cussed the role of accreting black holes in the re-ionization of the Universe.

The day, started under a chilly rain, ended with a sunny 'Beer and Brez'n' party in the MPE/MPA garden. Faithful to the Bavarian spirit, the organizers provided the guests with more than 250 liters of locally brewed beer!

The following morning the centre of attention was the centre of our own galaxy: the SMBH also known as Sgr A*. Reinhard Genzel (MPA), Mark Morris (UCLA) and Fred Baganoff (MIT) presented the amazing new data gathered in the last few years with the biggest telescopes on earth (VLT, Keck) as well as in space (Chandra). Thanks to these efforts, the case for a black hole in the Galactic Centre appears now to be iron-clad. Moreover, future theoretical interpretation of the data will likely significantly improve our understanding of the black hole growth mechanisms and the associated star formation very close to the black hole.

Another important question was discussed on Wednesday afternoon: the role of galaxy mergers, accretion and stellar captures for the overall black hole growth. David Merritt (Rochester) reviewed the various mechanisms by which SMBHs induce observable changes in the distribution of luminous and dark matter at the centres of galaxies. Later in the afternoon, Marek Abramowicz (Chalmers University) suggested that there are no theoretical limits on the rate at which the gas can be swallowed by a black hole.

On Thursday morning a new window of the gravito-electro-magnetic spectrum was opened to the study of SMBHs: gravitational waves. Sterl Phinney (Caltech) gave a comprehensive overview of the exciting prospects and challenges that lie ahead for gravitational wave astronomy. Bernard Schutz (MPI-Potsdam) illustrated the breathtakingly complex numerical simulations of BH-BH merger events, a possible target of the upcoming Laser Interferometer Space Antenna (LISA). And an overview of the technical aspects of the LISA mission was given by Karsten Danzmann (AEI Hannover).

How important is the feedback from supermassive black holes in structure formation? This fundamental question was deeply investigated by many of the speakers of Thursday afternoon's session. Andrew King (Leicester) advocated the importance of powerful outflows from rapidly accreting black holes in establishing the observed links between SMBHs and host galaxies. Mitchell Begelman (Colorado) showed how AGN feedback can solve the mystery of the lack of strong cooling flows in the centres of many clusters of galaxies, and William Forman (Harvard) presented many new Chandra observations of hot gas in galaxy clusters.

A chance to relax during this intense conference was the conference dinner at the Augustiner Grossgaststaetten in central Munich. The local organizing committee, Jorge Cuadra, Andrea Merloni, Emmi Meyer, Sergei Nayakshin and Rashid Sunyaev, all MPA, Thibaut Paumard (MPE) and Gijs Verdoes Kleijn (ESO), presented some gifts to the MPA secretaries (Maria Depner, Gabi Kratschmann, Kate O'Shea and Cornelia Rickl), whose help throughout the organization of the conference and during it was a real blessing to the LOC.

On the last day of the meeting, the classical problem of what the X-ray Background tells us about AGN activity and obscuration, both at low and at high redshifts, was revisited in the light of the most recent results from deep X-ray surveys by Andy Fabian (Cambridge) and Guenther Hasinger (MPE), and from the multi-waveband GOODS survey by Meg Urry (Yale University). The meeting was closed in an optimistic and somewhat humorous way by the 'Black Hole Manifesto' of Roger Blandford (Caltech), in which some of the most interesting developments from the meeting were summarized.

Those interested in more details of the meeting are invited to visit http://www.MPA-Garching.MPG.DE/~bh-grow/. Conference proceedings are to be published by Springer Verlag as a part of the "ESO Astrophysics Symposia" series.

Report on a brainstorming meeting about the

ALMA Interdisciplinary Teaching Project

Henri Boffin and Richard West (ESO)

Recent large-scale surveys have documented a widespread lack of interest in science and technology among Europe's young people. This development is highly worrying as it may lead to a lack of qualified scientists and teachers and may ultimately have dramatic demographic consequences on this continent. Various reasons for this situation have been identified and it is generally acknowledged that teaching quality at the primary and secondary levels plays a crucial role in this context. Means and methods to remedy this undesirable situation are being looked into in many countries and the European Commission has issued a strong plea for the creation of new educational initiatives, in particular broad and general ones that are easily adaptable to national curricula.

Having conducted educational programmes at the European level since 1993, the Education and Public Relations Department (EPR) of the European Southern Observatory has recently embarked upon another ambitious teaching project, this time in connection with the ongoing, intercontinental ALMA programme that aims at the installation of a unique astrophysical research facility consisting of 64 12-m radio antennas at 5000m altitude in the Chilean Atacama desert by 2011. The related frontline science and technology, as well the unusual site, clearly have a great potential for interdisciplinary education.

A first presentation of ideas for an ALMA educational project took place during the large-scale "Physics on Stage 3" educational meeting/fair at ESA/ESTEC in Noordwijk (The Netherlands) in November 2003. For this, Bernhard Mackowiak (ESO EPR) had produced a first draft text on some subjects that may be included in a future "ALMA Teachers' Cookbook". A direct outcome was the creation of a small group of expert teachers from secondary schools in several European countries, who expressed interest in contributing to the development of ALMA-related educational material for interdisciplinary teaching.

A first exchange of views with the members of this group took place in December 2003. Following the extensive and time-consuming preparations for the Venus Transit event in June 2004, the ESO EPR Department is now promoting a new international pilot educational project referred as the ALMA-Interdisciplinary Teaching Project (ALMA-ITP). The main goal is to develop and produce ALMA-related educational material at the secondary level, in particular a comprehensive ALMA Guide for Interdisciplinary Teaching. This project is fully in line with the current trend of lowering the walls between the various subjects and moving towards more interdisciplinary teaching in Europe's secondary schools. It constitutes a contribution towards alleviation of the current educational crisis, by attempting to provide attractive opportunities for more real-life, project-oriented education to teachers and their students. At the same time, it is obvious that the material may also form a very useful basis for similar efforts in other countries involved in the

H. Heyer (ESO)

Expert teachers and scientists from all over Europe attended the first ALMA-ITP meeting at ESO HQ in Garching (Sept. 4, 2004).

ALMA programme, following suitable adaptation to the national and regional curricula. For this, the ALMA Integrated Project Team (IPT) on Outreach and Education will act as a clearing house.

As a next step in this process, we invited a small number of expert teachers, many of whom participated in last year's ALMA-presentation during Physics on Stage 3 and also a number of scientists to come together during a one-day brainstorming meeting at the ESO-HQ in Garching. It started with an overview of the ALMA programme presented by H. Boffin (ESO), co-leader of the ALMA IPT. As well as illustrating the importance of millimetric and sub-millimetric astronomy for the study of some of the most relevant astrophysical fields of the 21st century, the talk also tried to answer the question "why is ALMA what it is and why is it located at Chajnantor?" It was followed by an overview by R. West (ESO) on future ESO projects and their potential role for education. A series of more specialised talks were then delivered: on the geography of the region (B. Mackowiak, ESO), on geology and the effect of Plate Tectonics on the formation of the Andes (E. Scheuber, Institute of Geological Sciences, Free University Berlin, Germany), on the fauna and flora of the Atacama desert (M. Grenon, Geneva Observatory, Switzerland), and on the medical aspects of living and working at high altitude (H. Welsch, German Air Force Institute of Aviation Medicine, Königsbrück, Germany).

These talks clearly illustrated the unique and highly exciting potential of the ALMA programme for education in various domains. This should come as no surprise, however: ALMA will be located on one of the highest plateaus in the world at a altitude of more than 5000m. As Ekkehard Scheuber pointed out, Chajnantor is surrounded by volcanoes, one of which still active (Lascar), and also by ignimbrite outcrops with large calderas, some of which are potentially explosive as they overlay large quantities of gas. The Atacama Desert is by all means the most arid place on Earth with an annual precipitation of less than 10 mm. By comparison, the Sahara desert receives 20 mm of water per year and Death Valley in California no less than 120 mm a year! But as Michel Grenon also showed with a unique and beautiful set of pictures obtained during numerous trips to this region during the past three decades, the Atacama Desert is far from being a place without life. Nature has – as always – shown wonderful creativity to explore many ways to circumvent the extreme UV-exposure, the dramatic lack of water as well as the enormous temperature variations, e.g., by having plants growing into the ground instead of out of it. And he had found plants at an altitude of 5150m, that is, even higher than the ALMA site!

The important medical aspects of living and working at high altitude were well exposed by German Air Force medical specialist Heiko Welsch who discussed the physiological mechanisms behind mountain sickness and how the lack of oxygen at high altitude can lead to hypoxia and sometimes incur life-threatening situations where quick action is paramount. Nobody should think that this added circumstance of the ALMA programme may be taken easily and the medical service must be well planned and always ready.

After this first series of talks, H. Wilson (ESA Education Office) presented the ESA Educational Kit on the International Space Station (ISS) and the lessons learned from preparing an interdisciplinary teaching kit at a European level. She stressed the great importance of involving experienced teachers from the start and to have a thorough review of a prototype teaching kit before the final release. Christiane Henkel and Denis van de Wetering (University of Bielefeld, Germany) presented a research project on interdisciplinary teaching and the importance of stating right from the beginning the objectives of the project as well as the target audience. They also reminded the participants of one of the goals of interdisciplinary teaching: to teach students core skills which are needed in our modern, accelerated and communicative society. These are, they assert, flexibility, creativity, cooperation and communication ability, teamwork ability, and tolerance, all keys for learning and working with others.

Two additional talks, both very much appreciated by all the participants, were given via a videoconference link from the ESO Santiago office, by Daniel Hofstadt (ESO) and Jörg Eschwey (ESO). Daniel Hofstadt shared his deep knowledge of the Atacama culture with its centuries-old traditions and the uniqueness of the scenery around San Pedro de Atacama. He also pre-

sented the various environment impact studies which were done prior the start of the ALMA project. These covered cultural, anthropological, archaeological and biological aspects. Jörg Eschwey embarked the audience on a trip from Antofagasta to the Chajnantor ALMA site to illustrate the complex logistics necessary to build major infrastructures in such extreme conditions. He explained the numerous challenges to be solved to construct a 12m wide road that allows the transport of 100 ton antennas, on a variety of soils between 2700m to 5000m altitude and the need to take into account and protect the different biotopes along the route. One example concerned the safety of a local species of rats, named tuco-tuco, by constructing tunnels under the road to allow the animals to transit it without trouble. All this has to be done while chasing large numbers of very curious donkeys watching the progress of the roadwork.

With all this information in hand to realise the enormous potential of ALMA-related education, the meeting participants embarked upon a wide-ranging discussion. It was clear from the beginning that the experience of interdisciplinary teaching is very different from country to country. It was therefore quickly realised that any material to be produced must be in modular form and be easily adaptable to the curricula of individual countries. The need to translate the material into as many different languages as possible was obvious, adding another complex element to this project.

The participants expressed a lot of enthusiasm and are eager to start the development and realisation of the project. During the discussion, a list of about 30 specific topics that could be addressed in a modular way was drawn up, serving as a useful starting point. Many of the teachers volunteered to work on them, with the goal to circulate drafts of the individual modules in some months' time. Specific conclusions were drawn about the desirable format of the future ALMA educational toolkit and on its foci. It will be concerned with the extraordinary and unique science to be made using the ALMA observatory and the variety of challenges to build an observatory like ALMA at Chajnantor. As one participant stated, this is really about "*how to make frontier science in extreme conditions*". The primary target audience is students in secondary schools, i.e. 11–18 years old.

A first draft of the ALMA Interdisciplinary Teaching Project should become available early 2005. It will then be evaluated and tested by teachers after which improvements will be made in a next iteration. It is planned to have a useful version ready for distribution via existing networks by the end of the summer of next year.

Obituary

JÜRGEN STOCK
1923 – 2004

On April 19, 2004 Jürgen Stock passed away at the age of 80. Jürgen Stock was never on the payroll of ESO, but he had tremendous impact on the early years of the organisation. In 1951 Stock did his PhD in Hamburg - his supervisor was Otto Heckmann, who later became the first Director General of ESO. After some years in Cleveland - and with a one year interval at Boyden Observatory, South Africa - Stock was asked by Gerard Kuiper to do a site test in Chile. The University of Chicago looked for a mountain in the Santiago area to put up a 1.5-m-telescope in the southern hemisphere. Stock accepted and took off for Chile within days. The trip, that was supposed to last a few weeks, lasted more than three years. "As a result, the world's largest collection of astronomical instruments is now in Chile", recalled Jürgen Stock four decades later.

After his arrival in Chile, Stock realised immediately, that the three pre-selected mountains close to Santiago were not really suited for an observatory. He decided to do site tests much further north, in the area of La Serena with its unique climate conditions between the cold Pacific Ocean and the high mountains. Stock travelled to Vicuña and climbed a nearby mountain on foot. At some distance he spotted a mountain with a perfect topography - quite isolated with an almost flat top. As the mountain was 40 km off the next accessible road, he organised mules and horses and made a trip to the top a few months later. He remembered it vividly: "The first night was so impressive: a perfectly clear night, absolutely calm, with a comfortable temperature: It couldn't be better. On top of that, it was perfectly dark in all directions." In those times an unknown mountain somewhere in Chile, this mountain has now a magnificent name: Cerro Tololo.

Due to Stock's euphoric reports from Chile, the project was handed over from University of Chicago to AURA. Now, the astronomers thought of something much bigger than just a site for a 1.5-m-telescope. With sufficient funds, Stock set up several teams for extensive site testing activities in that area. He checked almost a dozen mountains - Stock spent nearly three years on horse back to climb many mountains. While he was on expedition, he made notes every day - including not only the atmospheric conditions and astronomical observations but also the everyday life: Stock mentioned problems with the mules, the progress in the construction of some shelter on the mountains, the need for a support team bringing food and water, the conduct of the local people and so on. Each time he was back in Vicuña, he sent a letter with those notes to his boss Donald Shane at Lick Observatory. In a stroke of genius, Shane decided to type the reports, copy and distribute them among the astronomers in the US. Due to that, the "Stock reports" survived until today. The reports should be read by everyone who wishes to get an idea of what it meant to conquer the Andes for astronomy - there is a copy in the ESO historic archives.

In 1962, Tololo was finally chosen and Stock became the founding director of that observatory. In fact, he did almost everything: He was involved in the road construction, the blasting, the construction of the domes and support buildings etc. Due to his personal contact with Otto Heckmann and Jan Oort, Stock kept the Europeans informed about the progress in Chile. ESO - at that time about to sign the contracts with South Africa - decided to establish their observatory in Chile. Without this personal contact between Heckmann and Stock, ESO's first observatory might well have been erected in South Africa.

At first, there was a plan to build the American and the European observatories on the same mountain. But ESO soon decided to keep its independence and to build an observatory on La Silla. A wise decision, but Jan Oort realised the problems connected with that. He wrote in a letter to Heckmann in late 1963: "The worst thing is that we need some extra time to check the quality of the mountain and to construct a road to the top - and we should always keep in mind that we don't have a Dr. Stock."

In the 1960s, both Stock and Heckmann were directors of major observatories. In 1970 Stock was forced to leave Chile. He went to Venezuela and founded the CIDA observatory in the Andes near Mérida. His achievements for astronomy in Chile have almost been forgotten. Those of us who had the privilege to know him will remember his fine sense of humour, his brilliant mind and his great heart. Jürgen Stock was a man of great vision - modern astronomy has lost one of its last pioneers.

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