observations of extended objects such as stellar clusters, galaxies, and clusters of galaxies. With the new 2.3-m telescope, which will be the largest telescope in the East Mediterranean, our aim is not only to advance Greek observational astronomy, but also to promote a wider astronomical collaboration which could include the Balkan countries, East European and Black Sea countries, as well as the Arab countries and Israel.

The Site The new telescope will be installed at the top of Helmos (Aroaneia) mountain ($E\ 22^o\ 12'\ 32.5''$, $N\ 37^o\ 59'\ 35.3''$) in Peloponnesus, at an altitude of 2340 meters. The selected location is very near the fountain of Styx where Thetis the mother of the famous hero Achilles plunged him in infancy to make him invulnerable. The site is very dark, one of the darkest in continental Europe. During winter, approximately half of the cloudy nights the top of the mountain is above the clouds and this yields a great number of clear nights yearly.In addition, very often it is above the inversion layer of the atmosphere and this yields excellent astronomical images. Indeed, a first series of image motion measurements yielded values between 0.3 arcsec and 1.5 arcsec. This site profits from the existing infrastructure provided by the nearby ski center which is operated by the city of Kalavryta. At this site the new telescope will become a world class instrument. It will also be able to observe at the infrared too. Moreover, at this location there is no light pollution at all since all major cities are far away and well hidden by the intervening mountains.

E. Kontizas, P. Hantzios & D. Sinachopoulos

Future Meetings

Large-Scale Structure in the X-ray Universe Santorini Island, Greece, 20-22 September 1999

Topics: Clusters of Galaxies, Large-Scale Structures and the X-ray Background, Future Missions.

SOC: C.Canizares, L.DaCosta, G.Evrard, A.Fabian, C.Frenk,R.Giacconi, G.Hasinger, C.Jones, R.Mushotzky.

LOC: S.Basilakos, I.Georgantopoulos, E.Kontizas, M.Plionis.

information: http://www.astro.noa.gr/~santor99
email: santor99@astro.noa.gr

I. Georgantopoulos & M. Plionis

International Conference "B.V. Kukarkin: Variable Stars as a Key to Galactic Structure and Evolution" (October 25-29, 1999, Moscow, Russia)

October 30, 1999 will be the 90th birthday of the well-known Russian astronomer Boris V. Kukarkin (1909-1977).

Institute of Astronomy of Russian Acad. Sci., Sternberg Astronomical Institute (Moscow University), and the Euro-Asian Astronomical Society organize an international conference "B.V. Kukarkin: Variable Stars as a Key to Galactic Structure and Evolution", dedicated to Prof. Kukarkin's memory. It is suggested to discuss the modern state of research in B.V. Kukarkin's main fields of scientific activity:

- Galactic studies through investigations of variable stars.

- Structure and evolution of galactic subsystems.
- The system of globular clusters.
- Discoveries and classifications of variable stars and catalogues of variable stars.

Chairpersons of the Organizing Committees: N. Samus (SOC), A.V. Mironov (LOC).

It is planned to publish the proceedings of the conference.

The Organizing Committee of the conference will probably have rather limited possibilities to provide financial support to facilitate participance. For participants who need a visa to enter Russia, the organizers will send necessary invitations and provide visa support.

Contact addresses:
e-mail (preferable): almir@sai.msu.su
(subject: Kukarkin conference)
Postal address: Dr. A.V. Mironov, Sternberg Astronomical Institute, 13, Universitetsky Ave., Moscow 119899, Russia.
Homepage: http://lnfm1.sai.msu.ru/~eaas

Deadlines:
For pre-registration: June 1, 1999
For abstracts of contributions: September 1, 1999 (abstracts sent before this deadline in electronic form, LaTeX or ASCII, will be published before the beginning of the conference).

N.N. Samus & A.V. Mironov

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