20th General Assembly of the International Astronomical Union

Following the earlier IAU General Assemblies in Montreal (1979), Patras (1982) and Delhi (1985), the XXth IAU GA was held in Baltimore, Maryland, USA, from 2–11 August 1988. This was the first time in the United States since 1961. About 2,000 participants listened to more than 1,000 talks during more than 250 sessions, organized by 40 IAU Commissions. In addition, there were three Invited Discourses and seven one-day Joint Discussions.

A full report will appear in the IAU *Transactions* and *Highlights*. In the meantime, and for the benefit of those *Messenger* readers who were not present, here is a small selection of items from the GA. They were mostly written by participating ESO astronomers at the editor's request and should only be regarded as personal reflections, culled from the enormous information flow. Others are adapted from the excellent daily newspaper, *IAU Today* and unsigned notes are by the editor.

The Inauguration

The General Assembly was formally opened on 2 August by the President of the IAU, Professor J. Sahade from Argentina. During the Inaugural Ceremony, speeches were given by the hosts, Drs. A.F. Davidsen and R. Giacconi and the chairman of the National Organizing Committee, Prof. F. Drake. They were followed by the President of the Johns Hopkins University (Dr. S. Muller), the Mayor of Baltimore (The Honourable Kurt L. Schmoke), the Lieutenant Governor of the State of Maryland (M.E. Steinberg) and representatives of the funding organizations, NSF and NASA. Finally, the Science Advisor to President Reagan, Dr. William R. Graham, brought a message from the President.

All of the speakers stressed the importance of astronomy and astrophysics and although some of them hinted at some current funding shortages in the United States, most were optimistic about future discoveries and the realization of future, large facilities. Professor Sahade, in his speech of thanks, mentioned the importance of conserving optimal observing conditions and the need to avoid sky pollution. He explicitly mentioned the Celestis project as a potential major offender.

Astronomy is for Everybody

Have you ever been asked the question (perhaps by yourself) why developing countries should engage in astronomical research? If posed with an "If" at the front end, everyone engaged in astronomy will readily answer with "Yes". But the "Why" requires more thought and care. All the more remarkable is the convincing simplicity of the answer given by Mazlan Othman from Malaysia at a press conference. The following quotations of her statements are taken from the daily newspaper *IAU Today:*

Mayor Schmoke said (in the inauguration ceremony) astronomy is "the stuff of dreams and youthful fascination". This is true in the United States and it is also clearly true for us in developing countries. . . . Our youth are interested in astronomy and space just as much as young people in developed countries. And when you do achieve your dreams, we hope not to be too far behind you. . . . For excitement in science, there's nothing better than astronomy.

Fun, improved national self-reliance, gateway to scientific literacy, and technology transfer – maybe also in the developed countries we should pay more attention to these potentials of astronomy in other regions of the world.

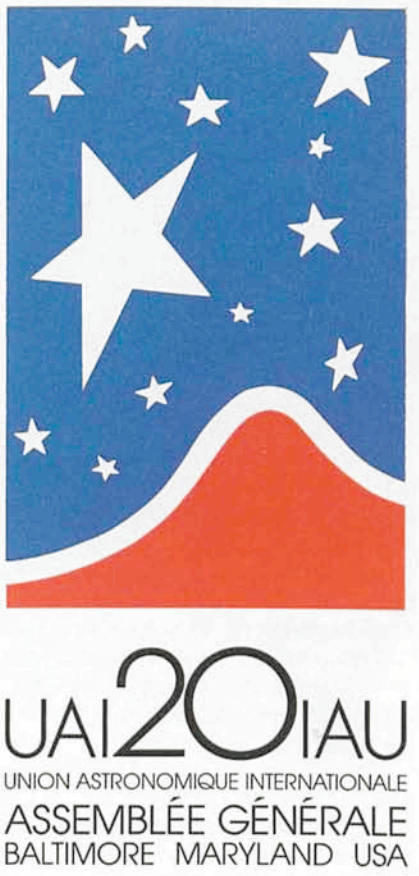
D. Baade

Optical Sensors

The world of optical sensors moves forward more slowly than many astronomers would wish, but it moves forward none the less. Even though we may not yet have the long promised Tektronix 2048 × 2048 CCD in our hands, definite evidence is now available to show that the charge-trap problem, which has plagued these devices in the past, has been brought under control. Meanwhile, other new devices with impressive performance figures have recently appeared on the scene. The 1200 × 400 Reticon CCD offers a very generous surface area for spectroscopic applications, and the new Ford-Aerospace CCDs show outstanding noise and CTE characteristics. Although neither of these chips has yet been thinned, both the major European CCD manufacturers, EEV and Thomson, have already produced examples of thinned devices in the last six months, as well as prototypes of their own large area imagers.

Altogether, the CCD landscape has taken on a decidedly more rosey hue than in recent years. Maybe by the next IAU General Assembly we will really be using the sensors of which we have long dreamt. Let us hope that our horizons have not expanded too much in the meantime.

M. Cullum



Photography

The Working Group on Photographic Problems (under Commission 9) held two well-attended sessions with talks ranging from recent developments in image processing to technical and astronomical aspects of the various projects in which the world's large Schmidt telescopes and other photographic instruments are now engaged. Of particular interest was a talk by D.F. Malin (AAT) on the combination of large numbers of plates showing clusters of galaxies. This enables photographic detection of objects down to 26th–27th magnitude. There was also a very detailed presentation by J. Burdsall from Eastman Kodak which offered a rare insight into the plate manufacturing process. He also discussed the possibilities of minimizing the batch-to-batch differences for the IIIa-emulsions and how to double the effective speed of these emulsions by changes in the manufacturing process. There was also a discussion about the new tablet-grain emulsion (Kodak T-max) which holds great promise in astronomy.

ESO was represented by a paper on the detection of low-mass star formation regions by means of very deep Schmidt plates (by Reipurth and Mad-

sen) and also a paper on elliptical galaxies with dust lanes (by Bertola et al.).

C. Madsen

Interferometry Progresses at All Wavelengths

Interferometry in the centimetre wavelength range has become an established tool in astronomy. This has been beautifully demonstrated by high resolution images from the VLA, Westerbork and other radio observatories. Now multi-aperture imaging is pushing towards full coverage of the metre to visible wavelength range, as is already the state of the art in single-aperture imaging. Among the many current projects are the metre wavelength array in India and also the IRAM submillimetre telescopes which will soon become operational in the combined mode on the Plateau-de-Bures.

The ultimate technological challenge now lies in the infrared and visible wavelength regions, as exemplified by the ESO Very Large Telescope. The first results with smaller arrays have shown that the complex problems of phasing are well understood; this was pointed out by Pierre Léna. Several projects with individual telescope sizes up to 1.5 m are planned or under construction; they have fancy names like SUSI, IOTA, COAST, INT, CHARA, etc. There were no less than four sessions about interferometry at the General Assembly – a crowded auditorium testified to the high expectations in this new, exciting field.

F. Merkle

Astronomy in Space

Inexperienced GA participants attending one of the various Joint Discussions run the risk of being disappointed in the sense that these events often are neither joint nor discussions. An interesting exception to this rule was the fourth session of JD VII *The Hubble Space Telescope – Status and Perspectives* which was devoted to long-term prospects. Not surprisingly, the nature of the discussions there was not purely astronomical.

A vision of an 8–16-m telescope as the successor of HST was commented upon as being too little innovative by a high-ranking ESA representative who felt that merely increasing the light collecting power was not in itself a sufficient goal. He also demanded that the costs must be kept within reasonable limits – nevertheless, twice the financial envelope of HST would not scare away too many interested parties, at least not on the astronomical side.

In the second presentation, a speaker from the USSR impressed the audience with this nation's ambitious plans for future space research, the most important point being that the heavy-lift rocket *Energija* has already been tested successfully. Proposals for collaborations were strongly encouraged, and the complementarity of the current situation of East and West was immediately realized by everybody and addressed by several participants in the discussion: availability of reliable launchers on the one side and still grounded high-tech equipment on the other one. The dependency of the rate of scientific progress on the advances achieved in the field of general politics was strongly felt. But the expectations aired during the following discussion were definitely more optimistic than pessimistic.

The last speaker, from the Royal Observatory in Scotland, suggested in an enjoyable and eloquent outline of his personal view of the next three decades of astronomy from space that in future more attention should be paid to possibilities to economize by not observing all kinds of object at all frequencies but rather being more selective. Not unexpectedly, this caused several astronomers rather vividly to express their personal reservations about what they perceived as doubts concerning the principal competence of their favourite frequency domain to solve the fundamental problems of astronomy.

D. Baade

Adaptive Optics Matures

Adaptive Optics is knocking at the front door in observational astronomy. For instance, an adaptive system has been developed by B. Smithson and has delivered the first results in solar work at Sacramento Peak Observatory towards the end of July 1988. The exciting seeing improvement was shown on video. Another system for stellar astronomy is nearing completion at NOAO in Tucson and is expected to give the first results in some weeks. Our own ESO system will join the club shortly. There are indications that other observatories plan to follow the pioneers; the interest in this new observational tool is great, and the two sessions and one tutorial on this subject in Baltimore was attended by many participants.

F. Merkle

Multi-Wavelength and Multi-Facility Astrophysics

Multi-wavelength and multi-facility astrophysics took an important step forward during the IAU General Assembly. A corresponding Working Group was created under the auspices of Commission 44 (Astronomy from Space); the first Chairman is Thierry Courvoisier who was formerly with ESO, and is now at the Geneva Observatory. The WG includes members from several European countries, and also from the USA, USSR, South Africa, China and Japan.

The WG held its first meeting following the day of its creation. Many specific ideas were brought forward about how to increase collaboration and to improve exchange of information between ground- and space-based observatories, and also between individuals and committees responsible for the scheduling of observing time at these facilities. The very first measure, which will now be implemented by the WG, is to compile and regularly update a list of the key persons at the various observatories. The WG will also help to exchange information about observing schedules. But there are many more complex issues concerning the organization of multi-facility observing campaigns and the archiving of the results, cross-calibration issues, dedicated ground-based support for space programmes. Moreover, this may influence the future design of instruments, and the extensive discussions in Baltimore resulted in a long list of action items which will be looked into during the coming years.

A striking aspect was the match between the need for facilities to be used in collaborative projects and long-term monitoring (for example with medium-sized optical and radio telescopes) and the resources actually available in many countries. It was also felt that multi-facility and multi-wavelength astrophysics may considerably improve the efficient use of many facilities for top-quality science. This approach is likely to have a positive impact on many astronomical programmes.

Th. Courvoisier and C. Sterken

Documentation

The Joint Discussion on "Documentation, Data Services and Astronomers" was attended by many astronomers, and also by quite a few librarians, who came from IAU Colloquium 110 ("Library and Information Services in Astronomy"), held during the preceding week in Washington D.C. The key words for these GA sessions were computers and networks: use of computers for libraries, for the preparation and submission of scientific papers (a subject presently being looked into by the editors of the main astronomical journals), for communications between astronomers (e-mail), for information retrieval (data bases) and for archiving of observational data.

The new programmes for observational data archiving (e.g. RGO at La

Palma; for the Space Telescope; at ESO in Garching) all make use of the FITS standard format to describe the material. The use and maintenance of the future, large-capacity storage media, like optical disks and video-casettes, was also discussed. In order to locate and retrieve the observational data, on-line data bases are being built up. The astronomical designation for the observed objects is one of the key parameters for the location of the objects; the ESO archive, for instance, will provide several synonyms for each object. The adopted ESO archiving policy was described in the June 1988 issue of the *Messenger* (**52,** page 3). *F. Ochsenbein*

News about Pluto and Charon

During one of the sessions in Commission 16 (Physical Study of Planets and Satellites), D. Tholen gave a summary of our current knowledge about the outermost, known planet in the solar system. With improved speckle techniques, and in particular from observations of the eclipses in the Pluto/Charon system, which started in late 1984, it has now become possible to measure the radii as 1,142 ± 9 km and 596 ± 17 km, respectively. The occultation of a 12-magnitude star by Pluto on June 9, 1988, was observed in several places and unambiguously showed that Pluto has an atmosphere that reaches at least 3,200 km above the surface. From spectroscopy it is known to consist of methane, and the surface pressure is about 10 microbar. The lightcurve has a period near 6.4 days and an analysis of the light variation, also during the eclipses, indicates that Pluto has at least one polar "ice"-cap and one or two dark and light areas on the surface. The colour of Pluto is reddish, while Charon is grey. Pluto is thought to have a silicate core with radius ~ 800 km and there is methane ice on the surface. The density is in the 1.8–2.1 g/cm^3 range.

R. M. West

Lithium Abundances

Duncan reported on new results which permit to recover the initial Lithium abundances in Population II stars, taking into account possible stellar depletion. As Reeves pointed out in his review to Commission 47, if this Lithium abundance is primordial, then it is possible to exclude that the density parameter $\Omega_{\text{barion}} = 1$, even in the case of the inhomogeneous models which have recently been proposed. *G. Setti*

The Companion of HD 114762

A team of astronomers from the Harvard-Smithsonian Center for Astrophysics announced the determination of a spectroscopic orbit for the IAU radial velocity standard star HD 114762, a seventh-magnitude solar-type star, about 90 light-years from the Sun. With a period of 84 days, the companion of HD 114762 is at about the same orbital distance as Mercury is from the Sun. The rather low velocity amplitude of 600 m/sec implies a mass of about ten times that of Jupiter, if the orbit is being viewed edge-on. Unless the orbit happens to be oriented nearly in the plane of the sky, the companion is a brown dwarf, and it may even be a massive planet. More than one hundred observations, spread over ten years, are now available, so more than 30 orbital periods have been covered. Because HD 114762 was recommended for intensive observation as a candidate for inclusion on a new list of IAU radial velocity standards, a beautiful series of CORAVEL observations is also available, and the CfA orbital solution has been independently confirmed by Michel Mayor of the Geneva observatory and his collaborators. This result is a small step towards understanding how frequently stars have planetary companions. *D. Latham*

Mass Loss from Early-Type Stars

On the fringe of the GA, a small two-day workshop – but with intensive participation by all attendees – was held at the STScI on variable mass loss from early-type stars. The undisputed highlight was the report by Stan Owocki on his numerical explorations of the dramatic instabilities in both the sub- and the supersonic zones of line-driven winds. The inclusion of time-dependent hydrodynamics by him and his collaborators for the first time offers an explanation *and* quantitative description of the discrete components in the extremely broad profiles of non-saturated UV resonance lines. About 15 years after their discovery and thousands of observations in hundreds of stars, this would be a major theoretical advance if borne out by future work. According to Owocki, the phenomenon is due to shocks and associated density enhancements in the flow at certain velocities (i.e. distances from the star). *D. Baade*

Radio Galaxy at Redshift 3.8

It was announced by Ken Chambers and George Miley that a record redshift of z = 3.8 has been measured for the radio galaxy 4C41.17. It is one of fifty radio sources, mostly in the "ultra-steep spectrum" class which have been studied during the past ten years. Seven of these were found to have redshifts above 2. The lines and continuum in 4C41.17 both extend over several arcseconds, proving the nature of the object beyond doubt. Such objects may possibly be detected to z = 7 and may become our best probes of the very distant universe during the next years. In any case, the observation of 4C41.17 now definitely shows that galaxies formed already within a few billion years after the Big Bang. *P. Shaver*

Standard Candles

The nature of the brightest galaxies in rich clusters, which have been used extensively as standard candles in observational cosmology, has been the subject of a long standing debate. Some authors have supported the hypothesis that these galaxies belong to a special class of objects, others think that they are simply the tail end of a statistical luminosity function. According to Bahvsar, both hypotheses may be correct. During a meeting of Commission 47 (Cosmology), he said that the magnitude distribution of these galaxies can best be explained if they are drawn from two populations, one of "special" objects which is normally distributed and another population of extremes from a statistical distribution. *G. Setti*

Quasar Absorption Systems

Quasar absorption systems in which the Lyman-α profile shows damping wings have been interpreted as the intervening H I disks of young galaxies. Hunstead has now reported about studies of heavy element enrichment in one such system towards the quasar PHL 957 with $z_{\text{abs}} = 2.309$, which indicate an abundance of only 5% of the solar abundance with very little evidence of dust. In another system towards the quasar 0836 + 113 ($z_{\text{abs}} = 2.465$), narrow Lyman-α emission is seen in the base of the damped Lyman-α line. The star formation rate inferred from the Lyman-α luminosity may be as low as 1 solar mass per year. *G. Setti*

Gravitational Lenses

Recent observations of the quasar 2237 + 030 show four images with identical spectra which can be interpreted as a gravitational lens system with the lensing galaxy unusually close (z = 0.039). Refsdal said that for this system the expected effects of micro-lensing are larger and can be more accurately estimated than for any other system presently known. He predicts that a typical change of 0.05 magnitudes per year for each of the four images due to micro-lensing can be expected. Since the time

delay between the images is only about one day or less, micro-lensing will produce a change in the luminosity ratios which, if detected, will be a proof of the micro-lensing effect, since variability intrinsic to the quasar would show up "simultaneously" in all images. *G. Setti*

The ESO Exhibition

The ESO booth in the cavernous exhibition hall was visited by hundreds and hundreds of conference participants, enquiring about ESO in general and – not surprisingly – about the Very Large Telescope in particular. The Milky Way Panorama also drew much attention and many visitors tried to locate their particular object of interest. Several ESO staff members took turns at the booth, answering questions and handing out information material, including copies of the most recent issues of the *Messenger*. In fact, the ESO booth soon developed into a sort of small communication centre for ESO staff where messages were passed and many discussions were held. And finally, on 10 August, four strong staff members dismantled the entire exhibition and packed it in less than three hours, most probably breaking some of the local "union rules"! *C. Madsen*

IAU Travelling Telescope Almost Ready to Go

The IAU's new travelling telescope should be ready for its first assignment later this year. Its purpose is to provide astronomers in countries where astronomy is still in the developing phase with practical training in observational astronomy. A grant from the Canadian International Commission for UNESCO and the Canadian International Development Agency has enabled the purchase of an 8-inch Celestron telescope, an OPTEC solid state photometer, Optomechanics slit spectrograph, camera, power supply and other accessories. Other instrumentation such as a microcomputer and a Reticon or CCD detector can be added.

All interested parties should contact John R. Percy, Department of Astronomy, University of Toronto, Ontario, Canada M5S 1A1. From *IAU Today*

Six More Countries Join the IAU

Six countries have requested to join the IAU since the last GA in Delhi. Following IAU tradition, representatives from Algeria, Iceland, Malaysia, Morocco, Peru and Saudi Arabia reviewed the situation of astronomy in their countries during short speeches at the second session of the General Assembly on 11 August 1988. The Assembly welcomed the new members with acclamation, bringing the number of member countries to 57.

The General Assembly also admitted more than 800 new individual members.

Resolutions

The IAU General Assembly passed 8 resolutions of which the full texts will appear in the IAU Bulletin. It is indicative that four of these are directly concerned with adverse influences on observational astronomy. The titles:

- Amateur-Professional Cooperation in Astronomy
- Adverse Environmental Impacts on Astronomy
- Improvement of Publications
- International Space Year 1992
- Cooperation to Save Hydroxyl Bands
- Sharing Hydroxyl Band With Land Mobile Satellite Services
- Revision Frequency Bands for Astrophysically Significant Lines
- Endorsement of Commission Resolutions

New IAU Executive Committee

Following the formal election procedures during the second GA session on 11 August, the new Executive Committee (1988–1991) now consists of: President Y. Kozai (Japan); President-elect A.A. Boyarchuk (USSR); Vice-presidents A. Batten (Canada), R. Kippenhahn (F.R. Germany), P.O. Lindblad (Sweden), V. Radhakrishnan (India), M. Roberts (USA), Ye Shu-hua (P.R. China); General Secretary D. McNally (UK); Assistant General Secretary J. Bergeron (France); Advisors J. Sahade (Argentina); J.-P. Swings (Belgium).

Next IAU General Assembly

The 21st General Assembly will take place in Buenos Aires, Argentina, supposedly from 23 July–2 August 1991. In response to various discussions which took place in Baltimore, partly because of the somewhat smaller number of participants than expected (the organizers had hoped for 3,000), the new Executive Committee has announced that it will study ways to make the format and content more attractive, possibly by incorporation of one or more symposia/colloquia into the next Assembly.

Comparison of Astronomical Journals

S. R. POTTASCH and F. PRADERIE, Editors of "Astronomy and Astrophysics"

At the request of the Board of Directors of *Astronomy and Astrophysics (AA)*, we have undertaken a comparison of the more important astronomical journals. The original reports covered the amount of material published, financial aspects, time delays in publication, aspects of refereeing and rejection of articles and the very difficult question of the overall scientific quality. Because of the general interest among astronomers in publishing and publications we have prepared this summary of the reports. Some of the information used has been supplied by Dr. H. Abt, editor of the *Astrophysical Journal (ApJ)* and Prof. R.J. Tayler, editor of the *Monthly Notices of the Royal Astron. Soc. (MNRAS)*. We have limited our comparison mainly to the three journals mentioned, plus the *Astronomical Journal (AJ)*.

1. Amount of Material Published

This comparison can most easily be made on the basis of the total number of pages published each year. This is somewhat misleading because the average number of words published per page varies significantly from journal to journal. Therefore, a better comparison can be made by using the average number of words on a printed page in each journal to convert to a common "equivalent page". There is a considerable uncertainty involved in this "conversion factor" however, because the different journals have somewhat different policies concerning the relative sizes of figures and tables. Such a comparison is shown for 1987 in Table 1. The first four columns show the actual number of pages published. In these columns, the Letters section is listed