European Astronomical Society NEWSLETTER

Issue 11. June 1995

Contents

EAS General Assembly 1995 in Catania	1
Business Meeting of the EAS	2
ESO and Chile - an Update	2
Ground Based Astronomy News	4
Space Borne Astronomy	5
Prospectives in stellar evolution	5
The EAS Emergency Fund	8
International observing time in the Canary Islands	8
Positions available	9
Meetings	9

Editorial

The collecting area of ground based telescopes is increasing at a rapid pace, as the "large" telescopes grow in diameter from typically 4m to 8 or 10m. The collecting area available to astronomers is now of about $150m^2$ of 3-6m telescopes. At the end of the century there will be some $650m^2$ of telescopes larger than 8m in diameter. European astronomers will have access to a large fraction of these telescopes, either through ESO and the VLT or through bi- or multi- lateral collaborations. The efficiency of the astronomical observations is further increased by new instruments capable of measuring up to several hundred spectra during one exposure.

These developpements will yield a large increase in the amount of data to be reduced, stored and archived. More importantly, these data will have to be understood and transformed into scientific knowledge of our cosmic environement. It seems that this increase in the data flow should therefore be matched with a commensurate progress in the complete processing chain, from the reduction to the scientific understanding. To improve our data reduction capacity, storage etc. with the ever improving computing hardware and software is probably quite feasible. Our machines do improve every year. However, the increase in humanware that is also required to make a proper use of the data and to synthetise a new and improved knowledge of the Universe seems to be much less evident. The support that society is ready to provide to science is not increasing and this trend is also reflected in astronomical research. We then have little hope to match or even to modestly follow the trend of the data acuisition with resources at our institutes.

The EAS in general and this Newsletter in particular can only make a very modest contribution to the preparation of the use of large telescopes in Europe. What we can do is to help promote the awareness of astronomers to the preparation of the use of large telescopes and foster the exchange of information between them. In this spirit, we would like to encourage readers who are concerned by these questions to write to the Editor and share their ideas with colleagues.

Thierry Courvoisier

EAS General Assembly 1995 in Catania

The organisation of the **4th EAS General Meeting**, which will be held jointly with the **39th Annual Meeting of the Italian Astronomical Society**, is smoothly progressing. About 450 participants have pre- registered to our Joint European and National Astronomy meeting (JENAM-95). About half of them are PhD students (55) and colleagues from Eastern countries seeking for financial support. The LOC (co-chaired by Santo Catalano) have got an obviously difficult selection task, not only because of the large number of qualified requests but also because the level of funding from various institutions is still not known with sufficient accuracy. Af-

ter consultation with several sources, in particular with the convenors of scientific sessions, and a careful examination of the applications, the LOC has selected **about 30 PhD students or young participants** (under 30 years old) and **about 50 EAS members** for full support of accomodation expenses and registration fee. Moreover, the registration fee will be waived for all PhD students and the cheapest possible accomodation at the meeting place will be provided. The registration fee will be 200,000 *Italian Lira (Lit.)* for EAS and SAIt members, and 300,000 *Lit.* for non-members. Advance registration (before July 30) for the latter participants will be 250,000 *Lit.* The present rate of change is about 1650 *Lit/USD* and 1150 *Lit/DM*.

About 400 contributed papers have been offered by pre-registered participants and the session convenors have selected some of them for oral presentation (see the detailed programme). A selection of the remaining papers (generally no more than one per participant will be accepted) will be presented as posters.

The list of session convenors has been finalised: Alec Boksenberg (*Advances in Astronomical Instrumentation*), Eric Priest (*The Sun*), Andrea Carusi (*The Solar System*), Francesco Palla (*Interstellar Medium and Star Formation*), Rolf-Peter Kudritzki (*Stars and Stellar Systems*), Cesare Chiosi (*Stellar Evolution and Normal Galaxies*), Thierry Courvoisier (*High Energy Astrophysics and Active Galaxies*), Jean-Pierre Blaser (*Astroparticles and Gravitational Waves*), Alain Blanchard (*Large-Scale Structures of the Universe and Cosmology*). The session convenors are presently finalising the scientific programme of their sessions. Any question related to the presentation of papers should be directly addressed to them.

In addition to the quoted scientific sessions, which will be held in parallel (only three at any given time), the programme includes plenary sessions consisting of invited talks on science and technology subjects, such as the Hubble constant (*G.A. Tammann*), recent highlights from the Hubble Space Telescope (*D. Macchetto*), ground-based and space projects for new observation facilities and their best scientific use (*C. Barbieri, R. Bonnet, R. Davies, R. Giacconi, M. Perrymann, P. Salinari, F. Sanchez, R. Schilizzi*), the search for extra-solar planetary systems (*S. Beckwith*), the opportunities for Astronomy in Antartica (*G. Dall'Oglio*), the aftermath of the Shoemaker-Levy impact on Jupiter (*R. West*), and the European status and policy on research, science and development (*L. Woltjer, F. Praderie, M. Malacarne*). In this way, the SOC and LOC intend to offer to the JENAM-95 participants an appropriate forum to discuss on the present and future of European Astrophysics.

The social programme includes several attractive items, in addition to the usual welcome reception and closing dinner: the Reggio Calabria Museum with the fabulous *Bronzi di Riace* sculptures (to those attending the Satellite Workshop on *Teaching Science in Europe*), and several other interesting destinations, such as Taormina, Syracuse, and Piazza Armerina.

Last, but not least, at JENAM-95 several matters related to the society life and organisation of the EAS and SAIt will be addressed during the course of scheduled business meetings.

For details on the JENAM-95 programme and agenda, see the 2nd and Final Announcement attached to this Newsletter. Note that the **deadline for final registration and hotel booking is July 30**. It will not be possible to offer assistance with hotel booking to late applicants because a tourist booming is expected in 1995 due to the favourable exchange rate of most currencies with respect to the Italian *Lira*.

Marcello Rodonò
Catania

Business Meeting of the EAS

The 4th EAS Business meeting will take place during JENAM - 95 on Wednesday 27 September at 9:00 a.m. A quorum of 50 members is currently necessary to approve the accounts. The agenda is:

1. The Minutes the 3rd EAS business meeting in Edinburgh
2. Report of the President
   (a) Society activities
   (b) Report from the Nominating Committee
   (c) Affiliated Societies
   (d) Cooperation with EPS
   (e) Any other items
3. Report of the Treasurer
4. Emergency Fund
5. Approval of the accounts for 1994
6. Future activities
7. Next EAS meeting
8. Any other business

ESO and Chile - an Update

During the recent months, there have been many reports in the media about ESO's situation in Chile, in particular the apparent problems around Cerro Paranal where the Very Large Telescope (VLT) Observatory is currently under construction. Wild rumours have circulated and it is understandable that many astronomers have wondered about the actual state

of affairs. I shall here attempt to summarize briefly the most important developments (as of mid-June 1995[1]). It is obviously not possible to expose all details of these complex issues in this restricted space.

As will be seen, there is now good reason to be optimistic about the ultimate outcome and astronomers in the ESO member countries, in Chile and elsewhere may look forward to using their new facility some years from now.

The main issues

Several issues have played a role in the recent discussions about the relations between ESO and its host state, the Republic of Chile. The most important are the access of Chilean astronomers to the ESO telescopes, the labour rules which apply to ESO staff members of Chilean nationality, and private claims concerning a small part of the land area at Paranal on which the VLT is being built.

The ESO/Chile Agreements

In 1963, ESO and the Republic of Chile concluded an Agreement (the "Convention"), regulating their future interactions. By this, ESO was granted immunities and privileges equal to those of the United Nations Economic Commission for Latin America (CEPAL) that is located in Santiago de Chile. More recently, and considering the scientific and technological changes that have occurred in Chile and in the world since 1963, ESO and the Government of Chile decided to widen their modes of cooperation. Following intensive negotiations, an "Interpretative, Supplementary and Amending Agreement" to the 1963 Convention (hereafter "ISA Agreement") was signed by the two parties in April 1995. It is now awaiting ratification by the Chilean Parliament and the ESO Council, after which it will enter into force.

In addition to reconfirming ESO's existing immunities and privileges within the territory of Chile, the ISA Agreement stipulates that ESO will continue to contribute substantially to the further development of astronomy and related scientific and technological specialties in Chile. In particular, Chilean scientists shall have access to present and future ESO instruments, including the VLT. When presenting meritorious observing projects to the ESO Observing Programmes Committee (OPC), Chilean scientists shall have the right to obtain up to 10% of the observing time available, it being understood that at least one half of this 10% shall be dedicated to projects of Chilean astronomers in cooperation with astronomers in ESO member countries. Chilean members will be added to the OPC and other ESO Committees. Moreover, a joint Chile/ESO Committee will be set up to monitor these arrangements.

The ISA Agreement furthermore states that the text of the ESO Regulations for Local Staff engaged in Chile shall be harmonized with the essential principles and objectives of Chilean labour law, in particular concerning labour association and collective bargaining.

The "Paranal Case"

In December 1987, the ESO Council decided to embark upon the Very Large Telescope project. In order to find the best site for the VLT, ESO performed a thorough investigation of many possible mountain tops, both near La Silla and in Northern Chile. They showed that the best VLT site would be the Paranal Mountain in the Atacama desert, 700 km north of La Silla and 130 km south of Antofagasta, the capital of the Second Region in Chile.

In October 1988, the Chilean Government by an official act donated the land surrounding Paranal (in all 725 km^2) to ESO. As is the case for the La Silla site (825 km^2, bought by ESO), this would serve to protect the VLT against all possible future sources of outside interference. The donation was made on the condition that ESO would proceed with the construction of the VLT at Paranal within the next five years. The corresponding decision was taken by the ESO Council in December 1990 and the construction at Paranal started immediately thereafter, thus fulfilling the condition attached to the donation.

According to information later received, the Chilean Ministry of National Properties ("Bienes Nacionales") inscribed in 1977 in its name various lands in the commune of Taltal, including the area of the Paranal peak. At that time, i.e. ten years before ESO decided to construct the VLT, nobody at ESO could imagine that this telescope would one day be constructed at that site.

ESO never had any doubt on the legality of this donation by the Chilean Government and it started the work at Paranal in full confidence that this generous act was correct. However, in April 1993, when the work at Paranal was already quite advanced, a Chilean family brought a lawsuit against the Chilean State and ESO, claiming that a small part of the land (about 22 km^2, including the very peak of Paranal) that was inscribed by the state in 1977, had been property of this family.

In keeping with its status as an International Organisation and conforming to the international practice of such organisations, ESO decided not to become a party in this lawsuit. ESO therefore restricted its involvement to merely invoking the immunity from lawsuit and jurisdiction to which it is en-

[1] For the newest information, please consult the ESO World-Wide Web homepage (URL: http://www.hq.eso.org/) or CompuServe (space science and astronomy area, GO SPACE).

titled according to the 1963 Convention. For ESO, the issue of past ownership is an internal Chilean matter.

Nonetheless, on the basis of a decision by the Chilean Supreme Court, a court official accompanied by Chilean Carabineros, forced an entry on 30 March 1995 to the premises of ESO on Cerro Paranal, to ascertain the state of the VLT construction. This happened without permission of ESO and without agreement between the Chilean Government and ESO, and although warned that this act was in violation of ESO's immunities and privileges in Chile. This action constituted a very serious and unprecedented event in the relations between an international organisation and its host state.

Also for some time, ESO experienced severe problems, for instance connected to the free import of materials into Chile. Although the work at Paranal never stopped during these months, this resulted in important delays of the construction work.

Fortunately, these obstacles have now been removed by action of the Chilean Government. It has also been reported in the Chilean media that the Chilean Government is about to conclude an agreement with the land claimants in order to settle this issue out of court.

The present situation

The ESO Council met twice recently, on April 19 and June 7-8, to discuss the situation of ESO in Chile and the developments around the VLT Project at Paranal.

On both occasions, Council expressed its appreciation of the continued efforts by the Government of the Republic of Chile to bring to a successful conclusion the various matters, some of which have been outlined above. Council expects that the ratification of the ISA Agreement will occur without undue delay and it has reiterated its intention to approve it at the same time as the Chilean Parliament. The ESO Management has been instructed to continue work at Paranal. Council was happy to welcome those Chilean scientists who will act as observers on the ESO Committees until the ISA Agreement enters into force and they become full members.

Nevertheless, the ESO Council still remains preoccupied about the recognition of ESO's immunities by the Chilean judiciary and it has requested from the Management an assessment of the financial and other implications of the recent events which have interfered with the VLT construction work at Paranal.

Meanwhile, the construction of the four VLT telescopes is continuing according to plan. Some of the heavy pieces are ready and after two years' polishing efforts, the first 8.2-m is very close to its optimal shape. The installation of the first telescope enclosure has now started at Paranal and if all goes well, there will be first light for the first 8.2-m unit VLT telescope in late 1997/early 1998.

Richard West
ESO, Garching

Ground Based Astronomy News

After having edited this section of the newsletter for many issues, Sperello di Serego Alighieri, has been swamped by other duties. With great pleasure I have accepted the offer to succeed Sperello in organizing the ground based astronomy section. I would like to thank Sperello for his work. The main intention of this section of the newsletter is to inform the community about new developments in ground based astronomy. I would like to invite everybody to contribute any news that might be of interest to fellow colleagues. A few individuals have agreed to serve as correspondents for several european countries or specific observatories but any additional contribution is very welcome. Please send electronic communication to swagner@mail.lsw.uni-heidelberg.de

The most important news from the largest European Observatory, ESO, deal with the "paranal case". After some considerable irritations and stops in the construction of the VLT project on Paranal prospects for a continuation along the planned timelines have improved. See the article of R. West in this issue. Further details can also be found in ESO press releases 02/95, 03/95, 04/95, 05/95 and 07/95, accessible via WWW at http://www.hq.eso.org/

At the largest European observatory in the northern hemisphere, the International Observatory on La Palma, construction for the 3.5m GNT (Galileo National Telescope) continues successfully. At the same time site-testing at the Roque de los Muchachos for a large telescope (8-12 m) has started. There are also contuning activities on the HEGRA site were new Cherenkov telescopes are installed by the HEGRA collaboration. These are the second and third telescopes of an array of 5 telescopes which shall be installed by 1996.

The International Scientific Committee (CCI) of the Observatories on La Palma and Teide in Tenerife invites applications for the international time on the telescopes of these two observatories. See the special announcement in this issue.

At ESO a major programme is now starting to produce scientific results. The DENIS project, operating the 1m tele-

scope on La Silla intends to produce a complete survey of the southern sky in the I, J, and K' channels. DENIS (DEep Near Infrared Survey) is an effort to provide a complere census in the near-IR range. The survey is carried out simultaneously with three cameras and is expected to achieve sensitivity limits of 18, 16, and 14 mags in I, J, and K' (0.8μm, 1.25μm, and 2.2μm) at resolutions of 1" (I) and 3" (J and K'). In 4 years of operation the DENIS survey expects to find 100 million sources from 4 terabytes of data, which shall eventually be made available to the community through European data centers. The data will be of enormous importance to a wide variety of fields in astrophysics, including complete studies of low-mass stars, evolved giants in the Galaxy and the Magellanic Clouds, galactic structure, protostellar objects, and evolved galaxies out to z=0.2. The entire project is organized in five dedicated working groups with PI N. Epchtein at Paris Observatory. After instrument specific tests the project is now taking data with two of the three channels and full survey operation is expected to start later this year. In April 1996 the project will organize another Euroconference on IR surveys.

Stephan Wagner
Heidelber

Space Borne Astronomy

Europe is fortunate in having a coherent and stable scientific space programme based round ESA's Horizon 2000 plan. This is particularly evident this year, with a very busy launch schedule, and a growing portfolio of excellent scientific missions, at various stages of development.

Of particular interest is INTEGRAL, the high energy astrophysics mission, finally approved at the SPC meeting held in Paris in early June. The successful re-creation of the payload consortia after the recent disturbances, is a significant achievement, and deserves congratulation. As now constituted the INTEGRAL payload is a powerful combination of hard-X and gamma-ray imaging and spectroscopy instruments, and will serve the astronomical community well in the years to come. Coming after GRANAT and CGRO, INTEGRAL, to be launched in 2001, will carry the discipline forward and ensure a firm base for European astronomers in the all important X-Gamma ray waveband where non-thermal processes take over from the mainly thermal processes which dominate the emission of most astronomical objects from the near infra-red through to X-rays. The exciting results from GRANAT and CGRO indicate the rich reward which will come from INTEGRAL.

Astronomers are equally fortunate in the infra-red mission, ISO, still on course for launch in September this year, with final integrated tests being completed at the end of May. Training of the flight operations teams is under way, and the ground facilities are on schedule. The spacecraft will be transported to Kourou by boat for a launch campaign beginning in June, and the operational teams are being transferred to Villafranca in Spain ready for the post launch operations. The necessary agreements with NASA and ISAS (Japan) to provide an additional ground station are now in place. For ISO the limited lifetime of the cryogen means that extreme efficiency in the observing programme is necessary; the programme has been determined in advance via an open call for proposals. Exciting scientific results should start to flow soon after the launch.

The autumn of 1995 is a very busy one for ESA with three spacecraft launches: ISO and Cluster launched on Ariane, from Kourou; and SOHO, on Atlas, from Canaveral. Both Cluster and SOHO are indicating flight readiness with a full system functional test of SOHO planned for end June, and launch on October 31st; and the shipment of the four Cluster spacecraft to Kourou at the end of July for launch on November 29th. SOHO and Cluster form a complementary pair of missions with SOHO, located at the 1st Lagrangian point (1.5 million km from earth), dedicated to the study of the Sun, its corona, and the solar wind; while the four spacecraft making up Cluster, will perform a three dimensional study of the Earth's plasma environment.

IUE continues to give good value in its 18th year of operation, surely the longest lived operational space observatory, and plans are in hand to continue operations for another year. Astronomers also await with eagerness the publication of the first results from the astrometry mission HIPPARCOS. PIs will see the catalogue from January 1996, with general release by the end of that year. In the meantime some preliminary statistical information will be contained in about 20 papers to be published late in 1995 in A&A.

The breadth and scope of ESA's scientific space activity is evident from the above selections; Europe is the envy of the world for its robust and stable Horizon 2000 programme. This year is crucial with the follow on, Horizon 2000+, being planned, and the ministerial meeting due in the autumn. It is to be hoped that the outcome of these activities will be equally robust and stable, with a strong European space programme through and beyond the millennium.

Martin Turner
Leicester

Prospectives in stellar evolution

If the bricks of the universe are galaxies, the main visible constituant of galaxies are the stars. Knowledge of how stars evolve is thus a prerequisite to the understanding of how galaxies change their colours, their brightness and their chemical composition. If in the past decades (and certainly still in the future) a lot of work has been (will be) done to refine the predictions of the theoretical stellar models in order to reproduce observations concerning their position in the Hertzsprung-Russel diagram, their surface composition, their distribution in number among the different types of stars, it is likely that in the future a still greater attention will be paid to the effects of the environment on the evolution of the stars and to the changes produced by the stars on their neighbourhood. In the following we shall illustrate this point by a few examples. But before let us recall some major difficulties which still remain to be overcomed in order to attack these questions with confidence.

Stars: the link in the universe between the microscopic and macroscopic physics

Stars are a priviledged place in the universe where microscopic physics interacts with macrocospic phenomena. If the long range force gravity plays the main role in driving birth of the stars, their life and sometimes their death, the other three interactions of physics govern the processes of production, transfer and loss of energy either under the form of electromagnetic radiation or through neutrinos. Very roughly one can say that the luminosity of the stars is a consequence of their global hydrostatic equilibrium, while their ability to maintain this equilibrium for many million or billion years, depending on their initial mass, is a consequence of the microscopic structure of matter, more precisely of the atomic nuclei.

In recent years many important improvements have been brought to some of the physical quantities necessary to describe these microscopic processes. Let us say a few words on two of them, namely the opacities which mainly determine the rate of energy loss by stars and the nuclear reactions.

The new tables of opacities obtained by the OPAL group (see e.g. Iglesias & Rogers 1993, *ApJ* **412**, 752) represent a major advance in our knowledge of this important physical ingredient of the stellar models. With respect to the older Los Alamos Opacity Library (Huebner et al 1977, Los Alamos Laboratory Report, LA-6760-M), these new tables present two significant differences, which depend primarily on the adopted metal abundance. For solar abundances, a first enhancement of the opacity, which amounts to a factor of 3, occurs at temperatures of a few hundred thousand degrees. A second enhancement, of much smaller amplitude (about 20% only), occurs at temperatures of about one million degrees. Another team, known as the Opacity Project group (OP), obtained results generally in close agreement, leaving no doubt about the magnitude of these changes (Seaton et al. 1994, *MNRAS* **266**, 805). One of the great successes of these new opacities is that they permitted astrophysicists to understand what has been a major challenge of stellar pulsation theory, namely the cause of β-Cephei variability (see e.g. Dziembowski & Pamyatnykh, 1993, *MNRAS* **262**, 204). The problem is now solved thanks not to new astrophysical ideas but to progress in opacity calculations. It is interesting to note that such an enhancement of the opacities had been suggested some years ago in order to explain the driving mechanism active in these variable stars (Simon 1982, *ApJL* **260**, 87). Will there be in the future new major improvements of the opacity tables ? It is not possible of course to discard such a possibility but we can note that the good agreement between the OPAL and OP groups, who used different technics to compute the opacities, does not suggest at the present time such a perspective.

Except for one reaction, all the rates of the nuclear reactions intervening in stars rely either completely or partially on theoretical calculations (see e.g. Rolfs & Rodney 1988, *Cauldrons in the cosmos*, Univ. of Chicago Press). So far, there is only one measurement which reaches the Gamov-peak energy region. The $^3He + ^3He$ reaction was measured down to $E = 24$ keV by Krauss et al. (1987, *Nucl. Phys.* **A467**, 273). Presently measurements of this reaction rate at still lower energy are attempted in order to know if a narrow resonance is present (Trautvetter 1993, Nuclei in the Cosmos, IOP Publ. Comp., 139). Let us note that such a resonance might be responsible for a part, if not all, of the famous solar neutrinos deficit. Can we have confidence on the other nuclear rates for which no direct experimental data are available in the Gamov peak region ? In general, at least for the H-burning phase, we can say yes and one reason for this optimistic statement relies on the observations of the surface abundances of initially massive stars which have uncovered their stellar core by ejection of their envelope through stellar winds (Wolf-Rayet stars). These stars have surface abundances representative of material processed through the CNO cycle. The good agreement between the observed and predicted values of CNO equilibrium indicates the general correctness of our understanding of the CNO cycle and of the relevant nuclear data (Maeder 1983, *A&A* **120**, 113). For the reactions taking place in the He-burning phase, a still important uncertainty entails the rate of the reaction $^{12}C(\alpha,\gamma)^{16}O$. First order results of the stellar models depend on the adopted rate for this reaction which may fluctuate according to different authors by a factor 3. Indeed this reaction not only governs the proportion of carbon and oxygen in the core at the end of the He-burning phase but influences also the type of stellar remnant (black hole or neutron star) left over by massive stars (Woosley 1986, *Nucleosynthesis and chemical*

evolution, 16th Saas-Fee Course, Geneva Observatory). An improvement of our knowledge of this key stellar nuclear reaction rate would represent a major step in the field of nuclear astrophysics.

The out of equilibrium situations: a major difficulty

When one considers the present status of the stellar models, one is surprised by both their relative crudeness in some of their aspects (in particular those describing convection) and nevertheless, by their successes in describing a great part of the major stellar features. This is due mainly to the fact that stars, during most of their life, are systems in equilibrium, in hydrostatic, thermal and, locally, in thermodynamic equilibrium. Whenever these assumptions are no longer valid, the problem becomes much more difficult to handle and some simplifying hypothesis have to be made. Actually, out of equilibrium processes are far from being well understood and as a consequence well numerically described. They intervene both in the stellar interiors (e.g. convection, semi-convection) and at the surface (e.g. stellar winds) and accompany the stars during their all life.

Many aspects of the stellar models depend on the way the chemical elements are mixed in their interior. Mixing may occur not only in convective zones, but also in more stable radiative regions where it may be driven by various instabilities as for instance the turbulence induced by the friction of stellar layers rotating at different velocities (shear mixing). Among the numerous problems which remain to be solved in this field let us cite the extent of the convective penetration zone (Zahn 1991, *A&A* **252**, 179) and the role of the gradient of the molecular weight in stabilizing turbulent flow. The difficulty in solving these problems comes from our ignorance of important parameters such as the turbulent viscosity describing the effects of viscous dissipitation. It is interesting to note that all these turbulent processes are at an intermediate stage between macroscopic and microscopic physics and involve many different distant and time scales.

Progresses in this field of research will certainly arise, as always in astrophysics, from both better observations and more realistic computations. To these two classical sources of astrophysical knowledge, one can also add the laboratory experiments which for what concerns the mixing processes can also significantly contribute. On the side of the numerical simulations, the ever increasing computing power is a chance for the modelisation of turbulence in stars. Even if a long time elapses before these phenomena will be treated consistently in stellar models, such computations can give very valuable insights on how to treat them in more simpler models (see e.g. Merryfield 1995, *ApJ* **444**, 318). In this respect it is also interesting to mention that the passage from a one dimensional code to a two or three dimensional one can significantly change the outputs of the numerical simulations. As an example let us mention the case of the type II supernovae explosions which seem to be much easier to obtain in two D than in one D code because of a better description of the convective zones which develop below the shock front (Herant et al. 1994, *ApJ* **435**, 339).

From the side of the observations new evidence for important mixing processes in stars have been collected in recent years. As a an example, the observations by Herrero et al. (1992, *A&A* **261**, 209) have shown the existence of main sequence OB stars presenting He-rich material at their surface. The fact that these stars are also fast rotators indicate a probable physical link between their special surface abundances and their high rotation rate. Many supergiants show also evidence at their surface for the presence of CNO processed materials. For the moment these observational features are not yet well accounted for by stellar models. Let us emphasize here that these kinds of problems largely go beyond the resolution of some specific inadequacies between theory and observation. They have also an important impact on our understanding of much more general processes as, for instance, the nucleosynthetic processes in stars.

Hydrodynamic phenomena may also occur in the outer parts of the stars through accretion and/or ejection of matter. During the pre-main sequence phase of stellar evolution, accretion plays a very important role (cf e.g. Palla & Stahler 1993, *ApJ* **418**, 414). The intringuing lack of O main sequence stars near the theoretical ZAMS (typically younger than 2 millions years) might be a consequence of the fact that at the time a massive star ($M > 40 M_{\odot}$) becomes visible, *i.e.* when the accretion stops, it has already burned a substantial fraction of its central hydrogen content and evolved towards lower effective temperatures (Bernasconi & Maeder 1995, *A&A* in press). One of the main difficulty in this domain is to correctly predict the accretion rate. It depends not only of the nature of the accreting object but also on the physical conditions prevailing in the star forming cloud. This can have very interesting consequences on the way stars are distributed in masses in different environmental conditions.

Another process which deeply modifies the output of the stellar models is the mass loss by stellar winds. The loss, or at least the decrease in mass, of the original envelope of the stars by stellar winds has a strong impact on the surface abundances, the enrichment of the interstellar medium in heavy elements, the distribution of the supergiant in the red and in the blue, the understanding of the Wolf-Rayet stars, of the Luminous Blue Variables, the nature of the stellar remnant (see the reviews by Maeder & Conti 1994, *ARAA* **32**, 227). Very roughly one can say that in the mass domain superior to 30-40$M_{\odot}$ the mass loss by stellar winds is clearly the dominant factor affecting almost all the outputs of the stellar models.

On the other hand the rates of mass loss are still affected by great uncertainties. If on the main sequence, in the massive star range, one can with a certain confidence estimate the errors on the mass loss rate to be at most of a factor of two, this is certainly not the case in the red supergiant phase for which the uncertainties are much greater. On can hope that in the next years, observations will provide a more complete picture on the degree of clumpling and non sphericity in the stellar winds. From the theory one can expect a better understanding of the mechanisms driving the winds. Let us note that some authors have proposed new physical instabilities in the high mass star range which could be responsible for the ejection of large amount of matter during the main sequence (Kiriakidis et al. 1993, *MNRAS* **264**, 50). Progresses will come also from the computation of complete stellar models taking into account, in the same calculation, the evolution of the internal structure and of the outer stellar layers. The first attemps in this sense have been successfully realised for hot stars by Schaerer (1995, PhD thesis, Geneva Observatory).

Stars and galaxies

Let us terminate these reflections on the prospective for stellar evolution by illustrating, through a series of interrogations, the need to consider the stars as immerged in larger complexes, the galaxies. The discovery by IRAS of ultra luminous galaxies in the far infrared, i.e. of galaxies emitting in this range of wavelengths more than 10^{12} $L_{\odot}$, has put in evidence the existence of galaxies undergoing huge bursts of star formation. The existence of galaxies presenting in their optical spectra non ambiguous signatures of the presence of numerous young massive stars is another aspect of the powerful star formation processes that some galaxies harbour (Conti 1991, *ApJ* **377**, 115). Many very interesting questions have to be explored in the context of these powerful star formation rate events. What are the causes of the starbursts ? Do we assist at least in some cases to the birth of the first generation of stars ? How the processes of the star formation depends on the strength of the formation rate itself (non linearity of the process), in particular how the accretion processes so important in the pre-main sequence are realised in starbursts ? What are the effects of the huge amounts of energy, mass and momentum ejected by the new born massive stars on the processes of star formation ? How would such mechanisms change the initial mass function ? Not only the way stars form but also the way they evolve could be different. In very dense star clusters collisions between stars could be frequent. Some authors have invoked this possibility for the centre of our own galaxy. However at the present time there seems to be no need to appeal to such a process to explain the stellar population in these central regions (Schaerer 1994, to appear in IAU Symp 169). Once all the most massive stars end their nuclear life, the starburst should become a supernova burst. A rule of thumb suggests that the simultaneous birth of 13 500 O type stars gives rise to a rate of about 1 supernova per century at the maximum (Meynet 1995, *A&A*, in press). This means that for one of the most extreme young starburst known (IRAS 01003-2238, Armus et al. 1988, *ApJL* **326**, L45) the rate of supernovae could amount to $\sim$ 45 supernovae per century, slightly less than one every two years. Can the presence of numerous massive stars, which are great injectors of matter and energy through their stellar winds and their final supernova explosion be responsible, at least in part, for the galactic superwinds ? Using the relation proposed by Heckman et al. (1990, *ApJS* **74**, 833) between the far infrared luminosity of a galaxy and its mass loss rate, one obtains than M82 loses about 1.3 $M_{\odot}$ per year while the ultraluminous galaxy Arp 220 loses 50 $M_{\odot}$ per year. These ejections of matter may have strong influence on the way the galaxies evolve chemically. Indeed matter, which has been essentially enriched by massive stars leaves the galaxy, contributing no long to the enrichment of the galactic interstellar medium. Inversely new synthetised heavy elements are injected in the intergalactic medium. This phenomenon is likely responsible for the high iron abundances observed in the X-rays in the intracluster medium (Arnaud et al. 1992, *A&A* **254**, 49).

The few examples briefly presented above, which have left aside numerous other very interesting areas of research like the observation and the modelisation of binary stars, show the richness of the investigations which remain to be done in the field of stellar evolution. The last section in particular shows some very promising directions of research reinforcing the links between stellar and galactic evolution, and thus enabling stellar evolution to bring its contribution to very fascinating problems such as the birth of galaxies or the processes involved in active galactic nuclei.

G. Meynet
Geneva

The EAS Emergency Fund

Support for Eastern Europe astronomy groups

The EAS fund, although modest, has provided in 1994 some support in the form of equipment to astronomical research groups in eastern Europe countries. Allocations for 1995 will be made in a few weeks. Please send your applications before JULY 31st to: Danielle ALLOIN, DAEC, Observatoire de Meudon/Paris, 92195, MEUDON, Cedex, France Fax: 33-1-45 07 74 69 e-mail: alloin@obspm.fr

Danielle Alloin
Paris

International observing time in the Canary Islands

The International Scientific Committee (CCI) of the Observatories of the Roque de los Muchachos (ORM, La Palma) and of Teide (OT, Tenerife) invites astronomers from Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom to apply for International Time (IT) on the telescopes of the two Observatories. The IT Programme for 1996 offers up to 18 days/nights on 10 telescopes which will be evenly spread throughout the year and (for the night-time telescopes) the phases of the Moon.

The closing date for submission of proposals to the 1996 IT Programme is 31 July, 1995.

Further information and the proposal forms are available on WORLD WIDE WEB at the IAC (General Information / Information on the CCI). Proposal forms can also be obtained from the Secretary of the CCI, Mr Campbell Warden, Instituto de Astrofisica de Canarias, E38200 La Laguna, Tenerife, Canary=20 Islands. E-Mail: cci@iac.es.

Positions available

Readers are reminded that the EAS is operating an electronic Job Notice board in collaboration with the Starlink project at RAL. The address of the STARJOBS account is star.rl.ac.uk. This service is free for members of the EAS. Details can be found in the EAS Newsletter issue 7.

Meetings

You are invited to bring to the attention of the editor the meetings you wish to see mentioned in this Newsletter.

- Chaos in Gravitational N-Body Systems
  La Plata, Argentina. July 31-August 3, 1995
  J.C. MuzzioObservatorio Astronomico, Paseo del Bosque, 1900 La Plata (chaos@fcaglp.edu.ar).
- Structure and Evolution of Stellar Systems
  Petrozavodsk, Karelia. August 13-17, 1995
  V.V. Orlov, Astronomical Institute St-Petersburg (kvk@astro.lgu.spb.su)
- IAU Colloquium 150: Physics, Chemistry and Dynamics of Interplanetary Dust
  Gainesville, Florida, USA. August 14-18, 1995.
  M.S. Hanner, JPL, California, USA (msh@iplsc8.dnet.nasa.gov)
- Photometric Systems and Standard Stars
  Moletai Astronomical Observatory, Lithuania. August 14-18
  V. Straizys, Vilnius, Lithuania (straizys@itpa.fi.lt)
- EAS General Meeting, jointly with the annual meeting of the Italian Astronomical Society: Progress in European Instrumentation and Prospective Impact on Modern Astrophysics
  Catania, Italy. September 25-28, 1995
  M. Rodonò, Catania.
- 9th Cambridge Workshop "Cool Stars, Stellar Systems and the Sun"
  Florence, Italy. October 3-6 1995
  R. Pallavicini, Osservatorio Astrofisico di Arcetri, Florence (pallavic@arcetri.astro.it).
- From Stars to Galaxies–The Impact of Stellar Physics on Galaxy Evolution
  Porto Elounda Mare, Crete, Greece. October 9-13, 1995
  crete95@stsci.edu
- IAU Symposium 176: "Stellar Surface Structure"
  Vienna, Austria. October 9-13, 1995
  Klaus G. Strassmeier, Vienna (iau@astro.ast.univie.ac.at)
- Science with the Hubble Space Telescope-II
  Paris, France. December 4-8, 1995
  stecf, eso, garching. (hst2@eso.org)
- Dark and visible matter in galaxies and cosmological implications
  Sesto Pusteria, Bolzano, Italy. June 25-28 1996
  M. Persic and P. Salucci, Trieste. (dm1996@tsmi19.sissa.it)

European Astronomical Society
P.O. Box 82, CH-1213 Petit-Lancy 2, Switzerland
President: P. Murdin
Vice-Presidents: C. Cesarsky, B. Shustov
Secretary: J. Palous
Treasurer: J.P. Swings
Councillors: F.-L. Deubner,
J. Gómez-Gonzáles,
B. Kolaczek, P.O. Lindblad,
M. Rodono
Newsletter Editor: T. Courvoisier
Geneva Observatory
CH-1290 Sauverny
Switzerland

You find below the standard application form for Membership in the **European Astronomical Society (EAS)**. Please bring this form to the attention of colleagues who are not yet members.

Herewith I submit my application to become

☐ Ordinary Member of the EAS

I have a doctoral degree, granted in 19. . .
by (Institute and adviser) .....

☐ Junior Member of the EAS

I have not yet reached the age of 30 and am a graduate student at:
.....
My adviser is .....
as confirmed in the attached letter from my thesis adviser.

Name: ..... First name: .....

Address: .....

.....

Telephone: ..... Telefax: .....

e–mail: .....

Date: ..... Signature: .....

Signatures of 2 supporting ordinary members:

Name: ..... Signature: .....

Name: ..... Signature: .....

Please send to:

European Astronomical Society
P.O. Box 82
CH-1213 Petit- Lancy 2
Switzerland

LOUIS-JEAN 05003 GAP CEDEX