The present newsletter is following the very successful JENAM2008 in Vienna and, as usual, it contains brief reports on the various symposia and events that took place during the meeting. The EAS via this Newsletter is making a constant effort to inform all Society members who could not be attend the annual meetings, about the activities and major science results that were presented. The success of this relies on the reports of the organizers of the various symposia and special events are being organized in parallel to the General Assembly and we highlight most of those in a dedicated session of the newsletter. Given that 2009 is also the International Year of Astronomy, this promises to be an exciting year for all of us as we can let everybody know about why understanding the universe is worth spending many nights on remote mountain tops and long days in the office.

Vassilis Charmandaris
University of Crete, Greece

MESSAGE FROM THE PRESIDENT

In January the International Year of Astronomy 2009 will officially start with the Opening Ceremony taking place in Paris. Many preparations have been done, and many global programs of activities centered on specific themes will be carried out. Of course, EAS is also involved. While the EAS - because of its limited manpower - is not able not able to organize a special event by itself, EAS has taken the initiative to finance a selection of projects that are officially affiliated to the International Year of Astronomy 2009 and that are already partially funded but are in need of complementary funding. The projects can be any action made at the national/regional level in order to promote astronomy among the public, at schools, or support initiatives by amateur astronomy clubs or societies EAS has invited proposals for amounts ranging from 500 Euro to a maximum 2000 Euro. The response to this call has been very good, a total of 27 proposals have been sent to us. The selection process is presently under way, the successful proposals which will be funded will have been announced in the meantime. The IYA 2009, which has been officially declared by the United Nations, will give us the unique opportunity to promote astronomy and astrophysics to the public on a worldwide scale. Of course, this requires special efforts from all of us and I want to appeal to all colleagues to invest time and to go to the public in order to make the IYA 2009 the big success we all hope for.

In September JENAM 2008 took place in Vienna. More than 500 participants attended this meeting, the highest number of participants since 7 years. Nine JENAM Symposia, a special colloquium on ‘Women in Astronomy’ and a number of invited review talks presented a wide spectrum of scientific topics, ranging from instrumental projects like the EELT over solar physics to topical cosmological questions. I would like to...
thank the local organizers lead by Gerhard Hensler for their great efforts which made JENAM2008 such a big success and all the institutions which supported JENAM.

And now I have to already announce JENAM 2009 which will take place from April 20-23 as ‘European Week of Astronomy and Space Science’ at the University of Hertfordshire in the United Kingdom. The meeting will be held together with the annual meeting of the Royal Astronomical Society. The early date in April was chosen in order to avoid having the meeting to close to the IAU General Assembly which will take place in August in Rio de Janeiro. Major European players such as ESA and ESO have agreed to to play a substantial role in organizing parts of the scientific program. I hope that many colleagues will come to England in April.

Joachim Krautter
President of EAS

EURO-VO NEWS

The European Virtual Observatory (EURO-VO), now well into its operational phase, continues providing support to the astronomical community via dedicated research initiatives and workshops.

As a response to the First AIDA (Astronomical Infrastructure for Data Access) Call for Proposals (deadline 15 June 2008), the EURO-VO received seven proposals from European groups. After thorough evaluation of the proposals from the members of the EURO-VO Science Advisory Committee and a dedicated workshop with selected PIs, held at ESO, in order to assess the technical and scientific requirements of the projects, four projects are currently receiving technical support. Support has been allocated for a maximum of 12 months from the beginning of each project. A second AIDA Research Initiative will be announced in the first quarter of 2009.

The EURO-VO Data Centre Alliance (DCA) organized the second workshop with title "How to publish data in the VO", at ESO in Garching. The workshop took place on 23-27 June 2008 and was particularly targeted at participants from astronomical data centers and larger projects in order to provide the knowledge and experience to enable them to publish a range of datasets to the Virtual Observatory (VO). All tutorials and show cases are available from the web pages of the workshop: http://www.euro-vo.org/dcaworkshop2008/

A Virtual Observatory (VO) Info-Workshop was held in Lisbon, Portugal, on 23-24 October 2008, bringing together EURO-VO experts and members of the Portuguese astronomical community. During the workshop a series of informative talks as well as real-life science workflows were presented. For more information as well as links to the various talks see http://www.sim.ul.pt/WorkshopVO-pi2008/

The first AIDA Community workshop on "Multiwavelength Astronomy and the VO" took place on 1-3 December 2008 at ESAC, Villafranca, Spain, gathering a total of 100 participants. The workshop is addressing Survey, multiwavelength astronomy and the available VO tools and services, concluding with real science cases making use of the VO. For more information on the goals and scientific program, visit the dedicated web pages: http://esavo.esa.int/Multiwavelength-VOWorkshopDec2008/

The next EURO-VO AIDA workshop will be a hands-on workshop, the first of its kind in Europe. It will be held at ESO, Garching at the end of March 2009. The participants will be asked to come with their science cases, that they will then address along with VO experts assigned from the EURO-VO consortium. The workshop will be announced shortly on the EURO-VO web pages.

In an effort to make European astronomers VO-aware, the EURO-VO organized a booth at JENAM 2008 (Vienna, 8-12 September 2008), where astronomers could stop by and be introduced to the VO world by means of presentations, posters, hand-outs and live demos.

For more information on the EURO-VO news and activities, the available VO tools and applications and the VO-related workshops and meetings, visit the EURO-VO web pages: http://www.euro-vo.org

Evanthia Hatziminaoglou on behalf of the EURO-VO Facility Centre

XXVIIth General Assembly of the IAU

The 27th General Assembly of the International Astronomical Union will be held in Rio de Janeiro, Brazil, on August 3-14, 2009. As usual a number of IAU Symposia have been scheduled in parallel with the General Assembly. The title, dates and contact persons for each Symposium follow:

IAU Symposium No. 262
Stellar Populations – Planning for the Next Decade
Rio de Janeiro, Brazil, 3 - 7 August 2009 (3.5.day)
Gustavo R. Bruzual <bruzual@cida.ve>

IAU Symposium No. 263
Icy Bodies of the Solar System
Rio de Janeiro, Brazil, 3 - 7 August 2009 (3.5.day)
Julio A. Fernandez <julio@fisica.edu.uy>

IAU Symposium No. 264
Solar and Stellar Variability – Impact on Earth and Planets
Rio de Janeiro, Brazil, 3 - 7 August 2009 (3.5.day)
Alexander Kosovichev <sasha@sun.stanford.edu>

IAU Symposium No. 265
Chemical Abundances in the Universe – Connecting First Stars to Planets
Rio de Janeiro, Brazil, 10 - 14 August 2009 (3.5.day)
Katia Cunha <kcunha@noao.edu>
IAU Symposium No. 266
Star Clusters – Basic Galactic Building Blocks throughout Time and Space
Rio de Janeiro, Brazil, 10 - 14 August 2009 (3.5 day)
Richard de Grijs <R.deGrijs@sheffield.ac.uk>

IAU Symposium No. 267
Co-evolution of Central Black Holes and Galaxies
Rio de Janeiro, Brazil, 10 - 14 August 2009 (3.5 day)
Bradley M. Peterson <peterson@astronomy.ohio-state.edu>

In addition a number of Joint IAU Discussion Sessions as well as Special Session will also take place in Rio de Janeiro over the same two weeks.

JD1 -- Dark Matter in Early-type Galaxies
Rio de Janeiro, Brazil, 3 - 5 August 2009 (1.5 day)
Leon V.E. Koopmans <koopmans@astro.rug.nl>

JD2 -- Diffuse Light in Galaxy Clusters
Rio de Janeiro, Brazil, 3 - 5 August 2009 (1.5 day)
Magda Arnaboldi <marnabo@eso.org>

JD3 -- Neutron Stars – Timing in Extreme Environments
Rio de Janeiro, Brazil, 3 - 5 August 2009 (1.5 day)
Margarida Cunha <mcunha@astro.up.pt>

JD4 -- Progress in Understanding the Physics of Ap and Related Stars
Rio de Janeiro, Brazil, 3 - 5 August 2009 (1.5 day)
Pascale Defraine <p.defraine@oma.be>

JD5 -- Modelling the Milky Way in the Era of Gaia
Rio de Janeiro, Brazil, 6 - 7 August 2009 (1.5 day)
James J. Binney <binney@thphys.ox.ac.uk>

JD6 -- Time and Astronomy
Rio de Janeiro, Brazil, 6 - 7 August 2009 (1.5 day)
Pascale Defraine <p.defraine@oma.be>

JD7 -- Astrophysical Outflows and Associated Accretion Phenomena
Rio de Janeiro, Brazil, 6 - 7 August 2009 (1.5 day)
Rajesh K Kochhar <rkochhar2000@yahoo.com>

JD8 -- Hot Interstellar Matter in Elliptical Galaxies
Rio de Janeiro, Brazil, 6 - 7 August 2009 (1.5 day)
Raymond P. Norris <ray.norris@csiro.au>

JD9 -- Are the Fundamental Constants Varying with Time?
Rio de Janeiro, Brazil, 10 - 11 August 2009 (1.5 day)
Jane C. Gregório-Hetem <jane@astro.iag.usp.br>

JD10 -- 3D Views on Cool Stellar Atmospheres – Theory Meets Observation
Rio de Janeiro, Brazil, 10 - 11 August 2009 (1.5 day)
Jane C. Gregório-Hetem <jane@astro.iag.usp.br>

JD11 -- New Advances in Helio- and Astro-Seismology
Rio de Janeiro, Brazil, 10 - 11 August 2009 (1.5 day)

JD12 -- The First Galaxies – Theoretical Predictions and Observational Clues
Rio de Janeiro, Brazil, 10 - 11 August 2009 (1.5 day)
Tommy Wiklind <wiklind@stsci.edu>

JD13 -- Eta Carinae in the Context of the Most Massive Stars
Rio de Janeiro, Brazil, 12 - 14 August 2009 (1.5 day)
Augusto Damineli <daminelj@astro.iag.usp.br>

JD14 -- FIR2009: the ISM of Galaxies in the Far-Infrared and Sub-Millimetre
Rio de Janeiro, Brazil, 12 - 14 August 2009 (1.5 day)
Maria R. Cunningham <maria.cunningham@unsw.edu.au>

JD15 -- Magnetic Fields in Diffuse Media
Rio de Janeiro, Brazil, 12 - 14 August 2009 (1.5 day)
Elisabete M. de Gouveia Dal Pino <dalpino@astro.iag.usp.br>

JD16 -- IUY Global Campaign – Whole Heliosphere Interval
Rio de Janeiro, Brazil, 12 - 14 August 2009 (1.5 day)
Barbara J. Thompson <Barbara.J.Thompson@nasa.gov>

SpS1 -- IR and Sub-mm Spectroscopy – a New Tool for Studying Stellar Evolution
Rio de Janeiro, Brazil, 3 - 6 August 2009 (2.5 day)
Glenn M. Wahlgren <Glenn.M.Wahlgren@nasa.gov>

SpS2 -- The International Year of Astronomy 2009
Rio de Janeiro, Brazil, 3 - 5 August 2009 (1.5 day)
Contact person: Pedro Russo <prusso@eso.org>

SpS3 -- Astronomy in Antarctica
Rio de Janeiro, Brazil, 6 - 7 August 2009 (1.5 day)
Michael G. Burton <m.burton@unsw.edu.au>

SpS4 -- Astronomy Education between Past and Future
Rio de Janeiro, Brazil, 6 - 10 August 2009 (2.5 day)
Raymond P. Norris <ray.norris@csiro.au>

SpS5 -- Planetary Systems as Potential Sites for Life
Rio de Janeiro, Brazil, 11 - 14 August 2009 (2.5 day)
Nicholas A. Walton <naw@ast.cam.ac.uk>

SpS6 -- The Galactic Plane – in Depth and Across the Spectrum
Rio de Janeiro, Brazil, 11 - 14 August 2009 (2.5 day)
Terence J. Mahoney <tjm@iac.es>
For more details on all the events, links to dedicated web page as well as registration information, visit the web site of the GA at: http://www.astronomy2009.com.br

In addition to the activities of the General Assembly, three more IAU Symposia are taking place in 2009. These are:

**IAU Symposium 260: The Role of Astronomy in Society and Culture**
19 - 23 January 2009, Paris, France
David Valls-Gabaud <david.valls-gabaud@obspm.fr>

**IAU Symposium 261: Relativity in Fundamental Astronomy**
27 April – 1 May 2009, Virginia Beach, VA, USA
Sergei Klioner <sergei.klioner@tu-dresden.de>

**IAU Symposium 268: Light Elements in the Universe**
9 – 13 November 2009, Geneva, Switzerland
Corinne Charbonnel <corinne.charbonnel@obs.unige.ch>

**JENAM 2008 - Symposium 1: “Science with the E-ELT”**

**Convenors: Roberto Gilmozzi, Guy Monnet**

A Symposium on ‘Science with the E-ELT’ was held at the JENAM 2008 Meeting. The 1st session featured 6 presentations on the development of a comprehensive science case for the European Extremely Large Telescope (E-ELT in short) project by the Community through the Opticon-ESO Science Working Group and how it is driving the current detailed design of the facility. The next 3 sessions addressed topical observational domains (planetary systems and stellar formation, the stellar component, the Universe fabric) in which the E-ELT is expected to have a major scientific impact: the 16 talks either covered a science domain and the potential results of the E-ELT equipped with a suitable instrumentation, or alternatively focused on one instrument presently under study and presented its science goals. In that way, most scientific aspects relevant to the E-ELT were covered in depth. Finally, conclusions were presented by the Opticon chairperson. All presentations can be downloaded from http://www.eso.org/sci/facilities/eelt/science/meeting/jenam08/EELT_JENAM08_Programme.pdf.

Guy Monnet
ESO

**JENAM 2008 - Symposium 4: “Asteroseismology and Stellar Evolution”**

**Convenors: Sonja Schuh, Gerald Handler**

The Asteroseismology and Stellar Evolution Symposium has been generously sponsored by the HELAS Forum, an activity of the European Helio- and Asteroseismology Network (initiative funded by the European Commission since April 1st, 2006, as a Co-ordination Action under its Sixth Framework Programme, FP6), and the Kulturabteilung der Stadt Wien (Magistratsabteilung 7).

The Symposium program was put together by the Scientific Organising Committee consisting of Conny Aerts (University of Leuven, Belgium), Annie Baglin (Observatoire de Paris, France), Wolfgang Glatzel (University of Göttingen, Germany), Gerald Handler (University of Vienna, Austria, Co-convenor), Ulri Heber (University of Erlangen-Nuernberg, Germany), Katrion Kolenberg (University of Vienna, Austria), Suzanna Randall (European Southern Observatory) and Sonja Schuh (University of Göttingen, Germany, Convener). Out of a total of 60 oral and poster contributions, 15 contributed talks were selected for presentation during the three half-day session program, with ample time for questions and discussion. There also was an opportunity to introduce the poster contributions during 2-min oral presentations, as well as a slot specifically set aside for poster viewing.

The scientific topics covered the three broad fields of statistically excited pulsators (main sequence, red giants, AGB supergiants), heat driven pulsators along the main sequence, and compact pulsators, and were introduced by two invited review speakers per field: In the first session, Konstanze Zwintz reported a Preliminary glimpse on CoRoT results and expectations (for Eric Michel), and Jadwiga Daszynska-Daszkiewicz summarised current Challenges for stellar pulsation and evolution theory, together giving an overview of the observational and theoretical status of the field. Anne Thoul and Oleg Kochukhov presented the state of the art in Asteroseismology of B stars and Asteroseismology of chemically peculiar stars, respectively, in the second session, highlighting the hot issues in understanding and interpreting the pulsational behaviour of these groups. The stellar evolution aspect was given special consideration in Asteroseismology and evolution of EHB stars by Roy Ostensen and Asteroseismology and evolution of GWV I r stars by Pierre-Olivier Quirion in the concluding third session.

A dedicated audience (on average 45 participants in each session), the excellent speakers, and our colleague Patrick Lenz who acted as the friendly and competent technician, made this Symposium a highly interesting, enjoyable, and successful event.

Sonja Schuh
University of Göttingen

**JENAM 2008, Symposium 7: “Grand Challenges in Computational Astrophysics”**

**Convenors: Herve Wozniak, Dieter Breischwerdt**

This symposium extended over 4 half-days as one of the symposia under the auspices of the Joint European and
turbulence models are supported by these simulations. Spatially rotating disk are of the order of 100 Myr. Cyclonic time scales of the B-field in a density stratified and differentially rotating disk are of the order of 100 Myr. Cyclonic turbulence models are supported by these simulations.

The talks were exciting and well received. Most talks showed impressive movies of the most recent challenging simulations. The discussions were very lively and often continued well into the coffee breaks. We were pleased to announce for all topics internationally outstanding speakers, both from Europe and the USA. The proceedings will be published by EDP Sciences in the EAS Publication Series. In the following we present some of the highlights of this conference.

Latest results from the cosmological simulations were presented, and most recent high resolution studies of Milky Way-sized dark matter halos were shown. From these results it was concluded that dark matter searches should be concentrated on the Galactic Centre, where the highest signal is expected.

Cosmological initial conditions were used for simulating the first generations of Pop III stars, including the complex interplay with their environment. These stars reionize the intergalactic medium, enrich their surroundings with heavy elements and thus provide the initial conditions for future Pop II generations.

Simulations of individual and interacting galaxies, as well as cluster of galaxies, reveal the necessary multi-scale approach (over several orders of magnitude) in the modeling of the physical interplay between the gravitation, the multi-phase ISM, the stellar evolution and the cosmological environment. We have to pay attention to the development of sub-grid models in the future. Understanding multiple star clusters and the formation of stars in rich and dense environments, such as the Galactic Centre have been also addressed.

High-resolution ISM simulations reveal the important role of turbulence and require sufficiently large computational boxes and evolution times in order to be meaningful. Both here and also in simulations of the intergalactic medium, energized e.g. by AGN, sub-grid modeling is required, but how to do this still remains a subject of lively debate.

Galactic mean field dynamo models have been tested by ab initio numerical simulations of a supernova driven ISM in order to find out the validity of assumptions. Amplification time scales of the B-field in a density stratified and differentially rotating disk are of the order of 100 Myr. Cyclonic turbulence models are supported by these simulations.

The formation and stability of protoplanetary discs were the topic of our last session. The most recent very high-resolution simulations enable us now to have a deeper understanding of the balance between cooling, turbulence and gravitation-driven instability effects. These instabilities are indeed essential for planet formation and should deserve a great attention in the future.

In conclusion the success of this meeting, which also brought together computational scientists from different branches of astrophysics, was overwhelming, so that we feel encouraged to think of the organization of similar conferences in the future.

JENAM 2008 - SYMPOSIUM 8: “DECONVOLVING GALAXY EVOLUTION FROM HIGH-Z SURVEYS”

CONVENORS: EELCO VAN KAMPEN, CHRIS CONSELICE, GERHARD HENSLER

The study of galaxy evolution is making rapid progress at intermediate redshifts, where observational data is of sufficient quality and quantity to disentangle the various physical processes that drive evolution. At high redshifts this is much harder, as morphological and 'archeological' data on high-z galaxies are far more difficult to obtain, and for small samples only. However, successful attempts are being made, and future facilities will build on this success to provide a statistically sound picture on how the first galaxies form and evolve.

The symposium brought together 30-40 people involved in this field, providing a clear overview of the current status, observationally as well as theoretically. The meeting started off with a theoretical overview, stressing the need to understand star formation at high redshifts: more stars need to be formed at early times to correctly match current observations. Various scenarios and processes were proposed to achieve that.

The remainder of the meeting was mostly focused on various observational samples of objects at high-redshifts, in different wavebands, and at observational methods to interpret these data. It would be fair to say that the subject is observationally driven at this point in time, and the availability of bigger telescopes with better instruments seems to drive our current understanding of high-redshift galaxies and AGN.
The confluence of the 400th anniversary of astronomical telescopes, the completion of the basic, cold, 5-year mission of the Spitzer Space Telescope, and the near-certain advent of JWST, ALMA, and extremely large, ground-based telescopes seemed to invite a symposium to investigate the past, present, and future of star formation studies. While this summary attempts to mention everybody, with at least one significant idea from each speaker, including the one-minute poster presentations, it will surely fail. The sessions were expertly chaired by L. Wolter, C. Cesarsky (also involved in the ESO event), J. Andersen, and H.-M. Maitzen.

The Symposium started with two historical introductions (V. Trimble & B.G. Elmegreen), addressing, first, the very long time required for astronomers all to agree, only after 1950, that star formation is an on-going process, not something that happened long ago (whether 107, 1010, or 1012 years ago) when the universe was very different, and second, the vital roles of Lyman Spitzer, his immediate predecessors, colleagues, and students, in establishing the existence and proper ties of interstellar matter, from which stars could form, and the processes that would allow them to do so. Remarkably, Spitzer was never interested in the idea of cold molecular hydrogen as the raw material of star formation and came rather late to the idea of turbulence as an important process.

We follow the “seven simplest lessons from 60 years of star formation”, as outlined by J. Alves, as a logical order to this summary, and invite you to keep an eye out for some of the topics of on-going dispute, including (a) whether the initial mass function (IMF) is universal, what determines it, and whether it is closely related to the mass distribution of dense cores in pre-stellar clouds (Core Mass Function or CMF), (b) whether triggering is important, (c) whether massive stars form the same way as ones that can remain below Eddington luminosity throughout the process, (d) environmental effects and the role of binaries, (e) how brown dwarfs form, and (f) how (in)efficient is star formation, and why. And so on to the seven “certainties”, keeping in mind that Z is metallicity and z is redshift.

1. Stars form continually in the cold interiors of dark molecular clouds (if you doubt this, please leave the room). Multiwavelength studies of specific regions persuaded us all to remain (I. Zinchenko, on S76E, with triggering by HII expansion; M. Rengel on the second class 0 source in Lupus 3, indicating these live only 104 yr; P. Persi on a new SF site NGC 6334 IV (MM3) ; and Nakajima, also on the Lupus 3 region).

2. Star formation is inefficient, meaning that, if you look at a particular mass of cool, dense molecular-gas, the fraction of it turned into stars in a dynamical time is typically a few percent (J. Silk), though larger values are possible in bound clouds (I. Bonnell) and very different numbers probably describe star formation in galaxies very unlike the Milky Way and at large z (E. Grebel).

3. Most stars form in groups of 10 - 106. Cluster environments can enhance disk accretion onto planetary cores (S. Pfalzner). Brown dwarfs are more spread out than stars (S. Schmeja), though, like the evidence for mass segregation as clusters age, this surely has some contribution from source confusion in dense centers.

4. There is a characteristic product, a log-normal IMF peaking at 0.2-0.3 M⊙ though this too could have been very different long ago and far away (Grebel). Also, low mass stars are single (R. Jayawardhana on Cha I and Upper Sco, also providing a candidate for the first directly-imaged exoplanet), in contrast to Herbig AeBe stars, most of which are binaries, their disks aligned with their orbit planes (R. Oudmaijer).

5. Feedback processes are ubiquitous and important. There are jets at all wavelengths (K. Stapelfeldt on numerous new Herbig-Haro objects detected by SST), the need for ongoing supernovae to keep star formation down to the observed 2% (J. Silk), and perhaps even massive star feedback to form clusters (J. Alves).

6. Stars form with and from accretion disks across the full mass range from BDs to OBs, and there is a definite time sequence over which the disks disappear (I. Tsukugoshi on T Tauri stars). There are also evolutionary sequences in maser type, radio emission, and SED shapes (R. Oudmaijer). Whole clusters also evolve (S. Schmeja) from hierarchical to centrally condensed structures.

7. Nature does some “pre-packaging”, so that the distribution of core masses, the CMF, has the same shape as the IMF (though shifted to larger masses) and must somehow give rise directly to the IMF (J. Alves). This was perhaps the topic of greatest dispute among the “certainties”. Several speakers asked whether the CMF predicts the IMF (R. Kawabe reporting several AzTEC/ASTE surveys; R. Smith noting that different methods yield different observed CMFs; P. Hennebelle remarking on the range of relevant processes, with outflows, accretion, and turbulence of comparable importance ; and S. Dib suggesting that the transformation from CMF to IMF is a function of environment), I. Bonnell firmly denied a directly link between CMF and IMF once one allows for continuing fragmentation as well as core accretion.

Not yet at the level of eternal verities are the primacy of massive stars in the formation process (with disk accretion, competitive accretion, and stellar collisions and mergers in environments of increasing density, according to R. Klein, and the private opinion of VT) the need for all the processes you can think of (gravity, angular momentum transfer, magnetic fields, accretion, turbulence, feedback - this is either the good news or the bad news, depending on how you
feel about programming). But the probability that there is no further missing physics counts as good news.

Then came four outstanding review talks, two from observers two from theorists (and if you are organizing a seminar series this year, try to get at least one of these speakers!). First, K. Stapelfeldt provided an overview of the Spitzer mission, the five-year cold part of which is essentially over, but a two-year “warm” extension, during which the two shorter wavelengths will still be usable, has been approved. SST is currently about 1 AU from Earth, drifting backwards, and eventually will not be able to turn in the right direction and send us data.

Among the discoveries important for star formation have been:

- 70% of infrared dark clouds have embedded protostars (and those that do not could have BDs or might eventually disrupt)
- at least one region has remarkably gray dust with A24μm/AK =0.44 there is spectroscopic evidence for many kinds of grains, including large ice-mantled ones
- water is found in many places as vapor or ice ; there is also acetylene
- the statistics of class 0, I and II sources are not quite as expected
- disks with central holes, perhaps due to planets, are fairly common
- protostellar disks last 107 years and debris disks 108 years ; debris disks imply that agglomeration has proceeded at least as far as planetesimals, comets, and asteroids

Second, E. Grebel absolutely blasted through the very different contexts in which star formation occurs, from star-bursts down to dwarf galaxies, pointing out the different rates, patterns, efficiencies, and probably IMFs, and the evidence for different modes in common galaxy types, as observed or as inferred from the resultant star populations. Continuous, episodic, or one-shot star formation occurs depending on gas content, mass density of the galaxy, and interactions or accretion. Some other points she made (far from a complete list) include,

- stars are now forming in Spirals and Irregular galaxies, in galactic centers, and in interacting galaxies.
- Star bursts process 100 M/yr and ULIRGs up to 1000 M/yr typical spirals form 20 M/yr, much larger than the Milky Way value of 1-3 M/yr.
- for many giant Ellipticals the rate is roughly 0 M/yr, but about 1/3 have evidence (including Galex UV colors) for active rather than passive evolution, that is some on-going star formation
- field giant Ellipticals have their oldest stars about 2 Gyr younger than cluster giant Ellipticals
- E+A galaxies indicate cessation of star formation at a definite time in the past
- the Milky Way has a number of discrete stellar populations, distinguished by age and Z, including globular clusters (not themselves all the same) two sorts of field halo stars, two sorts of disk stars, and a bulge

- there was a time gap between the end of halo and beginning of disk star formation in the MW which is not understood; the bulge stars are mostly older than 10 Gyr and have [Fe/H] across the range -2.0 to +0.5
- most large galaxies show age and metallicity gradient
- it is not clear whether Irr galaxies have massive halos; the star velocity dispersion is close to rotation speed, and HI tends to be spherical (consider maps of LMC)
- IR galaxies host 10-20% of current star formation
- there are tidal tail galaxies and BCDs (with HI and star formation concentrated at their centers)
- dwarf galaxy SF is very inhomogeneous, and you can see pollution by single SNe as scatter in relative abundances
- the ratio of s to r products is an age indicator
- winds are important
- star formation in the outskirts of Spirals is not understood

Third, J. Silk described the multitude of physical processes that must be considered in theories of star formation, the evidence for them, and some of the outstanding questions. Key issues include the IMF, star formation efficiency, turbulence, quenching, and triggering. Among the points he made were:

- the IMF is not necessarily constant, and if it was top heavy at large z, this will affect the SFR(z) you derive from any tracer
- the mass assembly history derived from SST and star formation histories derived by other methods disagree at z=3-4; differences in stellar M/L (the IMF) are a likely cause core velocities are mildly supersonic in the Oph region; more generally, porosity of the ISM is self-regulated, so that star bursts have high turbulence and low porosity, while quenching occurs with low turbulence and high porosity
- the percentage of gas in GMCs is also regulated by turbulence
- quenching is due to different processes on different scales and in galaxies of different masses, for instance fountain and outflows on large scales in normal galaxies, but BH accretion, jets, and radiation in AGNs, whose activity is quenched at the same time, corresponding to the well-known black hole – bulge relation
- triggering is seen on assorted scales but is not universal
- AGNs can also enhance star formation by compressing gas, and the SFR depends on interactions between hot and cold gas
- downsizing means both that big halos formed first and that the ratio of (SFR)/M(allready in stars) declines toward the present from z=2.5. The process is perhaps magnetically regulated.

Fourth, the primary discussion of star formation calculated from numerical simulations came from I. Bonnell, for whom the key questions are the why’s of star masses and the IMF, of inefficiency, of clusters vs. distributed SF, and the how of core proper ties giving rise to star masses. On this last point, he firmly concluded that, because of on-going accretion
plus fragmentation, it is very unlikely that there is a 1:1 relation between core mass and stellar mass. Initial conditions are obviously important for these simulations, so that the SST survey of GMCs (the stage where $\rho = 10^{-17} \cdots 21$ g/cm$^3$) is vital input. Other things that matter include binaries and disks. Most star formation occurs in bound structures, where low mass stars and BDs form from gas falling into the cluster, while high mass stars result from rapid accretion (slowed but not stopped by feedback) in incipient cluster cores. Bound gas clouds have SFE around 15% vs. 3% for unbound clouds.

Several of the shorter contributions were of direct relevance to these issues, for instance high resolution mapping of Av in Barnard 59 as a probe of SF efficiency (C. Roman), the need (in calculations) for external confining pressure to keep gas together and allow small length-scale fluctuations to grow (J. Dale), the dominance of small separations and mass ratios near one for low-mass binaries (R. Jayawardhana), and the significantly larger luminosities of ultracompact Hii regions compared to massive YSOs (R. Oudmaijer).

And the future came at the end. We heard about several ongoing and upcoming projects, including:

- the APEX, Atacama Pathfinder, which sees known SF regions, starless cores, hot molecular cores, IRAS sources, embedded clusters and CH3OH maser sources, for which follow-up searches with Effelsberg, IRAM, and Mopra yielded only one non-detection, a planetary nebula! (F. Schiller)
- SOFIA is coming, with a call for proposals due in December 2008 (M. Hannebush), and more about SOFIA from R. Klein, who pointed out that one of its major goals is to identify the dominant formation mechanisms for massive stars, though he left the impression that ever ything that anybody has suggested happens somewhere.
- an all-sky map of Galactic GMCs now in progress, derived from 2MASS extinction measurements (J. Rowsles)
- a concept study for a 4-meter space telescope usable from mid UV to near IR (R. Jansen)
- a survey of Gould’s belt (the diffuse material primarily, not the OB star) with HARP on the JCMT; and SCUBA-2 is coming in 2009 (J. Hatchell)
- ALMA, for which L. Testi described the science goals, required capabilities (in terms of mm/submm resolution of 0.1'' and sensitivity sufficient to map CO and [CI] over the entire Milky Way), and timeline. But, he said, it will neither image exoplanets “nor solve the star formation problem” (partly, one suspects, because it is a little difficult to decide just what “the” star formation problem is).

Our grandest view of the future came from M. McCaughrean who emphasized the facilities that will become available over the next decade or two, including ALMA, the large, ground-based E-ELT (plus the TMT and GMT), radio facilities like e-MERLIN, LOFAR, and SKA, and, in space, the upgraded HST, Herschel, Sofia, Gaia, and Kepler. But, he concluded, the most important new facility will be JWST, with a five-year mission promised and the potential for another five years before gases and such run out. He indicated that the single most important thing it has to offer is greatly improved angular resolution and that, similarly in planning the new, large ground-based telescopes, the best possible angular resolution is more important than pushing into the thermal infrared. Goals are $0.01-0.1''$, though one can make this sound more impressive by speaking of $10-100$ milliarcseconds. Some of these facilities will return data by the Tera- and PetaByte, so that improved capacity for number receiving, storing, processing, and crunching will also be vital. An interesting case (not mentioned) is LSST, where the decision has to be made just how much raw data can be kept, so that, for instance, if a flare occurs in a star formation region somewhere far away, one can go back over the past years’ images, where the source may have been a two-sigma, three photon smudge, and determine how bright and how variable it was previously.

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