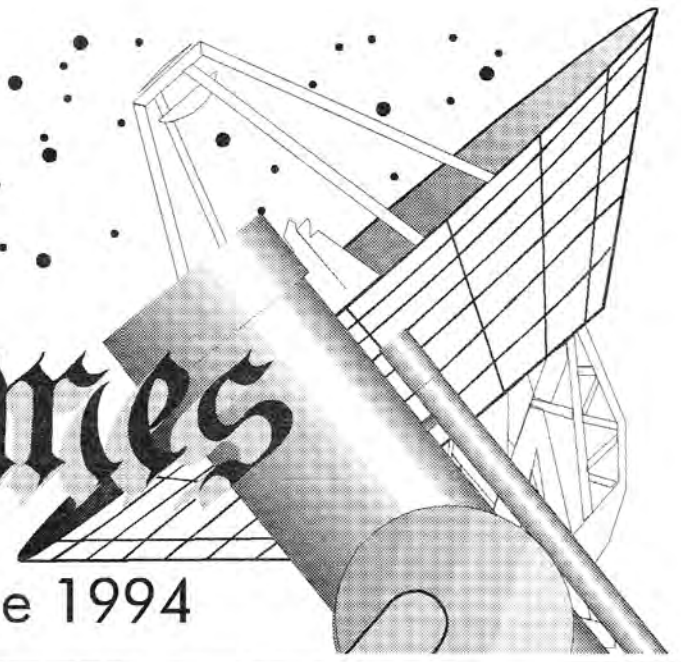


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



Editor: *SETH SHOSTAK*

Associate Editor: *RENÉ GENÉE*

No. 1: Tuesday, 16 August

## Welcome to The Hague

**T**he 22nd session of the IAU General Assembly will attract nearly two thousand participants this year. They will be privy to 23 professional sessions, and can participate in 14 working groups and joint discussions. An impressive, and intimidating, total of 600 talks will be given, and the poster presentations tally more than a thousand.

All in all, participants will enjoy a

wide variety of research results, educational presentations, and discussions of organizational questions such as naming conventions and other matters of general relevance to IAU members.

Needless to say, we also encourage those who are visiting The Hague for the first time to be sure to avail themselves of the many attractions and diversions in this cosmopolitan city.

As an easy first excursion, participants should go to Scheveningen, the beach community adjacent to The Hague. It is easily reached by walking three blocks down the Johan de Witlaan to tram 7. The tram trip takes 10 minutes or less.

For those of a more athletic bent, an aggressive walker can be in Scheveningen in 25 minutes - 30 minutes if your walking style is phlegmatic.



## After 66 Years, General Assembly Returns to Holland

**Hugo van Woerden, Chairman of the National Organizing Committee, reflects on the history of this year's General Assembly.**

**I**t's a great pleasure to welcome astronomers to this General Assembly. I have been a participant in 11 Assemblies, but this is my first time as host.

The train from Groningen to The Hague takes less than three hours, but this Assembly has required from me ten years — and in a way a lifetime — of preparation.

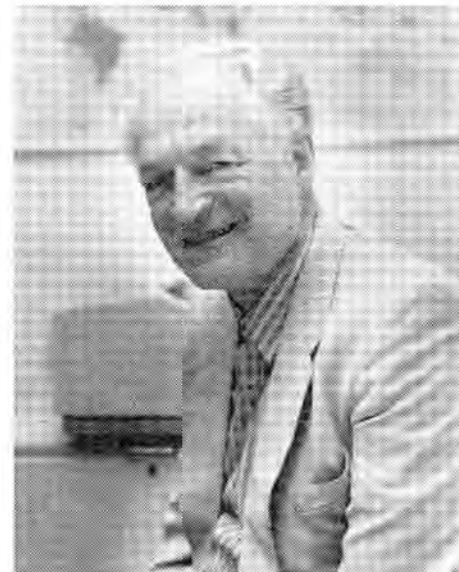
In November, 1984, Jean Pierre Swings — then Assistant General Secretary — asked me whether it would be possible for the IAU to have its 1991 General Assembly in The Netherlands. I promised to investigate, and after considerable discussion (an Assembly is not a minor undertaking) the Netherlands Committee for Astronomy (NCA) decided in favor of this plan. Its chairman, Harry van der Laan, obtained a promise of support from the Ministry of Education and Science. Together with Karel van der Hucht, I explored possible sites and facilities, and in 1985 could report that prospects were good. An informal invitation was sent to the Executive Committee in September, 1986 but there was a competing proposal from Argentina, and the latter got priority.

At Baltimore, in 1988, the new president, Dr. Kozai, asked me whether an Assembly in 1994 would be possible. Again, I promised to explore the idea.

This time, the road stayed open. In 1989, a Local Organizing Committee was formed with Ernst Raimond as its chairman, and since then he has carried the heaviest load. Because of his many duties for ISO, Karel van der Hucht was no longer available but others took his place. And the new NCA chairman, Ed van den Heuvel, proved to be very enthusiastic and an enormous supporter of our work. Thus, the years of preparation sped by, faster and ever faster.

A decade of preparation, yes. But a lifetime? Yes again. The first "Dutch" IAU was in Leiden (1928) around my second birthday. I was not even an amateur astronomer then. But from my earliest days as a student I was steeped in the IAU spirit. Jan Oort was General Secretary, and we students at Leiden were very much aware not only of his scientific stature, but also of his hard work for the Union.

When in 1948 the Zurich Assembly was approaching, I asked Oort whether I might participate. He found me rather too young, although he himself had attended an Assembly at the age of 22. But in the end, Oort gave in (except for attendance at the banquet, which was still a very formal affair). However, the army enlisted me, and I couldn't go. In the end, Dublin (1955) became my first Assembly.



*Hugo van Woerden*

It has been a great privilege to work for this Assembly. With its new format, it will be very different than earlier ones. I hope and trust that every participant will enjoy this meeting, and this will contribute to a strong and healthy future for the IAU.

**HUGO VAN WOERDEN**  
Kapteyn Astronomical Institute,  
Groningen, The Netherlands

## Logo Logic

**T**he red, white and blue logo for the 22nd General Assembly, used to adorn posters and other official publications (and reproduced above in modest monochrome), was designed by Arnold Berbers. Mr. Berbers, who resides in the city of Meppel, notes that the colors, which are those of the Dutch flag, were chosen to signify the Assembly's host country.

The circle represents a telescope's field of view, and the diagonally placed lettering is an additional graphic element suggesting a telescope.

Despite what the inventive minds of participants might imagine, Mr. Berber assures us that the red and blue stripes are not meant to represent redshifts or blueshifts. His logo is, then, apparently local.

## Registered?

**A**ll participants (including those who have pre-registered) must first go to the registration desk, register (if necessary) and collect their meeting packet containing the final program, abstract book, badge and tickets, all supplied in an attractive, blue carrying bag. The latter will serve you well for impressing family and friends once back home. *Note that badges will be required for all General Assembly meetings and events.*

The registration desk will be open through Saturday morning, 27 August. It is located in the entrance hall of the Nederlands Congresgebouw. Hours are from 08:00 until the end of the meetings.



## From the Editor

Once every three years, the IAU General Assembly emerges from dormancy to provide a global forum for astronomical inquiry and discovery. It has done so for three-quarters of a century, and a daily newspaper first appeared as part of this happy ritual in 1932 when



Seth Shostak

Cecilia Payne-Gaposhkin served as the editor.

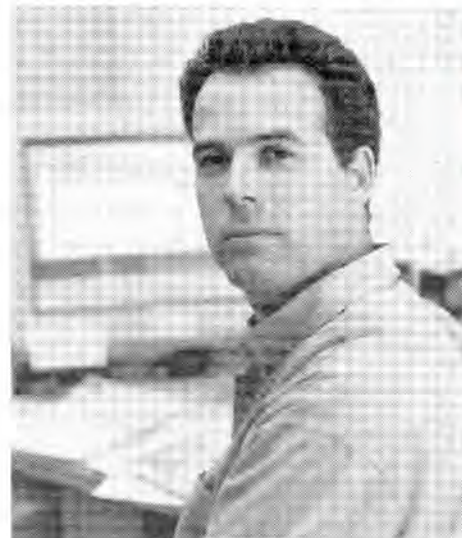
I am extremely grateful to the organizing committees for the invitation to edit the *Sidereal Times*. It is also a pleasure to share these responsibilities with Rene Genee, of the Netherlands Foundation for Research in Astronomy.

However, personal gratitude aside, the value of this publication is entirely dependent on the enthusiasm and cooperation of General Assembly participants. If you have a research result or an announcement of interest to those attending this meeting, I hope you will bring it our attention. We will do our best, within the constraints

of time and space, to include it in one of the issues of the *Sidereal Times*.

Photos of Mr. Genee and myself are printed here not as idle decoration or to bolster our egos, but to make it easier for you to locate us during the Assembly. The offices of the *Sidereal Times* can be found in Commissiekamer 2. You can also leave material for the paper in the appropriate pigeon hole (number 719) at the Convention Center, or under my name at the front desk of the Hotel Bel Air.

Young in comparison to the world's



Rene Genee

oldest science, the IAU is still sufficiently long-lived to have a rich tradition. The *Sidereal Times* is pleased to be part of this venerable heritage, and will strive to be a useful milepost along the exciting course of astronomical discovery.

SETH SHOSTAK  
Editor, *Sidereal Times*

## Message from the President

This Assembly is different from previous ones. It is preceded by three Symposia and will be followed by three others. Joint Discussions and Joint Meetings will take place during this two week event, in which various scientific discussions will take place.

For the past three years, a lot of interesting phenomena have occurred. As a result of very impressive, one might even say heroic work, the performance of the Hubble Telescope has been improved, allowing for the first time the possibility of obtaining diffraction-limited images which will lead to numerous discoveries. Regular observations with the 10 m Keck Telescope, the world's largest, began. The Shoemaker-Levy comet hit Jupiter, and this very rare phenomenon has been observed by numerous ground-based and space telescopes.

The change in the General Assembly format allowed us to enhance its scientific significance and has attracted a larger number of young astronomers, which is a welcome change.

I take this opportunity to thank the



Alexander Boyarchuk

Royal Netherlands Academy of Arts and Sciences for its invitation to hold our 22nd General Assembly, and the Netherlands Foundation for Research in Astronomy which assembled the tremendous facilities necessary to carry out this event. I sincerely believe that this General Assembly will be a success.

I wish all General Assembly participants a very fruitful conference, as well as a pleasant stay in the beautiful country of The Netherlands.

ALEXANDER BOYARCHUK  
President, IAU



## HOSTS AND SPONSORS

Many organizations have contributed effort and monies to make the 22nd General Assembly possible.

Hosts include the Astronomical and Space Research Institutes of the Netherlands: Sterrenkundig Instituut Anton Pannekoek (Amsterdam); Faculteit Natuur- en Sterrenkunde, Vrije Universiteit (Amsterdam); The Netherlands Foundation for Research in Astronomy, ASTRON/NFRA (Dwingeloo, Westerbork); Kapteyn Instituut (Groningen); Sterrewacht Leiden; Sterrenkundig Instituut Utrecht; and The Space Research Organization in the Netherlands (Utrecht, Groningen, Leiden)

Support, financial and in kind, for the organization of the 22nd General Assembly or for travel and participation grants was provided by the host institutions and by: AM Nederland; Carl Zeiss, Germany; Credit Lyonnais Bank; European Industrial Engineers (E.I.E.) (Italy); European Southern Observatory; European Space Agency; Fokker Space and Systems; Hewlett-Packard Corp.; KLM Royal Dutch Airlines; Kluwer Academic Publishers; Koninklijke PTT Nederland; Leids Kerkhoven Bosscha Fonds; Municipality of The Hague; Netherlands Ministry of Education and Science; Netherlands Ministry of Economic Affairs; Schott Glasswerke (Germany); Stichting Physica; Technisch Fysische Dienst /TNO.



by H. DICKEL & Comm. 5 WG

LOOK FOR THIS LOGO in upcoming issues for information from IAU Commission 5 WG on "Astronomical Designations"; such as where to look for the reference and

meaning of source acronyms found in the astronomical literature, where to find guidelines for designating sources, and examples of good and bad designations.

## Late Posters

### Symposium 164:

- 164.142 Takuji Tsujimoto, Toshikazu Shigeyama and Ken'ichi Nomoto, "The Chemodynamical Evolution of Spheroidal Systems"

### Symposium 165:

- 165.CV.201 J. Echevarria, et al., "Simultaneous Multiwavelength Observations of Dwarf Novae Outbursts; SU U Ma: Minihumps at mini-outburst?"
- 165.HX.202 J. F. Dolan, et al., "UV Polarimetry of X-ray Binary Systems"
- 165.PS.203 J. Gil, "Structure of Pulsar Beams and the Spectra of Millisecond Pulsars"
- 165.PS.204 J. Gil, "Microlensing of Pulsar Radiation in the Galactic Centre"
- 165.GS.205 P. Li, et al., "Deep ROSAT Observation of the May 1, 1992 Gamma-Ray Burst Field"
- 165.GS.206 P. Li, K. Hurley, C. Kouveliotou, G. J. Fishman and D. Hartmann, "Flares and Gamma-Ray Bursts"
- 165.PS.207 Andrej Cadez and Mirjam Galicic, "Are the Pulses of the Crab Pulsar Modulated?"
- 165.PS.208 Charles D. Dermer and Steven J. Sturmer, "Gamma-Ray Emission from Millisecond Pulsars"



# Symposium 165 Offers Companions with Fatal Attraction

*What do the following topics have in common:*

**Last year's Nobel Prize in physics. Discovery of the first extra-solar system planets. The strongest possible sources of gravitational radiation in the Universe. Millisecond pulsars in globular clusters. Gamma Ray Bursts. Supersoft Magellanic Cloud X-ray sources. Dwarf novae. Black hole "X-ray novae"?**

**The answer: they all are thought to be related to binary systems - present or past - that contain compact stars: neutron stars, black holes, or white dwarfs.**

The above topics, and many others, will be discussed at IAU Symposium Number 165 "Compact Stars in Binaries" during the first week of the General Assembly. Leading workers will review the status of research and recent developments in the field. New results will be presented in over a dozen contributed talks and some 200 posters.

The field of compact stars in binaries dates to the 1950's and 1960's with the discovery by Merle Walker and Bob Kraft of the white-dwarf binary character of the cataclysmic variables. These and related systems will be reviewed by France Cordova and Keith Horne on Tuesday afternoon, 16 August. The closely related supersoft ROSAT X-ray sources and their possible origins were reviewed by Joachim Trumper and Peter Kahabka, and by Saul Rappaport on Monday.

The discovery of the X-ray binaries in the early 1970's by the UHURU team showed that neutron stars and black holes can also occur in close binaries, while the discovery of the Hulse-Taylor binary radio pulsar in 1974 revealed that some binaries even manage to happily survive two supernova explosions!

At the symposium, the observations of X-ray binaries will be discussed by F. Nagase, Walter Lewin, and Michiel van der Klis, and on Tuesday morning by H. Inoue, who will particularly review the newest discoveries made with Japan's ASCA satellite.

The remainder of Tuesday morning is largely devoted to the evolution of binaries having compact stars, reviewed by Ron Taam, A. Lipunov, and Philip Podsiadlowski. The last-mentioned speaker will also discuss models for the formation of pulsar planets. Further on Tuesday morning, Simon Johnston and Vicky Kaspi will reveal some exciting news about the periastron passage of the radio pulsar PSR 1259-63, orbiting a B-emission star in 3.5 years, and about the new Small Magellanic Cloud radio pulsar that is orbiting an ordinary B-type star in about 50 days.

The discovery in 1982 of the first milli-

second radio pulsar by Don Backer and collaborators opened a rich field of research: that of the millisecond and binary pulsars. Although in 1982 only three binary and one millisecond pulsar were known, the present count is: 44 millisecond pulsars (of which 21 are found in globular clusters and > 50% are in binaries), and 43 binary pulsars (of which 14 are in globular clusters).

The study of binary and millisecond pulsars has produced a tremendous amount of new quantitative information on the evolution of close binary systems and of neutron stars and their magnetic fields. The morning session of Wednesday, 17 August is devoted to these objects, with review talks by Alexander Wolszczan (on pulsar planets), Don Backer (on pulsars as accurate clocks), Matthew Bailes (on pulsar velocities), and Andrew Lyne and Duncan Lorimer (on surveys for millisecond pulsars).

It has become clear that most millisecond and binary pulsars have been "recycled" by accretion in their progenitor systems, which mostly were X-ray binaries. These evolutionary aspects are at least partially dealt with in the Tuesday talks of Taam, Lipunov, and Podsiadlowski mentioned above, and in the review talk by Dipankar Bhattacharya on Wednesday morning.

Thursday morning is devoted to supernovae in relation to binary systems, with review talks by Bruno Leibungut and Ken Nomoto, and proceeds to Gamma Ray sources as reviewed by Gerry Fishman and Zwi Piran.

Thursday afternoon is devoted to the sources of gravitational radiation and its detection, with review talks by Kip Thorne on possible sources, by Fred Rasio on the coalescence process of neutron star binaries (as well as other binaries), and by A. Giazotto on the Laser Interferometer gravitational wave observatories presently under construction.

The second half of Tuesday as well as Thursday afternoons is devoted to poster sessions.

Friday, 19 August is the day for globular cluster sources, Low-Mass X-ray

Binary evolution and the Black Hole X-ray binaries. Piet Hut reviews the dynamical processes in globular clusters that may lead to the formation of exotic objects such as X-ray binaries and binary and millisecond pulsars. Shri Kulkarni reviews the observations of binary and millisecond pulsars in globular clusters, while Helen Johnston concentrates her review on the globular cluster X-ray sources.

Rashid Sunyaev, Phil Charles and Karen Hasswell review the X-ray and optical observations of the "X-ray Novae", now firmly established as being connected with black hole binaries in which the donor star is a low-mass G- or K-dwarf or G-subgiant. Jean Pierre Lasota surveys the possible mechanisms causing these "nova" outbursts, and Roger Romani reviews the possible ways in which these amazing black-hole binaries may have formed.

Finally F. Mirabel will report on an important new discovery: the first galactic source showing superluminal expansion. The symposium will be summarized by Jan van Paradijs.

We expect this to be an exciting symposium, and we look forward to seeing many of you there.

ED P. J. VAN DEN HEUVEL  
Chairman, Scientific organizing  
Committee IAU Symposium 165.

## Naming of an Asteroid after Prince Bernhard of the Netherlands

The International Astronomical Union is pleased to announce that it has recently authorized the naming of an asteroid "Bernhard", after His Royal Highness Prince Bernhard of The Netherlands. The number of this asteroid is 2643 in the listing of orbital elements of the I.A.U., and it is therefore known as (2643) Bernhard.

There have been other namings of asteroids for members of the Dutch royal family. Long ago, (392) Wilhelmina and (816) Juliana were named, most likely in honor of H. M.

## Van den Heuvel Welcomes Participants

On behalf of the Netherlands Astronomical Community, I warmly welcome all participants and guests of the 22nd General Assembly. We are very honored that the IAU has, for the second time in its 75-year history, chosen our country for this meeting.

The Netherlands is only a small country, though with a strong astronomical tradition, particularly in the past century, starting in the days of J.C. Kapteyn.

It has been said that Holland has three main export products: tulips, cheese, and astronomers. There may be some truth in that. Indeed, many prominent astronomers in other countries, notably the U.S., had their roots in Holland. Bart Bok, Gerard Kuiper, Dirk Brouwer and Willem Luyten are some well-known examples. They left Holland already in the 1920's and 1930's, to be followed by many others in the subsequent decades.

Luckily enough, a sufficient number of prominent astronomers remained in The Netherlands to keep the Dutch astronomical school strong and alive.

Oort and van de Hulst (Leiden) in the late 1940's founded Dutch radio astronomy, now one of the major branches of Dutch astronomy. Blaauw and his successors built out the Kapteyn Institute in Groningen, a very strong center of extragalactic research, while the Institutes in Utrecht and Amsterdam concentrated on the physics of the Sun and stars, a research tradition started by Minnaert and Pannekoek.

Furthermore, van de Hulst, de Jager and Borgman, in the 1960's, founded Dutch Space Research, another flourishing branch of Dutch astronomy, which made major contributions to the successful ANS and IRAS satellites.

The Netherlands Committee for Astronomy, in which all branches of Dutch astronomy are present, is the official representative of the Dutch astronomical community, both nationally and internationally. On behalf of this committee, I wish you all a most fruitful scientific meeting and a most pleasant stay in The Netherlands.

Queen Wilhelmina and H. M. Queen Juliana. Since Queen Juliana's abdication, when her daughter, the present Queen Beatrix succeeded her, she is known as H. R. H. Princess Juliana. Queen Wilhelmina was her mother, and Prince Bernhard is her husband.

TOM GEHRELS  
University of Arizona  
Tucson, Arizona



## Announcements and Tidbits

### Symposium 164: Stellar Populations

- Note that all afternoon sessions start at 14:00.
- Session 4 (Wednesday morning) will be chaired by Jeremy Mould.
- Art Wolfe's review on quasar absorption lines (Friday, August 19, 11:45 to 12:30) will not be given due to illness. This time slot will be used for a poster session, and poster authors are requested to take up a position near their poster during this time.
- Poster papers will be allotted 1 page in the proceedings. Authors will receive the *consent to publish* form in their pigeon holes. The submission deadline in October 15, 1994. For further information, see Gerry Gilmore (1583) or Piet van der Kruit (168).

### Getting to Other, Nearby Cities

The Hague has two main railway stations, Den Haag CS (Centraal Station) and Den Haag HS (Hollandse Spoor). You can take tram No. 7 to Den Haag CS (a stop is near the Nederlands Congresgebouw), and tram No. 8 to Den Haag HS. You'll find frequent service to Amsterdam and Leiden, as well as other domestic and international trains.

All major car rental companies have offices in The Hague. Cars may also be rented at Schiphol Airport, Amsterdam. In view of the high quality and frequency of public transport in The Hague, you may find that having a car is more curse than blessing.

### Food for Thought

In order to facilitate your decision as to whether to partake of the exquisite lunchtime culinary offerings at the Congresgebouw, the *Sidereal Times* will be printing the anticipated menu a day in advance.

For Wednesday, August 17, the lunch will consist of:

- Chicken schnitzel
- Cauliflower and fresh vegetables
- Choice of drinks

All of this can be yours for a mere 15 guilders. You must buy lunch tickets at least a day in advance. They are available at the Social Events desk in the Congresgebouw main hall.

## Popular Lecture Series

What could be more relaxing after a long day of technical talks than to listen to your fellow astronomers desperately trying to explain their craft to the general public? Sure, it's easy for *you* to read an article on the curve of growth analysis of yttrium abundance in peculiar A-stars, but how do you turn this scintillating scientific subject into a bang-up popular lecture?

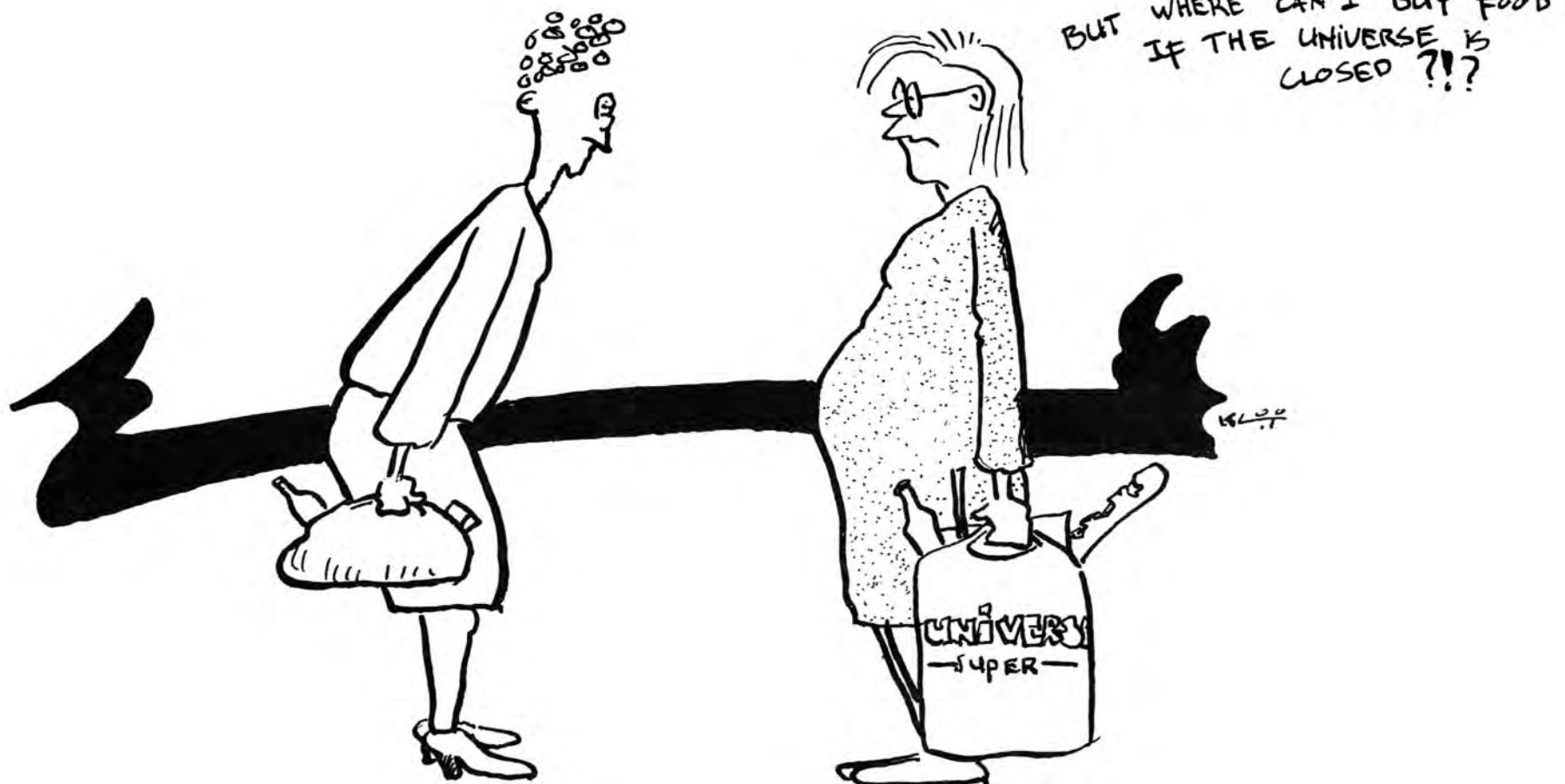
Ten astronomers will address this problem in a series of evening lectures intended for the public. The subjects and speakers are given below, and all of the lectures will be held in the nearby Museon, located at Stadhouderslaan 41. The presentations begin at 20:00 in the evening, and are scheduled for two hours. Admission is 7.50 guilders. Be warned that some of the talks will be held in Dutch, and therefore offer a good opportunity for you to brush up on this important language.

- Aug 15 "What Does an Astronomer Do?" Jacqueline van Gorkom
- Aug 16 "How are Planets Formed?" Rens Waters
- Aug 17 "Is There Life Beyond Earth?" Seth Shostak
- Aug 18 "Invisible Matter in the Universe" Herwig de Jonghe
- Aug 19 "A Cosmic Catastrophe? A Comet Impacts Jupiter" Richard Strom
- Aug 22 "New View of the Universe from the Hubble Space Telescope" Ronald Allen
- Aug 23 "Quest to the Big Bang" George Smoot
- Aug 24 "Black Holes" Michiel van der Klis
- Aug 25 "The Universe in 40 Steps" Vincent Icke
- Aug 26 "Astronomy in the Backyard" George Comello

## Late Posters

### Symposium 164:

- 164.136 Annette Ferguson, Rosemary Wyse, Jay Gallagher and Deidre Hunter, "Where Does Star Formation End in NGC 1058?"
- 164.137 B. M. Poggianti and G. Barbaro, "Evolution of Galaxies in Distant Clusters"
- 164.138 Francesco Paresce, Guido De Marchi and Martino Romaniello, "Very Low Mass Stars and White Dwarfs in NGC 6397"
- 164.139 Michael A. Pahre, Jeremy R. Mould, S. Djorgovski, Keith Matthews, David Shupe and Reinaldo de Carvalho, "Infrared Surface Brightness Fluctuations, Color Gradients, and the Fundamental Plane"
- 164.140 David Fisher, Garth Illingworth, and Marijn Franx, "Line-strength Profiles in Early-type Galaxies"
- 164.141 J. Anosova, K. Tanikawa and Y. Funato, "Binaries in the Universe: Possible Dynamical Mechanisms of Formation, Evolution and Disruption of Different Kinds of Constituents of the Universe"



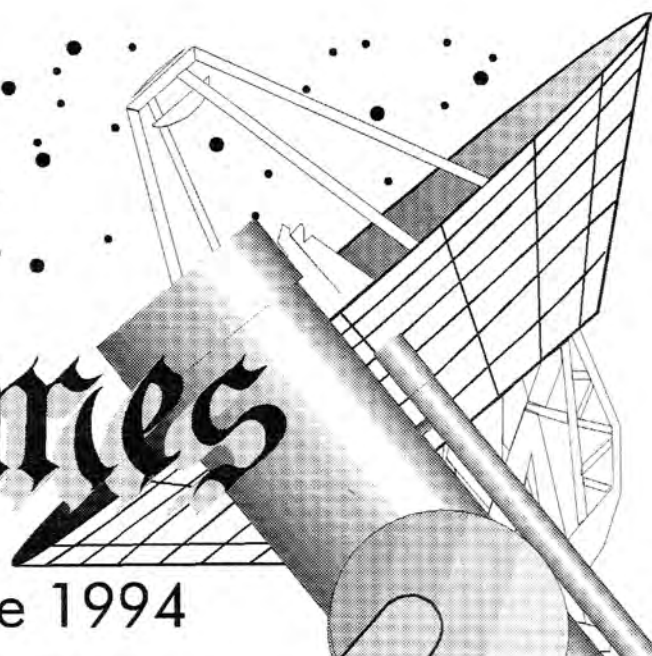


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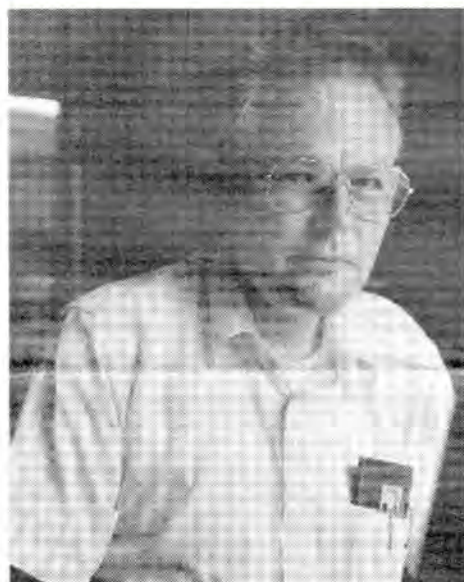


Editor: *SETH SHOSTAK*

Associate Editor: *RENÉ GENEÉ*

No. 2: Wednesday, 17 August

## The Chairman Is In



A visit to the office of Ernst Raimond, in Dwingeloo, is definitely worth the trip.

This somewhat cluttered space, in which a machete is usually necessary to traverse the 3 meters between door and desk, has been the nerve center of the Assembly for the past three years. The computer terminal beeps, FAXes roll in, and the telephone rings insistently. It is here, in this confluence of activity and chaos, that the Assembly sprang to life.

Ernst Raimond is Chairman of the Local Organizing Committee. Next time you see him, shake his hand.

## Royal Info

### Your chance to meet the Queen.

The 22nd General Assembly Inaugural ceremony will be attended by Her Majesty Queen Beatrix of the Netherlands. All participants and registered guests are invited to attend. The ceremonies will begin at 14:00 in the Prins Willem Alexander Hall, and the doors will *not* remain open for late-comers. Consequently, you are kindly requested to be seated before this time.

Following this majestic offering, participants are encouraged to attend a reception at the very heart of the democratic Dutch state, the Ridderzaal (Hall of Knights) located in the Binnenhof.

You can get to the Binnenhof by tram 7 or 8, or bus 4. Get off at the stop called 'centrum', and cross the street to the binnenhof. You will pass through a gate. An alternative route is to take tram 10 and to get out at the same stop. At the traffic lights you go to the left, and after 200m look to your right-hand side.

## Blobby Accretion Gives Neutron Star the Shakes

The way that accretion occurs onto a magnetized neutron star was set into sharper focus by a stunning observation shown to the Symposium 165 audience on Monday afternoon.

The X-ray binary 0535+262 went into outburst in February this year reported M. Finger, due to a sudden increase in mass transferred from the Be primary star onto its neutron star companion.

The extra energy released on impact onto the neutron star surface showed as an increase in X-rays. But matter flowing through the magnetosphere of the neutron star was evidently blobby, because the X-ray release was highly irregular.

However, the X-ray output showed both very regular oscillations that are evidence of the neutron star's rotation, and Quasi-Periodic Oscillations (QPO's), indicating modulation of the mass transfer rate.

Finger visualized this as blobs of accreting material, orbiting the magnetosphere of the neutron star, funneled in bursts onto the surface of the neutron star as the blobs pass over its magnetic poles. The QPO frequency represents the beat period of the

Keplerian orbital frequency of the blobs around the magnetosphere, and the rotation of the neutron star.

The QPO frequency doubled as the X-ray intensity rose to a maximum because the additional mass accretion compressed the neutron star's magnetosphere and diminished the blobs' orbital distances. At the same time that the QPO frequency rose, the spin-up rate of the neutron star was accelerated by the greater momentum transfer of the numerous blobs' impacts onto the neutron star surface. This confirmed the greater accretion rate and linked the observational parameters in a unique determination of the magnetic field characteristics of the neutron star.

Finger pointed to characteristics of the X-ray modulation that indicated that we have a particular view of the neutron star in 0535+262, looking down on its pole. If confirmed by other observations, this would be a strong indication that the blobby accretion model is accurate.

PAUL MURDIN  
Particle Physics and Astronomy  
Research Council, U.K.

## Jupiter Meets Comet: Special Session

On Thursday and Saturday afternoons, from 14.00-18.00, special sessions are scheduled for the latest results on the observations of the impact of comet Shoemaker-Levy 9 on the planet Jupiter.

More information on the program will be in the Thursday and Saturday editions of the *Sidereal Times*.

The Thursday session coincides with the afternoon session of JD2 on the origin and detection of planetary systems.

Don't miss this chance to get the facts you'll need to impress the hoi polloi who will accost you at your next cocktail party.

## LOST

A pen has been lost in the poster area of the Van Gogh room. It is a metal Parker. If you have found or accidentally removed this recording device, please contact the information desk in the entrance hall.

JACCO VAN LOON

A poster by Cesare Chiosi (pigeon hole #1338) on Chemical Evolution Models, disappeared from the poster board. Should your scientific enthusiasm have caused you to remove this poster, please consider the greater scientific good, and return it forthwith.



## The Famous Vatican Conference of 1957

### A Critical Moment in the History of Stellar Populations

On May 20-28, 1957 a Conference was held at the Vatican Academy of Sciences on the topic 'Stellar Populations'. The concept of stellar populations had been introduced in 1944 by Walter Baade.

In 1943, during the Second World War, when the night sky at Mt. Wilson was not disturbed by city lights, Baade was able to benefit from hours of exceptional seeing and succeeded in photographing the Andromeda Nebula and its satellites M32 and NGC 205 down to fainter apparent magnitudes than had ever been possible before.

To his surprise and deep satisfaction he discovered that, once photographic magnitude 22.4 had been reached, a population of red stars (colour index +1.3) in these systems appeared in immense numbers. This population, moreover, had a very uniform distribution over these systems, quite different from the much sparser population of bright blue stars that are scattered along the spiral structure in the Andromeda Nebula. Baade concluded that we are dealing with two different kinds of populations, and he labelled

them Population I (the one with the bright blue stars) and Population II (the newly discovered one). This latter one he readily identified with the population that we were already familiar with from the globular clusters in the Galaxy.

It soon was realized that the two populations are samples of stars at widely different evolutionary stages: Population I the younger ones, and Population II a very old one.

Fourteen years after Baade's discovery, the Vatican Academy made the Stellar Populations the subject of one of their Study Weeks ("Semaines d'Etude"). It led to a much more refined classification system, with both Population I and II subdivided into a younger and an older one, and in between I and II, a new class: the Disk Population. The Vatican Conference marked an important epoch in galactic research, because the sequence of stellar population classes soon became the basis for studies of the evolution of the Galaxy.

ADRIAAN BLAAUW  
Kapteyn Astronomical Institute  
Groningen, The Netherlands

## Mergers and Migrations Mark Galactic Prehistory

The story of the human race was once visualised as the present epoch of change and war, preceded by a pre-historic Golden Age of peace and tranquility. Galactic history could likewise be perceived as the present interesting epoch of active pulsars, black holes and X-ray stars, preceded by a long, quiet and rather boring period in which not much happened, except, at its start, the formation of globular clusters.

From this biased perspective, the cutting edge of modern astrophysics is represented by Symposium 165 on compact stars in binaries here at the General Assembly, while Symposium 164, on stellar populations, is tidying up the few loose ends which remain in an astronomical study which is nearly finished of a single set of events which happened long ago.

In fact, the detail of galactic pre-history, beginning to be revealed by modern astrophysics, is as complex a story as modern archaeology has revealed human pre-history to be. As Jim Hesser, Flavio Fusi Pecci and Gerry Gilmore showed in Tuesday's session of Symposium 164, star formation in our Galaxy is a complicated and

incompletely known story of multiple generations and population mergers.

For example, the apparently homogeneous globular cluster system of our Galaxy consists of numerous subsystems with a large spread of ages. The globular clusters which lie at great distances from the galactic center tend to have plunging retrograde orbits, in contrast to the globular clusters near the galactic center, whose more circular orbits follow the rotation of the Galaxy. This implies that two (or more) groups formed from material moving in different orbits and at different times.

Again, there is a subgroup of five very metal-poor (and therefore very old) globular clusters which have the same age — presumably they all formed in a common event of long ago, distinct from the rest. By contrast to this old subgroup, there is a much younger subgroup of globular clusters (Arp 2, IC 4499, Ter 7 and Rup 106) with colour-magnitude diagrams which seem to indicate a common, relatively recent time of origin (10 Gyr ago).

Interestingly, all the members of this subgroup of four lie in the same plane around our Galaxy containing



Some of the participants during a session of the Vatican Conference. From left to right: D. Chalonge, A. Blaauw, B. Stromgren, Abbe Lemaitre, G. Herbig, D. O'Connell (Director Vatican Observatory), O. Heckmann.



After the Conference, Walter Baade, Jan Oort, Mrs. Oort and Blaauw spent a few relaxed days at Amalfi, on the coast of Italy, where he took this photograph.

the Magellanic Cloud and the Magellanic Stream. It looks as if these globular clusters migrated from the Magellanic Clouds to join our Galaxy.

Like the mass migrations of mankind, this migration of stars was not without cost: these are all puny globular clusters (as Flavio Fusi Pecci remarked, they don't have NGC numbers, so you can infer by inspection that they are not bright). It seems that some of their stars fell by the wayside in the migration process. At the time of capture by our Galaxy, they would have looked like the newly discovered dwarf spheroidal galaxy in Sagittarius, tidally distorted into a long thin sausage by our own Galaxy. Indeed, the Sagittarius Dwarf Spheroidal galaxy seems to be associated with the subgroup of four young globular clusters and the Magellanic Clouds.

According to Gilmore, its population

of stars is joining with our Galaxy's at this very time; earlier mergers of other similar galaxies may have contributed, even wholly been responsible for, the thick disk and halo of stars in the Galaxy, as well as some of the other globular clusters.

Even within a single globular cluster there are sometimes multiple generations, not the single generation that a first glance suggests. The formation of globular clusters is therefore not always a simple process. NGC 2808 has a bi-modal color-magnitude diagram looking like a mixture of the color-magnitude diagrams of NGC 288 and NGC 362. Illustrating the spread of ages in a single star system, Hesser flashed up new data showing that the color-magnitude diagram of the

continued on page 4



## Population Information Explodes Symposium 164

IAU Symposium 164, to be held during the first week of the General Assembly on the topic of Stellar Populations, coincides with the 50th anniversary of the classical paper by Walter Baade that introduced the concept. Baade, in this seminal paper announcing the resolution of the Andromeda galaxy M31 and its elliptical companions into stars, realized that spiral galaxies consisted fundamentally of two distinct populations: Population I in the solar neighborhood and Population II in the globular clusters (and the central bulge of M31). The distinction was locally also evident in the low- and high-velocity stars.

The concept was extended in the next decade to the understanding that Population II was old and in general metal-poor, and Population I younger and more metal-rich. This came mostly as a result of detailed models for stellar evolution beyond the Main Sequence stage, measurements of stellar absorption lines as probes of heavy element content, and the development of the concept of nucleosynthesis.

This development culminated in the famous "Vatican Symposium" of 1957, where the concept was extended to a scheme of five population types with Baade's original two the extreme ones. In addition it was the basis of a synthesis of all knowledge into a picture of the collapsing Galaxy, in which the halo formed first and the disk later on (see Oort's contribution to the Vatican proceedings).

Since then, our understanding and perceptions have changed to the point where the Vatican terminology is no longer adequate. Also, our detailed studies of the distributions of stars and their ages and metallicities have thoroughly destroyed the simple picture of the 1950's, while studies of nearby galaxies and systems at large redshifts have given us many, often conflicting clues concerning the origin and evolution of stellar systems. The existence of dark matter, population and metallicity gradients in galaxies, the occurrence of merging in clusters, sweeping of gas from galaxies, bursts of star formation in distant galaxies, age distributions of stars in Local Group dwarfs, and possible inflow of matter from intergalactic space (to name a few) have a profound influence on our understanding of galactic formation, structure and evolution.

It is the purpose of this symposium to address these matters. The first session was historical and related to the anniversary of Baade's discovery and reviewed events leading up to it,

and subsequent developments until the Vatican Symposium. The second session is devoted to globular clusters, their stellar content, systems of globular clusters in our own and external galaxies, and halo stars in between them.

Then the conference moves on to the galactic disk (open clusters, early type stars, ages, metallicities, chemical evolution) and the transition from disk to halo. How distinct are disk and halo? What is the "thick disk"? Is there indeed infall of gas from intergalactic space? The next session has a detailed look at the stars in Local Group galaxies and addresses issues such as the time dependence of star formation.

Session 5 is entirely devoted to dark matter, reviewing the evidence for it, and the amount of it in the disk of the Galaxy, spiral and elliptical galaxies and clusters. Then follows a session on elliptical galaxies and questions of the amount of young stars (the UV-upturn), population synthesis and gradients of stellar populations and the effects of the environment and merging. Session 7 then moves to larger redshifts, where the structure of galaxies and their populations, evolution as evidenced in faint counts and quasar absorption lines as probes of galaxy formation and evolution are being reviewed and discussed.

The final session will start with an overview of theories of galaxy formation and developments from stellar evolution theory of relevance to the problem. A panel discussion will address the question of the classification and terminology of stellar populations, followed by a summary. The subject of stellar populations encompasses almost all aspects of astronomy and astrophysics.

It is fitting to discuss this in front of a large audience as expected for an IAU General Assembly, and a timely tribute to Baade's pioneering work. The scientific organising committee (of which Gerry Gilmore and I are the chairmen) looks forward to a very exciting meeting.

**PIET VAN DER KRUIT**  
Kapteyn Astronomical Institute,  
Groningen



The Himalayan site of the new radio observatory.

## New Instruments Will Peek from World's Highest Peaks

After years of searching a good observatory site has apparently been found in the high Himalayas in India.

The Ladhak Plateau is a high altitude, dry desert, 4.5 km high, with less than a millimeter of precipitable moisture nearly year-round. Satellite observations over the last three years indicate that cloud-free skies can be expected as often as 300 nights per year. The site is now being intensively investigated by a team from Bangalore; a spot near a place called Hanle appears to meet the necessary logistic demands, and detailed site surveys have been initiated.

A Giant Meterwave Radio Telescope

(GMRT), working from meter to decimeter wavelengths, is nearing completion in India. As seen from preliminary observations, a matching optical/IR facility will be essential, as the existing facilities in India will not fully utilize the capabilities of the GMRT.

Scientific organizations or individuals interested in the project may contact Prof. J. C. Bhattacharyya (pigeon hole #1819) at this meeting, or write to Prof. R. Cowsik, Director, Indian Institute of Astrophysics, Bangalore 560034, India.

**J. C. BHATTACHARYYA**  
Bangalore, India



by **H. DICKEL & Comm. 5 WG**

**H**OW MANY SOURCE ACRONYMS BEGIN WITH KH? Consult the "Interactive Dictionary of Acronyms."

On Internet: telnet simbad.u-strasbg.fr (which is 130.79.128.4); login as "info" (no password). At the "info" prompt, type "cati KH" for the list and follow-up with "-1 cati KHG" for more details and the reference for a specific entry (e.g. KHG).

**W**HERE CAN I FIND THE IAU "specifications concerning names, designations, and nomenclature for astronomical radiation sources outside the solar system"?

Telnet to simbad.u-strasbg.fr, login as "info" and on the info line type "IAU," or look in the yearly indexes of *Astronomy and Astrophysics* (e.g., 1993, A&A 280 A12-15).



## Mergers and Migrations, cont'd.

Carina dwarf galaxy has not only a mixture of types of giant stars, but also a main sequence with at least two turnoffs, indicating multiple generations of stars that have reached different stages of evolution at the present moment.

For the future, new techniques which will help sort out the phases of galactic pre-history include the high resolution capabilities of the Hubble Space Telescope, producing color-magnitude diagrams from data about resolved stars and therefore a clear

chronology, as well as infrared arrays whose data is less susceptible to confusing reddening effects. But, as Hesser pointed out, even low-technology aids like a pair of binoculars, will reveal the globular cluster M 15 in the night sky tonight (despite the light-polluted Hague!). M15 was formed at a time in galactic pre-history represented by a cosmological redshift barely within the horizon of the biggest telescopes!

**PAUL MURDIN**  
Particle Physics and Astronomy  
Research Council, UK.

## Announcements and Tidbits

### Food for Thought

For Thursday, August 18, the luncheon being offered in the elegant dining facilities of the Congresgebouw will consist of:

- Chopped pork
- Pasta
- Vegetable salad
- Choice of drinks (but *you* pay!)

Remember, all of this can be yours for a measly 15 guilders.

You must buy lunch tickets at least a day in advance. They are available at the Social Events desk in the Congresgebouw main hall.

## Late Poster

### For Symposium 166:

E. Hoeg, I. D. Novikov, and A. G. Polnarev, "MACHO photometry and astrometry."

## Resident Artist

Kloot, the artist whose cartoons appear in this paper, is in reality Olaf Kolkman, a graduate student in astronomy at the Kapteyn Institute in Groningen. When he's not busy at the drawing board, Olaf studies the interaction between star formation and interstellar matter in the nearby galaxies M31 and M33. He is an important contributor to the production of the *Sidereal Times*, and drinks more India ink than coffee.

## Popular Lecture Series

The editor respectfully, if immodestly, points out that tonight's public lecture will be "Is There Life Beyond Earth?" This discussion of modern efforts to uncover evidence for intelligent extraterrestrials will be presented by Seth Shostak, of the SETI Institute in Mountain View, California. In order to challenge the local populace, the talk will be in English. Note that the public lectures begin at 8:00 pm in the Museon, a short walk from the Congresgebouw, and cost a modest 7.50 guilders. Lectures conclude by 10:00 pm. You are encouraged to come and ask difficult questions.

## Strip Trip

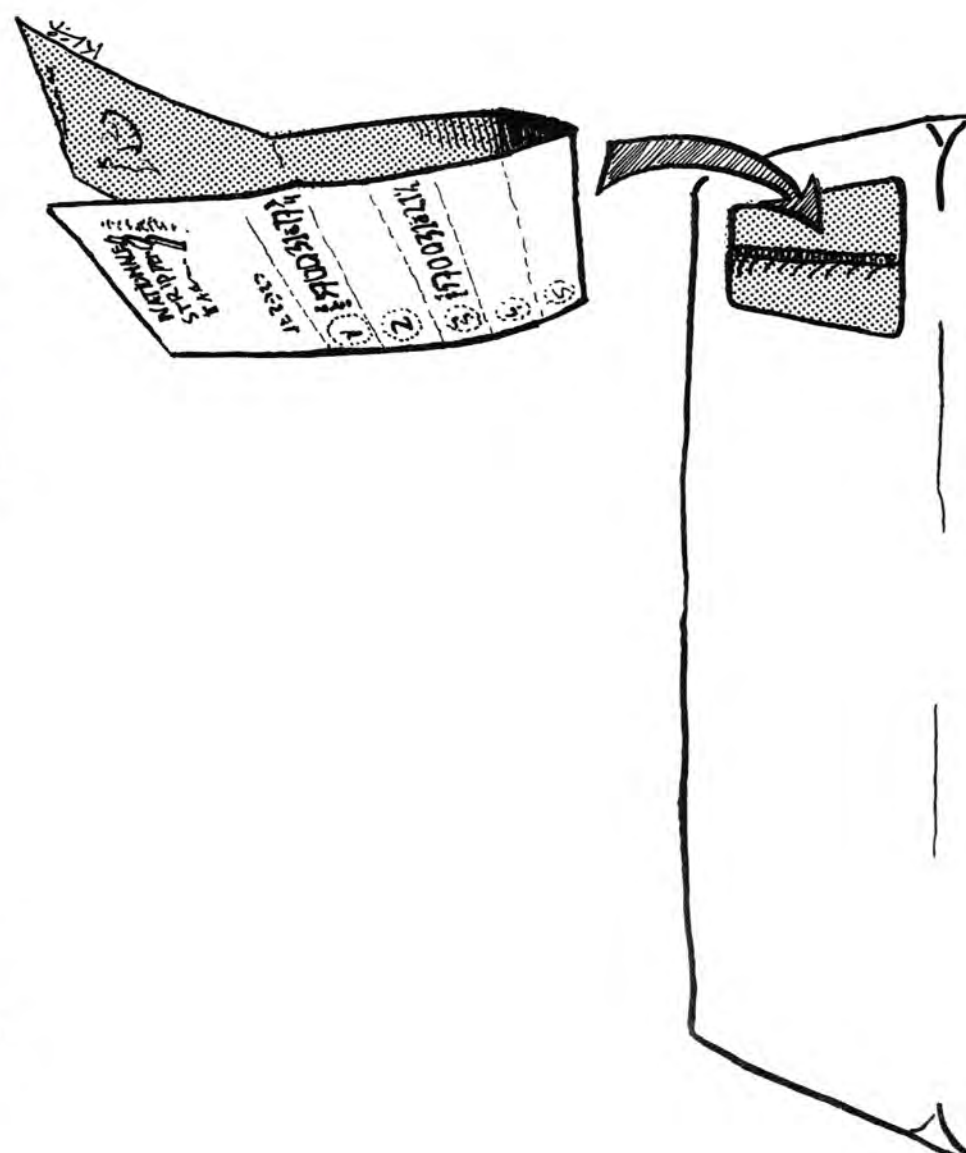
Several IAU participants have remarked that use of the Dutch "strippenkaart" is a bit of a puzzle. The *Sidereal Times*, in the interests of mobility, will try to ameliorate this difficulty by noting the following:

The strippenkaarten are good for transport on trams and busses throughout the country. You can buy them at the Assembly at Congress Desk 1, any railway station, post offices, or in hotels and tobacco shops. The cost is 11 guilders, for which you get 15 "strips."

Use of the cards is intended to be comprehensible to the general public. Ergo, it is undoubtedly also comprehensible for attendees at the General Assembly. Trips cost two "strips" or more; the cost depends on how many

zones you traverse. This can be determined by checking the maps that are posted at bus and tram stops (for your benefit, and also for the benefit of graffiti artist). From the Congresgebouw to Scheveningen, for example, requires the minimum expenditure of two strips. Therefore, as you board the tram, fold your strippenkaart so that when you stuff it into one of the yellow stamp machines on the tram, it marks the strip *two down* from the *last* used strip (see illustration). If you still find this mysterious, have the driver stamp your card for you — you will then see how it is done.

You should also be aware that travelling without a valid, stamped card can result in international embarrassment and, more to the point, a fine.



## LOOKING UP LOOKING DOWN



THE EARLY DAYS PART I

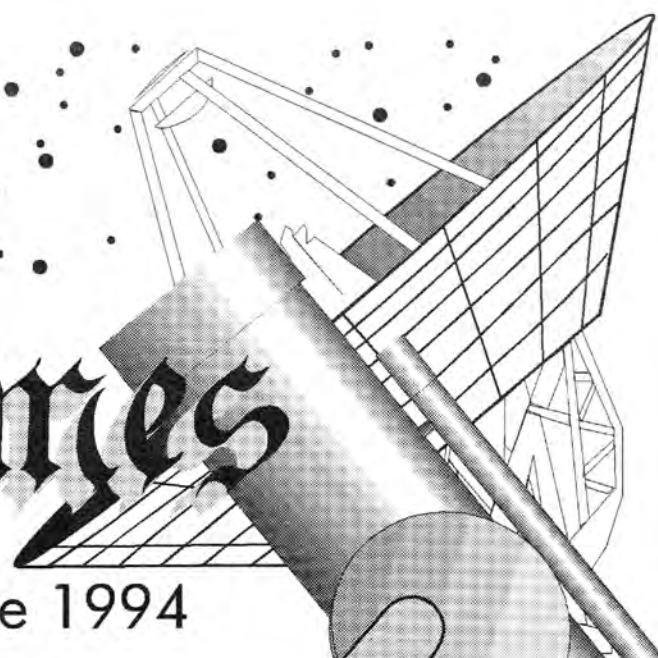


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



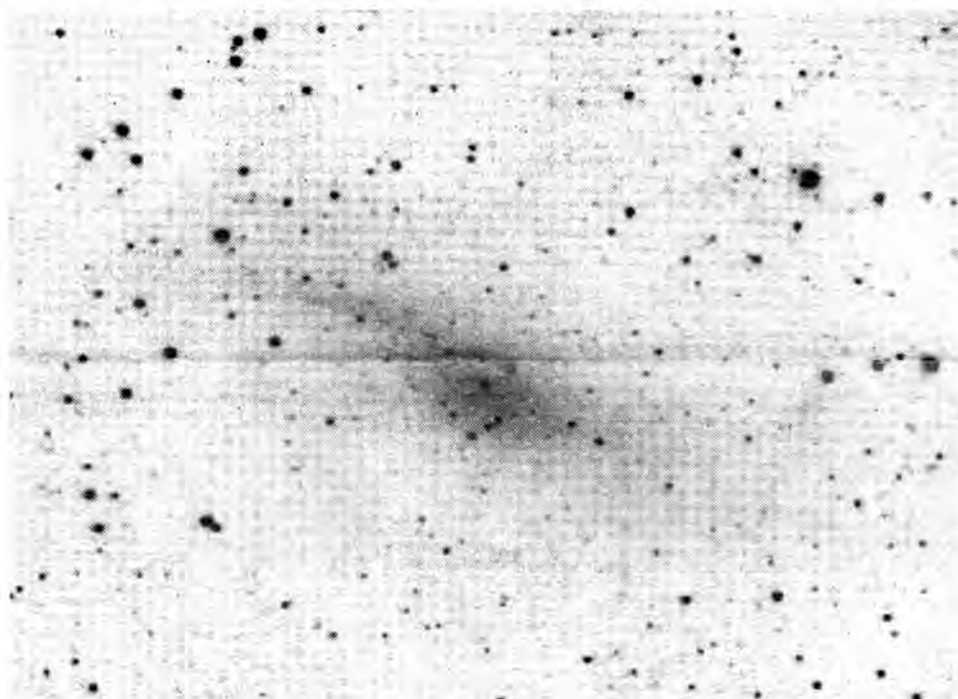
Editor: *SETH SHOSTAK*

Associate Editor: *RENÉ GENEÉ*

No. 3: Thursday, 18 August

## New Nearby Galaxy!

### World's Oldest Radio Telescope Discovers New Galaxy



*Infrared K-band image of the Dwingeloo galaxy, obtained by Remo Tilanus, Colin Aspin, and Tom Geballe at UKIRT. The scale is roughly 3 arcminutes on a side. The image is suggestive of the central core of a (possibly barred) Sb galaxy.*

A large, nearby spiral galaxy has been discovered as part of the Dwingeloo Obscured Galaxy Survey being carried out with the 25-m telescope.

Built in 1956, this venerable old workhorse is being used to find galaxies in the Zone of Avoidance. This was reported yesterday by Butler Burton of Leiden Observatory, representing collaborators Kraan-Korteweg in Groningen, Loan, Lahav, Lynden-Bell at Cambridge University, and Henning and Ferguson in the U.S.

The first hint that the galaxy's neutral hydrogen signature had been detected came on August 4, and by the time of the General Assembly a number of other telescopes had been brought to bear on the suspect. The Westerbork Synthesis Radio Telescope, when tuned to the radio signature of the hydrogen gas, revealed the characteristic patterns expected from a rotating galaxy. The UKIRT in Hawaii obtained a K-band image. Co-workers at Cambridge University identified a faint smudge on a Palomar red plate which shows

that even at the latitude of this object, -0.1 degrees and 138.5 degrees longitude, some light manages to struggle through the obscuration caused by the Milky Way. Burton noted that the Dwingeloo galaxy, which is located about 1.5 degrees from Maffei 2 has a systemic velocity of 256 km/s with respect to the Milky Way.

The Fisher-Tully relationship provides a preliminary distance estimate of 3 Mpc. Burton and his colleagues interpreted their data as indicating an Sb galaxy with a hydrogen mass of order  $5 \times 10^8$  solar masses, which makes this one of the largest nearby spirals, not quite as large as the Milky Way or M31, but with the potential to affect the dynamics of the Local Group. The Dwingeloo galaxy is itself a likely member of a sub-group consisting of IC342 and Maffei 1 and 2, and clearly represents a major new addition to the inventory of nearby galaxies.

GERRIT VERSCHUUR  
U.S.A.

## Solar Research has Bright Future

### Joint Discussion 3

Since the early 1960s, the surface of the Sun has been known to be in a regular pulsating motion with periods of about 5 minutes. While various explanations were offered early on, only in the 1970s was it recognized that these so-called solar oscillations are manifestations of global motions of the Sun about its equilibrium.

Helioseismology is the name of the branch of astrophysics that deals with deciphering these data, which cover the whole range of spherical harmonics from simple radial to very high angular order. Thanks to modern observational data of superb quality (each of the oscillation frequencies is measured accurately to better than one part in ten thousand), our knowledge of the Sun has leap-frogged in the last 20 years. For instance, we now know the run of temperature inside the Sun, and have good information about the internal solar rotation. In regard to the solar neutrino problem, the data from oscillations have become an important test for any model proposing to explain the discrepancy between observed and theoretically predicted solar neutrinos.

Asteroseismology is the effort to extend helioseismic techniques to the stars. What has so far emerged? Nothing really analogous to solar oscillations has yet been found, although several groups have tried to observe them. However, there is progress, and that will certainly be reported at this General Assembly. The principal difficulty comes from the fact that stars are so far away that they are not spatially resolved. Unless one resorts to tricks, such as travelling bumps in spectral lines, the star only reveals the lowest-order modes. Of course, the smaller the number of frequencies is, the less we can infer about the stellar interiors. In other words, the analogy to helioseismology is weaker.

In this situation it is wise to look at the existing multi-periodic variable stars to gather experience. Such multi-mode variable stars do indeed exist. Essentially there are three classes of such stars: 1) Pulsating white dwarfs, 2) Rotating Ap stars, 3) Delta Scuti stars. Although the aforementioned objects already marginally qualify for asteroseismology (in the eyes of some researchers, at least), there is tremendous interest in seeing oscillations of solar-like stars. We could learn how average (or peculiar) our Sun really is.

We are interested in stars that are superficially similar to the Sun. Asteroseismology could reveal if these stars also resemble the Sun in their interior. Such information would have a tremendous impact on the theory of stellar evolution.

WERNER DAPPEN,  
University of Southern California

## David Allen

All members will be sad to know of the death of David Allen, after a brave battle against cancer.

He was a graduate of Cambridge University, but spent much of his career at the Anglo-Australian Observatory at Siding Spring. His researches extended over many fields, but his most lasting contributions were in infrared astronomy, where he not only carried out important observations but designed and used new equipment.

Quite apart from this, he was a splendid writer of popular books and articles as well as technical publications — and he was also a first-class broadcaster on radio and television.

David Allen was only 47. He had many friends, and no enemies; his death leaves a gap which cannot be filled — and he will never be forgotten.

PATRICK MOORE



## THE GREAT COMET CRASH

Just one month ago we all witnessed an event unique in the history of astronomy — the collision of two solar system bodies. Between 16 and 22 July, more than 20 fragments of Comet P/Shoemaker-Levy 9 impacted the far side of Jupiter, just out of direct line-of-sight from the Earth. The energy from each of these impacts amounted to millions of megatons (TNT equivalent).

If a similar event had happened on this planet, it would have precipitated severe environmental collapse and possibly a mass extinction.

The worldwide astronomical community mounted an observing campaign of unprecedented magnitude to study the impacts and their effects upon Jupiter. For a 2-week period, nearly every telescope on the Earth, not to mention orbiting observatories and the Galileo probe, were focused on Jupiter. Before the impacts took place, we had no idea whether the events would be easily visible. As it turned out, they were spectacular beyond our highest expectations, and the large and persistent scars on Jupiter were visible even in small, amateur telescopes.

The timing of the present General Assembly could hardly be better for receiving initial reports from these observing programs. During the impact events themselves, much of the preliminary data were made available via internet, and there was widespread discussion in the press. This publicity stimulated interest in the events but did not in itself yield much in the way of new scientific knowledge.

Now, however, after several weeks of examining the data, astronomers are able to compare their observations and begin to draw some tentative conclusions.

This first opportunity for observers and theorists to present both data and

results will take place here in The Hague on Thursday and Saturday of this week.

A special Seminar on the comet collision is sponsored by Commissions 15 and 16. The Chair of the Organizing Committee is Catherine de Bergh (VP Comm. 16), supported by Mike A'Hearn (VP Comm. 15), Alan Harris (Pres. Comm. 15), and David Morrison (Pres. Comm. 16).

The special sessions will be held on Thursday afternoon (Room Jan Steen), replacing the second half of JD 2, and Saturday afternoon (Room Rembrandt). The program includes presentations of results from the Hubble Space Telescope, the Galileo mission, the NASA Kuiper Airborne Observatory, the UKIRT, Keck, and IRTF telescopes on Mauna Kea, the European Southern Observatory, Pic-du-Midi, NOT, Calar-Alto, and various radio observatories. An attempt to reconcile these observations with theory will also be given by Kevin Zahnle.

For those who will come to the session on Saturday but may not be able to attend on Thursday, Mike A'Hearn will include a summary of the first session at the beginning of the Saturday meeting. Various observers are also welcome to remain after the sessions on both days to compare notes and try to resolve any possible areas of contradiction.

While these sessions may be a little hectic, we expect that they will provide a stimulating opportunity for us all to see and participate in an ongoing research effort, dealing with a phenomenon never seen previously.

DAVID MORRISON  
NASA Ames Research Center  
Mountain View, California

### Special Session on the Collision of Comet Shoemaker-Levy 9 with Jupiter

Thursday, August 18, 1994 (14h - 18h 20 — Room Jan Steen):

- 14h: Overview of the event (M. A'Hearn)
- 14h 45: Hubble Space Telescope visible imaging during the crash (H. Hammel et al.)
- 15h 10: Results of UV imaging with the Hubble Space Telescope (J. Clarke et al.)
- 15h 35: The altered composition of Jupiter's atmosphere after comet SL-9 from HST, UKIRT and IRTF spectroscopy (K. Noll et al.)
- 16h 15 - 16h45: Coffee Break
- 16h 45: Keck observations of the SL-9 impact on Jupiter (I. de Pater et al.)
- 17h 05: Near-infrared spectroscopic monitoring of Jupiter at the time of the SL-9 impact from ESO-NTT (R. Schulz et al.)
- 17h 25: Near-infrared imaging from ESO (K. Jockers et al.)
- 17h 40: 10-micron imaging from NOT and ESO (P.O. Lagaga et al.)
- 18h: Continuous monitoring with the IUE satellite of the Jovian upper atmosphere during the Shoemaker-Levy 9/Jupiter collision (W. Harris et al.)

Saturday, August 20, 1994 (14h-18h20 - Room Rembrandt):

- 14h: Overview of the event (Repeat) (M. A'Hearn)
- 14h 45: Summary of the presentations of August 18

## The Status of Archiving Astronomical Observations

The practice of keeping records of astronomical observations commends itself strongly nowadays. Examination of the history of sudden events and abrupt changes, or the refinement of long-term periodic orbits and their elements, is impossible without the preservation and accessibility of past observations, and signatures of evolution itself can be detected if the time-base is sufficiently long.

The availability of observations derived from different types of instruments provides an opportunity to expand and improve knowledge that has been acquired from a more restricted project; it also creates possibilities for teaching, hardware and software development, simulation experiments, etc., not to mention safeguarding against accidental loss. Once regarded as an optional extra, demanding additional resources and therefore difficult to justify as a stand-alone venture, the practice of saving observational data is nowadays becoming accepted as an essential ingredient in astronomical design, mission and research. Recent advances in computer technology render it feasible, even easy.

It is important to recognize the fundamental differences between a *database* and an *archive*. A telescope in space, for instance, sends back everything generated by its instruments into an observations database. Such a database therefore includes, separately and in raw format, each individual component that is necessary for converting the observations into intelligible units (i.e., calibration of pixels into frequencies, photon counts into absolute fluxes, etc.). A database is therefore a *sine qua non* for the creation of an archive, but the latter is not synonymous with a database. An astronomical archive consists of a selected subset of its database, calibrated as far as is reasonable within a generalized framework, supported by sufficient documentation, keywords or com-

ments to provide basic information about its contents, and readily accessible. Both a database and an archive are objective entities.

Neither constitutes information or knowledge, which are subjective; *information* embraces measurements made on the observations and is the main ingredient of catalogues of quantities like source positions and parallaxes and centres like the CDS and the ADC, while *knowledge* is the wisdom derived from interpreting information.

The word *data* is frequently applied too loosely to an observation at each and every stage or even to anything digital, and therefore requires a qualifier such as *raw data*, *reduced data*, *data bank*.

The IAU recognizes astronomy's basic need to pursue archiving policies where feasible, and has set up Working Groups in three major areas — Radio Astronomy, Wide-Field Imaging and Spectroscopy — to investigate the requirements of the different activities. All three WGs have done their best to encourage, persuade and educate in their respective fields, and with the turning of the world tide of opinion in their favor they have achieved considerable progress, given that their members act only as volunteers in a non-executive capacity.

The time is now ripe to discuss the incorporation of global efforts into an official enterprise, to be led by a modest number of experts in the necessary skills, and possibly seconded from existing agencies, and acting under the auspices of an impartial organization like the IAU. The Joint Discussion to be held on Wednesday August 24 will focus on these matters of policy and principle, and your participation is warmly invited.

ELIZABETH GRIFFITH  
Cambridge, U.K.

- 15h: Observations of the Jupiter's synchrotron radiation throughout the SL-9 impacts (I. de Pater et al.)
- 15h 20: Review of Calar Alto imaging, photometry, and spectroscopy of the SL-9 impacts (T. Herbst et al.)
- 15h 30: Calar Alto results from the A and Q impacts (D.P. Hamilton et al.)
- 15h 45: Results from IRTF imaging (M. A'Hearn et al.)
- 16h: 0.35-1 micron imaging and 0.67-1 micron spectroscopy of impact sites at ESO (K. Horne and R. Schoenmakers)
- 15h 15-16h 45: Coffee Break
- 16h 45: Imaging and spectroscopy from La Palma (I.P. Williams et al.)
- 17h: Pic-du Midi spectroscopy and imaging (M. Roos et al.)
- 17h 20: Millimetric observations from JCMT and IRAM (Owen et al., Lelouch et al.; report by C. de Bergh)
- 17h 35: KAO observations (report by D. Morrison)
- 17h 50: Models of the comet collision (K. Zahnle)

Organizers:

C. de Bergh, D. Morrison, M. A'Hearn and Harris.



## SYMPOSIUM 166: High Accuracies and High Expectations

The last decade has witnessed tremendous achievements in astrometry.

While most classical ground-based astrometry (meridian circles, astrolabes, astrographs) continue to cope with precisions of the order of 0.1 arcsec or more, Hipparcos is now producing positions, annual proper motions, and parallaxes to better than 1.5 mas (milliarcseconds) for more than 100,000 stars. Tycho will provide somewhat less accuracy for a million stars. Very long baseline radio interferometry (VLBI) is now well under the milliarcsecond precision for 400 radio sources. Ground based optical interferometry also works in the range of a few mas. The symposium will review these achievements during the first two half days, with an emphasis on interferometry, Hipparcos and the Hubble Space Telescope.

The astronomical and astrophysical consequences of these advances will be one of the main driving forces in the progress of stellar astrophysics and galactic astronomy during as the century ends. As examples, one could mention for the field of galactic dynamics important contributions to the following problems: determination of the local expansion of the Galaxy, tests between spherical and cylindrical models of the galactic potential, assessing the reality of the Gould belt and other kinematic structures, recognition of various types of stellar population, etc. Velocity and distance distributions and the luminosity function will be the major tools to reach these goals. Similarly, new stellar masses, absolute luminosities of a large number of different stellar types as a function of metal content, rotation, temperature, and gravity will be the inputs for major developments in stellar structure and evolution theories. Many examples could be given in other domains such as open clusters, the cosmic distance scale, search for brown dwarfs, dark matter, etc.

But this is only a prelude for larger and more fundamental advances in

astrometry. Hipparcos is a product of 1980's technology. So is the Hubble Space Telescope. Only a very small portion of the Galaxy is accessible with sufficient accuracy with these instruments. The figure shows the distribution in distance of stars in the Hipparcos program compared with the mean error in distance which is expected for single stars. Even taking into account the statistical improvement when considering many stars of the same type or at the same distance (clusters), the limitation will be in any case of the order of 1,000 parsecs.

So, there is much to be gained with better data. Now, with CCDs, interferometric techniques, high speed receivers, and on-board data processing, it is becoming possible to build satellite instrumentation which can achieve accuracies of  $10^{-4}$  to  $10^{-5}$  arcsecond for several tens of hundred million stars up to magnitudes of the order of 17 to 20. Current projects will be presented during the last day of the symposium.

But the core of Symposium 166 is devoted to the scientific opportunities that these new prospects will allow. An increase of a factor of 20 to 100 in precision, and 100 to 10,000 in the number of measurable stars will indeed change a lot.

A major fraction of the Galaxy will be surveyed for trigonometric distances, proper motions and double star dynamics. Astrometry will reach significant results not only for the Magellanic Clouds but also for the local group of galaxies. For all types of stars, including the supergiants, precise absolute luminosities will be obtained and many more masses will be derived. Direct dynamical data on black matter and MACHOs will be obtained. These topics, and some others, will be described in more than thirty presentations and some posters. The subjects will include stellar astrophysics, binaries, stellar populations, the search for extra-solar planets and dark matter, galactic kinematics, dynamics and evolution, clusters,

Magellanic clouds, the cosmic distance scale, reference frames as well as consequences for the study of the solar system or Earth's motions.

In conclusion, this symposium is, one might say, a preview for astronomy of the first part of the 21st century, and we hope that the dreams that will be presented here will soon become reality.

JEAN KOVALEVSKY  
Observatoire de la Cote d'Azur  
France

### A Personal View

When one considers the developments in space astrometry — the success of Hipparcos, the Hubble Space Telescope, the AiST Project in

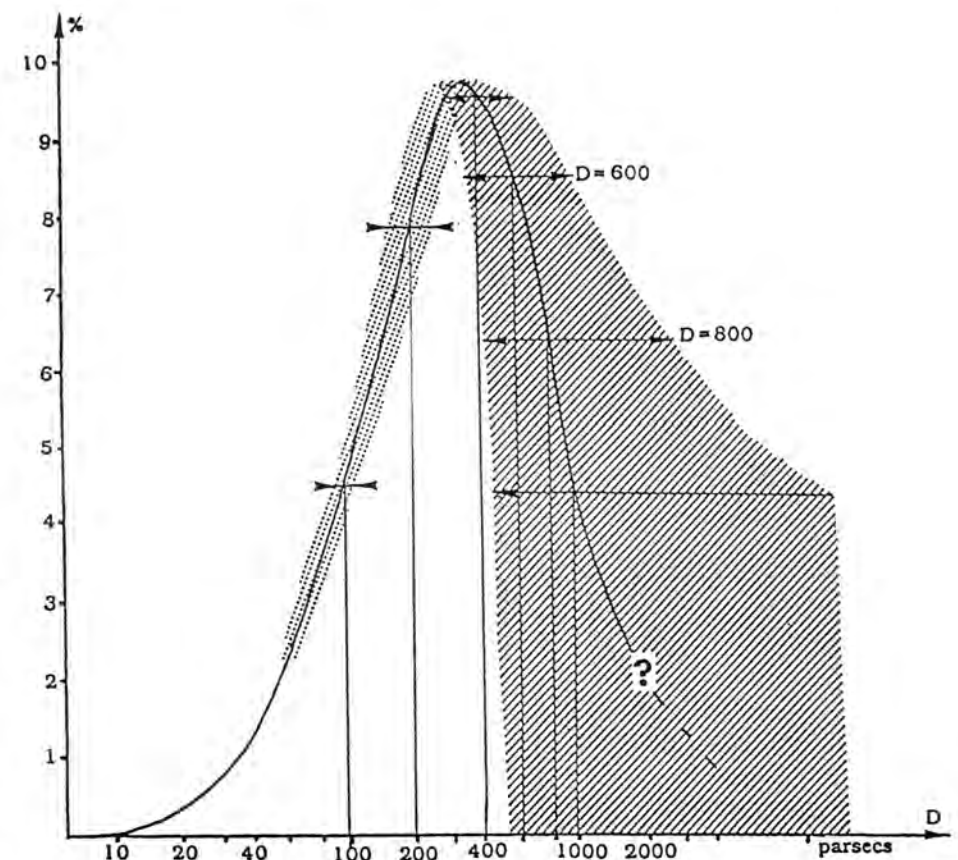
Pulkovo, etc. — astrometrists are justified in reconsidering their plans for future investigations. Clearly, preference should be given to projects that will make some kind of significant addition to the results obtained via space astrometry.

However, at first it will be necessary to make comparisons between classical astrometry and the new methods of space astrometry.

For this reason, during the next decade it will be important to continue traditional observations, using the meridian and photographic instruments, including the newer ones. After that, only those programs will be continued that can be considered as supplemental programs to the space astrometry efforts. This is my point of view on the future developments of classical astrometry.

DIMITRY POLOJENTSEV  
Pulkovo Observatory

*The figure shows the distribution in distance of stars in the Hipparcos program compared with the mean error in distance*



### CURRENT DEVELOPMENTS IN ASTRONOMY EDUCATION

The health of astronomy is profoundly affected by the quality and quantity of astronomy education. Education plays a direct role in attracting and training the next generation of astronomers. It contributes to the awareness, understanding and appreciation of astronomy among the taxpayers who support us.

Education is the specific mandate of only one of the IAU's 40 commissions: Commission 46 (The Teaching of Astronomy), and it is the topic of only one of the many symposia and meetings at this General Assembly: JD4 ("Current Developments in Astronomy Education").

Some of those developments are technological. Computers, electronic databases and networks have an increasing impact on education in all fields, at all levels. Textbooks are being supplemented by video and CD-ROM material, or replaced by multimedia "electronic textbooks". CCD's have become simple and inexpensive enough for school and amateur use, and software, manuals and activities have been developed for educational settings.

As well, there are conceptual developments, such as research which shows that school children (and therefore adults) have serious misconceptions about even the simplest astronomical topics: gravity, light, seasons and moon phases. These misconceptions can be overcome by carefully designed, activity-based curricula, such

as the US Project STAR (Science Teaching through its Astronomical Roots).

International development of astronomy is a major concern of the IAU, and many of Commission 46's programs are aimed at the developing world. The hope is to share the educational and research successes of the astronomically developed countries with those less fortunate. The means of doing so must be very carefully tailored to the specific nature and needs of the targeted countries.

The most remarkable achievements in astronomy education often consist of creative exciting programs and projects developed by enthusiastic local groups or individuals. Thousands of amateur astronomers work to organize "International Astronomy Day", to bring astronomy to the public.

Community groups develop plans for a local planetarium or science center, which acts as a focus for astronomy education. Imaginative, dedicated teachers develop astronomy curricula, and creative astronomers (both amateur and professional) write books, produce radio or TV programs, to "spread the word". In the developing countries, one lone astronomer often does all of these things.

Astronomy educators form a worldwide network of "kindred spirits", dedicated to improving knowledge and appreciation of astronomy. At JD4, these kindred spirits (and all who wish to join them) will gather to celebrate recent achievements, and to plan for the future.

JOHN R. PERCY  
University of Toronto, Canada



# Announcements and Tidbits

### Food for Thought

The gourmet offerings reported to us for the Congresgebouw lunch on Friday, August 19, are as follows:

- Fish
- Mashed potatoes
- Carrots
- Choice of drinks (not included)

Once again, this not-easily-forgotten dining experience is available to all for a modest 15 guilders.

You must buy lunch tickets at least a day in advance. They are available at the Social Events desk in the Congresgebouw main hall.

### JOINT COMMISSION ("BUSINESS") MEETING: Friday, 19 August, 11:00 - 12:30 Co-sponsored by Commissions 15, 20 and 22

During the last triennium, two leading astronomers in the field of comets, minor planets, and meteors passed away. Jan Stohl, then President of Commission 22, Director of the Tatras Observatory, and Vice-President of the Slovak Academy of Sciences passed away on March 21, 1993. He specialized in meteor astronomy, particularly the dynamics of meteor stream orbits. Lubor Kresak, a past-President of both Commissions 15 and 20, and acting President of Commission 22, and a Vice-President of the IAU from 1979 to 1985, passed away on January 20, 1994. Kresak's specialty was the interrelationships between meteors, comets and asteroids.

Commissions 15, 20 and 22 will pay tribute to these two leaders in a joint session of scientific papers highlighting some of the recent developments in topics relevant to the fields of interest

to Stohl and Kresak. Following is the program as currently planned:

Session Chair: A. W. Harris, President, Comm. 15

- Tribute to J. Stohl (5 min)  
I. P. Williams, Acting President, Comm. 22
- Tribute to L. Kresak (5 min)  
A. Carusi, President, Comm. 20
- Meteor-Comet Relationships (15 min)  
A. Hajduk (Slovakia)
- Meteor-Asteroid Relationships (15 min)  
D. I. Steel (Australia)
- Comet P/Shoemaker-Levy 9 (15 min)  
D. K. Yeomans (U.S.A.)
- Trans-Neptunian objects (15 min)  
I. P. Williams (U.K.)
- (243) Ida and its satellite (15 min)  
D. Morrison (U.S.A.)

### New Meetings

Space Interferometry Science Working Group, Chaired by Deane Peterson, will meet on Thursday at 14:00. The ESA Committee, chaired by Chris Dainty, will also meet on Thursday at 14:00.

### Missing Boards?

The black boards that give the updated agendas for sessions are located in the Paulus Potter room, downstairs (where the posters are situated). You will find the all-important boards to the back and to the right.

### Appointment of the Resolutions Committee

The Executive Committee proposes the establishment of a Resolutions Committee under the chairmanship of Dr. J.-C. Pecker, with Drs. M. F. McCarthy, J. Sahade, J. Smak, P. Wayman, and B. Yallop.

## Popular Lecture Series

Tonight's public lecture is by Professor Herwig Dejonghe, from Ghent in Belgium, and is entitled "Invisible Matter in the Universe." As always, this offering -- designed to bring some of the excitement of contemporary research to the general public -- will be held in the Museon, a few hundred meters from the Congresgebouw's blocky blue edifice.

You may join the throngs by showing up at 20:00 this evening, and paying the rather small sum of 7.50 guilders. Incidentally, this talk will be in Dutch, in deference to the locals. Given the subject matter of Dejonghe's presentation, you should expect good visual aids.

## Strip Trip Part II

Could it be that the folks who print the *Sidereal Times* have never used a strippenkaart? To our editorial embarrassment, yester-

day's illustration on the use of these cardboard passports was published upside down. Either that, or the illustration was published correctly and the rest of the paper was printed upside down.

We trust that Assembly attendees, and particularly the Australians, have already figured this out. Our apologies.

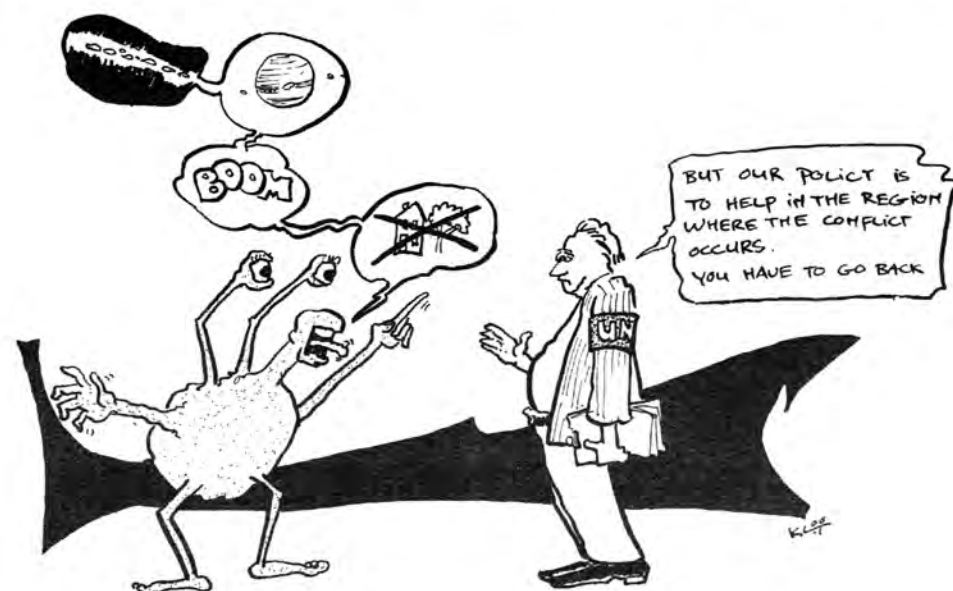
## Late Posters

### Symposium 164:

- 164.152 T. K Chatterjee, "Enhanced Star Formation in Binary Interacting Elliptical Galaxies"
- 164.145 A. Arellano Ferro, L. Parrao, L. Mantegazza, "Supergiant Stars as Tracers of Galactic Chemical Composition"
- 164.146 G. De Marchi, F. Paresce, M. Romaniello, "Sifting Through the Ash Heap"
- 164.151 B. M. Poggianti, G. Barbaro, "Determination of Young Population Ages in Cluster Galaxies"
- 164.153 A. Vallenari, G. Bertelli, C. Chiosi, S. Ortolani, "The History of Star Formation in the Large Magellanic Cloud"
- 164.154 T. P. Stecher, "The Ultraviolet Imaging Telescope: Past and Future Results from the Astro-1 and Astro-2 Mission"

## Jovians No Longer Jovial

It seems that Earth's gain is Jupiter's loss. While many astronomers, including some of the readers of this publication, have benefitted from the recent comet suicide, there are other, flatter beings that have had their entire day ruined by the event. As you can see from the publication below, the Jovians have appealed to Earth for help. Dutch organizations have established a Giro number for contributions to aid our bilious buddies on Jupiter. Others who may wish to financially aid these victims of solar system aggression should bring their checks and cash to the offices of the *Sidereal Times*. No methane, please.



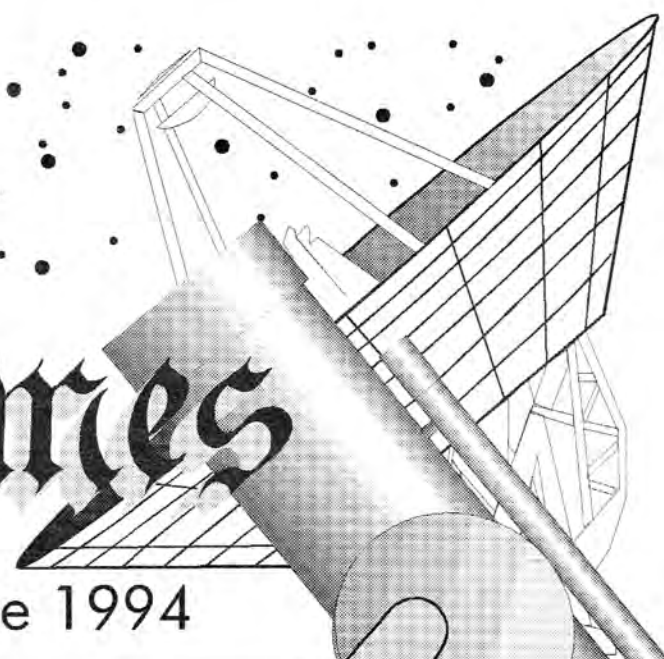


The

# Siderial Times



XXIInd General Assembly - The Hague 1994



Editor: SETH SHOSTAK

Associate Editor: RENÉ GENEÉ

No. 4: Friday, 19 August

## Faster Than Light?

### Superluminal Motions in the Galaxy

Researchers using the Very Large Array have reported the first apparent superluminal motion ever detected in our Galaxy. Due to relativistic time dilation effects, the observed plasma clouds appear to be moving at 125% the speed of light.

Felix Mirabel (Saclay, CEA,

France) and Luis Rodriguez (UNAM, Mexico, and NRAO) observed a remarkable ejection event from a compact source of gamma-rays known as GRS 1915+105. The discoverers infer that material has been shot out in opposite directions at physical velocities of 92% the speed of light. Such powerful ejections are known in distant quasars, but the object found here is a black hole or neutron star within our own Milky Way Galaxy.

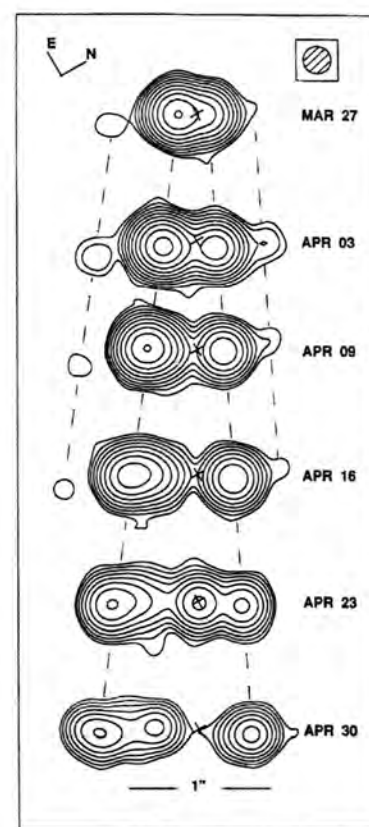
Because of its proximity, this "superluminal microquasar" may now offer the best opportunity to gain a general understanding of relativistic ejections seen elsewhere in the universe.

At a distance of 12 kpc, as determined by Mirabel and Rodriguez on the basis of HI absorption, GRS 1915+105 frequently becomes the most powerful X-ray source in the Galaxy, with a luminosity of ~10 times that of the classic stellar black hole candidate, Cygnus X-1.

GRS 1915+105 appears as a scaled-up version of the famous stellar radio jet source, SS 433, once believed to be unique in the Galaxy. However, GRS 1915+105 is capable of more powerful ejections: plasma clouds having masses ~1/3 that of the Moon at 92% the speed of light.

The researchers expect that ejecta with superluminal expansions will now be found not only in distant quasars, but also in high energy sources of stellar mass in our own cosmic neighborhood.

The results will be published in the September 1st issue of *Nature*.



Pairs of plasma clouds moving away from the high energy source GRS 1915+105. These maps were made at the Very Large Array at 3.5 cm wavelength, with a beam size of 0.2" and a positional accuracy of 0.02".

## Queen Attends *Our* Inauguration

Her Majesty Queen Beatrix of the Netherlands honored the Assembly with her attendance at the Inaugural Ceremony on Wednesday. She was officially welcomed by professors van den Heuvel and van Woerden. Griet Van de Steene, now finishing her thesis at the University of Groningen, offered a traditional floral bouquet to Her Majesty as she entered the Congresgebouw.

After the ceremony, the Queen was invited to the exhibition area, and was introduced to some of the participants. She expressed great interest in the latest developments in astronomy, and was less than strict in sticking to a very tight schedule that would have had her leave somewhat earlier.

Queen Beatrix is one of the best-loved monarchs in Europe. Her charm, grace, and interest in the world's oldest science impressed all in attendance.



Astronomy graduate student Griet Van de Steene welcomes Queen Beatrix with a spherically symmetric assortment of flowers.

The Queen speaks with Professor Ed van den Heuvel, of the University of Amsterdam, before the opening ceremonies begin.



## Astronomy's Future to be Decided Saturday!

Don't forget that an extra meeting is planned for Saturday afternoon, 20 August, 14.00 to 17.30, in meeting room Mesdag 1, to discuss strategies for "Future Large Scale Facilities in Astronomy." Plans for a number of proposed but as yet unfunded large observing facilities will be presented, and the necessity of, and the strategies chosen for the international collaboration necessary to make them happen will be discussed.

The climate for financing science is changing rapidly in many countries. A notion commonly encountered in government policy-making circles these days is that we are moving to a future situation where only one large observational facility in the world of each type will be affordable. For political reasons we astronomers should perhaps not reject this idea out of hand, but consider how we might react in a constructive way to ensure the next generation of astronomers also has access to advanced facilities in all wavelength regions.

The mechanisms of international cooperation to develop joint facilities have evolved since the 1960's. Have we found the right mechanisms for major collaborations, or are there other possibilities? Can an approach be found to help us maintain strong national programs while also providing for very large telescopes through international consortia?

Consensus has proven an important element in obtaining support for national projects. Should we try to reach consensus on a world-wide basis, possibly with a role for the IAU or for the OECD Mega-Science Forum, on which facilities should be planned for, and in which order, during the early decades of the new century?

The meeting on Saturday afternoon will provide a forum to consider these matters. A detailed program of speakers will appear in Saturday's *Siderial Times*.



## Yes, Virginia there is a SETI!

Today, there are three SETI observing programs on telescopes around the world, a fourth is about to come back on line, and Project Phoenix is rising from the ashes.

The Berkeley piggyback program SERENDIP is at Arecibo, the Planetary Society's META SETI is at Harvard and META's clone continues from Argentina. The long-running sky survey at Ohio State will soon be back on the air, and all these systems have upgrades in their future. That's four.

What about NASA's big SETI program — the High Resolution Microwave Survey that encompassed both a Sky Survey from 1 to 10 GHz and a Targeted Search of a thousand nearby solar-type stars from 1 to 3 GHz? Dead; the victim of Congressional budget slashing. Senators proved their fiscal prudence to the folks back home by eliminating the \$10M for HRMS from the FY 93 budget! So much for its 10-year observing program. So much for intelligence in Washington!

Fortunately for those who believe that SETI is important, there is intelligence and vision among the wealthy individuals who pioneered the hardware and software that ultimately makes SETI possible.

## No Planets Yet Around Normal Stars

Many planets "discoveries" have been announced in the past. Yet, despite increasing precision in both astrometric and radial velocity surveys, there is still no conclusive evidence for planets beyond our own solar system, except for the pulsar planets.

In fact, Geoff Marcy reported to the audience at Joint Discussion 2 that radial velocity surveys of more than 500 stars have not yet yielded detections even of brown dwarfs! The observations of a handful of low-mass companions can be understood as being stellar companions observed at high inclination angles.

Dr. Marcy concluded that fewer than 1% of single main sequence stars can have brown dwarf companions

Project Phoenix is a continuation of what would have been NASA's Targeted Search. Alas, the Sky Survey was too intimately dependent upon NASA's DSN telescopes to successfully make the transition to private funding. Since October of 1993, the SETI Institute has raised \$7.5 million to continue the search. In January of 1994 it will deploy the old NASA equipment, now more than doubled in capability, to Australia where it will search the southern target stars using antennas at Parkes and Mopra continuously for 5 months.

Meanwhile, the SETI Institute will continue working to establish an endowment so that the remaining goals of the old NASA Targeted Search can be completed by the end of the decade. Such an endowment will at last provide a stable source of annual funding for systematic, exploratory programs seeking evidence of other technologies.

Will they succeed? I would not bet against the fundraisers, and if (as this author believes) there are Alien Astronomical Unions somewhere out there, then eventually the searches will also succeed.

JILL TARTER  
SETI Institute  
Mountain View, California

within 5 AU. Extremely high precision radial velocity observations (to 20 m/s) of about 30 stars carried out by several groups also have negative results, indicating that < 5% have "planetary" companions with masses greater than 3 Jupiters.

George Benedict reported that HST astrometry has also failed to detect evidence of planets orbiting two of the nearest stars, Proxima Centauri and Barnard's star. All these reports suggest that planetary systems are difficult to detect and may, in fact, be rarer than optimists have in the past suggested.

DAVE MORRISON  
NASA Ames Research Center  
Moffett Field, California

## New Turkish Observatory Seeks Collaboration

The Scientific and Technical Research Council of Turkey is developing a site at 2,500 m altitude with excellent seeing at Bakirlitepe, near Antalya, for a national observatory. The road and power lines to the summit will be ready at the close of the summer, and construction for a first small dome to house a 40 cm telescope from Utrecht will begin next summer.

The Turkish Astronomical Society is seeking collaboration with universities and observatories, offering infrastructure and observing time in exchange for telescopes and equipment. An agreement already exists with the Engelgardt Observatory, Kazan, Russian Federation to install their 1.5 m telescope.

Please contact Ali Alpar, Chairman, Turkish Astronomical Society, for further information and for a paper describing the seeing statistics at Bakirlitepe.

Ed van den Heuvel greets the Queen.



## Talk Tips!

Insiders have reported to this publication the sad fact that a few attendees have not yet learned the rudiments of public speaking. In the interest of improving the presentations of all speakers, and particularly those whose talks are more conducive to sleep than to thought, the *Sideral Times* offers the following talk tips:

Your talk should have three parts: a clear, not-too-short introduction to the problem (if your first slide is of a dome on a cold mountain top, you probably haven't explained the astronomical problem), what has been done to address the problem, some details of the research (this section includes the more boring stuff, but don't stoop so low as to include the calibration), and the grand finale, your conclusion.

Remarkably enough many speakers assume explication of the problem is implicit in the title of their talk, speed through every single observational detail and run out of time before getting to the conclusions. This leave only the boring part. Your listeners will curse you in the public lavatories.

Overhead sheets, poorly prepared, are a curse on mankind. Use no more than 10 to 15 lines per sheet. You will

## Isaac Newton Institute Branch in Moscow

The Isaac Newton Institute, a Chilean private institution for astronomical research founded in 1978 by Gonzalo Alcaïno, has recently opened a branch in Moscow. The group is composed of seven scientists from both the Sternberg Observatory of Lomonosov University, and the Institute of Astronomy of the Academy of Sciences. It works under the local direction of Nikolai Samus and has the sponsorship of the President of the Russian Academy of Sciences. Fundamental research topics include the study of globular clusters in both the Galaxy and the Magellanic Clouds. Most of the data are obtained at ESO, La Silla, by the Isaac Newton staff in Santiago.

GONZALO ALCAÏNO  
Santiago, Chile

not be excused just because you offhandedly remark "I know you probably can't read this table in the back..." Give the yellow, pink and orange pens to your kids or to one of the many aspiring Dutch graffiti artists. The common trick of sliding opaque material down the sheet to dramatically reveal new truths is guaranteed to make enemies.

Finally, speak to the entire hall, not just to the unfortunates in the first five rows.

## JD 6 Handles Hot Stuff: Sun and Heliosphere

Joint Discussion 6 covers an interdisciplinary topic that goes somewhat beyond what astronomers normally deal with: the Sun and the Heliosphere.

The discussion in general addresses challenges for solar-terrestrial physics, magneto and hydrodynamics.

Some of the papers deal with in-situ measurements rather than the familiar remote-sensing observations. Such measurements in the terrestrial magnetosphere (the most accessible cosmic plasma), in the solar wind and in the heliosphere in general are the basis of three papers on 'non-equilibrium processes' (based on actually measured deviations of particle populations from Maxwell distributions), on 'fractionation of the solar wind' and on 'acceleration processes in heliosphere'.

The one-day meeting will, of course, also contain papers based on remote sensing: there will be reports on 'irradiance variability and luminosity changes of the Sun', on a 'unified view of the structure of the solar magnetic field' and on the 'magnetodynamics of the solar corona' (especially as observed by Yohkoh).

The Discussion is organised in three main topics:

I. Global Effects of the Solar Magnetic Field

II. Plasma Heating and Acceleration of Particles, and

III. Heliosphere and Earth as Cosmic Sensor,

where the last topic, in a way, closes the cycle.

The third and last part will consist of a presentation on the 'modulation of the cosmic radiation and its manifestation of cosmogenic isotopes' and — to highlight the gaps in our understanding of the influence of the magnetic field — a discussion, led by Peter Foukal on the question: 'is the cosmogenic isotope variation connected to solar irradiance variations, and if so, how?'

If recent developments, as, for example, helioseismology are a guide, the detailed investigation and comprehensive study of our 'cosmic habitat' is of broad interest to astronomy: in this case it concerns the deeper understanding of Sun and heliosphere - a paradigm of stellar and circumstellar astronomy.

C. BINGHAM  
ESA, ESTEC  
The Netherlands



## Distant Eclipses Could Reveal Planets

**A**t a morning session on August 16th, David Morrison described a possible method of detecting Earth-sized planets round solar-type stars. The transit of such a planet across the star would produce a drop in magnitude which, of the order of 0.008 % for an Earth-sized planet, is within the limits of detectability with CCD equipment used from space.

Dr. Morrison said that it was clearly essential to monitor a large number of stars over a long period, since the chance of suitable alignment for the transit of a planet such as Earth or Venus was only about half of one percent. But if, say, 5000 suitable stars could be monitored simultaneously, it was conceivable that the rate of observed phenomena could be as great as one per week — though there are of course great uncertainties. A 1.0 to 1.5 metre space telescope could be used specifically for the purpose, and although the project would be challeng-

## Music of the Spheres

At Wednesday's Inaugural Ceremony you were entertained not only by some distinguished IAU members and invitees, but also by two great musicians. Carmen Keijser on piano and Barbara Langendijk on flute played two pieces by Gabriel Faure: 'Sicilienne' and 'Morceau de Concours'. Carmen and Barbara also essayed an intermezzo by Francis Poulenc: 'Cantilena,' which gave the Secretary of State incentive to note the appropriateness of music at an astronomical conference.



Carmen Keijser

ging, it would also be straightforward.

If funded, such a telescope could be in orbit in about 3 years.

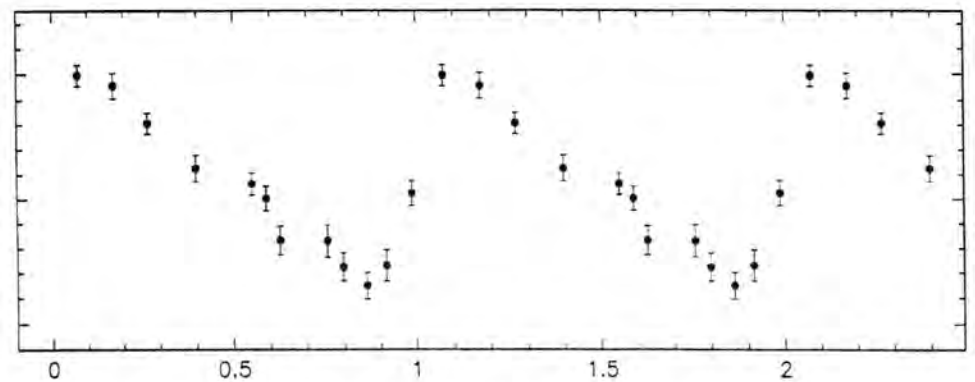
The project would complement other searches (such as those using astrometric methods) which are looking for Jovian planets. There would also be scope for "spin-off" programs, such as studies of star-spots and stellar rotation.

PATRICK MOORE  
U.K.

## Discovery of Cepheids in the Virgo Cluster Galaxy M100

**O**ne of the most frustrating remaining problems in observational cosmology is the lack of an accurate value for the Hubble constant, the parameter which specifies the present expansion rate of the universe. In 1985 measurement of this quantity was designated as a key pro-

M100: VIRGO GALAXY CEPHEID V7220



Light curve for the Cepheid V7220 in M100.

ject by the Space Telescope Science Institute.

The primary goals of the key project are twofold: 1) to discover Cepheid variables and to measure accurate distances to about two dozen spiral galaxies useful as calibrators for a wide range of secondary methods, and 2) measurement of the distances to the Virgo and Fornax clusters. The ultimate goal is to provide a measure of  $H_0$  to 10% accuracy.

In an optimally-spaced sequence of observations obtained with the WFPC2 in April through June, 1994, the Virgo Cluster galaxy M100 was imaged at 12 separate epochs in the V band and 4 epochs in the I band. A sample of about 20 Cepheids has been identified, and light curves and mean period-luminosity relations obtained at V-I. The newly-discovered Cepheids have periods in the range of 15 to 60 days. These results were presented at the Stellar Populations Symposium 164 on Wednesday morning by Freedman (Carnegie Observatories, Pasadena, California)

The key project team is now working on an independent ground-based calibration of the HST photometry and expect to have a reddening-corrected distance to M100 shortly. Current estimates of the distance to the Virgo Cluster range from 15 to 27 Mpc. The depth of the Virgo cluster is small compared to this factor of 2 discrepancy, and hence these new HST data will provide a very first test of the two competing 'long' and 'short' distance scales.

WENDY FREEDMAN  
Carnegie Observatories  
Pasadena, California

## Life in the Universe Looking Up

For all you water-loving carbon-based Eukaryotes out there, nice places to live in the Galaxy may be more abundant than you previously thought.

A mix of Planetary Science, Astrophysics, and Biology for the investigation of Circumstellar Habitable Zones has recently resulted in substantially more optimistic estimates on the number of possible homes for the peculiar type of biology that exists on *terra firma*. The inner boundary of the Habitable Zone (HZ) is now determined by the runaway greenhouse effect while the outer boundary is defined by the condensation temperature of  $CO_2$ , limits that are about an order of magnitude wider than previous studies indicated.

The bad news is that the Earth will leave the solar ecoshell in about 2.4 billion years (stellar evolution can sometimes be an inconvenience). The good news is that K stars can be quite comfortable to live around. Even M star HZ planets, in spite of being tidally locked in rotation, can also be habitable as long as the atmosphere can maintain at least 100 millibars of  $CO_2$  to keep the atmosphere from freezing out.

Recent simulations of terrestrial planet formation have also indicated that about one terrestrial-mass planet should form within the ecoshell distance from stars regardless of spectral type. Biologists also surprised everyone by indicating that the time for biogenic materials (in water brought principally from comets) to form the most primitive prokaryotes could be as short as ten million years. It is known

that these primitive photosynthesizers that existed in the oceans took about 3 billion years to terraform the Earth's atmosphere into a free oxygen component (these were Earth's "salad days") before complex biology emerged.

But even this time scale may be shortened if a less reducing initial planetary atmosphere can be formed. There is, of course, too much about our home among the stars to report here, but a volume entitled "Circumstellar Habitable Zones," edited by the author, should be coming out later this year reporting on the conference.

In summary, it is clear, that astro-physicists need planetary data to calibrate solar evolution models, biologists can no longer ignore comets when thinking about the evolution of species, and planetary scientists cannot understand the evolution of the Earth's atmosphere without including both the effects of biological modification and solar evolution modeling. The results of this mixing of research fields has resulted, in general, in a more optimistic estimate of the prevalence of circumstellar habitable zones.

As it has sometimes been said, "There's no place like home." I'm beginning to wonder who else in the Galaxy might be saying the same?

LAURANCE DOYLE  
SETI Institute  
Mountain View, California

## Haydn History

Just as the Van Gogh Museum in Amsterdam shows the artist's reworkings of Millet and other predecessors, so the Beethoven version of "The Heavens Are Telling" sung by the Spakenburg Choir at the Inaugural Ceremony can be considered his own reworking of the similar earlier piece from Haydn's "Creation."

According to Haydn's biographer, Professor Landon-Robbins, that composer wrote his "The Heavens Are Telling" (a setting of Psalm 19) as a direct inspiration from his visit to William Herschel's telescope (if I remember correctly, the giant 40-foot reflector).

Haydn mentioned in a letter how impressed he was. The historical record doesn't show any documentation from Herschel himself, though as a composer of considerable competence, Herschel must have doubly appreciated Haydn's visit. In any event, Herschel was one of the subscribers to the published edition of Hadyn's "Creation."

OWEN GINGERICH  
Cambridge, Massachusetts



## Announcements

### and Tidbits

#### Food for Thought

The fine fare you'll find steaming and waiting for you on Saturday, August 20, has been reported by our roving gourmet to be as follows:

- Salad with meat pieces and veggies
- Cold cuts
- Bread
- Choice of drinks (at extra cost)

Once again, this delicious lunch is available to all for a modest 15 guilders.

You must buy lunch tickets at least a day in advance. They are available at the Social Events desk in the Congresgebouw main hall.

#### Commission 31, Joint Discussion 8

For organizational reasons, the first two sessions of JD8 are inverted:  
14:30 - 16:00 New possibilities in time-frequency standards.  
16:30 - 18:00 Nes on atomic and dynamical time scales.  
The meetings are held in the Rembrandt Hall.

#### Commission 44:

This commission will meet in Mesdag 1 on Friday afternoon, 14:30 - 16:00.

## READ THIS!

Due to unforeseen circumstances, the visit to the Leiden Astronomy Department has been cancelled. Instead, participants in Tour 10, Technical Visit to Leiden and ESTEC on Saturday, August 20, will be offered a guided tour of the National Museum for the History of Science, also in Leiden.

The ESTEC visit will take place as planned. Arrival and departure times are unchanged.

If too many talks have you on a short fuse, consider attending the Fireworks Festival, August 18 - 21. The action begins at 22:00, on the Scheveningen boardwalk

- JD3.12 S. Talon and J.P. Zahn, "The Second Order Effect of Rotation on Stellar Pulsation Stability"  
JD3.13 A. Baglin et al., "The Space Mission COROT"  
JD3.14 T. Bedding et al., "Stellar Parameters of Eta Boo"  
JD3.15 B. Gelly, "Frequencies and Linewidths from the IRIS Network."  
S165.CV.209 E.N. Ecran et al. "Rosat Observations of TT Ari"  
S165.SN.210 O.R. Pols, K. Nomota, E.P.J. van den Heuvel, "A C+O Star Model for the Type Oc Supernova 1994I"  
S165.HX.211 J.Greenhil et al., "H-alpha Photometry of an X-ray Binary"  
S165.NH.213 S. Grebenev, M. Pavlinsky, R. Sunyaev, "Population of X-Ray Sources near the Center of our Galaxy according to the ART-P/GRANAT"  
S165.BH.214 S. Grebenev, R. Sunyaev, M. Pavlinsky, "Spectral States of Galactic Black Hole Candidates. Observations with the ART-P/GRANAT"  
S165.BH.215 J.M. Bonnet-Bidaud, M. Mouchet, "The Optical Spectrum of GRO J0422+32 in Quiescence"  
S165.NT.216 C.K Chou et al., "The Modified Kompaneets Equation with Astrophysical Applications."  
S165.CV.217 M. Siarkowski P. Pres, "Structure of the AR Lac Corona from ROSAT PSPC All-Sky Survey Observations"  
S165.LX.218 L. Angelini et al., "The LMXRB pulsar 4U 1626-67"  
S163.219 A.Hukeirat "HDRHD — A Multidimensional Radiative Hydrodynamical Solver for Accretion Flows Around Compact Objects"  
S165.220 J.F. Dolan et al. "The UV Polarization of 4U1700-37, Vela XR-1 and Cyg XR-1"  
S165.222 M.I. Wanas, M. Melek, M.E. Kahil "Is it true that SN1987A Observations Confirm WEP?"  
s165.223 S. Brandt, N. Lund "Monitoring the Activity Variations in Galactic X-ray Sources with WATCH on EURECA"

## Popular Lecture Series

Jupiter's recent lunch on Shoemaker-Levy 9 was comparable, mass-wise, to a human feasting on a hamburger smaller than a grain of sand. No matter. The excitement is out of proportion to the serving size. Tonight's popular lecture will be by Richard Strom, of Dwingeloo, and bears the tempting title, "A cosmic disaster? A comet collides with Jupiter."

The lecture, which begins at 20:00 in the Museon (10 minute walk), costs 7.50 guilders, and will be in Dutch. You are encouraged to come, and to bring friends, relatives, and random folks you may have met on the tram.

## Late Posters

## Active Centers Topic of Joint Discussion 5

The first of what we would now call active galaxies were pointed out by Seyfert (who otherwise worked mostly on star clusters) just over 50 years ago. Recognition that M82 (the prototypical — meaning not at all average — star burst galaxy) is also pretty weird dates to about the same time.

To the 1950's belong the optical identification by F.G. Smith, B.Y. Mills, W. Baade, and R. Minkowski of the first radio galaxy (Cygnus A) and the recognition by L. Woltjer that con-

finement of gas velocities as large as those implied by Seyfert galaxy line widths requires a central mass near  $10^8 M_{\odot}$ . The phrase quasi-stellar radio source first appeared in 1963 (for 3C 273 and 3C 48, of course). And it is a little disconcerting to realize that we are now more than 50% further away from the Schmidt, Hazard, et al. discovery of QSOs than 1963 was from Seyfert's seminal paper.

Current interesting questions in the field include (a) which active galaxies contain central monsters, which are fueled by starbursts, and which (seemingly a considerable number) have both? (b) To what extent do close encounters or interactions between galaxies trigger star bursts and fuel monsters? (c) Does the current paradigm of central black hole, accretion disk, and collimated jets provide a good match to the active galaxies we see, and can the various subtypes be fitted into a single unified scheme? And (d) are quasars (etc.) important in the grand picture — that is, do they significantly affect the chemical and dynamical evolution of their parent galaxies; do most galaxies have dead AGNs in their centers, etc?

The last few years have seen relevant data accumulate rapidly in a number of wavebands. JD 5 will include observational talks on gamma ray (Zdziarski), X-ray (Kunieda), and

extreme ultraviolet (Konigl) AGNs. The "are they important" issue will be addressed by talks on the core of the Milky Way (Genzel), fossils of past activity (Bender), black holes in quiescent galaxies (Kormendy), and galaxies at high redshift (Miley).

The issue of interactions will be probed by talks on theory and observations of the dynamics of gas and stars in interacting galaxies (Fridman, Combes, Barnes), Markarian galaxies with binary nuclei (Khachikian), and barred and ring galaxies (Athanasoulas). Starbursts as an alternative to monsters will be considered by Terlevich, Sanders, and Mirabel.

Pastoriza will address the interpretation of emission lines as a probe of the paradigm structure. Finally, Barthel and Rees will ask (though possibly not answer) questions about standard and unified models and their implications for the evolution of the AGN population over the history of the universe.

In addition, somewhere between 36 and 60 posters (depending upon draconian decisions by the LOC) and a few short oral contributions will complement the invited review talks.

VIRGINIA TRIMBLE  
Univ. of California, Irvine, and  
Univ. of Maryland





The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



Editor: *SETH SHOSTAK*

Associate Editor: *RENÉ GENEÉ*

No. 5: Saturday, 20 August

## Gamma-Ray Sources Not Nearby

### Merging Neutron Stars and Black Holes?

About once per day from a random location on the sky a tremendous burst of gamma radiation appears. During its brief appearance, lasting from a fraction of a second to several hundred seconds, it outshines the combined brightness of all other sources of gamma rays in the sky.

The origin of these gamma-ray bursts has become one of the greatest mysteries of modern astrophysics.

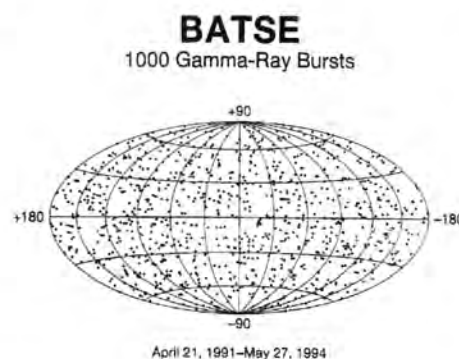
A review of gamma-ray burst observations and some new results from the NASA Compton Observatory mission were presented on Thursday, 18 August, at Symposium No. 165, *Compact Stars in Binaries*. A leading theory of gamma-ray bursts speculates that they result from the merger of two neutron stars or a neutron star and a black hole. The details of such a merger were described by Tsvi Piran, from Israel.

The energetics and the frequency of such mergers are of the same order as that observed in gamma-ray bursts, if it is assumed that they occur at a redshift of about 1 to 2.

Gamma-ray bursts were discovered by accident over 20 years ago by US nuclear bomb detection satellites. Since that time, they have been observed by many experiments on a wide variety of earth-orbiting and interplanetary spacecraft. Currently, the Burst and Transient Source Experiment (BATSE) on the Compton Observatory is providing the most sensitive observations of gamma-ray bursts.

A sky map plotted in Galactic coordinates, showing a thousand gamma ray bursts observed by BATSE is shown here.

In the 1980's, virtually all workers in the field believed that gamma-ray



bursts were due to isolated neutron stars scattered throughout the Galaxy. Detailed models of sudden accretion, thermonuclear explosions or neutron star-quakes were developed to explain the bursts. However, the distribution of bursts on the sky, coupled with their intensity distribution observed by BATSE, now make the Galactic neutron star models very unlikely.

Most researchers now believe that the bursts are coming from cosmological distances, and that the observed deficiency of weak bursts is due to their extreme distance and redshift. If that is the case, then a time dilation should be seen in the time profile of bursts. Such a dilation has been reported, but the results are somewhat controversial. Perhaps the best way to solve the gamma-ray burst problem is to observe a counterpart in another wavelength region or to observe a gravitationally-lensed gamma-ray burst.

Other recent burst results from the Compton Observatory mentioned at Symposium 165 were the recording of a much higher energy photon (~ 20 GeV) and a longer duration (1.5 h) from a gamma-ray burst than have been recorded previously. These new observations serve to deepen the gamma-ray burst mystery.

GERALD J. FISHMAN  
NASA/MSFC, USA

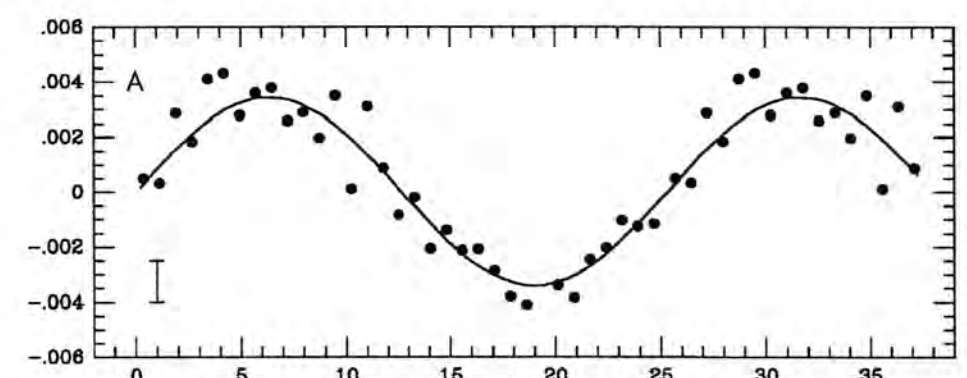
## Flash! New Pulsar Planetary System

The first planetary system outside our own has been detected in 1992 around an old neutron star, PSR B1257+12, a 6.2-millisecond pulsar, 1 kpc away from the Sun.

The evidence is based on microsecond precision timing measurements of the pulse arrival times. It reveals the existence of three planets with the corresponding masses of 0.015, 3.4 and 2.8 Earth masses, orbital periods of 25.3, 66.5 and 98.2 days, orbiting the pulsar at the distances of 0.19, 0.36 and 0.47 A.U.

The planets have been confirmed in 1994 through the detection of the predicted effect of gravitational perturbations between the two more massive planets. A near 3:2 resonance condition of these two objects perturbs the orbits to a sufficient extent for the effect to be clearly detectable in the pulse arrival time data collected over 3.5 years.

The discovery of pulsar planets demonstrates that Earth-mass bodies in bound orbits do exist outside the Solar System and it appears to support the idea that discovering planets



Post-fit residuals of pulse arrival times for folded modulo the orbital periods of 25.34 days for planet A. Arrival time variations for other planets are removed.

## Concert Worthy of Note

With a small, but concerted effort, you can enjoy an exciting program of music by Marini, Vivaldi, Mozart, Van Wassenaer and Viotti on Monday night.

Twenty-eight members of the Combattimento Consort are performing this exclusive IAU program. The admission price of 35 guilders is a pittance, and you will be greatly impressed by both the music and the ambience. Tickets must be purchased at the Social Events Desk in the Congresgebouw.

Take tram 7 or 8 to the Spui to find Houtmarkt 17, the site of the Dr. Anton Philipszaal (you know this man: he sells light bulbs and razors.) It is only a five minute walk from the Central Station, incidentally.

For a late night dinner, an information desk will direct you to excellent eating establishments.

around Sun-like stars is only a matter of time, and means necessary to perfect the detection techniques. Moreover, the superb precision of the pulsar timing technique (a microsecond timing precision corresponds to a millimeter-per-second accuracy of radial velocity measurements) makes it a powerful tool with which to study the dynamics of pulsar systems.

Such studies may become essential for further improvement of the understanding of planet formation processes and of a possible link between pulsar planets and the planetary systems around more familiar kinds of stars.

ALEX WOLSZCZAN  
Penn State University



## Quasars and the Seas

Astronomers recovering from the meetings at the Dutch coast and contemplating the change between high and low tide may be aware of the classical connection of this spectacle to our discipline.

They may be less aware of the dialectic relation between the geometric description of the most distant objects and the nearest, our Earth.

The positions of quasars are currently determined using VLBI with to accuracy below the milliarcsecond level. The measurement principle implies the transport of the interferometric baseline through space by the rotating Earth, thereby intimately connecting the quantities of Earth's rotation and quasar positions. Expressing the accuracy above in earthly terms, we recognize that our planet is slow or fast by a tenth of a millisecond of time (or by centimeters in the spatial position of an equatorial point).

The interest in such variations is a twofold one: everybody measuring positions even in deepest space has to know the orientation of his observational platform (the solid Earth), while scientists investigating the Earth itself are interested in the reasons for its variations.

Besides free motion (which any spinning top is allowed to have), the main cause for variations in the short run consists in the exchange of angular momentum between the solid, fluid and gaseous constituents of the Earth. Due to its much greater mobility, the atmosphere dominates the variations.

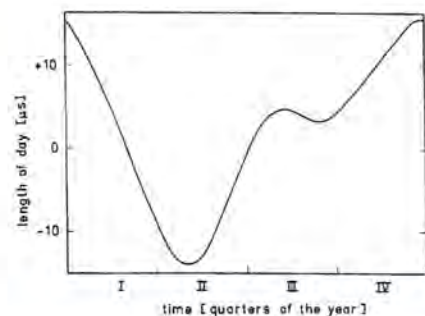
But because of the steadily increasing precision of VLBI and other observational methods, the oceans must not be neglected any longer.

We have shown that the short-period tides (such as the best known semidiurnal lunar tide) lead to millisecond variations in Universal Time — and we were able to find them in VLBI data. We refers to oceanographers from Hamburg, and astronomers and geodesists from Bonn.

Now we are concerned with the seasonal changes caused by the thermohaline circulation within the oceans, influenced by wind stresses and the interplay of precipitation and evaporation. Most advanced models of such a circulation can predict the angular momentum content of the oceans and thereby their influence on the length of day (the rotation rate of the solid Earth).

The figure shows these changes within an average year. The observational confirmation of the theoretical results is a very difficult task, not only because of random errors but even more since there is a whole zoo of competing effects.

PETER BROSCHÉ  
Germany



## GALAXY GROUPS AND HIGH REDSHIFT QSO's

Recent work has investigated the supposition that quasars are truly at the distances indicated by their redshifts. The idea is to look carefully at the region of sky surrounding QSO's to see if a surfeit of galaxies is to be found there. If so, then one can make conclude that the QSO's are located in these distant galaxy groupings.

Images were obtained with the CFHT of two groups of mostly radio-quiet QSO's: 14 at  $z \sim 1.1$  and 7 at  $z \sim 2.3$ . In the  $z = 1.1$  sample, these were broad-band R and I, and narrow-band at the wavelength of [O II] in the QSO rest frame. In the  $z = 2.3$  sample only R band data were used. In the broad-band images all faint sources were counted, and the region surrounding the QSO compared with the rest of the image.

In both datasets, the QSO surroundings have an overall excess of galaxies at a  $>5$  sigma level. There is an excess of emission-line candidates at the same significance level, and a slight excess of blue objects, in the  $z = 1.1$  QSO data. The excess is in faint, small, and irregular galaxies.

The results suggest that the QSO's live in compact 'clusters' of galaxies, or have such clusters preferentially in the line of sight.

The lack of absorption lines in the QSO spectra, the ubiquity of the phenomenon, and the moderate QSO luminosity argue against the foreground cluster explanation. The colors and the implied luminosity suggest that the associated galaxies are dominated by very hot stars, and are in the process of an initial starburst. The clusters are dense and small, and presumably evolve passively or via mergers to the small groups seen near QSO's at low redshift. The activity of the QSO thus seems to be associated with galaxy interactions and hot star formation at all observed redshifts.

JOHN HUTCHINGS  
Dominion Astrophysical Observatory  
Victoria, Canada

## CONTROL OF LIGHT POLLUTION

A joint conference between IAU Commission 50 (Identification and Protection of Observatories) and Technical Commission 4.21 of Commission Internationale de l'Eclairage (the international professional body of lighting engineers) will be held Saturday 20 Aug at 14:00 - 17:30 in Mesdag 2.

The program is:  
**Astronomical Requirements**  
 K. Tritton  
**Units in astronomy and lighting**  
 D. Crawford  
**Light pollution levels**  
 A. Uppgren  
**Propagation of light pollution**  
 J. Mason  
**Road lighting**  
 R. Holmes  
**Outdoor lighting**  
 N. Pollard  
**Light pollution control**  
 P. Murdin

All are welcome.

## THE WORLDWIDE DEVELOPMENT OF ASTRONOMY

The IAU has long been concerned about astronomers whose geographic or economic situations have hindered their full participation in the international community.

Commissions 5, 38 and 46 all have done and are doing much to help. In 1987, the Executive Committee created a Working Group for the Worldwide Development of Astronomy to consider specifically the problems faced by many of our colleagues.

At this Assembly we are concentrating on the problems of astronomy in Africa, and hope to have representatives from every country on that continent with IAU members. The UN and ESA have recently held two workshops on space science in Africa, and there is to be an international school for young astronomers soon in Egypt.

These events, combined with the recent sweeping political changes in South Africa make the time ripe to consider cooperation on the continent and how outsiders can help.

We hope many of you will come on Saturday morning (09:00-12:30 in Mondriaan) to learn about some of the problems faced by our colleagues on the world's poorest continent, and to see if you or your institute can offer help.

A.H. BATTEN  
Chairman, WGWWDA

## General Assembly Dinner

OK, this is the social event you've come thousands of miles to attend. You will have the opportunity to meet world famous astronomers informally, enjoy a buffet dinner and dance (but not simultaneously.)

The cost is 65 guilders per head. The rest of your body is free. The location is in the Jan Steen Room. Tickets are available at the Social Events Desk. Oh yes: the date and time are **20:00, Wednesday evening, August 24.**

## FUTURE LARGE SCALE FACILITIES IN ASTRONOMY

Meeting Room: Mesdag 1

Saturday afternoon, 20 August 1994  
 I. POLICY ISSUES (14:00 - 15:10)

Harvey Butcher, NFRA, Introduction  
 5 min.

Francoise Praderie, OECD/OP  
 Large Facilities: Present Policy Issues  
 20 min.

Richard Schilizzi, JIVE Struggles with  
 Global Collaboration, 15 min.

Morris Aizenman, US NSF  
 Perspectives on collaboration, 10 min.

Lodewijk Woltjer, OHP/IAU  
 Strategies for the Future, 20 min.

II. SPECIFIC PROJECTS (15:10 -  
 15:30, 16:00 - 17:10)

Roy Booth, Onsala, Next generation  
 mm arrays, 15 min.

Tetsuo Hasegawa, Tokyo, Large mm  
 & Sub-mm Array, 15 min.

Robert Braun, NFRA, Square  
 Kilometer Array, 10 min.

Oddbjørn Engvold, Oslo, Large Earth-  
 based Solar Telescope, 10 min.

Michael Burton, NSW, Antarctic  
 observatories, 10 min.

Holland Ford, JHU, Polar  
 Stratospheric Telescope, 10 min.

Serge Volonte, ESA, Post-Horizon  
 2000 missions, 20 min.

III. GENERAL DISCUSSION  
 (17:10 - ...)

## Turkish Observatory Site (cont'd)

Those interested in the Bakirlitepe site development can contact Ali Alpar via e-mail at [alpar@newton.physics.metu.edu.tr](mailto:alpar@newton.physics.metu.edu.tr)

## Warning!

Please **DO NOT** write on the wooden poster boards, either with pencils, felt pens, or engraving tools. This is causing great consternation for the organizers. Don't use push-pins on the black boards, either. Be good!

## CORRECTION

Symposium 168, rather than 169, will meet in the Van Gogh Hall, and use the Van Gogh Lounge for posters.

Posters for Symposium 169 will be in the Paulus Potter Hall. Our apologies.



## Joint Discussion 8: Time Scales: State of the Art

One of the problems of general interest in astronomy and astrophysics today is to define and maintain specific *space-time reference systems*.

The accuracy of the observed phenomena in dynamical and physical astronomy is now such that the relativistic effects in definition, keeping, and transfer of the time-unit and time-scale can no longer be disregarded.

In contrast to the inertial coordinates of Newtonian astronomy, there exist no global coordinates in relativistic astronomy which may be treated as physically meaningful measurable quantities. For this purpose new relativistic (dynamical) time scales: "Geocentric Coordinate Time" (TCG) and "Barycentric Coordinate Time" (TCB), and new relations with the observed Terrestrial Time (TT) and International Atomic Time (TAI) were introduced at the 21st IAU General Assembly in Buenos Aires (1991).

Progress in the establishment of atomic and dynamical time scales has been made in the last years, and seems possible in the near future to remove further ambiguities in time scales introducing a modified atomic time scale (TAIM) as the physical realisation of the Geocentric Coordinate Time (TCG).

With regard to the problems pertinent to the establishment and maintenance of atomic time scales, new progress in cesium frequency standards have been achieved: the instability for averaging times of the order of 100 days at the Physikalisch-Technische Bundesanstalt and at the United States Naval Observatory is today about 6 parts in  $10^{15}$ , and new primary frequency standards are developing in different laboratories.

On the other hand, it is very significant and encouraging to note the results achieved in the use of frequency standards derived from the frequencies emitted from radio sources such as the pulsars. The stability of some millisecond pulsars (PSR 1937+21 and PSR 1855+09) is now comparable (order of  $10^{14}$ ) to the stability of atomic frequency standards for averaging times longer than one year.

The problem of the dissemination and transfer of frequency standards and atomic time scales is very important in many scientific and Technical activities. The use of the Global Positioning System (GPS) and the Russian Global Navigational Satellite System (GLONASS) are among the most precise and accurate methods for

time comparison between remote clocks on the Earth over intercontinental distances or in its close vicinity. These methods have the potential for reaching an accuracy approaching 1 nanosecond in time comparisons.

Very successful time transfer with a precision of 100 picoseconds has been achieved between Western Europe and North America using the LASSO (Laser Synchronisation from Satellite Orbits) experiment on geostationary satellites, and solutions have been proposed that may lead to clock synchronisation by laser techniques using non-geostationary satellites.

EDOARDO PROVERBIO  
Osservatorio Astronomico  
Gagliari, Italy

## GALAXY POPULATIONS IN THE $Z=0.23$ Cluster A2390

How does the population of galaxies change as you move from the center of a cluster?

We have studied the galaxy population in the  $z=0.23$  cluster A2390 as part of a photometric and spectroscopic survey of 341 galaxies in a  $46 \times 7$  arcmin strip, centred on the cluster's

## IMAGING OF LOW REDSHIFT QSO'S WITH THE RESTORED HST

Imagery obtained with the Hubble Space Telescope of low redshift QSO's ( $z < 0.32$ ) has indicated previously unseen structure in these objects suggestive of considerable disturbance.

Two of the observed quasars are radio-loud, and two are radio-quiet.

One of the radio-quiet QSO's is a strong IR source. Of the radio-loud QSO's, one has compact radio structure and one is a large triple source.

Thus, the four objects span a range of parameters. In all except the large radio source there is evidence of recent or ongoing tidal interaction in the host galaxy structure.

The new data reveal the following new morphological features: compact knots of blue luminosity in tidal debris that have the colour, size and luminosity of as few as  $\sim 100$  O stars, details of tidal tails that indicate different origins such as disk arms or star-formation in stripped gas, and a jet-like nuclear feature.

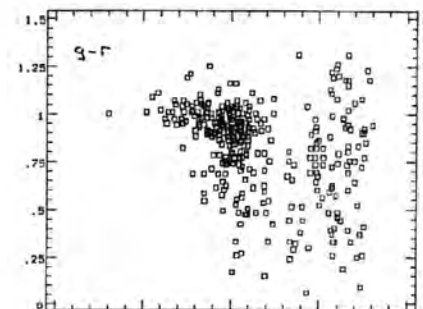
Full analysis of the images is still underway. While the sample is small and somewhat biased towards unusual objects, some conclusions are suggested. No host galaxy is an undisturbed

cD galaxy. The galaxy population in A2390 changes from a very red central population in the inner 100 arcsecs to a population as blue as the surrounding field. The small spread in color of the central galaxies limits their interval of formation to 3 Gyr or less, equivalent to redshift 1.7. The red population is virialised while the blue galaxies appear to be an infalling population. There is also at least one subcluster with an evolved population.

There is a population of strong Balmer absorbers in both field and cluster, characteristic of truncated (disk or starburst) star-formation, but no obvious population of strong starbursts in the cluster. The galaxy morphologies show a sharp rise in the early type population at a radius of  $\sim 500$  arcsec: many of the strong Balmer absorbers lie outside this radius and appear to be interacting. It appears that the cluster accretion involves merging and truncation of star-formation in the outer parts of the cluster.

The cluster buildup must have occurred without much radial mixing in order to preserve this structure. The blueness of the cluster envelope, cluster galaxies, suggests that either the cluster environment has no effect on galaxies at large radii, or that the rate of cluster infall from the field remains high (as is appropriate for a high omega universe) at  $z \sim 0.23$ .

JOHN HUTCHINGS  
Dominion Astrophysical Observatory  
Victoria, Canada



Colors as a function of log distance from the cluster center, for Abell 2390. The vertical scale is  $g-r$ , and the horizontal scale runs from 10 to 100,000 arcsecs, thus including field galaxies on the right-hand side of the graph. Note the very narrow scatter of red galaxies near the cluster center.

standard type galaxy.

However, the radio-loud QSO's appear to be in galaxies that generally have elliptical properties, while one of the radio-quiet QSO's has definite spiral morphology. Further image restoration and photometric measurements will provide more detailed evidence of the tidal events that appear to trigger the nuclear activity, and may yield clues as to the essential difference between radio-loud and radio-quiet nuclei.

JOHN HUTCHINGS  
STEVEN MORRIS  
Dominion Astrophysical Observatory  
Victoria, Canada



## Lithium a Puzzle in Black Holes

Lithium more of a puzzle in black holes than black holes

X-ray binary stars are some kind of compact X-ray star circling a companion. There are two black hole binaries amongst the soft X-ray novae, according to Phil Charles in Friday's session of Symposium 165: V404 Cygni and A0620-00.

When the accretion disc excited by X-rays in the X-ray novae has faded, there remains a K-type star's spectrum in both these systems. Measurements of the K-star lead to masses for the X-ray emitter of 10 and 12 solar masses in A0620-00 and V404 Cyg respectively — too high to be neutron stars, and the best candidates to be black holes.

It's very neat — but there is one puzzling detail in each system. If you subtract the spectrum of an ordinary K-type star from the binary star spectrum, as expected, you see residual H-alpha emission from near the X-ray emitter. However, you also see a lithi-

um absorption line with a strength 10,000 times more than the field star.

How has this extra lithium been made?

The likely explanation, according to Rashid Sunyaev, is spallation with two alpha-nuclei combining to make lithium-7 and a proton, with a 478 keV gamma ray. Sunyaev linked this explanation to a spectral line seen by the Granat experiment in X-ray transient Nova Muscae.

If this is the right explanation, Sunyaev pointed out that we should also see a (proton, neutron) reaction yielding deuterium and a 2.2 MeV gamma ray. This spectral line ought to be one of the major discoveries in X-ray binaries made by the gamma ray satellite Integral when it is launched early next century.

PAUL MURDIN  
Particle Physics and Astronomy  
Research Council, U.K.



## Announcements

### and Tidbits

#### Food for Thought

Our official informant relays the following list of items that will be waiting to accost your taste buds during the Congresgebouw lunch on Monday, August 22:

- Lamb (=young sheep)
- Rice
- Mexican vegetables
- Choice of drinks (at your cost)

As you now undoubtedly know, these culinary offerings can be yours for only 15 guilders.

You must buy lunch tickets at least a day in advance. They are available at the Social Events desk in the Congresgebouw main hall.

#### Gravitational Lens Monitoring (schedule)

Joint Commission Meeting 28, 47 - Saturday, August 20, 9:00-10:30

A. 12 minute contributions :

**The Princeton lens monitoring program**, S. Malhotra (Princeton)

**Variability of quasars from the HQM program**, K.-J. Schramm (Liege, Hamburg)

**Radio monitoring of gravitational lenses**, B. Burke (MIT)

**Determination of time delay for 0218+357 from radio polarization measurements**, P.N. Wilkinson (Jodrell Bank)

**Results from optical imaging of B 0218+357, 1208+1011 and HE 1104-1805**, F. Grundahl (Aarhus)

**Light curves of UM 425, UM 673, H 1413+117**, F. Courbin (Liege, Paris)

B. Other (very) short communications and/or general discussion, (To be determined)

Contact: J.-P. Swings

#### Talk Has Title

Despite appearances to the contrary, the talk by S. Chakrabarti for JD 5 does have a title, and one guaranteed to suck in attendees, at that: **"How Massive is the Black Hole in M87?"**

#### IUCAA COMPLETES FIVE YEARS

At the Baltimore General Assembly of the IAU, Jayant Narlikar made a presentation concerning a proposed national facility for Astronomy and Astrophysics for the universities in India. Known as the Inter-University Centre for Astronomy and Astrophysics (IUCAA) the centre was founded on December 29, 1988.

After five years, the IUCAA now has its own building in the pleasant surroundings of the University of Puna. It has excellent facilities including a computer center, electronic mail, data centre, an A&A library and a laboratory for astronomical instrumentation. (see posters on IUCAA Nos JD4:D19 and WG1:5 in the basement)

IUCAA welcomes visitors from abroad for its workshops, conferences etc. The IUCAA hosted the IAU Regional Meeting VI for the Asian Pacific Region in August, 1993 and an ISYA in January, 1994.

J.V. NARLIKAR

## Popular Symposium

In remembrance of Jan Oort's 70 years of research on the Milky Way, the Netherlands Association for Weather and Astronomy — a national group that promotes astronomy throughout the country — has engaged four engaging (not to mention eminent) researchers to present an afternoon of talks on the theme "New Light on the Milky Way." The program, which will be introduced by Hugo van Woerden, consists of the following:

- 13:30 **Welcome and Introduction**, Hugo van Woerden, Kapteyn Institute, Groningen, The Netherlands  
 13:40 **Oort and the Milky Way**, Leo Blitz, Univ. of Maryland, College Park, Maryland  
 14:30 **Structure, Composition and Dynamics of the Milky Way, and the Role of Dark Matter**, Ken Freeman, Mt. Stromlo and Siding Spring Observatories, Canberra, Australia  
 15:50 **What's Going On At the Galactic Center?** Reinhard Genzel, MPI, Garching, Germany  
 16:40 **Formation and Evolution of the Milky Way Galaxy**, Francesca Matteucci, Osservatorio Astronomico di Trieste, Italy  
 17:30 Discussion  
 17:45 It's a wrap...

## Late Posters

- C20 and C24 I. I. Brejdo, N. M. Bronnikova, O.M. Michailova, D. K. Michailov, "Investigations of the Russian Astronomical Unsensitized Plates, NT-1A and Orthochromatic NT-1AG"  
 S165.224 A. O. Allakhverdiev, et al., "On Pulsar-Supernova Remnant Associations"  
 S164.156 T. Lejeune, R. Buser, "Compared Synthetic Photometric Properties of Two Theoretical Stellar Spectra Libraries"  
 S165.224 A. O. Allakhverdiev, "On Pulsar-Supernova Remnant Associations"  
 JD5.57 G.K.T. Hau, R. C. Thomson, "Elliptical Galaxies with Peculiar Kinematics: Decoupled Cores or Decoupled Halos?"  
 SL 1 J. Watanabe, "Prompt Report of Japanese Observations on SL 9 - Jupiter Phenomena"  
 JD 12 V. L. Khokhlova, J. Zverko, J. Ziznovsky, "Spectra of a Unique Eclipsing Binary AR Aur with CP Components"  
 JD 6 Yihua Yan, and Jingxiu Wang, "The Numerical Analysis of 3-D Magnetic Topology of AR 6659 Under Magnetohydrostatic Conditions: Solution of Constant-Alpha Force-Free Field"  
 JD11.22 D.A. Lubowich, B.E. Turner and L.M. Hobbs, "A search for Enhanced Lithium and Boron in the Galactic Center"  
 JD11.23 H. Reeves and N. Prantzos, "Cosmic Ray Activity in the Orion Cloud and the Galactic Evolution of Light Elements"  
 S168.59 M.A. Pahre and S.Djorgovsky, "A Near-Infrared Search for Protogalaxies, and Limits on the Reprocessing of Continuum Radiation from High-Redshift QSOs"  
 S168.60 M.B. Mosconi and D.G. Lambas, "Galaxy formation in CDM model"  
 S168.61 R. Nan and Z. Cai, "A Hint to Possible Anisotropy in the Radio Universe"  
 S169.L.99 D. Schaerer and G. Meynet, "The Galactic Center Star Cluster: Normal Evolution !?"  
 S169.L.100 M. Schultheis et al., "Near Infrared Photometry of Semi-Regular Variables in the Galactic Bulge"  
 S169.L.101 M. Sevenster et al., "An OH-Survey and its Applications"

## LOOKING UP LOOKING DOWN



## Decoding Designations

by H. DICKEL & Comm. 5 WG



WHERE CAN I GET HELP IN CREATING A NEW DESIGNATION? Consult the Chairperson of IAU Commission 5 WG on Designations (currently P. Dubois) for the list of members and their e-mail addresses in the "clearing House," a subgroup within the WG who can answer questions and give advice.

HOW SHOULD I GO ABOUT DESIGNATING A NEWLY DISCOVERED SOURCE? Consult the IAU "Specifications" document, think up an acronym and check the "Interactive Dictionary of Acronyms" to be sure it is unique, and consult the "Clearing House" of IAU Commission 5 WG on Astronomical Designation (current chair, P. Dubois).

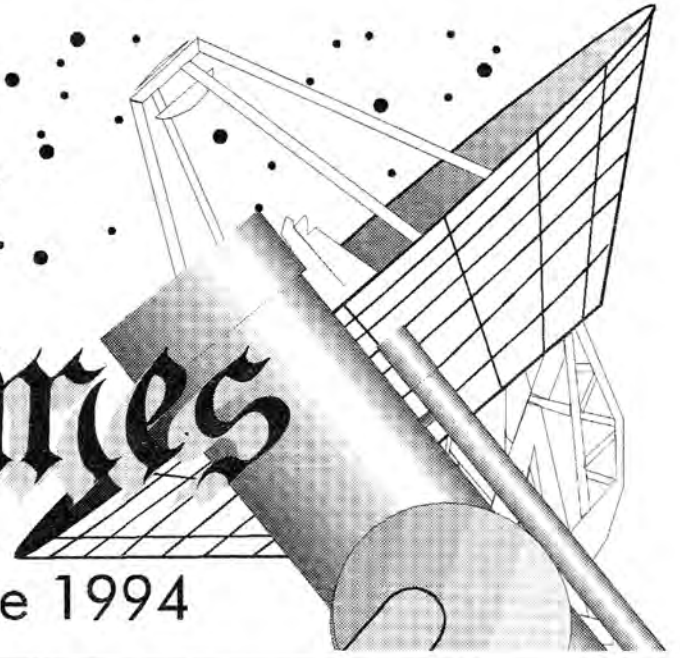


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



Editor: SETH SHOSTAK

Associate Editor: RENÉ GENEÉ

No. 6: Monday, 22 August



Ida and its newly-discovered moon, Dactyl, as imaged by the Galileo spacecraft. This is the first conclusive evidence that natural satellites of asteroids exist. Although appearing to be next to Ida, the satellite is actually somewhat in the foreground. The physical distance between Ida and its diminutive pal is about the distance from The Hague to the Belgian border.

## Secrets of Ida

Despite the problems with its high gain antenna, the Galileo probe is sending back invaluable data, and at a Joint meeting of Commission 15, 20, and 22 on Thursday morning Dr. David Morrison gave the latest results of the fly-by of the asteroid Ida.

Previously Galileo had imaged only one asteroid, Gaspra, and it has been found that there are very important differences between the two.

Ida belongs to the Koronis family of asteroids; it measures 56 x 24 x 21 km, with a rotation period of 4.63 hours and an albedo of 0.29. The main difference from Gaspra is that Ida is much more heavily cratered.

From estimated impact rates it had been estimated that the age of the surface of Gaspra is of the order of 200 million years, but if we assume the same cratering rate this would make Ida's surface improbably old so that there is a problem here. Ida, unlike Gaspra, shows "blocks" of material; the escape velocity is a

mere 11 inches per second, though we cannot be sure whether it is monolithic.

The other main difference from Gaspra is that, Ida has a satellite, Dactyl. It measures 1.6 x 1.4 x 11 km, and is remarkably spherical; it seems to have the same spectrum and albedo as Ida, and is presumably of similar composition.

The orbit is not easy to determine, but this is of great importance, as it will give a clue to Ida's mass - we know the volume of Ida which is 1600 cubic km, and the density is probably of the order 2.5-3.5. Certainly Galileo is proving its worth!

The Joint Meeting was dedicated to the memory of two great astronomers, J. Stahl and K. Kresak, both of whom have died recently.

PATRICK MOORE  
U.K.

## Brobdignagian Beast in NGC 4258

NGC 4258 (M106) is an active galaxy with anomalous radio arms, high velocity jets, and a curious nuclear water megamaser.

So, what's going on in the center of this galaxy?

Study of the megamaser with VLBI has revealed a nuclear molecular ring only 0.1 pc in radius. Lincoln Greenhill reported today on behalf of his collaborators (Jiang, Moran, Reid, Claussen, Lo, Henkel, Becker, Wouterloot, and Wilson) in JD 5 the results of their study. Inspired by the recent discovery of maser emission extending in velocity over almost 2,000 km/s, they looked at the galaxy with an intercontinental array of radio telescopes.

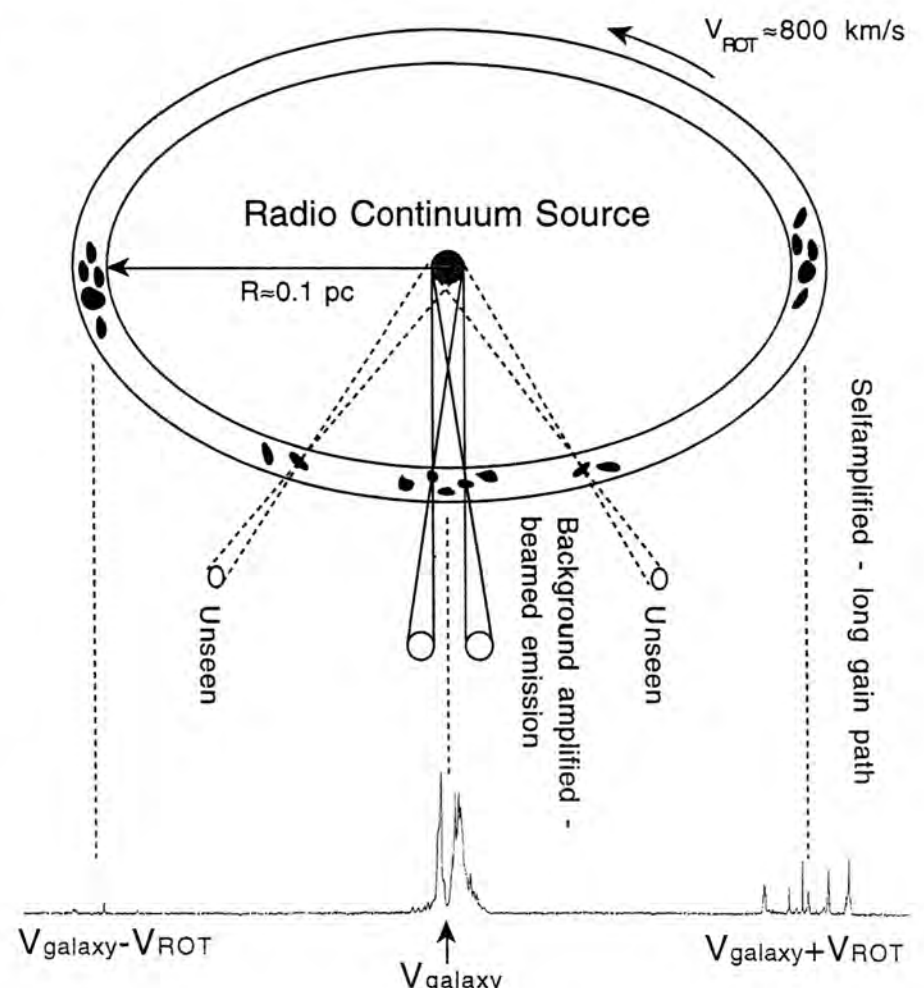
They found an elongated structure with a well-defined velocity gradient of 8,000 km/s/pc in the maser features near the velocity of the galaxy, clearly suggesting a Keplerian disk structure, as depicted in the figure. The disk radius and rotation velocity of 800

km/s require a binding mass of  $10^7$  solar masses, with a mass density of at least  $2 \times 10^{10} M_{\odot} \text{pc}^{-3}$ . The expected centripetal acceleration of the maser features is 7 km/s/yr as they drift in front of the central source, and has been confirmed by observations at Haystack and Effelsberg.

The proper motions of the systemic maser features with respect to the high velocity maser features should be about 24 microarcseconds per year, for a distance of 7 Mpc. This can be readily measured in observations spanning a few years with VLBI, and could provide an accurate measure of the distance to the galaxy.

Is this another massive black hole? The jury is still out, but the smart money says yes.

JIM MORAN and  
LINCOLN GREENHILL  
CfA, Cambridge, Massachusetts





## Don't Be Road Kill on the Information Superhighway

Times are changing. The e-mail terminals available for participants at this meeting are but one sign of how electronic communication is knitting together our international community.

In line with this trend, the *Astrophysical Journal Letters* will soon be available electronically. A short description of the American Astronomical Society's program for publishing journals electronically will be presented in the session on Astronomical Data/Libraries on Tuesday, August 23.

The program is based on taking small steps and getting community reaction and feedback. After two years, 98% of the AAS meeting abstracts are submitted electronically and are available on line. In MOSAIC, open the url - <http://blackhole.aas.org/AAS-Homepage.html> — and go to the 'meetings' page to see the abstracts.

Now, as part of your subscription to any AAS journal, you get every six months a CD-ROM version of data from articles published in the major U.S. journals, *ApJ*, *AJ*, *ApJ Suppl* and *PASP*.

Next we will bring the *Astrophysical Journal Letters* on line. An electronic version of the special issue of the *ApJ Lett* featuring papers from the repaired Hubble Space Telescope will be demonstrated at the January, 1995, meeting of the AAS in Tucson.

We encourage all astronomers from around the world to try the AAS electronic abstracts and journals as they become available, and send us

your comments. If done right, electronic distribution has the potential to link our community together in ways never before possible. We want to produce electronic publications which serve the community. We depend upon your comments to ensure that what we do is useful.

PETER B. BOYCE  
Executive Officer  
American Astronomical Society

## IAU Enters New Millenium

The role of the IAU has been raised frequently during the last years. It seems to me that there are three essential aspects: The IAU sets international standards, it fosters the development of astronomy in the world, and it serves as a forum for international cooperation in our science.

The standards include not only time, coordinates, photometric systems, etc., but also the symposia and colloquia. Many astronomy meetings are held in the world, but the IAU symposia set a high standard. While most meetings are forgotten ten years later, the 160 symposia of the IAU are still well remembered. The IAU also sets standards in other areas, for example, for astronomical sites, including space, which it attempts to protect.

The young astronomer schools, visiting lecturer programs and other activities contribute to raising the awareness of astronomy in many countries. The General Assemblies contribute to the cooperation in our science. We learn many new things from the talks being given, everyone has a chance to present the latest results of his or her work, and probably most important we meet colleagues every three years whom we would not otherwise meet.

Astronomy has developed much

over the last decades and so has the number of astronomers. New fields have opened up, and fields with a long past have gained new vitality. Not suprisingly, the result has been that many members feel that the Union is no longer entirely representative, and in tune with the needs of the times. I would hope that new, flexible structures can be created to provide a framework in which change can occur smoothly and organically without cre-



Lo Woltjer discusses the next century, ating unnecessary upheavals.

The Executive committee has made proposals to this effect. All of us should make an effort to ensure that our Union can enter the next century preserving what is positive from the past, but addressing the demands of the future.

LO WOLTJER  
President Elect

## Hot Topic: Big Infrared Arrays

The National Optical Astronomy Observatories (NOAO) and the U.S. Naval Observatory (USNO) in collaboration with the Santa Barbara Research Center have undertaken to develop 1024 x 1024 (27 micron) pixel InSb infrared array detectors.

Progress during the past year has been encouraging, and we expect to test the first prototype detectors at the telescope this fall.

The silicon readouts have been tested warm to obtain yield statistics;

Another ordeal was the withdrawal of China in 1961, a situation which was not resolved until the 1979 Montreal General Assembly, with much personal involvement by Blaauw himself. This personal human touch that astronomers have used to deal with the often oppressive problems of global politics is what makes this book such a good story. So, don't look for the advancement of science in this book.

Blaauw's book also shows a few very nice examples of the precursors to the newspaper you are reading

some 9% of the arrays are perfect, with 1024 good rows and columns. The overall useful yield is over 50% good quadrants (512 x 512 pixels).

Several of the readouts were packaged for cold testing down to 30K. The gain uniformity is better than 1%, and the noise at the readout level is comparable to the 256 x 256 InSb devices.

Detectors should be available for deployment in instruments at the end of the development phase early in 1995. USNO will utilize the detectors in its infrared astrometry programs and in various photometric programs. NOAO will upgrade existing instruments as well as deploy the arrays in new instruments such as the Phoenix high resolution spectrometer and the GRASP multi-color spectrometer.

NOAO is seeking collaborations to pursue further production runs of these new 1024 x 1024 InSb arrays to make the detectors available at other observatories. If your institution is interested in participating in this collaboration, please contact Ian Gatley ([igatley@noao.edu](mailto:igatley@noao.edu)) at NOAO for further discussions.

CATHERINE  
PILACHOWSKI  
NOAO, USA  
HAROLD ABELS  
USNO, USA

## Book Signing

Adriaan Blaauw will be signing his new book, "History of the IAU," during the afternoon coffee break. You will find him, pen in hand, at the Kluwer book display one floor up.

It is gratifying to the editor of this dubious publication that you are reading the text in this little, left-over block of space. In the hectic last minutes of laying out this issue, we just couldn't find anything to fit in here.

Newspaper layout is really a puzzle, as you can imagine. Perhaps there are some of you who are interested in writing articles of about 50 words in length. Thanks.

## Blaauw's Blue Book

A wonderful little gem can be bought at this Assembly. "The History of the IAU" is Adriaan Blaauw's most recent book, and by now most of you must have heard about.

With an almost herculean effort, Blaauw has been able to get his book to the publisher just in time for the Assembly. Now you can buy it at one of the bookstands. After having devoured this little blue-bound (how appropriate) volume in one evening, I thought I would share some impressions for those of you who still have yet to read it.

What makes this work particularly valuable is the collection of photographs and numerous verbatim sec-

tions of letters from the IAU archive (for some you may have to brush up on your French, German or Russian).

Adriaan covers the birth of the IAU, officially recorded as July 28, 1919, and its first 50 years of existence. The IAU's 75th birthday passed pretty much unnoticed by most of us a few weeks ago.

The common thread throughout the book is, despite how much we all dislike it, global politics is intimately interwoven with the IAU. In fact, the IAU was born as a direct result of WW I, and it wasn't until the Leiden (third) General Assembly (1928) that members from the former "Central Powers" were allowed to be present, although by invitation only.

now. The first such paper, *Cosmos*, was trilingual and appeared at the 1958 Moscow assembly, and even included cartoons! This was followed by the *IAU News Bulletin* (1961, Berkeley), the *Daily News Bulletin* (1964, Hamburg) and the *NVNIO SIDERIO*, or *Celestial Messenger* (1967, Prague).

This is a good book. If you are an Assembly attendee, you will certainly agree.

PETER TEUBEN,  
College Park, USA.



## EXTRAGALACTIC PLANETARY NEBULAE

During the last two decades, and in particular during the last few years, there has been very rapid progress in the study of planetary nebulae in other galaxies with the help of high quality CCD images.

By comparing CCD images of the [OIII] 5007 Å line with the continuum, a very large number of planetary nebulae in other galaxies has been detected. In fact the number of planetary nebulae catalogued in other galaxies now surpasses the known number in our own Galaxy, which is of the order of 1200. In the galaxy NGC 5128 alone, a large elliptical galaxy known as Centaurus A, more than 400 planetary nebulae have been detected.

Such studies have now been made in about two dozen galaxies as far as the Virgo cluster.

In the local group of galaxies, planetary nebulae in the LMC, SMC, M31 and M33 have been thoroughly studied by the above technique.

These objects are resolvable at large distances and their detection provides information on stellar death rates, the mass returned to the inter-

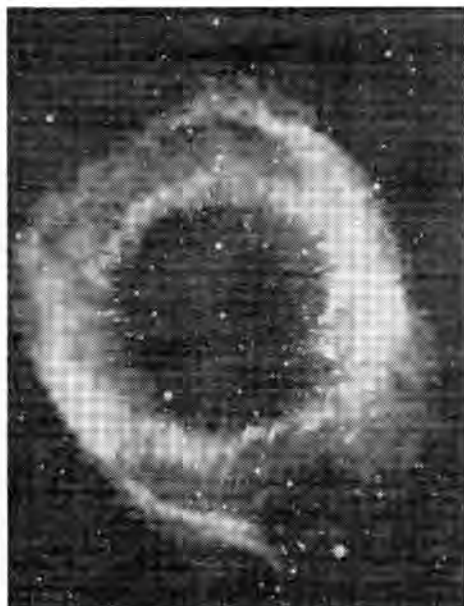
stellar medium, and the ionizing flux from the hot central white dwarf stars. In addition, their radial velocities can be measured and the resulting velocity distribution can be used to determine the mass distribution in the galaxy, including probing the outer regions and haloes. In addition planetary nebulae can be used to examine the effects of metallicity on stellar evolution in different types of galaxies, and even investigate the abundance gradients in galaxies.

Paradoxically one of the most interesting consequences of studying planetary nebulae in other galaxies has been to determine the distances of these galaxies, and even deduce the Hubble constant and the age of the universe. The paradox exists because the distances to the planetary nebulae in our own Galaxy remains a formidable problem where uncertainties of factors of 3 or more in the distances of individual planetary nebulae are not uncommon.

The method of obtaining distances to other galaxies uses the planetary nebulae luminosity function as calibrated for the Andromeda galaxy, M31. The bright cut-off of the planetary nebulae luminosity function is used as a distant indicator. Distances for more than 25 galaxies have been measured with this method, and the derived Hubble constant appears to be intermediate between the high and low values reported by other methods. The planetary nebulae luminosity function method is not without controversy, and some feel that it is a poor method as a distance indicator.

JD10 during the IAU General

*The Helix Nebula, perhaps the most photogenic of the planetary nebulae. If you wish to impress the less knowledgeable, you can also refer to it as NGC 7293.*



Assembly is, for the first time, exclusively devoted to work on Extragalactic Planetary Nebulae. On August 22, four sessions have been scheduled:

1. Observations and Kinematics
2. Chemical Abundances
3. Stellar Evolution
4. Cosmic Distances

Clearly, the study of planetary nebulae is becoming very prominent indeed!

YERVANT TERZIAN

Cornell University, Ithaca, New York

## Element #3 Makes It to the Big Time

**The lithium problem: a multifaceted subject.**

Data about lithium are used for trying to solve mainly two astrophysical problems: stellar internal structure and Big Bang nucleosynthesis.

Lithium is a very peculiar element: its nucleus is very fragile and is easily destroyed by proton fusion in the hot internal layers of the stars.

Lithium is preserved only in the external (cooler) layers. And even then, any mixing between the deep and superficial layers decreases the lithium abundance in the external layers, where the abundance is observed and measured.

Lithium may therefore be used as a powerful tracer of the mixing processes in the stars, thus bringing important information about the stellar internal structure. Owing to lack of time, this point will be discussed in the JD 11 only in relation to the second main aspect: the primordial lithium.

Lithium is, at least partly, produced in the Big Bang nucleosynthesis, and the comparison of the lithium abundance in young and old objects of the Galaxy would provide in principle, by extrapolation, the primordial abundance, which in turn, gives essential

constraints on the Big Bang nucleosynthesis and on the baryonic density of the Universe.

The fact that lithium may be destroyed in stars brings great difficulty to the problem, so great that the observational data have two competing interpretations:

1) The (high) lithium abundance found in *all* the young objects of the Galaxy is taken as the primordial abundance, preserved up to present times by a nearly exact compensation of a moderate production and a permanent destruction of lithium (astration in the stars of the Galaxy).

But why is the lithium abundance 10 times lower in the old stars? Lithium destruction in these stars, and a mixing between deep and superficial layers may account for such a large decrease. The difficulty is that the old metal-poor stars have the SAME (low) Li abundance, and this abundance is independent of the metallicity, age, effective temperature, mass, Galactic orbit of the stars.

Several rival theories have been proposed for explaining this uniformity of lithium destruction and mixing in the old stars, and are under discussion and criticism.

2) The low lithium abundance found in *all* the old stars in the Galaxy is taken as the primordial abundance, preserved up to present times in these old stars, owing to their reduced opacity. But why is the lithium abundance so high in the young objects of the Galaxy?

A copious production of lithium in the Galaxy has to take place, and several possibilities have been proposed.

The solution of the dilemma depends on the reality of tiny differences between models and observations, and the necessity of this pushes the present techniques to their limits. Progress is necessary; in particular progress in observations of interstellar gas, in theory of stellar internal structure and of stellar atmospheres.

F. SPITE

Observatoire de Paris  
Paris, France

## Atomic Databases New Power Source for Astronomy: JD 16

One of the principal probes for acquiring knowledge about the universe remains radiation emitted by stars. Atomic and molecular data are essential to carry out spectral analyses of this radiation and to derive, as well as model, conditions within astronomical objects.

As new and increasingly powerful telescopes and their associated high resolution spectrometers with high quantum efficiency electronic detectors have become operational (and more are in the planning stage), concerns about the adequacy of the atomic and molecular database have become more widespread in the astronomical community, especially among spectroscopists.

The central question is if the available atomic and molecular database is sufficiently complete and of sufficient

quality for analyzing and modeling a wide variety of phenomena. Fortunately, with the advent of supercomputers and powerful workstations with near supercomputer power, several sophisticated large-scale atomic structure calculations have been undertaken. The resulting new atomic databases are orders of magnitude larger than anything available just a decade ago, and the quality of these data — especially with respect to atomic oscillator strengths, and photoionization and excitation cross-sections — is also much improved.

Thus the application of these new databases to astrophysical research holds great promise to pursue new problems and to solve existing ones at much greater confidence levels and in much more detail.

This Joint Discussion is intended to

present the first applications to several astronomical problems. The Iron and Opacity Projects, the OPAL Code, and the Harvard-Smithsonian Database as well as new molecular databases will be discussed. In many respects, these are complementary efforts.

Atomic data have played a major role in the calculations of stellar atmospheres and interiors as well as the emergent spectra for many years. The lack of completeness of the relevant databases affects these models in a variety of ways which have to be assessed for comparison with observations.

With a wide variety of astrophysical objects to be studied come corresponding data needs. Besides dealing with static stellar photospheres and interiors, there are chromospheres and

coronae to be modeled. Pulsations and winds must be modeled dynamically, as well as hydrodynamical processes in stellar envelopes.

Also, atomic and molecular processes affect the interstellar medium and objects such as planetary nebulae, HII regions, and accretion disks which involve the interactions of gas with radiation.

Progress in all these areas goes hand in hand with progress in obtaining the needed atomic and molecular data.

W. L. WIESE

National Institute of Standards  
Gaithersburg, Maryland



# Announcements and Tidbits

## Food for Thought

Congresgebouw comestibles for Tuesday, August 23, have been said to be as follows:

- Soup (liquid, but otherwise unspecified)
- Ham and cheese sandwiches
- Salads and fruit
- French Bread
- Choice of drinks (not included)

Yep, you guessed it. This rip-roaring repast is yours for only 15 guilders. It's self-service, but who will serve you better?

You must buy lunch tickets at least a day in advance. They are available at the Social Events desk in the Congresgebouw main hall.

## Corrected Program for JD 16:

Astrophysical Applications of Powerful New Atomic Databases

Monday, August 22, Afternoon  
The New Atomic Databases

Introduction: New Atomic Data and their Impact on Astrophysical Models, M. Seaton (U.K.)

Role of Opacities in Constructing Atmospheres and Stellar Interiors, D. Mihalas (USA)

Summary of the Iron and Opacity Project, K. Berrington (UK)

The OPAL Opacity Code, F. J. Rodgers (USA)

Data for Weak Lines, A. Hibbert (UK)

Summary of the Situation on Molecular Databases, U. Jorgensen (Denmark)

A Comprehensive Database on Atomic and Molecular Spectra, R. Kurucz (USA)

Tuesday, August 23, Morning  
Stellar Atmospheres (as announced)

Tuesday, August 23, Afternoon  
Stellar Structure

Solar Structure and Helioseismology, P. Demarque (USA)

Horizontal-branch Evolution and RR Lyrae Star Pulsation, A. N. Cox (USA)

Cepheid evolution and Pulsation, N. Simon (USA)

Cepheid Variables: Period Ratios and Mass Determinations, i.e. Low Density/High-Velocity Range, P. Moskalik (Poland)

Role of Opacities in Accretion Disks, R. Wehrse (Germany)

Effective New Opacities on White Dwarf Models, S. Kawaler (USA)

Summary and Outlook, Future Needs for Atomic Data, B. Baschek (Germany).

## CHANGES TO PROGRAM, COMMISSION 5

Wednesday, Aug 23.

11:00  
WG I Astronomical Data, Chair A. Heck, 30 min.

A. Heck, Report on the past triennium and interactions with CODATA

M. Creze, Quality control of astronomical data and information

TG Data centers and Network, Chair M. Creze, 30 min.

TG FITS, Chair P. Grosbol, 30 min.

14:00  
WGII Information Handling, Chair A. Heck, 45 min.

A. Heck, Introductory remarks and generalities

C. Christian, The National Information Infrastructure Testbed

D. Wells, AstroWeb and the future of astronomical resources on the web

TG Designations, Chair P. Dubois, 45 min.

16:00  
Follow-up of the first Business session, Chair B. Hauck, 15 min.

WG II Information Handling, Chair A. Hearn, 30 min.

WG III Libraries, Chair W. Warren/B. Corbin, 45 min.

W. Warren, Plans for the LISA II meeting

B. Corbin, Report on the Astronomy Thesaurus project

P. Boyce, AAS electronic publishing plans and preprints meeting

D. Lubowich, The future of astronomy online databases

TDB, Update on the Astrophysics Data System (ADS)

B. Corbin, Report on the library "Partner's" project

## CORRECTION

Symposium 168, rather than 169, will meet in the Van Gogh Hall, and use the Van Gogh Lounge for posters.

Posters for Symposium 169 will be in the Paulus Potter Hall.

Our apologies.

The spiritual leader of the organization for this symposium, Drs. Theo Jurriens, has reported to this publication that over 6,000 push-pins have been used at the Assembly. This fact may prove useful. More likely, it will not. Unless, of course, you're in the push-pin business.

## Durchmusterung Catalog Reprinted!

The three Durchmusterung Catalogs (Bonner, Cordoba, Cape Photographic) are still available in reprinted form from:

World Data Center A for Rockets and Satellites\*  
NASA/ Goddard Space Flight Center  
Greenbelt, Maryland 20771, USA

The ten volume set is \$150. Originally, it was distributed free to professional astronomers but that may not be possible now. Many corrections have been incorporated.

\*US requesters should replace this line by Coordinated Request and User Support Office.

## JD 15 Schedule

Supporting Commissions: 25 (Stellar photometry & polarimetry), 27 (Variable stars) & 29 (Stellar spectra)

SOC: S. Adelman (co-Chairperson, USA) and A. Schwarzenberg-Czerny (co-Chairperson, Poland)

At least 13 posters have been accepted.

Monday August 22, morning

Time-series analysis of variable stars: views of an innumerate observer, J. Percy (Canada)

Temporal spectroscopy of variable degenerate stars, E. Nather (USA)

At last a chaotic pulsating star: A novel analysis of R Scuti, R. Buchler (USA)

Analysis of light curves of cepheid and RR Lyrae stars, N. Simon (USA)

Coffee Break

Analysis of time series of events in X-ray and gamma-ray astronomy, M. van der Klis (Netherlands)

Indexed and discrete time series: period changes in variable stars, Ch. Koen (South Africa)

Sampling and resampling of 1D observations, H.-M. Adorf (Germany)

Software for analysis of astronomical time series, J. Pelt (Estonia)

Statistical properties of signals and their models: comparison, A. Schwarzenberg-Czerny (Poland)

## Popular Lecture Series

Now that the Hubble Telescope has been to the optometrist, astronomers are privy to startling sights such as would make a French postcard vendor jealous. Ron Allen, now at the Space Telescope Science Institute, in lovely, glamorous Baltimore, will present tonight's popular lecture: "New View of the Universe from the Hubble Space Telescope."

Those who are adept at remember litany will recall that the lectures are held at the Museon, around the corner from the Congresgebouw (direction of Bel Air Hotel), and begin at 20:00. Entry price is a reasonable 7.50 guilders.



You ARE JUST ONE SIGMA SHORT OF  
A PERMANENT POSITION



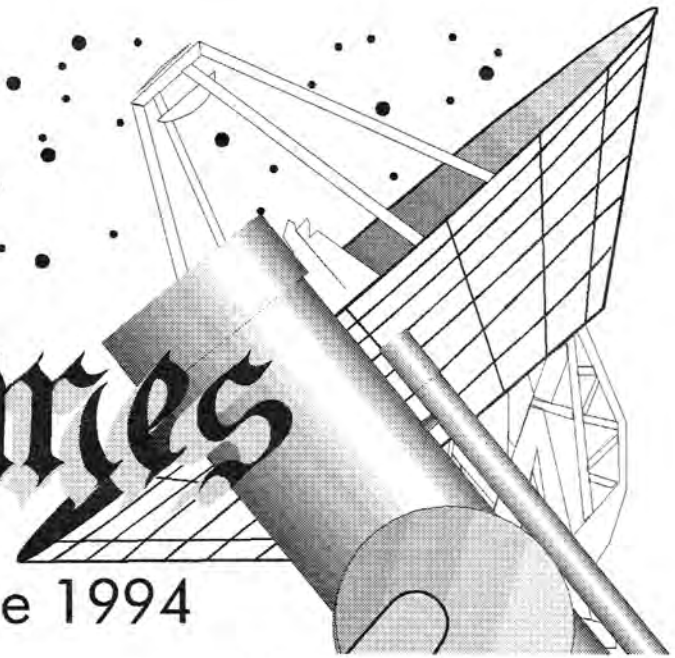


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



Editor: SETH SHOSTAK

Associate Editor: RENÉ GENEÉ

No. 7: Tuesday, 23 August

## Black Hole Binary Candidate Flares!

### Entire Southern Hemisphere Observing While Assembly Meets...

**O**n July 27, a bright X-ray nova suddenly appeared in Scorpius and within one day became one of the brightest objects in the X-ray sky.

The new object, X-ray Nova Sco = GRO J1655-40, is just a few degrees above the galactic plane, suggesting a distance of at most a few kiloparsecs.

The object was just seen by the

BATSE all-sky monitor on the Compton Gamma Ray Observatory. After a coarse location was determined, an IAU Circular was issued on August 4 to alert astronomers around the world. An optical counterpart and then a radio counterpart to the X-ray object were soon found. There have been a flurry of IAU circulars about X-ray Nova Sco for the past three weeks, as more observers study this remarkable source.

William S. Paciesas (University of Alabama) reported on the object Friday afternoon during Symposium 165.

These X-ray novae are thought to be caused by an episode of sudden accretion onto a black hole in a binary star system.

As often discussed at the Symposium, previous observations of such sources have provided our best candidates for galactic black holes.

The BATSE data showed the source to be somewhat unusual for such transients. Its fast rise to maximum (less than ~0.5 days), short duration (~17 days), relatively soft power-law spectrum, and lack of short timescale flickering may indicate a different origin, but the number of known X-ray novae is too small to permit confident classification.

Monitoring of the nova at radio frequencies was started shortly after the X-ray event by Duncan Campbell-Wilson (University of Sydney, Australia), using the Molongolo Observatory Synthesis Telescope (MOST) which operates at 843 MHz.

### Escape Velocity Escapes Editor's Notice

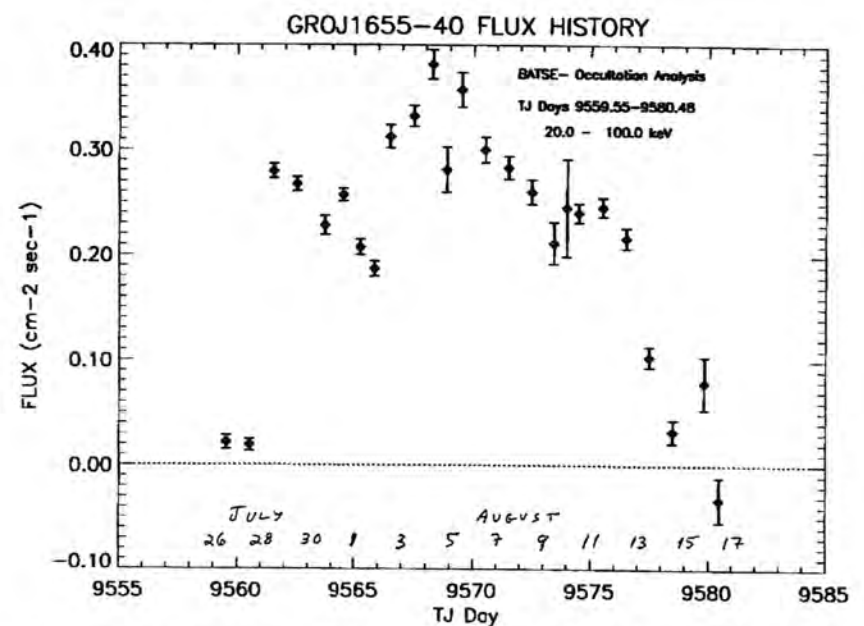
Unfortunately, yesterday's *Sidereal Times* misrepresented the escape velocity from Ida. Rather than 11 inches per second, this speed should have been printed as 11 meters per second.

## Gargantuan Atoms in Space!

**A** hydrogen atom in the ground state is about 1 Angstrom in diameter. Can you imagine atoms in the ISM which are about  $10^5$  times larger?

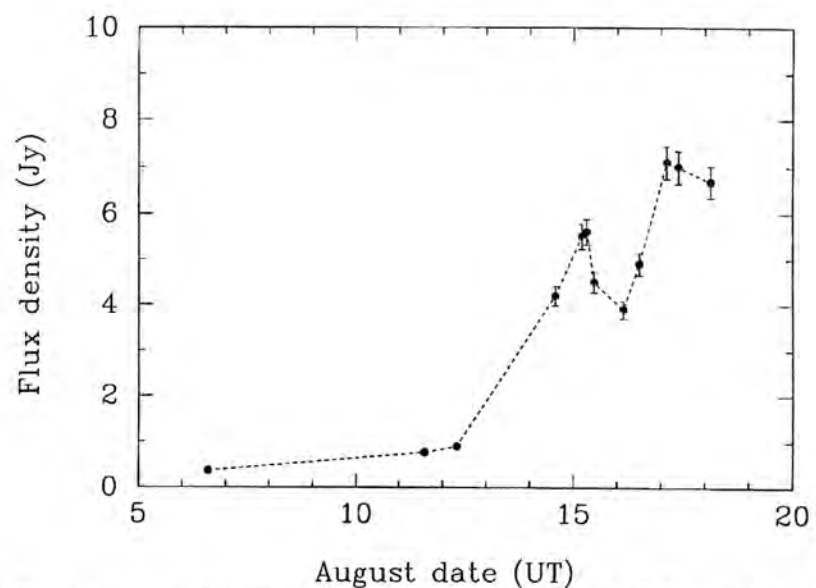
They have in fact been observed by Konovalenko *et al.* of the Institute of Radio Astronomy in Ukraine. These are carbon atoms, in neutral HI clouds, with their last electron excited to principal quantum number  $n = 814$ ! When these atoms make transition to an adjacent quantum number the resulting spectral radiation appears at a wavelength of 25 meters. This line has been observed, in absorption, towards Cas A by Konovalenko *et al.* using their UTR-2 radio telescope and it represents the lowest frequency (12.2 MHz) recombination line yet observed. Since such atoms are likely to be very fragile and easily influenced by their surroundings, these spectral lines are a useful diagnostic of physical conditions in the cold neutral phase of the ISM.

K.R. ANANTHARAMAIAH  
Raman Research Institute  
Bangalore 560080, India



Compton/BATSE observations showing the unusual intensity variation in X-ray Nova Sco.

### MOST observations of GRO J1655-40



Radio continuum observations of the flux density at 843 MHz, made with the MOST (resolution 43 arcsec).

The most dramatic increases in the radio continuum flux density occurred after the X-ray intensity had faded; the peak flux density measured so far (~7 Jy) makes it one of the brightest sources in the southern skies.

The obvious anti-correlation of the radio flare with the hard X-rays is in-

triguing, but the data are too new

for the observers to provide any interpretation. It suffices to say that this exciting new source will receive intense scrutiny in the coming months and years, and it may prove to be a significant step forward in our understanding of black holes.

WILLIAM S. PACIESAS  
University of Alabama, Huntsville

### General Assembly Dinner

**L**et's face it: humans are social animals, much like ants, bees and caribou. So why not express your animal heritage and attend the social event of the week? You will have the opportunity to meet moderately famous astronomers in an informal setting, chow down on a buffet dinner, and dance (but not simultaneously.)

The cost is 65 guilders per humanoid. The location is in the Jan Steen Room. Tickets are available at the Social Events Desk. Oh yes: the date and time are 20:00, Wednesday evening, August 24.



## Letters to the Editor:

Sirs:  
While your publication is occasionally informative and often useful for wrapping leftovers, I cannot find the local television listings.

Yours faithfully,  
C. Aardappel

Dear Sirs:  
Those gamma-ray sources must be exploding black holes!

Respectfully,  
L. Doyle

Dear Sirs:  
Your attempts to divert readers from your inability to lay out this publication without useless holes by filling same with impenetrable prose is regrettable. In the future, why not simply save the ink, and leave these spaces blank?

Unappreciatively,  
Marvin Fudnik

## Data Acquisition Made Simple

Do you have problems getting telescope time? Do you need observations now? Have you ever considered using archived data?

Why not try the La Palma Data Archive, purveyors of observations since 1986?

There is a Working Group meeting on archives on Wednesday morning, August 24, JD 20.

# Read me...

**The program of symposium 168 has undergone a major change. The latest version of the program will be available at the entrance of the Mondriaan hall.**

## Chretien Award Could Be Yours

**A**re you missing an opportunity? Are you planning an observational research project which involves international collaboration. Will you visit another country to work with your colleagues?

The Chretien Award program of the American Astronomical Society can provide funding. Named for the famous French optician and astronomer, Henri Chretien, the program awards \$20,000 every year to one or more astronomers. The winners are selected on the basis of a number of criteria including

- the quality of the proposed science
- the degree of international involvement
- the originality and creativity of the research idea
- the degree to which the recipient will benefit
- the independence of the project

Like the IAU Exchange of Astronomers program, the AAS Chretien awards are meant to foster long term collaborations between astronomers living in different countries. The awards are not given for the purpose of adding to an large existing project, nor is travel to another country simply to observe considered sufficient international involvement to deserve an award.

To be considered for funding, a proposal of no more than three pages plus a curriculum vitae, a budget and two letters of recommendation must arrive at the AAS Executive Office by April 1. More complete instructions can be found in the Membership Directory of the American Astronomical Society or are available from the AAS FTP archive (ftp to blackhole.aas.org).

The chair of the Chretien Award Committee, Kam-Ching Leung (#950), will be glad to answer any questions you might have about this program.

PETER B. BOYCE (#731)  
American Astronomical Society

## JD 19 on Nutation

**T**he Joint Discussion 19 is entirely dedicated to nutation. One part concerns the observations, i.e. determination of precession and nutations from Lunar Laser Ranging and Very Long Baseline Interferometry analyses. Another part concerns the IAU nutation theory and the perspectives of its change. This includes a study of the present status of the nutation theory for a rigid Earth as well as of the geophysical models for nutation.

An *a priori* model for the reduction of the nutation observations will also be presented. Some resolutions for future activities in precession and nutation researches will be discussed.

VERONIQUE DEHANT

Appeal for  
Contribution

# List of Wide- Field Plate Archives

**T**he list of Wide-field Plate Archives (WFPA) has been created as an IAU initiative of the Commission 9 Working Group on Wide-field Imaging.

The first version of the list was published in 1992 as a result of circulars sent to more than 200 astronomical institutes and observatories. The total sum of WF Plates in the listed archives is 1,764,600. 562,079 of the plates are in computer readable form and 37,960 are partially readable by computer.

An updated version of the WFPA list is displayed in the communication room (La Bourgogne). Copies of the list are available on request from M. Tsretkov (#326) or WFPA@BGE-ARN.BITNET after the Assembly of the IAU.

We would appreciate further contributions to the list on any information concerning wide-field plate archives missing in the list, corrections and remarks on the listed data, etc. This will help us to complete the information and make it more accurate.

MILCHO TSVETKOV  
Sofia, Bulgaria

## Schedule:

### NEW DEVELOPMENTS IN ARRAY TECHNOLOGY AND APPLICATIONS

**August 23, Tuesday**  
**New Developments in CCD  
Technology**

Morning, Chair D. Philip

WELCOME  
Immo Apenzeller, Assistant  
General Secretary, IAU

INTRODUCTION  
A. G. Davis Philip, Union College  
and ISO

ARRAY DETECTORS AND  
INSTRUMENTS FOR THE ESO  
VERY LARGE TELESCOPE  
Sandro D'Odorico, ESO

DESIGN AND FABRICATION OF  
LARGE CCDs FOR THE  
KECK OBSERVATORY DEEP  
PROJECT SPECTROGRAPH  
Richard Stover, Mingshi Wei, Kirk  
Gilmore and William Brown, Lick  
Observatory

SCIENTIFIC CCD PROSPECTS  
FOR 1994 AND BEYOND, Chair  
Walker, P. R. Jordan and A. P. Oates,  
Royal Greenwich Observatory

NEW DEVELOPMENTS IN CCD  
TECHNOLOGY FOR THE UV -  
EUV SPECTRAL RANGE  
Giovanni Bonanno, Osservatorio  
Astrofisico di Catania

SCIENCE WITH THE WFPC-2  
CCDs [CANCELLED]

AFTERNOON  
Chair, Cullum

CCD CONTROLLERS  
Robert Leach, San Diego State  
University

ACTIVE CCD ACQUISITION SYS-  
TEMS  
A. Blecha, Observatoire de  
Geneve

CCD DEVELOPMENT ACTIVI-  
TIES AT ESO  
O. Iwert, ESO

NEW DEVELOPMENTS IN IR  
DETECTOR ARRAYS Chair,  
Blecha

INFRARED ARRAY DETEC-  
TORS: PERFORMANCE AND  
PROSPECTS  
Ian S. McLean, UCLA

THE LICK OBSERVATORY TWO  
MICRON IMAGING CAMERA  
K. Gilmore, D. Rank and P. Temi,  
Lick Observatory

POSTER PAPER Discussion (Session  
A) Chair, McLean



## Developments in Array Technologies and Applications

Ask the Boss for Arrays!

IAU Symposium Number 167 is being held in recognition of the revolution during the last decade in methods of detecting photons at telescopes. The advent of charge coupled devices (CCDs) and other array detectors has allowed astronomers to obtain images and spectra of extremely faint objects and of objects in regions of severe crowding which were unreachable by older methods (such as photography and single channel photometry). An added benefit is the increased accuracy of the new measures.

At the major observatories of the world just about all the imaging work is now done with this new technology. Among amateur astronomers and at small observatories all over the globe a similar revolution has taken place as CCD technology turns smaller telescopes into instruments capable of observing objects once visible only with the largest telescopes. This new technology is a major aid in the teaching of astronomy; beginning students can do actual astronomical investigations themselves rather than just read about them. From amateur, to student, to professional astronomer, all have had their possibilities in obtaining observational data materially increased.

One can think of the CCD as a silicon device that is made up of many thousands of individual photometers. When light hits the surface of a silicon semiconductor, the number of electrons emitted is directly proportional to the intensity of the light received. This is true over a large range of

intensities, some five orders of magnitude. Unlike the complex relation between intensity and density on a photographic plate, the relation between intensity and the charge generated on a CCD surface is linear to 0.1% over most of its range.

Modern devices have dimensions of 2048 x 2048 (4,194,304 pixels) and even larger chips are now being constructed. These larger chips have high resolution since their pixels are small and many pixels cover the area to be investigated. However, to make uniform CCDs that are larger than 2048 pixels on a side has proved to be very difficult. A different way to increase the area of the sky being investigated is to create mosaics of CCD chips. Mosaics of four 2048 x 2048 CCD chips have been made, covering an area of 2.5 inches square. Depending on the telescope used, areas on the sky up to almost a square degree can be measured with mosaic devices.

The CCD is sensitive to photons over a very large range of wavelengths, from X-rays to near infrared. No other single detector covers such a wide range of the spectrum. The quantum efficiency of the CCD is higher than almost any other device, except at ultraviolet wavelengths where it is relatively insensitive. The human eye sees about one out of every hundred photons. In a CCD, over half the photons are detected. Another important characteristic of the CCD is that the noise associated with each measure is very small (of the order of ten electrons per pixel). This means that

even very faint stars can be measured accurately. One of the main advantages of the CCD is that the data are in digital form, which means one can change their appearance under software control. The density scale can be increased or reduced so as to bring out details that otherwise could not be seen.

Developments in technology have been especially dramatic in infrared astronomy. There was no way of producing a detailed infrared picture in the early days of infrared work. By the early 1980's, there were small arrays of 32 x 32 pixels and by 1992 the arrays had grown to 256 x 256 pixels. Presently manufacturers are making infrared arrays 1024 pixels on a side. Now photographs are taken in the infrared which show objects at high resolution, a great change from the early days of infrared astronomy when the telescope had to scan an area on the sky to even locate where an infrared source was.

At IAU Symposium No. 167, we will cover the topics of new developments in CCD technology, new developments in IR detector arrays, direct imaging with CCDs and other arrays, spectroscopy with CCDs and other arrays, astrometry with CCDs and large field imaging with array mosaics. Scientific results of these investigations will be given in the poster sessions, as well as some additional papers on instrumentation.

A. G. DAVIS PHILIP  
Union College and The Institute for Space Observations, New York

## Upcoming Eclipse

*Sol to be Shadowed*



A total eclipse of the Sun will cross South America on November 3, and for the first time a joint IAU site has been organized.

The eclipse crosses parts of Peru, Chile, Bolivia, Paraguay, Argentina and Brazil. Weather forecasts are best for the western sites. Based on an exploratory trip I took to Chile and Bolivia on eclipse week minus one year, I have made arrangements for professional astronomers to use facilities at a Chilean army base in Putre, Chili, at an altitude of 3,500 m (12,000 ft).

We expect astronomers from the U.S., France, Japan, Korea, India, Belgium, Chili, and elsewhere. Prof. Oscar Matsoura from Brazil has made other arrangements for professional astronomers to observe from his

country, including scientists from Russia, France, Ukraine, Georgia, Brazil and elsewhere. On October 24, 1995, another total solar eclipse will cross Iran, Afghanistan, Pakistan, India, Bangladesh, Myanmar, Thailand, Cambodia, Vietnam, Sabah of Malaysia, and outer islands of the Philippines and Indonesia.

The IAU Working Group on Eclipses authorized by Commission 10 and 12, will meet at 9 a.m. on Tuesday, August 23 in the Frans Hall Room for 90 minutes. Members from countries that these eclipses will cross, as well as members considering scientific observations for these eclipses, are invited to attend.

JAY M. PASACHOFF  
Chair, IAU Working Group, Eclipses

## JD20: The Status of Archiving Astronomical Observations

JD20, scheduled for Wednesday morning, will debate the proposal which was summarized in the final paragraph of the article by Griffith in *Sideral Times* No 3, Aug 17, 1994, page 2.

The official list of speakers is necessarily limited, and the organizers are aware that some of the intending participants are already hoping for an opportunity to speak at the meeting.

If those people would care to leave a note to that effect in my mail box (#586), I will ensure that the chairman will look out for you.

ELIZABETH GRIFFITH  
Cambridge, U.K.

## Secret Dutch Plans to Build World's Largest 'Scope!

The *Sideral Times* has uncovered clandestine plans by the Dutch astronomical powers-that-be to construct mankind's largest optical telescope.

According to a document smuggled out of the Dwingeloo Radio Observatory by a disgruntled graduate student, the Dutch hope to trump the international consortia who currently dominate the field by building a mammoth reflector in The Netherlands. The document cites Dr. Ernst van der Dander, who complains of "a hundred years' worth of brain drain. Sure, drainage has been good for the country — particularly the farmers — but the cost of continuing to supply the world's observatories with astronomers and directors has become more than we can bear. From now on, we're going to stay home."

The Dutch apparently intend to circumvent the difficulties of a flat, frequently-cloudy country by constructing an artificial mountain 5 km high. This will be built out of pig, chicken and cow manure — fertilizer, or "mest" — which is overabundant in Holland. "We need 2 10<sup>9</sup> m<sup>3</sup> of fertilizer," according to van der Dander, "but that should take less than 3 years to produce and pile up."

The new peak will be situated on a geological feature known as the "hondsrug" (dog's back) near the town of Beilen, as this will give the engineers a 2 meter head start. Currently, the highest elevation in The Netherlands is an overpass on the A5 highway, but this is unsuitable as a site due to mercury vapor lamps.

The observatory will be known as the Middle European Super Telescope (M.E.S.T.), although other names such as Kip Peak, Mauna Koeien, and Pig du Midi were considered. The telescope itself will be a 20 m affair, incorporating active optics, adaptive optics, and non-reflective optics. It will be capable of imaging a bicycle lamp at the distance of Neptune (although none are expected.)

The new mountain, which will be visible on a clear day from Manchester, will change weather patterns in Germany, and is expected to occasion complaints for several years because of the odor. Flies will be kept away from the dome slit with pneumatic swatters.

The project has the full support of the Ministry of Agriculture and the Dutch cabinet. The latter has plans to be evacuated to the site in case of a major break in the dikes.

What will it be like to observe atop a 5 km high heap of cow pies? According to van der Dander, "Good seeing is worth the stench, and of course inside the dome we'll have breathing masks. But stepping outside could be a real pain in the dairy air."



## U.S. National Committee for the IAU Holds Bash Astronomers Press the Flesh at Hotel des Indes

On Saturday evening, approximately 150 Assembly attendees and their better halves were guests of the U.S. National Committee for the IAU at a reception held in the chic Hotel des Indes. Donald Osterbrock, Peter Boyce and Roger Bell were the gracious hosts, and the U.S. Ambassador to The Netherlands, K. Terry Dornbush, was on hand to greet the assembled Assembly multitude.

The Sidereal Times sent out one of its crack photographic teams (also, its only photographic team) to provide you with these up-close-and-personal images of astronomers run amuck.



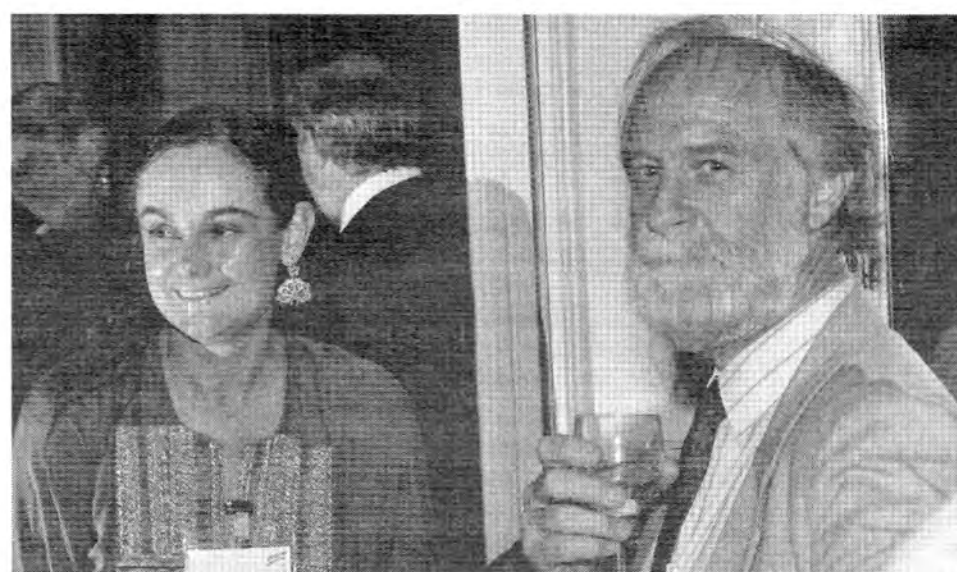
Dave Morrison considers the impact of liquid refreshments, together with Mr. and Mrs. Ken Seidelman.



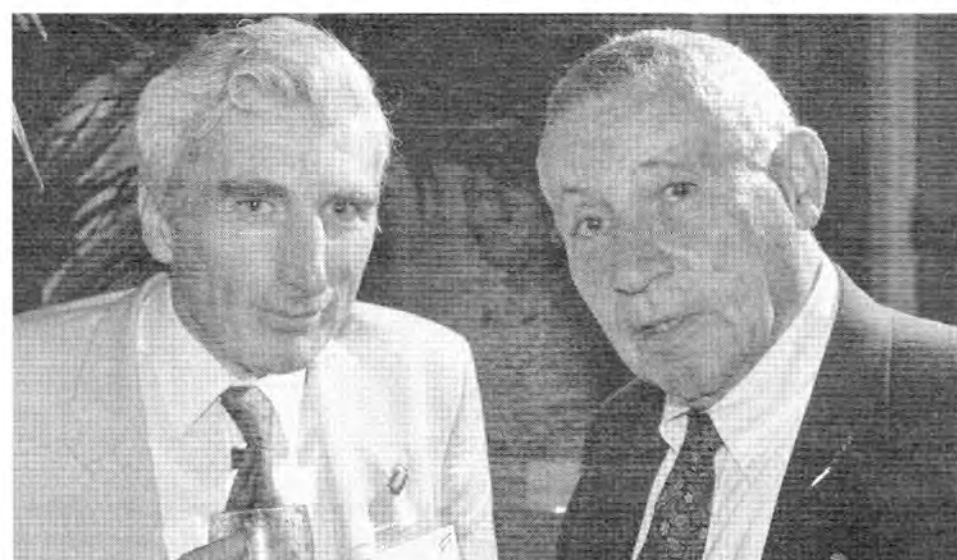
Jaqueline Bergeron and Ken Kellerman waltz into view.



Jerry Ostriker, looking dynamic.



Virginia Trimble and Ron Ekers are amused.



Martin Rees and Mort Roberts read the fine print on the photographer's lens.





David Helfand on his knees before Geoff Burbidge. The request was granted.



Peter Boyce and Terry Dornbush consider shifts in policy.



Charlie Tolbert demonstrates the proper technique for imbibing Jenever.

## Software Packages for Positional Astronomy

During the past seven years, a number of software packages have become available for astronomers who need various kinds of astrometric information, including ephemerides of solar system objects. Printed almanacs are no longer the only source for accurate and authoritative data of this type.

The U.S. Naval Observatory has produced MICA, the Multiyear Interactive Computer Almanac, a high-precision almanac for PCs and Macintosh systems. This menu-driven program provides positions of the Earth, Sun, Moon, planets and catalog objects (the user can define his or her own catalog) for any place and time between 1990 and 1999, with respect to any of nine coordinate systems.

Planetary physical ephemerides, sidereal time, rise and set times and other kinds of data can also be produced. A "batch" mode allows MICA to be integrated into other systems. MICA is distributed for USNO by the U.S. National Technical Information Service. (For more information, drop a note in box 573 or e-mail [ghk@ceres.usno.navy.mil](mailto:ghk@ceres.usno.navy.mil) after the Assembly.)

At the Royal Greenwich Observatory, Her Majesty's Nautical Almanac

Office is developing a software package based on the data and algorithms published in "Compact Data for Navigation and Astronomy". The package, called NAVPAC, will fit on a single floppy disk. The program is interactive and the data used by the program may be easily updated. The program has also been carefully error-trapped. It is intended to market this program with the next edition of "Compact Data" to be published in 1995.

In St. Petersburg the first version of the Astronomical Yearbook, Part I, has been prepared by the Institute of Theoretical Astronomy on a floppy disk.

The Ephemeris Service of the Institute of Applied Astronomy, Russia, has produced a programming system called ERA, which is designed to solve a wide range of problems involving ephemerides and dynamical astronomy.

The system effectively creates a PC-based work station for both theoretical and observational astronomers. It may also be used as a teaching aid. The system is extremely versatile and IAA is seeking independent testing and suggested improvements.

The Bureau des Longitudes, Paris, has established an ephemerides service on the French "Mintel Service" carried by the public telephone network. In the UK, ephemeris data are available to astronomers using the STARLINK network.

This list is not exhaustive. Clearly there is a great demand for these packages. They remove the pain and guesswork from planning observations. Undoubtedly they will grow in flexibility and sophistication in the coming years.

GEORGE KAPLAN  
BERNHARD YALLOP

### Session on Pollution and Junk Out There

Astronomers are especially urged to attend this afternoon's session for non-specialists on light pollution, radio interference, and space debris entitled "Environmental Impacts on Astronomy" in Mesdag 2, at 14:30. This session is sponsored by an inter-union commission, and chaired by the IAU's own Derek McNally.

Give a hoot. Don't let them pollute.

### IAU Style Manual and the Universal Decimal Classification for Astronomy

G. A. Wilkins, of Exeter University, would be glad to receive suggestions for improvements to the IAU Style Manual that was published in the Transactions of the 1988 General Assembly.

Please contact George A. Wilkins or send him your suggestions. He would also be pleased to receive offers of help for the revision of the Universal Classification for Astronomy (UDC 52/524). The schedule was last published in 1977 and its revision is long overdue. He would be particularly glad to have assistance from astronomers who would be prepared to review and update the parts of the schedule in which they have expert knowledge. If you are interested in helping, please contact him (pigeon hole #1334 or internet [G.A.WILKINS@EXETER.AC.UK](mailto:G.A.WILKINS@EXETER.AC.UK)).

### Come to Paraguay for Next Solar Eclipse

Although weather prospects may seem better to the north, in Bolivia, conditions should still be good in Paraguay. We would also like to point out the excellent roads and abundance of habitation along the path of totality in Paraguay.

We encourage you to write to the Direccion General de Turismo in Asuncion, Palma 468, Asuncion, FAX: (595-21) 49-1230 to arrange for yourself and your equipment. A.E. Troche Boggino  
Universidad Nacional de Asuncion



# Pulkovo Observatory: An Historical Perspective

The founding of the Pulkovo Observatory is closely related to the Russian Emperor, Nicholas the First.

Czar Nicholas invited academician Friedrich Georg Wilhelm Struve, the Director of the Dorpat Observatory, to work on the project and define the scientific program of the future observatory, and generously provided him with all necessary financial means.

In 1834 the construction of the observatory was begun on the Pulkovo Hills near Saint-Petersburg, with designs from architect Alexander Bruellow. The astronomical instruments were ordered by Wilhelm Struve from the best German telescope makers. Pulkovo Observatory, *alias* *Primaria Specola Astronomica Russiae*, was inaugurated on August 19, 1839. It began its scientific life along the lines laid out by Wilhelm Struve, and in particular the determination of precise star positions and proper motions, of positions of the major planets and their satellites, in compilation of absolute star catalogues, in geodetic surveys of vast territories of the Russian empire etc.

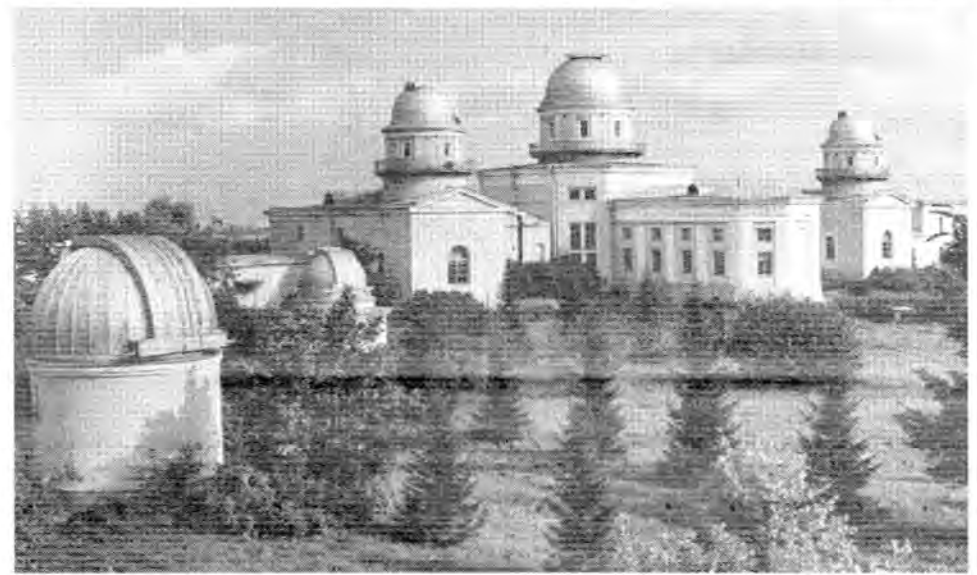
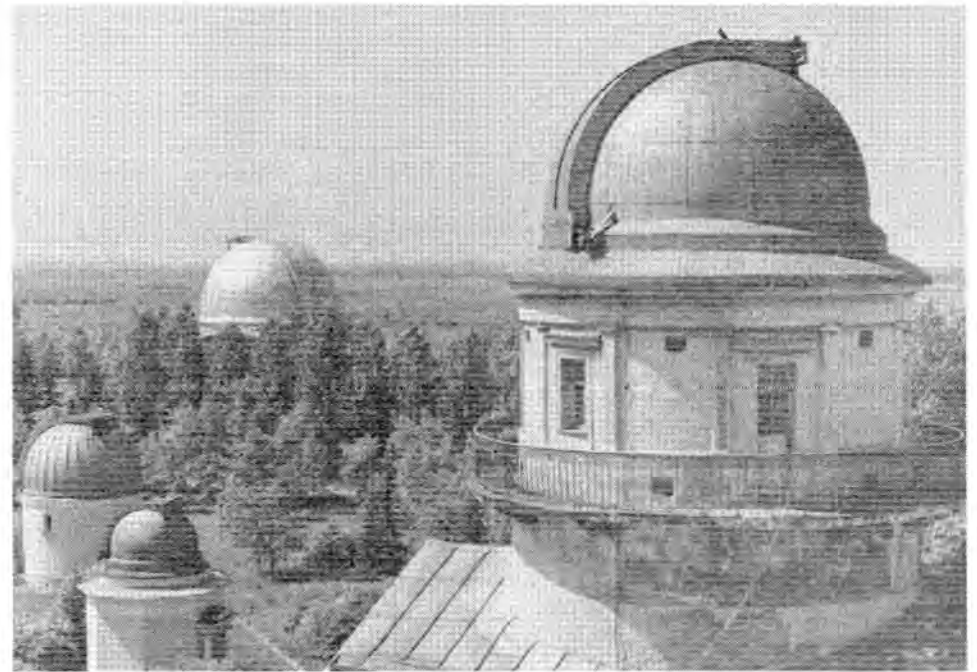
Later, when Otto Struve succeeded his father, the scope of the scientific problems had been increased to include astrophysics of the stars and the Sun. The fruitful activities of Pulkovo astronomers brought to the Observatory much glory, including a

designation of the "astronomical capital of the words." Regretfully, after the prosperous and flourishing state of the Observatory in the 19th century, three severe blows struck the Observatory in this century; confiscation of funds after the bolshevik turnover in October, 1917, purges by Stalin among the Pulkova astronomers in the 1930s, and the total destruction of the observatory due to the WWII military actions in September, 1941.

Immediately after the end of WWII, the restoration of the Pulkovo Observatory was undertaken, and in May, 1954 the second inauguration of the Observatory took place.

Among the major achievements of the Pulkova Observatory in the post WWII period were the design and manufacture of the 6 meter reflector, the 600 meter radio telescope RATAN, the stratosphere solar telescope, etc. should be mentioned. Now despite the very grave political and economical situation in Russia, the astronomical investigations at the Pulkova Observatory are going on. And thanks to sincere and generous support by, and wide-scale cooperation with, our dear colleagues from many countries over the world, we have never lost hope for a better future, and continue to work on ambitious projects in Space Astro-metry and Astrophysics as well as on classical astronomical observations.

VICTOR K. ABALKIN



## THE STAR\*S FAMILY: AN EXAMPLE OF INTEGRATED YELLOW-PAGE SERVICES

The **Star\*s Family** is a growing collection of directories, dictionaries, databases and, more generally, on-line yellow-page services.

The products are structured essentially around three sets of master files:

- The directory **StarGuides** of astronomy, space sciences, and related organizations of the world, with its associated database **StarWorlds** (more than 5,000 entries from about 100 countries)
- The dictionary **StarBriefs** of abbreviations, acronyms, contractions, and symbols in astronomy, space sciences, and related fields, with its associated database **StarBits** (more than 75,000 abbreviations)
- The database **StarHeads** of individual web pages essentially of astronomers and related space scientists

A demonstration of the facilities can be seen at the CDS terminals located in the mailbox area. Direct access is also available via Internet and tools such as Mosaic through the following URLs:

- for **StarWorlds**, <http://cdsweb.u-strasbg/~heck/sfworlds.htm>
- for **StarBits**, <http://cdsweb.u-strasbg/~heck/sfbits.htm>
- for **StarHeads**, <http://cdsweb.u-strasbg/~heck/sfheads.htm>

Leaflets are also available at the CDS-Simbad booth.

For more information, contact:

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Fax: +33-88 49 12 55 e-mail: [heck@cdsxb6.u-strasbg.fr](mailto:heck@cdsxb6.u-strasbg.fr)

URL: <http://cdsweb.u-strasbg.fr/~heck>

## Binaries Make Unabashed Contact

Although W UMa contact binaries are somewhat abundant among field stars and cluster variables, no one has ever observed the formation of one. It appears that this rare, transient event has now been observed.

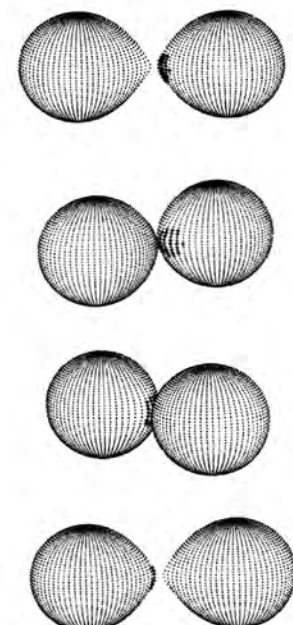
The interacting, nondegenerate binary, V361 Lyra is apparently in the throes of such a transition from a semi-detached configuration to that of contact. CCD images of the system were taken on five nights in June, 1993 at Kitt Peak National Observatory. The observations reveal a strange asymmetric light curve. It is found that the main distortions in this light curve can be reproduced by a near contact configuration with the primary component filling its Roche lobe, and the secondary filling 95% of its respective critical surface.

The periodicity study reveals that the secondary star is accreting mass at a prodigious rate of about  $10^{-6}$  solar masses/year. This creates a superluminous region which rivals the entire binary system in brightness! Otherwise, the system consists of two fairly normal late G to early K spectral type dwarf components with a photometrically determined mass ratio of greater than 0.9. The secondary component is rapidly filling its Roche

lobe and coming into contact with a mass ratio nearest unity.

The period should continue to decrease via angular momentum loss due to solar winds and ultimately the system should coalesce into a fast rotating FK Comae subgiant.

RONALD SEMAC



Four representations of V361 Lyr shown at orbital phases of 0.25, 0.35, 0.63 and 0.75. The transient hot spot rivals the entire binary in brightness.



## IAU Scientific Meetings in 1995

During its last session here in The Hague, the IAU Executive Committee finalized the scientific meeting program for 1995.

Below is a list of all Regional Meetings, Symposia and Colloquia sponsored by the IAU which will take place in 1995:

### Regional Meetings:

VIII Latin American Regional Meeting, November 20-25, 1995, Montevideo, Uruguay

### IAU Symposia:

Symposium 170: "CO: Twenty-five Years of Millimeter-wave Spectroscopy" May 29-June 2, 1995, Tuscon, USA.

Symposium 171: "New Light on Galaxy Evolution" June 19-23, 1995, Heidelberg, Germany.

Symposium 172: "Dynamics, Ephemerides and Astrometry in the Solar System, July 2-8, 1995, Paris, France.

Symposium 173: "Gravitational Lensing" July 9-14, 1995, Melbourne, Australia

Symposium 174: "Dynamical Evolution of Star Clusters Confrontation of Theory and Observations" August 22-25, 1995, Tokyo, Japan.

Symposium 175: "Extragalactic Radiosources" August/September, 1995, Bologna, Italy.

Symposium 176: "Stellar Surface Structure" October 9-13, 1995, Vienna, Austria.

### IAU Colloquia:

Colloquium 154: "Solar and Interplanetary Transients" January 23-27, 1995, Pune, India.

Colloquium 155: "Astrophysical Applications of Stellar Pulsation" February 6-10, 1995, Cape Town, South Africa.

Colloquium 152: "Astrophysics in the Extreme Ultraviolet" March 27-30, 1995, Berkeley, USA.

Colloquium 153: "Magnetohydrodynamic Phenomena in the Solar Atmosphere" May 22-26, 1995, near Tokyo, Japan

Colloquium 156: "The Impact of Comet Shoemaker-Levy 9 on Jupiter" May, 1995, Baltimore, USA

Colloquium 157: "Barred Galaxies" May 30-June 3, 1995, Tuscaloosa, USA

Colloquium 158: "Cataclysmic Variables and Related Objects" June 26-30, 1995, Keele, UK

Colloquium 150: "Physics, Chemistry, Dynamics of Interplanetary Dust" August 14-18, 1995, Gainesville, USA

In addition the IAU will support a special meeting on "Library and Information Services in Astronomy" (LISA II) which will take place May 10-12, 1995, at ESO, Garching bei Muenchen, Germany.

## Saving the Bits at Kitt Peak

Elizabeth Griffith has eloquently described the reasons for archiving observatory data in a recent issue of the *Sideral Times*. The first step toward a true astronomical data archive is capturing the data.

The "Save the Bits" archive of the National Optical Astronomy Observatories has been in operation at Kitt Peak for over a year. This low cost program relies on existing network infrastructure to collect and store images on Exabyte tape. Observers at KPNO telescopes acquire over 250,000 CCD and IR array images (including spectra), totaling about 0.5 terabytes, each year.

The operation of the system is quite simple. The data acquisition software notifies a local daemon whenever an image is obtained. The local daemon produces a FITS copy of the image and queues it for transfer to a central archive computer. The central archive computer receives images from eight telescopes on Kitt Peak and translates the images to FITS image extensions. Every 50 Mb is written to Exabyte tape as a single FITS extension file for efficiency. The archive can be configured to write any number of simulta-

neous tape copies.

Image headers are also stored in a separate catalog. An index file cross-references the catalog with the tape, file, and image location of the actual data. Given a list of index entries, the archive staff can recover the requested images using a simple program which unpacks the large FITS extension files into individual FITS images. The desired images are written to a directory from which they can be retrieved over the network or written to a distribution tape.

KPNO is happy to make the archive software available to other observatories interested in archiving data. The hardware requirements are minimal — a networked workstation with one or more tape drives. To find out more about the KPNO data archive, visit the NOAO Web page: <http://www.noao.edu>, or contact Rob Seaman ([seaman@noao.edu](mailto:seaman@noao.edu)). A poster describing the KPNO archive in more detail is also available in conjunction with JD20.

CATHERINE PILACHOWSKI,  
#1170  
National Optical Astronomy  
Observatories

## IMPORTANT ANNOUNCEMENT!

The texts of the proposed resolutions and the proposal for the restructuring of the Union for approval by the General Assembly on Wednesday afternoon will be printed in tomorrow's edition of the *Sideral Times*.

## Our Last Day!

Cambridge University Press would like to thank all our customers at the conference, and to remind those who still have books to collect to please come along today and do so. We hope to see you all at the next meeting.

ADAM BLACK  
JOANN MOTHERWELL

## Personals

The Baltimore General Assembly began on my 76th birthday. The Buenos Aires G.A. ended on my 79th birthday. This G.A. began two weeks after my 82nd birthday. This suggest a new "Law of Nature". The IAU General Assemblies should begin on my birthday, plus or minus two weeks. I regret that there are no penalties for violation of this law.  
FRANK K. EDMUNDSON, #178

## Killer Comets!

The Earth orbits the Sun within a swarm of asteroids and comets, many of which will eventually impact our planet. Although such impacts are tiny on an astronomical or geophysical scale, they have led to environmental disasters that strongly influenced the course of biological evolution.

During the past decade astronomers have become aware of the potential risk of future impacts, and particularly of the interest of the public and of various governments in averting such disasters. Three years ago, the IAU formed a Working Group on Near Earth Objects (NEOs), chaired by Andrea Carusi, to look into these risks and recommend possible courses for international cooperation to provide a warning of such future catastrophes.

On Saturday, the WG on NEOs presented a half day report on its work of the past triennium. Evaluation of the contemporary impact hazard shows that most of the risk is associated with impacts by comets and asteroids with diameters on the order of 2 km. These are the smallest impacts that are thought to be able to induce a global catastrophe that might lead to widespread death and a possible breakdown of civilization. The frequency with which the Earth collides with 2-km NEOs is such that the chances of such an occurrence taking place within any given human lifetime is about 1/5000. Thus, while such impacts are indeed extremely rare, the risk of

death from impacts is comparable to that from other more familiar natural disasters, such as volcanic eruptions or earthquakes. In fact, most people would consider the impact problem to be much more important, since it is the only type of natural disaster that threatens civilization itself.

Even larger impacts are possible. Brain Marsden pointed out that Comet P/Swift-Tuttle (the parent comet of the Perseid meteor shower) is now thought to have a diameter of about 20 km. It is on an Earth-crossing orbit, and the possibility of an impact sometime in the next few centuries is not zero. If we were hit by an object this large, the result would be a mass extinction, and humanity itself might conceivably come to an abrupt end.

Amidst all this doom and gloom, the WG on NEOs has some positive news as well. It is a relatively straightforward problem to discover and catalogue all of the near-Earth asteroids larger than 2 km in diameter, using modern astronomical techniques. A NASA working group has proposed such a program (called the Spaceguard Survey), based on six dedicated telescopes of 2-3 m aperture, and recent studies reported by E. Bowell suggest that even telescopes as small as 1 m could carry out such a survey. Several existing asteroid observing programs are currently being upgraded to dramatically increase the discovery rate.

In the wake of the collision of Comet

P/Shoemaker-Levy 9 with Jupiter, the U.S. Congress has recently instructed NASA to present an international plan to discover all of the larger near-Earth asteroids within the next decade. If such a program is carried out, astronomers will be able to make a practical contribution to the future of human civilization that is more concrete and perhaps more understandable to the public than many of our discoveries in fundamental science.

## Chalonge Book on Mountain Climbing

One of the founders of the sport of mountain climbing, Tyndall, was a 19th century physicist, and some of the more adventurous and athletic among astronomers still seek respite from their work among Alpine peaks.

One such was the famous French astronomer Daniel Chalonge who worked hard on behalf of the IAU in the post-World War II period as a Vice President. Now his daughter, Karin Chalonge, has produced a beautiful book of Daniel's reminiscences of the mountains full of poignant and amusing experiences and entitled "Les Hautes Routes d'Antan"

Copies, priced at Dfl 70, are available at "The Shop at the End of the Universe" near to "The Orangerie" on the main Congress floor, or by order (FF 185) from Mlle. Karen Chalonge at 7 rue de le Dantec, Paris 75013.



# Announcements

## and Tidbits

### Latest Lunch Listing

For those of you who are curious as to the Congresgebouw comestibles for Wednesday, August 24th, we are pleased to report the following information:

- Minced pork
- Pasta
- Salad
- Choice of imbibations (at extra cost)

And, by golly, it's a mere 15 guilders. We are obliged to remind you that lunch tickets must be purchased a day in advance, at the Social Events desk in the Congresgebouw main hall.

### CORRECTION

Symposium 168, rather than 169, will meet in the Van Gogh Hall, and use the Van Gogh Lounge for posters.

Posters for Symposium 169 will be in the Paulus Potter Hall. Our apologies.

### IMPORTANT NOTICE FOR HONCHOS...

#### General Secretaries Past Present and Future Present at the 22nd IAU:

The distinguished IAU members on the list that follows have been, are, or probably will be, general secretaries of the IAU. We have been informed that all these people are present at the General Assembly and we would like to invite them to come to Commission chamber 2 on **Wednesday, August 24, at 14h00.**

A picture, not only appropriate for the *Sidereal Times* front page but also for the scientific historians of the next millenium, will be taken.

- Jean-Claude Pecker 1964-1967
- Cornelis de Jager 1970-1976
- Edith Muller 1976-1979
- Patrick Waykan 1979-1982
- Richard West 1982-1985
- Jean-Pierre Swings 1985-1988
- Derrek McNally 1988-1991
- Jeaqueline Bergeron 1991-1994
- Immo Appenzeller 1994-1997
- Johannes Andersen 1997-2000

### Commission 31

The business sessions of Commission 31 will not be held Wednesday, August 24, but Tuesday, August 23 at 9:00 - 10:30, Mesdag 2.

E. PROVERBIO

## Better Resolutions

The chairman of the Resolution Committee wishes to inform all the members of the IAU that the resolutions submitted to the IAU General Assembly are all posted on a special board in the Paulus Potter room on a black pillar behind the tables. As some of them will need a vote by the national delegations, it is suggested that all members to read them.

The Committee apologies for the poor presentation of some of these resolutions. Time is short and it has not been possible to retype them.

J.-C. PECKER

# Public Lecture

Few of those in attendance at this Assembly will remember the Big Bang personally, but George Smoot, from Berkeley, knows it intimately. Tonight, at 20:00 in the Museon (within shouting distance of the Congresgebouw), Smoot will hold forth on his exciting investigations into the dramatic birth of the universe. The title of this two-hour, popular presentation is: "Quest to the Big Bang," and you can bring both yourself and as many other humanoids as you wish, for the very reasonable price of 7.50 guilders each.

Despite the fact that Berkeley is often regarded by Californians as a separate, sovereign entity, Professor Smoot has assured the organizers that he will make his presentation in a widely understood language, namely English.

## Exposition in the Museon

Those of you who are itchy to get out of the building, but would feel morally awkward about losing touch with astronomy, should perhaps pay a short visit to the Museon.

The hall of the Museon has a lovely photo exposition illustrating all sorts of astronomical objects collected from roughly 40 countries. These photos are also printed on a large calendar, which can be purchased at our little Shop at the End of the Universe (main hall) for only 10 guilders. This promises to be a fantastic collectors item, and it's always possible that if you sell it in 50 years or so, you'll have guaranteed the retirement of your grandchildren.

So procrastinate no longer, rush out and get one for your own use, as well as one to comfort colleagues who were not fortunate enough to get travel money. Admittance to the exhibition is free (opening hours from 10:00 - 17:00, in the weekend from 12:00 - 17:00). The voucher in your congress bag also gives you free admittance to the Museon itself. The Museon can be reached with a three minute walk. Turn right when exiting the Congresgebouw, and pass the Bel Air Hotel. The Museon is at the next corner.

## Late Posters

- JD 20.19 A. A. Nemiro, V. A. Fomin, "The Pulkovo Scheme of Astrometric Reflector"
- JD 19.21 V. A. Fomin, "On the Determination of the Equinox and Equator Corrections of Fundamental Catalogues from Meridian Observations of the Moon"

### JD 5 Program Changes: Correction

A misprint in yesterday's *Sidereal Times* gave a confusing date for Program Changes for Commission 5.

The date should read Tuesday, August 23.



## Decoding Designations

by H. DICKEL & Comm. 5 WG

WHEN COORDINATE BASED DESIGNATIONS ARE DONE RIGHT the coordinates are preceded by the code letter J for Julian 2000 equatorial coordinates or by B for Besselian 1950 coordinates. If no B or J is specified, B is assumed. Thus a QSO in *Ap JS 77 203 1991* with coordinates 1950 RA = 00h48m48.97s DEC = -42d42'52.1" and with coordinates 2000 RA = 00h51m02.5s DEC = -42d26'03" is named QSO 0048-427 = QSO B0048-427 = QSO J0051-4226

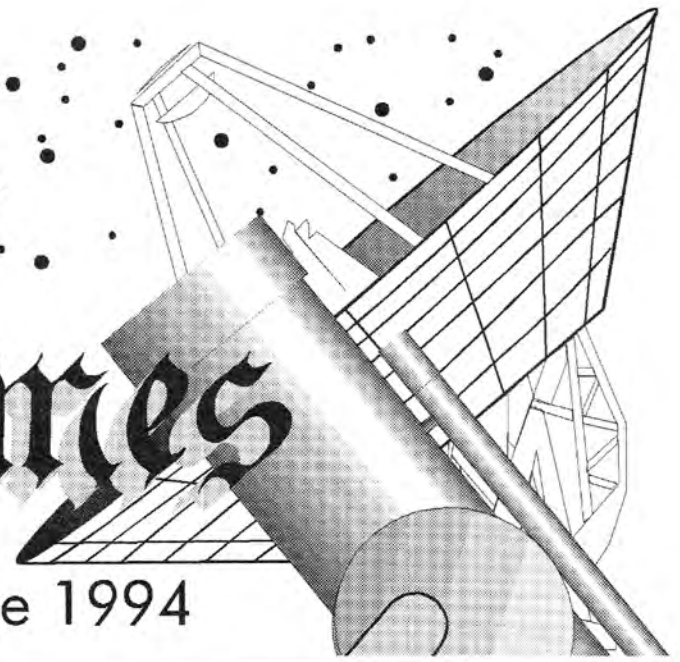


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



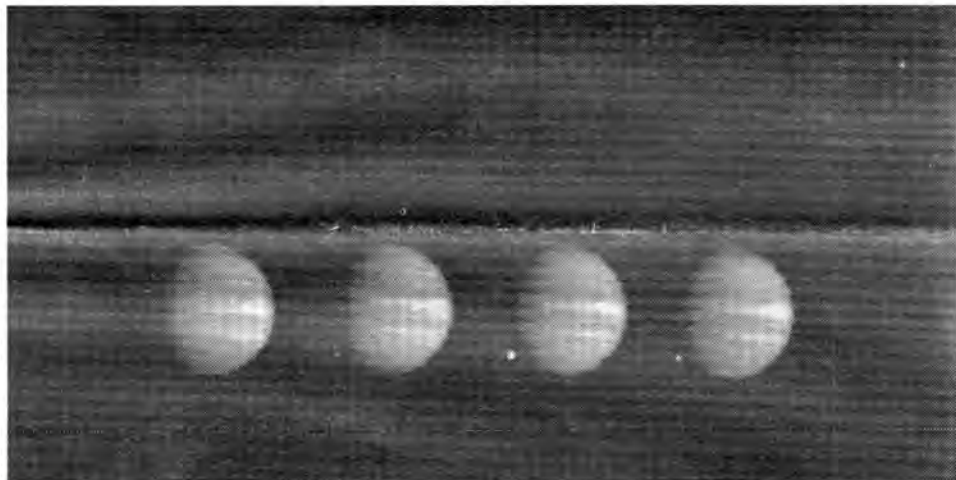
Editor: SETH SHOSTAK

Associate Editor: RENÉ GENEÉ

No. 8: Wednesday, 24 August

## Galileo Sees Jupiter Take Hit from Comet!

The only direct pictures of the impact taken with Galileo's CCD camera, on July 22



The spacecraft was 238 million kilometers (1.5 AU) from Jupiter at the time these pictures were made, and 621 million kilometers from Earth. As seen from the spacecraft, Jupiter was at phase angle of about 50 degrees (compared to 10 degrees for Earth observers), permitting this direct view. The images were taken at intervals of 2-1/3 seconds using the green filter (visible light).

The first image, taken at an equivalent time to 8:06:10 UTC, shows no impact. In the next three images, a point of light appears, brightens so much as to saturate one of the pixels, and then fades again, seven seconds after the first picture. The location is approximately 44 degrees south as predicted; dark spots to the right are from previous impacts. Jupiter is approximately 60 pixels in diameter.

Galileo tape-recorded most of its observations of the Shoemaker-Levy events during the second week of July, 1994 and has since been playing the tape back selectively. Many more pictures and data from other instruments remain to be returned from the spacecraft's tape recorder. Playbacks will continue through January, 1995.

On the basis of time-scale arguments, it is most likely that this is the meteor bolide (the comet fragment entering Jupiter's atmosphere) rather than the subsequent explosion and fireball. Once all the Galileo, Hubble Space Telescope and ground-based data are integrated, an excellent start-to-finish characterization of these remarkable phenomena will be available.

Our model has allowed us to plan observational strategy for both Galileo and ground-based observations of the comet events. It has also been used in interpretation of the detected events, for example to distinguish "real" events from cosmic rays, to determine the width of the events, and to estimate total flux in saturated pixels. The model was of great benefit in analyzing previous calibration data from Galileo, allowing us to properly characterize the instrument performance.

STEVE B. HOWELL  
Planetary Science Institute  
Tucson, Arizona

## Dinner, Dance and Discussion

What are you going to do tonight? Sure, you could take the tram to Scheveningen for the 11th time, and walk along the boardwalk. Yes, you could stroll onto the beach and kick sand into the face of random tourists. And it's true you might essay yet another herring dinner with sate sauce on the side. But why not join the beautiful people for tonight's official social event?

The cost is 65 guilders per human attendee, with special discounts for sentient non-primates. The location is in the Jan Steen Room. Tickets are available at the Social Events Desk. You will find the names of minor planets on the tables; make of this what you will. The band is the Harlem Quintet, well known in this country, and frequently lauded for its ability to produce music not only eminently suitable for dancing, but also for calming barnyard animals. Oh yes: the date and time are 20:00, Wednesday evening, August 24.

## Researchers Face Up to Venus' Complexion Problems

At a meeting of JD 18, Gordon Pettengill gave an account of the radar mapping of Venus — carried out largely by the Magellan probe which was launched from the shuttle *Atlantis* in May, 1989, reached the neighborhood of Venus in August, 1990, and continued radar mapping for two years increasing our knowledge of the surface beyond all comparison.

There are various types of features; impact craters, tectonic features, magma flows, volcanic structures and, of course, wind effects even though the wind velocities at the surface are low. This, together with the lack of water, accounts for the relatively modest degree of erosion. The average age of the features is of the order of 500 million years, naturally much younger than for the surfaces of worlds such as Mercury and the Moon.

### Corrections

Among the many imaginative typo's in yesterday's *Sidereal Times*, we note that the Pulkovo Observatory should have appeared as the "astronomical capital of the world." The author's name should be V. Abalakin.

Important differences between the impact craters of Venus and those of the Moon were stressed, due to Venus' thick atmosphere which incoming meteoroids have to penetrate. This affects the pattern of ejecta, which shows sharp boundaries; there are also, in some cases, dark haloes due to particles which were sent up to considerable altitude and took hours to settle. Other features not found on the Moon or Mercury are the "coronae", due to rising material of higher temperature and lower density, and the strange volcanic features commonly called "pancakes" due to material of viscosity such that the formation was a gradual process taking perhaps a thousand years.

Magellan has provided detailed radar maps of much of Venus' surface, but one thing it has not shown is any change over the two-year period during which mapping was being carried out. No doubt changes do occur over relatively limited periods, but future missions will be required to detect them.

PATRICK MOORE  
Sussex, U.K.





Attendees have probably noted the informal attire that's accepted at most Dutch restaurants. This fish emporium, located on a nearby beach, is typical. While the view offered other patrons is not always attractive, the server may have a more severe esthetic problem.

This restaurant is not listed in the *Michelin Guide*. It does, however, accept checks, should you have a place to carry them.

## Lost Population of Quasars?

Recent IR observations of radio selected optically faint quasars indicate that a large part of the quasar population has been missed. The implications for cosmological studies will be discussed in an extra panel discussion on Thursday, 25 August from 13:00 to 14:00 in the Mondriaan Room.

The proposed panel consists of: Jerry Ostriker (Chairperson), Jill Bechtold (\*), Peter Shaver, Ulf Borgeest, Rachel Webster, Bernie

Burke and Isabella Gioia (\*).

All are welcome and additional contributions are welcome. Friday's *Sidereal Times* will have a contribution concerning this meeting.

(\* to be confirmed)

ULF BORGEEST (#830)  
Hamburg Sternwarte

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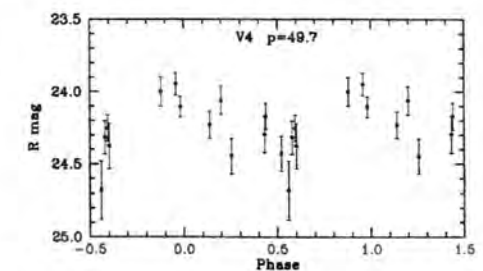
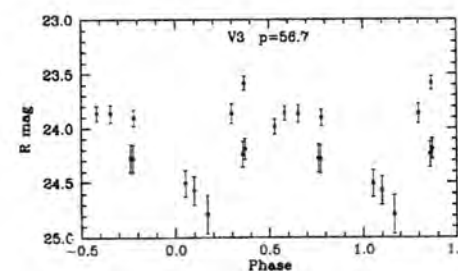
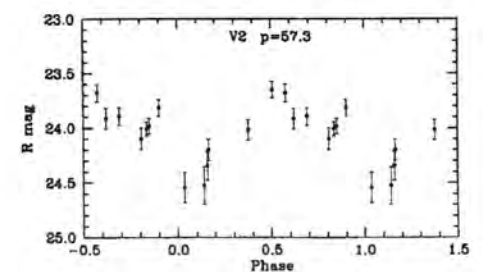
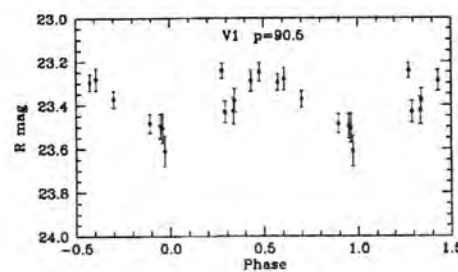
## Cepheids in the Virgo Cluster

### An Important Contribution to the Cosmic Distance Scale

**A** lively controversy still surrounds the cosmic distance scale.

In an effort to resolve this problem, an American and four Canadian astronomers have used the Canada-France-Hawaii telescope to search for Cepheid variables in the Virgo cluster galaxy NGC 4571. This object has a low radial velocity which makes it probable that it is situated in, or close to, the cluster core. Furthermore this Sc II galaxy was selected for study be-

From all four Cepheid suspects, one obtains  $\langle m-M \rangle = 30.75$ , which (neglecting reddening) corresponds to a distance of  $14.1 \pm 0.4$  (internal error) Mpc. This value supports the short distance scale to the Virgo cluster. The suggestion that NGC 4571 might be a foreground object can probably be rejected because of its (Sc II) luminosity classification, its hydrogen deficiency (probably due to sweeping by intra-cluster gas), and because NGC 4571 is located only 2.4 degrees from



Lightcurves of suspected Cepheid variables in the Virgo galaxy NGC 4571.

cause its outer regions exhibit a low rate of star formation that results in less severe crowding of stellar images than is observed in most late-type Virgo spirals.

Using the HRCam tip-tilt seeing corrector, a team consisting of Michael Pierce, Douglas Welch, Robert McClure, Sidney van den Bergh, and Rene Racine obtained frames of NGC 4571 at 13 epochs in 1992 and 1993. Photometry and blinking revealed four variables that are suspected of being Cepheids. Light curves for these objects are shown in the figure.

Periods of the candidate Cepheids, which have mean red magnitudes between 23.4 and 24.1, lie in the range 50 - 90 days. Apparent red distance moduli were calculated from the period-luminosity relation found by Madore and Freedman.

M87, which is situated at the bottom of the Virgo cluster potential well.

A Virgo cluster velocity  $V(\text{cosmic}) = 1311 \pm 132$  km/sec has been derived by the author from the mean Coma cluster velocity and the Coma/Virgo distance ratio. With  $D = 14.1 \pm 0.4$  Mpc and  $V(\text{cosmic}) = 1311 \pm 132$  km/sec, one obtains a Hubble parameter  $H_0 = 93 \pm 10$  km/sec/Mpc. This value assumes that the Cepheid suspects in NGC 4571 are all unreddened. If one were to adopt an average red absorption of 0.2 magnitudes, then the value of  $H_0$  would increase by 10%. A bias in the opposite direction would result if the present observations preferentially discovered Cepheids that, at a given period, have above-average luminosities.

SIDNEY VAN DEN BERGH  
Dominion Astrophysical Observatory

### The Competition

**F**rustrated by the ruthless editing required to reduce your *magnum opus* to the 250 word limit imposed at the *Sidereal Times* editorial desk? *Mercury* magazine from the Astronomical Society of the Pacific is for you.

*Mercury* is the popular-level, bimonthly magazine designed to communicate the excitement of modern astronomy to the widest possible audience in a non-threatening way. Professionals, amateurs, educators and the general

public compose its readership. All are eager to learn your research motivations as well as your results.

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ROBERT HAVLEN  
Astronom. Soc. of the Pacific  
(note: shortened by Editor)



## History and Artifacts

D. McNally, former General Secretary (1988-1991) of the IAU, has brought the attention of Commission 41 (History of Astronomy) to the fact that 1994 is the 75th anniversary of this institution. Accordingly, Commission 41 held special sessions in The Hague; JD 7 was devoted, for the most part, to the subject.

A number of talks have been given by various authors from different countries on subjects related to the IAU, its beginning, parts of its history, recollections, and reminiscences.

An introductory talk was given by A. Blaauw who has, after his successful writings regarding the history of the ESO, has undertaken to do the same with the IAU. During the meeting, Edith Muller, one of the past General Secretaries, informed us that the very first IAU archives, which were at the Royal Observatory in Belgium, were sent to the Permanent Secretary of the IAU in Paris. They are now believed to be located at the Institut d'Astrophysique de Paris. Some of the later archives used by Blaauw are now at the Kapteyn Laboratory in Groningen.

The value of these archives once again should focus the attention of astronomers on the great damage caused by improperly preserved archives, not only in the present case, but from a more general point of view. Many astronomers have employed archives for modern research. Data and infor-

mation extracted from old archives, notebooks, and letters are found throughout the world from south to north. This is also true for instruments, whose preservation allows us to use them for comparison with past observations and data.

But in some cases it is known that archives or instruments have been forever lost. Some astronomers' widows have destroyed archives or sold instruments even if they were not private property. It has also occurred that some directors of observatories, heads of departments, and even astronomers themselves, have thrown away papers, notebooks, instruments, photographs, and paintings to make room for their modern research. Papers and instruments have been abandoned in buildings no longer in use, or kept by heirs even when official property. Instruments and buildings have been dismantled without careful examination of the best approach to either saving them or documenting their construction.

Astronomy will lose not only elements for the writing of its history but also elements to be used in research itself without knowing what could be the use of the "present archives" within two or three centuries. Therefore Commission 41 has issued a call for reconnaissance and inventory of all astronomical archives.

SUZANNE DEBARBAT

## Mexico - Armenian Cooperation

Availing themselves of the opportunity afforded by the IAU General Assembly, the Directors of the Institute of Astrophysics, Optics and Electronics, Mexico, and the Byurakan Astrophysical Observatory, Armenia, Drs. A. Serrano and H. Harutyunian, have signed an agreement on scientific cooperation between their respective institutions.

The scientific ties between Mexican and Armenian astronomers began some decades ago under Professors V. Ambartsumian and G. Haro.

ELMA PARSAMIAN  
Mexico and Armenia

**Preliminary Announcement  
Astronomy  
with Large Telescopes  
31 May - 3 June 1995  
The University of British  
Columbia  
Vancouver, Canada**

With the building and completion of several 8 to 10 m class telescopes in the next few years, this is a good time to consider and prepare for their

impact on astronomy. To this end, we shall organise a meeting on the scientific objectives of large telescope observations as opposed to the technology which makes them possible. We will also strongly encourage the participation and input of young astronomers and graduate students who represent the eventual users of these facilities.

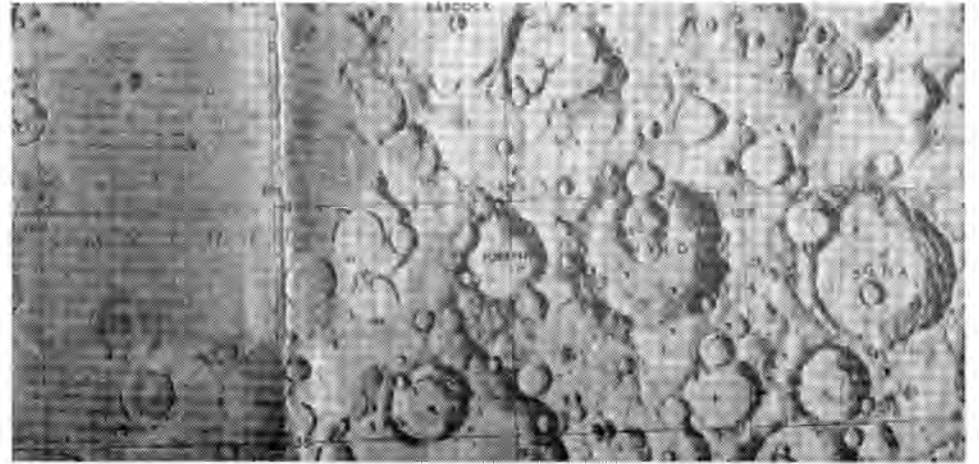
The program will feature some 10 invited reviews and about 20 contributed papers together with ample time for discussion around the general themes of:

- Resolved Galaxies
- Cosmological Tests
- Star Formation
- The Solar System
- Faint Galaxies
- Dark Matter Candidates
- Stars and Star Clusters
- Active Galaxies
- Intergalactic Medium
- Interstellar Medium

A formal First Announcement is forthcoming. If you would like further information, or wish to be added to the mailing list for future mailings, please respond to: awlt@astro.ubc.ca

At the General Assembly, you may contact Jaymie Matthews (box 682) or Harvey Richer (box 427) for more information.

## Observing Site on Moon?



Your future observing site? Crater Saha is center right in this map.

It can be predicted that within two or three decades it will be impossible to conduct SETI (Search for ExtraTerrestrial Intelligence) observations from locations in line-of-sight of the Earth. This will be due to:

- The increase in man-made radio interference.
- The improvement in receiver sensitivity. In the 34 years since the first SETI search, the efficiency of the search systems has doubled every eight months.

It can also be predicted that within the next 20 to 30 years, humankind, which currently runs 8 SETI programs, will be deeply involved with this endeavor, attempting to collect information contained in signals emitted from quite a number of extraterrestrial civilizations. Historically, as soon as a new phenomenon is discovered (e.g., quasars, pulsars, gravitational lenses, etc.), scores of additional examples are uncovered within just a few years. For SETI, as soon as even one artificial signal is found (next month, next century...) this will constitute immediate proof that extraterrestrial civilizations are plentiful in the cosmos, and the drive to investigate them, in all of their variety, will become quite strong.

Therefore, it is a philosophical and political obligation for humankind to provide a safe and suitable location for the pursuit of SETI during the next two to three decades. A solution that is often mentioned is to use the far side of the Moon. However, this suggestion frequently creates misunderstanding and opposition from those involved in future enterprises to explore and exploit the Moon because they take it to mean that SETI needs all of the far side.

For this reason, I have recently pointed out that, based on simple and sensible criteria, SETI would require only a single, specific crater: Saha. This 100 km diameter feature, a ringed structure in the equatorial eastern region, is a little farther than Mare Smythi, and 500 km from crater Shubert C, which was selected by NASA as a possible candidate for a manned, permanent lunar base.

This proposal for a dedicated, far side lunar crater for SETI, and more generally for sensitive radio astronomical research, requires investigation of current plans for the upcoming decennia,

transportation and infrastructure, international and interdisciplinary cooperation, and mutual efforts for environmental protection. In addition to the scientific, technical, legal and even philosophical aspects of this proposal, I think it is also not too early to consider the political aspects as well.

J. HEIDMANN  
Paris Observatory

## Colloquium on Stellar Pulsations Approved

We are pleased to announce that the IAU executive committee has approved support for this colloquium which is to be held in Cape Town, South Africa from 6-10 February, 1995.

Stellar pulsation is of fundamental importance to our understanding of the evolution of stars, and forms one of the cornerstones of the distance scale of the universe. Several recent developments in the field promise to make this meeting a particularly interesting one. Among the topics discussed are the following:

- Population I stellar structure and evolution
- New developments in pulsation theory helioseismology
- Pulsation and evolution in degenerate stars
- Theory of Miras and OH-IR stars
- Cool stars and galactic structure
- Cepheids, related stars and galactic structure
- Pulsating stars in the Magellanic Clouds
- The Sydney University stellar interferometer.
- The MACHO project and pulsating stars.

This is the first meeting of its kind to be held in Africa and will be hosted by the South African Astronomical Observatory and the University of Cape Town.

For further details, please send e-mail to: PULSATION@SAAO.AC.ZA

JOHN PERCY



# Restructuring of the IAU

Below follows the text of the proposal that has been made by the Executive Committee to the Presidents and Vice-Presidents of the Commissions. The only changes which have been made to the text concern the framework of the divisional structure that has been revised following the meeting of the Executive Committee (EC) with the Commission Presidents and Vice-Presidents.

## Introduction

It is not a simple matter to analyze the responses to the proposals for restructuring made by the General Secretary (Sept 13, 1993). Some Presidents favor overall restructuring provided their own Commission is left out. Others make a joint proposal, just in case restructuring will occur, but at the same time their individual responses indicate serious reservations. Overall, the EC conclude that 2/3 - 3/4 of the Commission Presidents who have expressed an opinion do not favor the proposals for "Super Commissions"; however, when weighting the opinions by the Commission membership the opinions more nearly balance.

It has been frequently mentioned that the younger members seem disaffected with the IAU. While a certain lack of interest in Commission matters on their part may be rather natural, nevertheless the general perception of the IAU as being an organization mainly preoccupied with "old fashioned" scientific topics, in which the practitioners of the newer subjects have only limited influence, is worrisome. And such opinions prevail not only among the young. In addition, rightly or wrongly, many of the Commissions are perceived to be little closed "clubs" that have not much interest in letting new winds blow through. Finally, the discussions of the last three years have raised expectations among those favoring change, and doing nothing will lead to a strong sense of deception.

At the same time it is clear that the EC cannot and should not try to force extreme changes on the Commissions against their will. A solution has to be found which preserves the positive of the present situation, while satisfying those who want renewal.

## Proposal

In view of the various aspects mentioned by the Commission Presidents and others, and in order to create a flexible mechanism for change which fosters increased interaction, the EC would propose the following:

I. All of the Commissions as presently constituted stay in place and continue their work in the usual way.  
II. A divisional structure is introduced to which the Commissions may affiliate. These divisions are run by a board composed of:

- a) the Commission Presidents for divisions with more than 3 Commissions;
- b) the Presidents and vice-Presidents of Commissions for divisions with 2-3 Commissions;
- c) the President and vice-President plus 3 other Members for divisions which are composed of 1 Commission.

Thus, each divisional board is composed of 5 + 1 persons. These boards elect their own President.

The tasks of the divisions or rather of the divisional boards would include:

1. The endorsement of Symposia and Colloquia.
2. The organization of Joint Discussions.
3. To propose candidates for the Special Nominating Committee (requires a change in the By-Laws).
4. To coordinate the activities of the Commissions in the division, including the making of proposals for new Commissions, proposals for dissolving or combining existing Commissions and proposals for Working Groups.
5. To regularly report and to advise the EC, in particular by having the division Presidents attend the meetings of the EC at the time of the General Assembly.

With regard to (1), this does not change the role of the Commission Presidents, except that consultation across Commission boundaries will take place, which would seem to be very positive. Item (2) also does not much change the present situation, except, again, that consultation with all adjacent Commissions will take place. Of course, this does not in any way exclude meetings sponsored by more than one division.

Item (3): Since the divisions would have globally equal numbers, it would seem to enhance the fairness in the elections process for the Special Nominating Committee. Still, as at present, the Nominating Committee would have its role (as specified in By-Law 12a) to ensure that a reasonable balance of nationalities be achieved.

Concerning (4), the division structure provides a flexible framework for adapting the Commissions to evolving circumstances, without creating the feeling that such adaptation is "imposed" from the outside. Finally, with regard to (5), the present meetings of the EC with some forty Commission Presidents hardly seem to allow effective

communication to be established, while a meeting of the 12 member EC with some 12 representative division Presidents would be more practical.

The Commissions that are at present Commissions of the EC should probably remain so and not become part of a division. This includes Commission 5, 6, 38, 46 and 50 which have very specific functions and which directly relate to the General Secretary.

The proposed framework for the divisional structure follows:

## Scientific Divisions Commissions\*

Commissions*	Members
1. Fundamental Astronomy 4, 8, 19, 24, 31	454
2. Sun, Heliosphere 10, 12, 49	763
3. Solar System 15, 16, 20, 21, 22	667
4. Stars 26, 29, 35, 36, 45	964
5. Variable Stars 27, 42	619
6. Interstellar Matter 34	657
7. Galactic System 33, 37	512
8. Galaxies and the Universe 28, 47	915
9. Optical Techniques 9, 25, 30	531
10. Radio Astronomy 40	752
11. Space and High Energy Astrophysics 44/48	645

Commission 14 would become a commission of the EC. For the moment Commissions 7, 41 and 51 would remain unattached to a division.

## Conclusion

The present proposal would create a high visibility divisional structure with some well defined functions. Moreover, it is a flexible structure: If the proponents of the "Super Commissions" are right, gradually the divisions may take over from the Commissions. If they are wrong, the Commissions will continue to flourish in a framework which fosters communication but leaves each Commission master in its own house. There is no need to foresee the outcome now, and one can let the situation evolve naturally over the coming decade. Perhaps equally important, one would obviate the need to raise this rather divisive and distracting issue again and again.

The presently proposed divisions would face none of the problems which the "Super Commissions" would meet. Commission members and their Presidents would communi-

cate in the same way as in the past, and so there would be no problems of mass mailings. Also the many Commission members who feel more comfortable in smaller, more cohesive units would continue to have these. Nevertheless, more cohesion would be achieved between the related Commissions, as well as indirectly between the Commissions and the EC.

The triennial "Reports on Astronomy" would continue to be prepared by the commissions as usual with possibly some synchronization by the divisional boards to avoid both duplication and lacunae.

Some direct communication between the divisions and their members might also be useful. The simplest way of achieving this could be through the IAU Bulletins, if each divisional board would have, say, two pages reserved for it in each bulletin; perhaps this might also make the Bulletin more readable.

## Lists of the resolutions covered by the report of the Resolution Committee

### Resolutions having financial implications

- B1 On supporting the Lund Meteor Data Centre
- B2 On funding the archival organization of the IAU
- B3 On publication of the Debrecen Photoheliographic Results

### Resolutions concerning IAU and other bodies, which have to be read and voted upon, individually

- B4 On the measurement and improvement of environmental impact on astronomy
- B5 On the prohibition of Satellite Systems having a potentially adverse environmental impact
- B6 On the WG on Reference Frames
- B7 On the second generation high-angular resolution plate scanning
- B8 On the need to develop Submillimeter Arcsecond Optical Astrometry
- B9 On a joint WG of IUGG & IAU on theoretical geophysical-based nutation
- B10 On the policy w.r. to the hazardous Near-Earth Objects (NEO's)
- B11 On the preservation of astronomical relics
- B12 On the continuation and extension of the activities of the WG on astronomical standards
- B13 On an interunion WG concerning the millimeter and submillimeter



## astronomy

- B14 On an inter-union WG concerning a large radio telescope
- B15 Considering the sharing of hydroxyl band with land mobile satellite services
- B16 Concerning the band utilisation of radio communication in the lunar environment
- B17 About the International Decade of Solar Cycle Studies (IDSCS)

**Resolutions by Commissions, endorsed by the global resolution B18**

- C1 On the observations of the offset of celestial pole and the theory of nutation
- C2 On the use of the J.2000.0 equinox co-ordinator
- C3 On protection of Julian Day Numbers
- C4 On research and inventory of existing archives
- C5 Concerning comet designations and names
- C6 On the use of 1976 system of astronomical contacts
- C7 On the definition of J.2000.0 and time scales
- C8 Concerning the Space VLBI

Once again, we have this left-over space. The *Sideral Times* will take the opportunity to give you a factoid about Dutch society: They are considered cheap by the Belgians. For their part, the Dutch consider the Belgians to be simple.

**Prestigious Prize Goes Down Under**

In an editorial board meeting of the international review journal, *Vistas in Astronomy*, the New Zealand-based astronomer William Tobin was declared the winner of the 1994 Arthur Beer Prize of 1,000 pounds. This award is made every three years for an original review of high quality published in the journal.

Dr. Tobin, a British-born scientist who has worked for the last ten years in Paris and New Zealand, won the Prize for his in-depth review of one of the key milestones of 19th century physics and astronomy. His essay "Toothed Wheels and Rotating Mirrors," focuses on Foucault's pioneering work in the accurate determination of the velocity of light.

Also highly commended by the Prize judges was B. C. Schaefer of NASA-Goddard Space Flight Center, whose article examined "Astronomy and the Limits of Vision."

PETER BEER  
Essex, U.K.

**Next General Assembly in Kyoto, 1997**

On behalf of the National committee of Astronomy and the Astronomical Society of Japan, I am very pleased to tell you that the Union has chosen us to host the 23rd General Assembly at Kyoto International Conference Hall during 17-30 August, 1997.

Astronomical research in Japan around 1997 will be as follows: ASCA and YOHKOH satellites will have obtained a wealth of observational data. The SpaceVLBI satellite, VSOP, will have been launched. Super KAMIOKANDE will have brought new data on solar neutrinos, and a tera-flops dedicated computer GRAPE will be making large-scale simulations. A 300 m GW laser interferometer and an 8 m SUBARU telescope will be in the final phases toward completion, though the latter takes place in Hawaii

Kyoto was the capital of Japan for 1,100 years. The Reizei family has archived the famous supernova in Taurus in its Meigetsu-ki (diary, beautiful moon) in 1054. Old temples and



Daiichiro Sugimoto

shrines are in lovely harmony with today's modern industrialized life.

Please bring your family with you. A new airport will soon open in Osaka, from which Kyoto can be reached within 90 minutes by train. Looking forward to seeing all of you and astronomers from around the world in Kyoto in 1997.

DAIICHIRO SUGIMOTO (#199)

**Report of the IAU Finance Committee**

The Finance Committee appointed a subcommittee to make an examination of the accounts and the proposed budget of the Union and to prepare the report for presentation to the General Assembly. The subcommittee was composed of:

Peter B. Boyce, Chair  
James Hesser  
Birgitta Nordstrom  
Vytautas Strazys  
Patrick Wayman

The Subcommittee report was adopted by the Finance Committee as follows:

This is a time of rapid change in the status of many countries and institutions. So, too, the financial operations of the IAU have undergone significant changes in the last three years. A list of significant recommendations were made by the Finance Committee in 1991, and the present Committee notes with great approval that virtually every item on that list has been addressed actively and successfully. We commend the General Secretary and the office staff for their effectiveness in the financial area.

The Finance Committee is very pleased that the change to accrual accounting as recommended at the previous General Assembly has been instituted. In this method of reporting, which is now being required for most organizations, the expenses incurred within a given year are counted in that year's expenditure, no mat-

ter when they were actually paid. While more complicated to use, this method allows program costs to be compared effectively with budget amounts, which was not possible under the old cash system.

The Committee is also pleased that the fiscal reports have been reorganized such that the reports and the budgets are made for the same period. It is now much easier to make the comparison between budget and actual expenditures which is vital for responsible fiscal management. However, since the budget for the first year of the new triennium was prepared three years ago, conditions have changed and the budget does not represent actual conditions. The Committee recommends that in the future the General Secretary prepare, as part of the budget process, a revised budget for the first year of the new triennium which reflects up-to-date information.

On a matter which concerned the Committee in 1991, the Committee notes with pleasure the sharply reduced costs of operating the Executive Committee during the last triennium. In fact, the growth in the total administrative costs of the Union have been minimal. The Committee encourages the next General Secretary to continue efforts to control the growth of administrative costs. In particular we encourage the Presidents of Commissions and others who travel on behalf of the Union to seek funding from their own countries and organizations and not automatically expect

to receive full travel support from the Union.

The Finance Committee wishes to commend the General Secretary for achieving a high return on the IAU investments and for securing a particularly large quantity of special contributions of the Union. Both these sources of income have been important to the operation of the Union during the last three years. In particular, the generosity of the contributing organizations has made it possible to expand the amount of support for scientific activities by 25 percent, and the amount for grants to travel to the General Assembly by a factor of 2.5 above the previous triennium. This represents a real change in the balance between science and administration and we encourage the next General Secretary to pursue with vigor additional special contributions which can provide for an even stronger program of scientific activities during the next triennium.

The Committee notes that the Union has established the position of Treasurer who is acting in the role of advisor to the General Secretary who prepares the budgets. In time the role of the Treasurer should be more clearly defined. In addition, the Committee notes that the Chair of the Finance Committee has informally provided advice regarding financial matters to the General Secretary during the last triennium. The Committee recommends that this practice continue.

At the last General Assembly, the Committee recommended that the financial reserves be kept at a value equal to one year's operations. In light of the growing fiscal uncertainty faced by many institutions around the world, the Finance Committee recommends that a one year's reserve be considered a minimum and appropriate value.

The operations of the Union do not seem to be taking as much advantage of electronic communication as might be desired. The Committee envisions that, in the long run, substantial savings in printing and postage will result, and the immediate value of having up to date information readily available, e.g. lists of commission officers, membership, national representatives, etc., is obvious.

The Committee notes the inflation rate of three percent per year projected for the next triennium (1994-96 and provisionally for 1997) is reasonable, and recommends adoption of the following rates for the unit of contribution:

1995:	2580,	1996:	2660,
1997:	2740		

Finally, the Committee has inspected the proposed budget for the remainder of the triennium, 1994 - 96 and the provisional budget for the year 1997. We find this budget to be reasonable and recommend its adoption.

Respectfully submitted,  
PETER B. BOYCE  
The Hague, August 22, 1994



## Astronomers Should Be Glad About Recent Explosion

I would like to point out to attendees of the Assembly an object that, in my opinion, deserves more attention than it has been given so far: Geminga. As we now know, it is a nearby and relatively young pulsar.

The supernova which gave birth to this object exploded some 300,000 years ago, and created a huge bubble that swept away most of the interstellar matter from the supernova's vicinity. We are now inside the bubble, and this is why the interstellar absorption is so low close to the Sun.

Imagine that there was no supernova, and that we happened to be inside of an opaque, dusty patch of interstellar matter! What would the sky look like? What would astronomy be like? Think of this the next time when you hold a glass and your hand and view the twinkling stars through it. Perhaps you should raise a toast to Geminga!

KAZIMIERZ STEPIEN  
Warsaw Univ. Obs., Poland

### Schedule Symp. 167 for Wednesday Developments in Array Technology and Applications

Morning  
Chair, Mclean

INFRARED ARRAYS, G. Finger, P. Biereichel, M. Meyer, and A. F. M. Moorwood, ESO

THE IMPACT OF INFRARED ARRAY TECHNOLOGY ON ASTRONOMY, Giovanni G. Fazio, Center for Astrophysics

MONOLITHIC Si BOLOMETER ARRAYS: DETECTORS FOR FAR INFRARED AND SUBMILLIMETER DETECTION, Harvey Moseley, Goddard Space Flight Center

OBSERVATIONAL CONCERNS AND TECHNIQUES FOR HIGH BACKGROUND MID-INFRARED (5 - 20 MICRON) ARRAY IMAGING, Chair, Fazio, Daniel Y. Gezari, Goddard Space Flight Center

AN INFRARED CAMERA BASED ON A LARGE PtSi ARRAY, I. S. Glass and K. Sekiguchi, SAAO

PtSi INFRARED ARRAY IN MOSAIC CONFIGURATION, Munetaka Ueno, University of Tokyo



Ben Oppenheimer, who keeps himself constantly busy with variables.

### Paper Presented by Youngest Astronomer

**B**enjamin D. Oppenheimer — a 16 year old high school student — is the youngest author presenting a paper at the Assembly. His work is titled "An Analysis of Longterm AAVSO Observations of the Recurrent Nova RS Ophiuchi."

Mr. Oppenheimer, who has been a summer research assistant at the American Association of Variable Star Observers (AASVO) in Cambridge, Massachusetts, studied the behaviour of RS Ophiuchi during its five outbursts since 1988, and its significant light variability during intervals between outbursts. He used 26,966 observations over 104 years from

AAVSO data archives and for his analysis employed Date Compensated Fourier Techniques, developed for P.C. computers at AAVSO for a special high school project. (See poster paper JD4.A.2.)

The paper was presented at Symposium 165, by Janet A. Mattei, Director of the AAVSO, who guided Ben during his research. Mattei met him during a talk she gave at his high school as part of her NASA Astrophysics Grant Supplement for education.

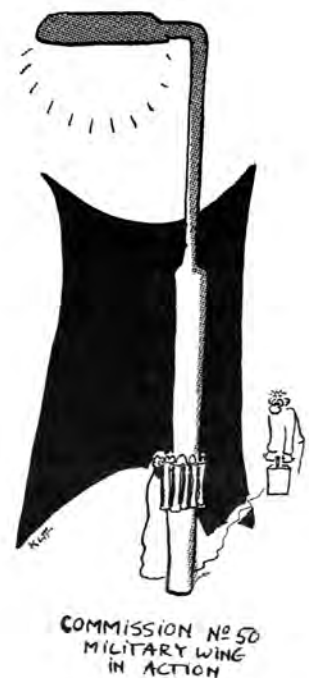
He continues to work at AAVSO this summer, analyzing the behavior of more stars and providing AAVSO data to astronomers involved with satellites such as Hipparcos and HST. Ben has been interested in astronomy since age 4, and has plans to be... a professional astronomer!

### The Sidereal Times Time filler

A contribution designed to appeal to the modest cerebral power of our volunteers as well as anyone else who wants to try. We're told that the following problem has two solutions. Actually, there are many solutions, but only two are correct.

You have 12 identical coins and a balance. There is 1 false coin with a different weight. You can use the balance only 3 times. Which coin is the false one and is it more or less heavy than the real ones?

Solution (exclusively?) known to:  
KOSTAS TZIOTZIOU  
Utrecht, The Netherlands



## Jupiter Sessions A Hit!

**O**ne of the best attended meetings of the 22nd IAU General Assembly was undoubtedly the very successful presentation of the newest results about the recent comet collision, reported during two sessions on August 18 and 20, most ably organized at very short notice by Catherine de Bergh, David Morrison, Mike A'Hearn and Alan Harris.

This was the first opportunity to assess the full range of data available. It was also the first occasion for the observers to meet and compare their data and for the theoreticians to make the first comparisons between their models and the data.

The audience was treated to a true feast of new and unique data, but it was also clear that for lack of time, very little of it has so far been properly reduced and interpreted. There were many examples of the unprecedented degree of international collaboration involved.

We saw the first direct measurements of transient emissions of vaporized neutral metals that have until now only been seen in comets that pass very close to the Sun. We saw the first true IR lightcurves of the gigantic fireballs and how these were transformed into large, flat structures

within an hour after the impact. We are still observing the long-term evolution of this cloud material at this moment. There were effects in the Jovian magnetosphere which led to changes in the radio emission.

There were changes in the northern hemisphere as well.

The creation of new molecules was reported, including some which suggest that the impacting bodies were very carbon-rich and that they did not penetrate deep enough to excavate a large amount of water from Jupiter's troposphere.

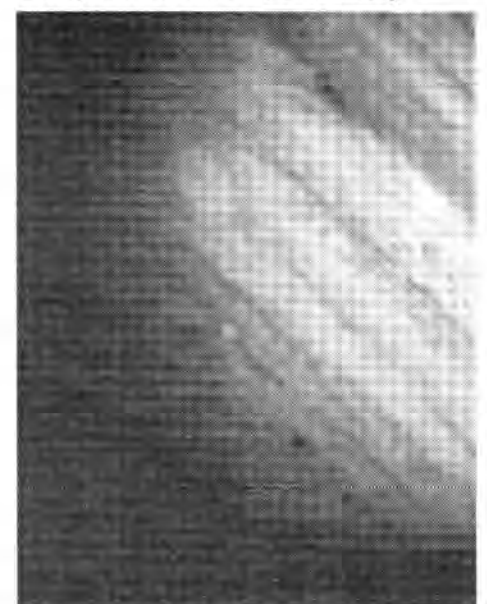
However, some of the fragments must have gone below the upper ammonia cloud and the hypothetical ammonium hydrosulphide clouds, since the fireballs were apparently very rich in sulphuric compounds, not expected in comets.

Many other exciting conclusions are expected from the rich data.

Comet Shoemaker-Levy 9 is no more. But there is no doubt that this name and the dramatic event it so kindly created have already become synonymous with exciting and successful science. Solar-system astronomy will never be quite the same after this powerful demonstration of natural forces!

The next SL-9/Jupiter meeting will take place at the AAS-DPS (October 31) at Washington, D.C., and many meetings are bound to follow thereafter.

RICHARD WEST  
European Southern Observatory



Jupiter takes it on the chin. The consequences of eight impacts are visible on this NASA Hubble Space Telescope photo. The smallest features on this image are less than 200 km across.



## New Photo Plates for Astronomy

In an epoch of mass attacks on traditional astrometrical methods by CCDs, the problem of astronomical plates may seem to be not very essential. However we must take into consideration that a lot of observatories are still using photography in their research.

Photographic plates are simple and reliable information media. Unfortunately, there is a tendency to reduce the production of astronomical plates. Recently the firm ISC "Slavich-Dar" in Pereslavl-Zalessky of the Yaroslavl Region of the Russian Federation began to produce experimental plates for astronomical purposes. These plates have been carefully investigated at Pulkovo and other observatories. It appears that these Russian astronomical plates are of the same quality as the famous plates made by KODAK and ORWO, and in some ways even better.

Detailed results have been presented at WGMA. You can request information from the authors, as given below.



*Dimitry Polojentsev. Note that this image was made using traditional, silver halide technology.*

DIMITRY POLOJENTSEV (#187)  
OLEG P. BYKOV (#1837)

## New Scope to Decorate Kitt Peak

Construction of the new 3.5m WIYN Telescope on Kitt Peak was recently completed, and the commissioning of the telescope is underway.

The WIYN Telescope is a collaboration of the University of Wisconsin, Indiana University, Yale University, and the National Optical Astronomy Observatories in the U.S. The universities have provided most of the funds for the construction of the telescope, and NOAO will provide most of the telescope operations.

The WIYN Telescope was designed from the outset to take advantage of the good seeing available at Kitt Peak. The primary mirror is supported by 66 actuators which are adjusted to achieve the best optical figure. In the absence of seeing, the telescope can deliver 0.04" images. The temperature of the primary mirror is actively controlled and is routinely held at 0.2C below ambient throughout the night. The primary mirror supports and thermal control systems were provided by NOAO.

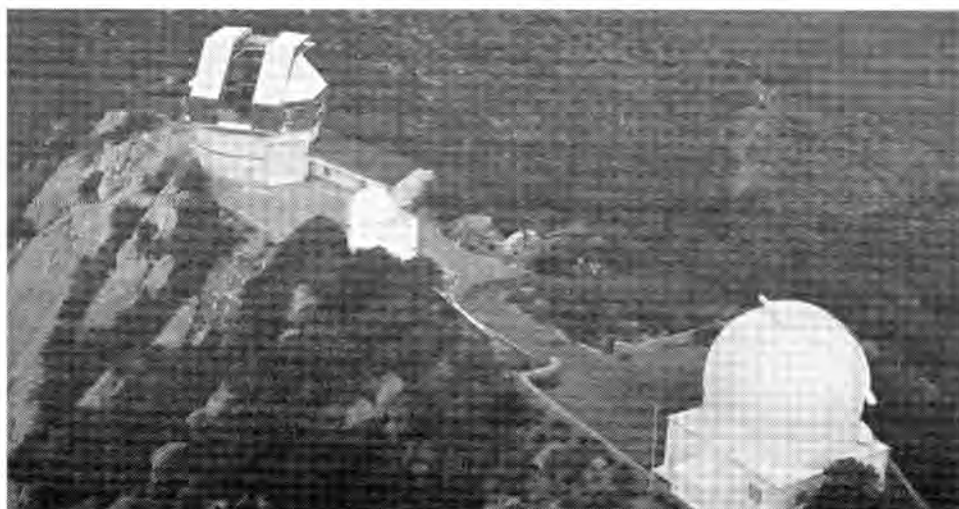
The innovative enclosure is

designed to minimize dome seeing. A wide slit and vents around the perimeter provide rapid flushing by outside air. Air is also drawn through the telescope mount to maintain it at ambient temperature. The reflective surface of the exterior of the enclosure also reduces radiative cooling of the structure at night. Infrared scans of the enclosure demonstrate that it is nearly isothermal.

Observations obtained during the early commissioning phase in July suggest that the median seeing will be well below one arcsecond. The best images so far obtained have a FWHM of 0.45".

Science operations are expected to start in March, 1995. The instruments available will include a CCD imaging camera and the Hydra multi-fiber positioner and spectrograph which is being moved from the KPNO 4m Mayall Telescope to the new WIYN Telescope.

CATHERINE A. PILACHOWSKI  
#1170



WIYN telescope to left. Mountain to bottom.

# Radio Astronomers Battle Interference

Just as optical astronomers are hampered by ever growing light pollution, radio astronomers are always fighting for clear radio skies. At this General Assembly, IUCAF (Inter Union Committee for Allocation of Frequencies, chaired by Brian Robinson of Australia) has held several sessions on the current issues. These include:

1) THE GLONASS navigational satellite system of Russia:

For the past decade astronomers studying the 1612 MHz OH transition from HII regions and late-type stars have encountered strong interference whenever one of the 24 GLONASS satellites passes anywhere above the horizon. But constant pressure from radio astronomers has now produced agreements that will eventually greatly reduce this interference. The number of satellites will be reduced to 12, the frequency channels will be shifted away from 1612 MHz, and (possibly) the bandwidth emitted by each satellite will be reduced.

2) Mobile Satellite Communications

Motorola is planning a 66-satellite system called Iridium which would allow you to call your spouse to make excuses no matter how remote your location. This system (whose first satellite has to be launched next year) and other similar proposed systems are potentially harmful to observations in the range of 1600 - 2000 MHz, but discussions between radio astronomers and the commercial engineers are proceeding in a (usually) cooperative manner. It is hoped that a scheme can be developed that will either protect the specific locations of radio observations or allow some sort of time-sharing.

3) Far side of the Moon

Commissions 40 (Radio Astronomy) and 50 (concerned with light pollution and radio interference) have proposed that the IAU adopt a resolution in support of a recent proposal by the various space agencies of this planet. The proposal would create a radio-quiet Lunar Shielded Zone for the entire far side of the Moon; transmissions would be confined to only 2000 - 3000 MHz. Thus whenever a radio observatory is eventually established on the far side of the Moon, it should be protected not only from the Earth's interference, but also from experiments and communications in or around the Moon.

**Auctioning off the radio spectrum**

Radio frequency bands have traditionally been allocated to specific users in each country by their national agen-

cies. Several nations are now discussing (or have already begun) the idea of no longer granting these allocations free of charge, but to the highest bidder! This new economics may or may not worsen the situations for radio astronomers (presumably we will NOT have to pay mega-dollars each year for, e.g., our allocation of the 21-cm hydrogen line!), but we wish to closely monitor the situation.

In summary, there are many concerns for today's radio astronomers, but through coordinated efforts positive results have been, and can be, achieved. Also note that a display concerning some aspects of these issues (as well as light pollution) is in the Exhibition Area. This has been assembled by the ICSU Working Group on Adverse Environmental Impacts of Astronomy (chaired by Derek McNally of the U.K.)

WOODRUFF T. SULLIVAN  
University of Washington



## Concert by Consort

On Monday evening the ensemble "Combattimento Consort" gave us a taste of baroque music during a concert at the "Anton Philips Zaal". About 800 people attended the concert in the main concert hall, which is equipped with an adaptive acoustics system.

The Combattimento Consort, founded in 1982 by Jan Willem de Vriend, has built up an impressive reputation in Europe playing 17th and 18th century court music and has issued over ten CD's. At last Monday's concert, the Consort began with a very cheerful sonata by Marini. This set the stage for music by Vivaldi, Mozart and the Dutch composer Count Unico van Wassenaer, with an ever increasing number of musicians playing.

Van Wassenaer is a relatively unknown composer from the early 18th century. For years people thought his work was composed by Pergolesi and others. It was not until 1979 that Van Wassenaer finally got the recognition he deserved. The concert ended at about 22:30 with music by Giovanni Battista Viotti. The enthusiastic response of the audience triggered an encore, which was a little piece from Jean-Philippe Rameau's 'La Boriade'.

RENS WATERS  
Amsterdam



# Announcements

## and Tidbits

### Latest Lunch Listing

Haute cuisine from the Pays-Bas can be yours for the piddling price of 15 guilders — if you buy your lunch ticket a day in advance at the Social Events desk in the Congresgebouw.

You may have noted that all lunch offerings now consist of an elegant buffet, featuring a wide range of organic molecules. Soup, luncheon meats, salads, fruit, and bread of all geometric shapes are available for your gustatory enjoyment.

As usual, drinks are extra.

Tip the waiter, and you may get a

### General Secretaries Past Present and Future Attending the 22nd IAU:

The distinguished IAU members on the list that follows have been, are, or probably will be, general secretaries of the IAU. We have been informed that all these people are present at the General Assembly and we would like to invite them to come to Commission chamber 2 on **Wednesday, August 24, at 14h00.**

A picture, not only appropriate for the *Sidereal Times* front page but also for the scientific historians of the next millenium, will be taken.

- Jean-Claude Pecker 1964-1967
- Cornelis de Jager 1970-1976
- Edith Muller 1976-1979
- Patrick Waykan 1979-1982
- Richard West 1982-1985
- Jean-Pierre Swings 1985-1988
- Derrek McNally 1988-1991
- Jacqueline Bergeron 1991-1994
- Immo Appenzeller 1994-1997
- Johannes Andersen 1997-2000

### Don't Shrug Off Atlas

Several copies of *An Atlas of Objective-Prism Spectra* (1974) and *A Second Atlas of Objective-Prism Spectra* (1984) by Houk et al. are available free to anyone from countries having currency problems that make paying in U.S. dollars very difficult.

Leave a note in pigeon hole #596.

N. HOUK

### Encouraging the International Development of Antarctic Astronomy

This morning, 11:00 - 12:30 IAU Commission 34 hosts a special session on Antarctic Astronomy:

- J. Peterson (USA) The COBRA Project
- M. Burton (Australia) Site testing at the South Pole
- A. Stark (USA) The AST/RO Project
- P. Recabarren, M. Mosconi (Argentina) Argentinian Activities in Antarctic Astronomy
- J. Storey (Australia) Automated astrophysical observatories for the high plateau
- K. Maslennikov (Russia) Russian plans for Antarctic Astronomy
- R. Lowenstein (USA) Communication needs for Antarctic Astronomy
- M. Dopita (Australia) The International Antarctic Balloon Observatory

### Glow Must Go

Will the owner of the small plutonium sample please address him- or herself to the offices of the *Sidereal Times*? The death of our plants is not really a problem, but the glow is disturbing.

# Public Lecture

Black holes, unlike most astronomical objects, were found first on blackboards, not through a telescope. Despite their ephemeral nature, black holes continue to suck in the public, not to mention the occasional hunk of hot gas.

For those of you anxious to brush up on your black hole banter, consider attending tonight's public lecture at the Museon. The latter is only a matter of minutes from where you sit reading this rag. Tonight's speaker is Michiel van der Klis, and the talk is imaginatively entitled "Black Holes." The festivities begin at 20:00 (local proper time) as always, and costs a miniscule 7.50 guilders. The presentation will be in Dutch.

# Late Posters

S169.L.99-101 R. Buser and J. Rong, "Homogenized Basel RGU-photographic high-latitude survey of the Galaxy."

- I. "Determination of optimized structural parameters from systematic population models"
- II. "Existence and structure of the thick-disk population component"
- III "The metallicity structure of the Galactic thick disk and halo"
- S169.L.102 D.Schaerer and G.Meynet, "The Galactic Center Star Cluster: Normal Evolution ?!"
- S169.L.103 M. Sevenster et al. "An OH Survey and its Applications"
- S169.L.104 B. Weiner and J.A. Sellwood, "Properties of the Galactic Bar as deduced from hydrodynamical models"
- S169.L.105 A. Withworth, "The structure of the interstellar medium"
- S169.L.106 D.A. Levine and M. Morris, "Report on a survey of H2O masers toward the Galactic Center"
- S169.L.107 K. Uchida et al., "The Possible Energy Source of the Galactic Center Nonthermal Filament"
- S169.L.108 F. Yuset-Zadeh et al., "Polarization and molecular-line studies of a system of nonthermal filaments (G359.54+0.18)"
- S169.L.109 W. Dehney, "A f(E,Lz)-model for the Galactic Bulge"
- S169.L.110 W.J. Schuster and C. Allen, "Effects of chaos in the Galactic Halo"

### Missing

Four 8 x 10 inch color photos from the poster S166.3 "Hubble Space Telescope Relative Positional Stability" were removed. The author would very much like to have these photographs back (pigeon hole #338) — no questions asked. If you would like legitimately obtained versions of these photos, you can order them from NASA. Please do not impose cost and inconvenience on an Assembly participant. Bring 'em back!



by H. DICKEL & Comm. 5 WG

ISFUNCTIONAL DESIGNATIONS CONVEY MISLEADING INFORMATION. For example there is a source called MG 0419+1316 (Ap JS 61 105 1986). However, there is no source corresponding to these 1950 coordinates in the list. But there is a source listed with J2000 equatorial coordinates = 04h19m24.4s +13d16'22" and B1950 = 04h16m36.5s +13d09'11". The proper designation is thus MG J0419+1316.

READFUL DESIGNATIONS FOR NEWLY-DISCOVERED OR SURVEYED OBJECTS, GIVE AN ACRONYM YOURSELF- otherwise you can expect surprises such as the dreadful designation SMC 1 which refers to a Planetary Nebula in the LMC! It was given no name in the original publication (Savage, Murdin & Clark 1982). The preferred designation is SMP1 104A from Sanduleak, McConnel & Philips in IAU Symp 108 231 1984.

DERIVATIVE DESIGNATIONS ARE A BAD IDEA. Do not alter or abbreviate an existing name. Refer to the elliptical galaxy NGC 63 not N63 (which may be confused with Henize nebula 63 in the LMC or in the SMC). Refer to SN 1987 A not just 1987 A.



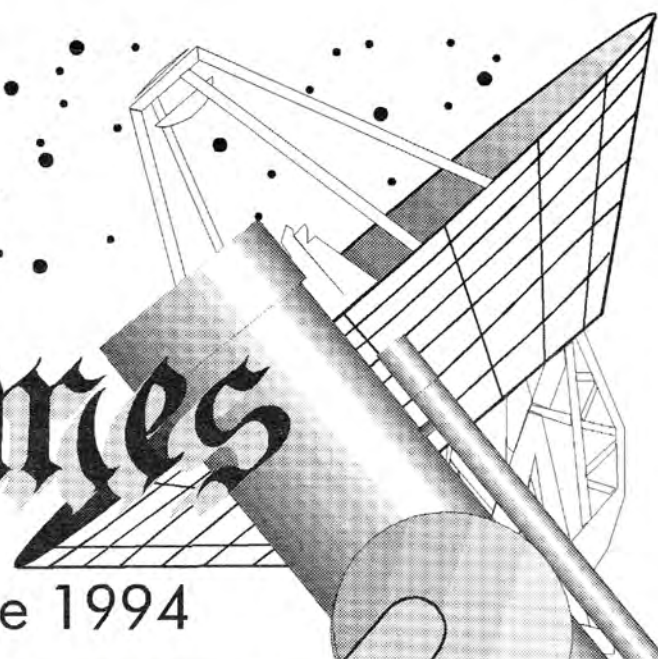


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994

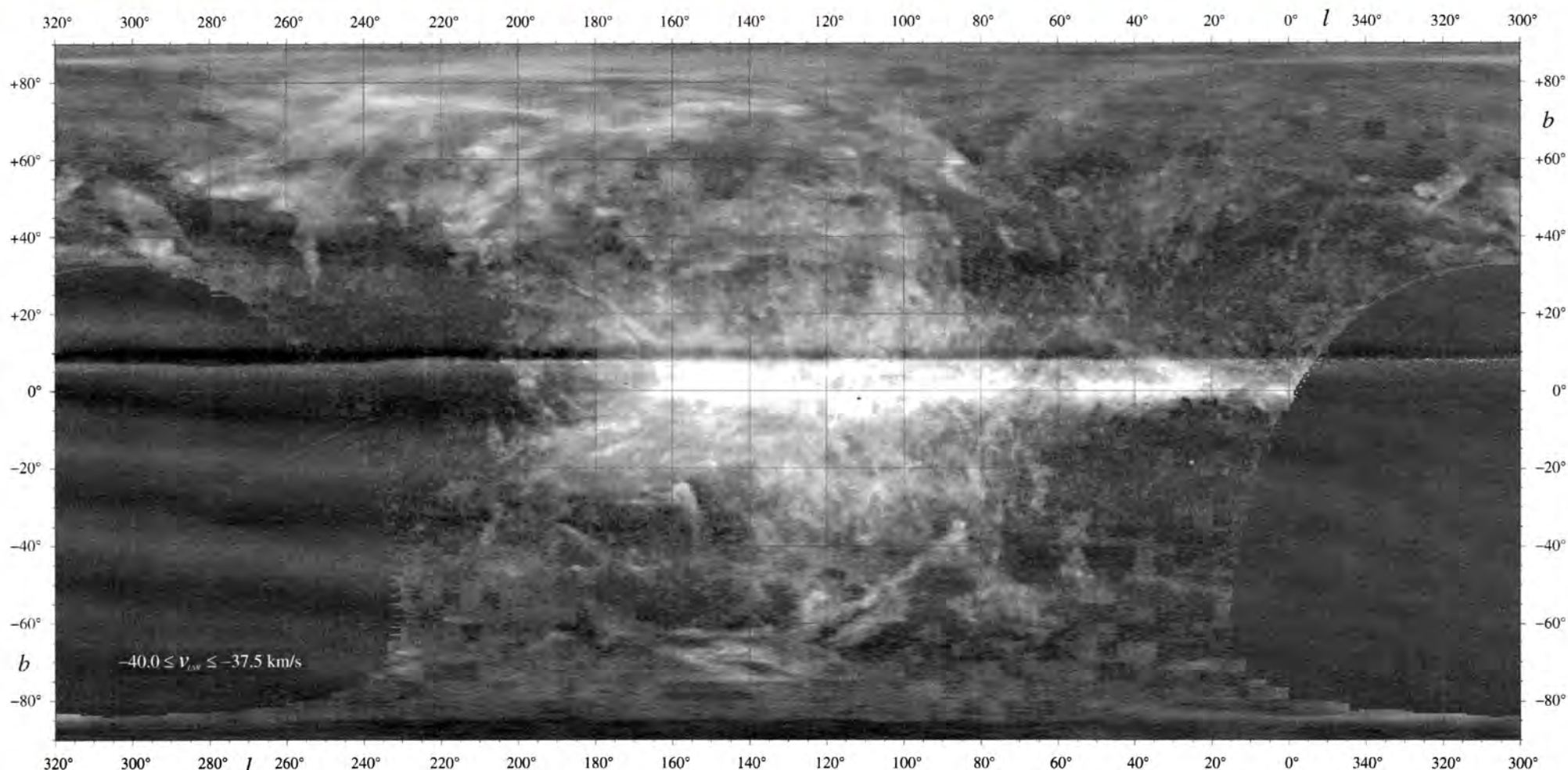


Editor: *SETH SHOSTAK*

Associate Editor: *RENÉ GENEÉ*

No. 10: Friday, 26 August

## Leiden-Dwingeloo HI Survey *Milky Way Finally Well-Mapped*



**F**or five years the Dwingeloo 25 m radio telescope (built circa 1956, beamwidth 36') has been used to make an all-sky survey of galactic neutral hydrogen — but with a difference. The data have been corrected for stray radiation arising in near and far sidelobes.

Such an ambitious program has never before been attempted, reports Dap

Hartmann of Leiden Observatory. Hartmann's Ph. D. thesis reporting the results is now being printed under his personal supervision. The above figure is but one of hundreds, mapping the neutral hydrogen brightness at specific velocities; in this case averaged between -40 and -37.5 km/sec with respect to the local standard of rest, and displayed in galactic coordinates for the whole sky accessible from Dwingeloo.

Plainly visible are great swaths of filamentary structure extending to the galactic poles. The bright region in the galactic plane between longitudes 100 and 140 degrees shows gas in the Perseus spiral arm, but otherwise most of the non-planar gas at these velocities is believed to be local. Why it looks the way it does, or why it moves at these velocities (the so-called intermediate velocity gas at high latitudes) is far from understood.

Hartmann reports that 300,000 profiles were recorded in the survey. Each profile was a 3 minute integration made with 1 km/s bandwidth. The survey provides full velocity coverage from -500 to 500 km/s, and 1,000 maps like the above (but in color) will be published by Cambridge University Press in 1995. A CD ROM will be included.

*continued, page 2*

## X-ray Nova Scorpius Excitement Continues

**I**n a drama so well timed it appears to have been organized by the IAU, the Scorpius X-ray nova has continued to command the frantic attention of researchers during the 22nd General Assembly.

Radio astronomers working south of the equator have interrupted all ongoing programs to observe the dramatic radio outburst which followed the X-ray flare from GRO J1655-40 reported at IAU165 and covered in

Tuesday's edition of the *Sidereal Times*. The radio event has been strong enough (peaking at 7 Jy on Aug 18) to obtain milliarcsec VLBI resolution observations during the outburst. Interest was further heightened by the announcement from Felix Mirabel of superluminal motions in another galactic X-ray variable (*Sidereal Times*, 19 Aug) and the prediction by some participants at IAU165 that the new Scorpius source

would be another example of sudden accretion onto a black hole in a binary system.

The radio outburst has been of short duration, and has been exponentially decaying since August 18, with a half-life of about 3 days. During the outburst, VLBI observations have been obtained using radio telescopes of the ATNF in Parkes, Narrabri and Mopra, the NASA DSN antennas at Tidbinbilla and Goldstone, antennas

in Tasmania and South Africa, and the new VLBA antenna in Mauna Kau. Detailed images won't be available until after the MkII VLBI tapes have been correlated this week at the Caltech/JPL correlator. However a real-time link is in place between Tidbinbilla and Parkes, and the Australian team has been able to watch the source expanding on this one baseline.

*continued, page 2*



*Milky Way mapping, continued*

The sidelobe corrections have greatly enhanced the sharpness seen in HI area maps such as this. "At high galactic latitudes," notes Hartmann, "more than 50% of the total area in the HI profiles is contributed by stray radiation in far sidelobes." The corrected data are a wonderful resource that will allow students of diffuse HI to more accurately determine the nature of this material. Hartmann confesses that upon review of the data "it is difficult to find much evidence for the existence of 'clouds.' The filamentary nature of the gas is most striking."

Once again we learn that the world's oldest radio telescope has been used to carry out a piece of work of stun-

ning importance. Last week it was the discovery of a nearby spiral galaxy in the zone of avoidance in a program that grew out of the completion of the all-sky survey.

It seems almost unbelievable that it has taken over 40 years since the discovery of the 21-cm hydrogen line for this study to have been carried out. Project leader W. B. Burton and Hartmann are to be congratulated on completing this Herculean task.

GERRIT VERSCHUUR  
Rhodes College  
Tennessee

*X-ray Nova Scorpius, continued*

An instant analysis of these data by Dave Jauncey indicates a pair of very elongated (20:1) jets already 500 - 600 milliarcseconds long, and expanding at 10-15% per day!

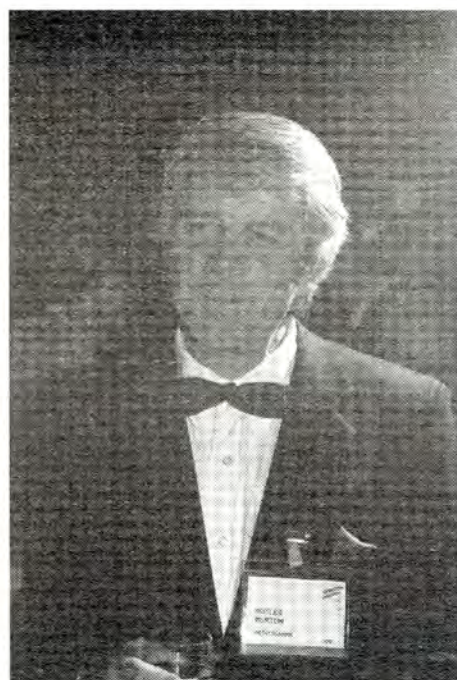
During the intense outburst, Mike Kesteven has used the Australia Telescope compact array to measure accurate HI absorption profiles. These include absorption features going out to the Norma/Scutum arm implying a distance of about 3.5 kpc, so the jets were already about  $3 \times 10^{16}$  cm long and are expanding relativistically.

The Molongolo observations of the total intensity (*Sidereal Times*, 23 Aug) are continuing at 0.843 GHz and Derek McKay has been using the AT compact array since August 15 to

monitor a further 6 frequencies between 1.4 and 9.2 GHz. The outburst has been optically thin since then, with a spectral index of about 0.7.

This IAU General assembly special event was exquisitely timed to ensure that most of the astronomers were on the wrong side of the Earth. Now, in the dying days of the General Assembly, Nova Scorpius is also fading away, and has already become too weak to continue high resolution VLBI imaging. However, as compensation it is now large enough to be resolved with the VLA, which will be able to follow it a little further. Additional details are being reported in the IAU circulars.

RON D. EKERS  
Australia Telescope National Facility



Butler Burton, one of the 8-cylinder powerhouses behind the Dwingeloo-Leiden HI survey.

## Sober Editorial

It has been the penchant of this editor to write in a facile, occasionally humorous style, and to avoid the first person voice. I would like to deviate from these precepts to say something serious and heartfelt.

In particular, I would like to thank those people who have made it possible to produce this paper every day, despite withering deadlines and modest technical facilities.

You already know from the masthead that Rene Genee is the Associate Editor for the *Sidereal Times*. In addition to dealing with the imperatives of the media, Rene has wonderfully organized all aspects of this paper.

Olaf "Whirlpool" Kolkman, a graduate student of astronomy in Groningen, originally came to the paper as a cartoonist. But he has done yeoman's work of every sort, and I note the simple fact that without his tireless efforts, you would not be reading these soporific lines.

Griet Van de Steene, also a graduate student from Groningen, has regularly helped the *Sidereal Times* production team, and has done this without complaint and with tremendous enthusiasm and care.

Finally, I would like to thank our "cub reporters," the eyes and ears of this newspaper. These are fellow astronomers who have taken the time to write articles so that you might know of the goings-on at this Assembly. In particular, excellent contributions were repeatedly received from Paul Murdin, Dave Morrison, Peter Teuben, Rens Waters, Gerrit Verschuur, and Patrick Moore.

To all of these people, working unseen in the small room that houses the *Sidereal Times*, I offer my thanks, and yours.

tion include our Mercury magazine, the Annual ASP Meeting, information packets, and Project ASTRO, an NSF funded program to pair teachers with astronomers for learning experiences that extend far beyond the classroom.

Whatever your role in astronomy - as researcher, educator, or administrator - we welcome your input, your support and your membership.

ROBERT J. HAVLEN  
Astronomical Society of the Pacific

Space here for another Dutch tidbit: It is a well-known (or at least, frequently-repeated) fact that Leiden has the lowest average IQ of any city in The Netherlands. It is not clear whether the university is intended to remedy this situation, or is the cause of it.

## The ASP Not Very Pacific

Most professional astronomers are familiar with the Publications of the Astronomical Society of the Pacific (PASP), but not many IAU members know about the ASP - its history, membership, and the full scope of its programs and activities.

With nearly 6,500 members in over 60 countries, the ASP is *not* confined to the Pacific region. Promotion of astronomy at all levels is of primary importance at the ASP, as members are drawn from the ranks of professionals, amateurs, educators and the public. Examples of the ASP at work can be found at our display in the exhibit area.

Of special interest is a demonstration of the newly Digitized Sky Survey - produced by the Space Telescope Science Institute and distributed by the ASP - and compiled from the ESO/SERC IIIaJ southern plates and the northern POSS E plates.

The entire 101 CD-ROM set will prove to be an essential research tool.

Also available for a special 25% discount are over 60 volumes from the ASP Conference Series Proceedings. If you would like an upcoming meeting proceeding considered for publication, contact [PASP@XRAY.BYU.EDU](mailto:PASP@XRAY.BYU.EDU).

The ASP mail-order catalog attempts to meet the great need of astronomers and educators for quality educational materials. We welcome all suggestions and encourage your assistance in developing products for distribution.

Proceeds from the catalog support development of new materials and educational programs such as our teachers newsletter "The Universe in the Classroom," which is distributed free of charge to over 12,000 educators worldwide.

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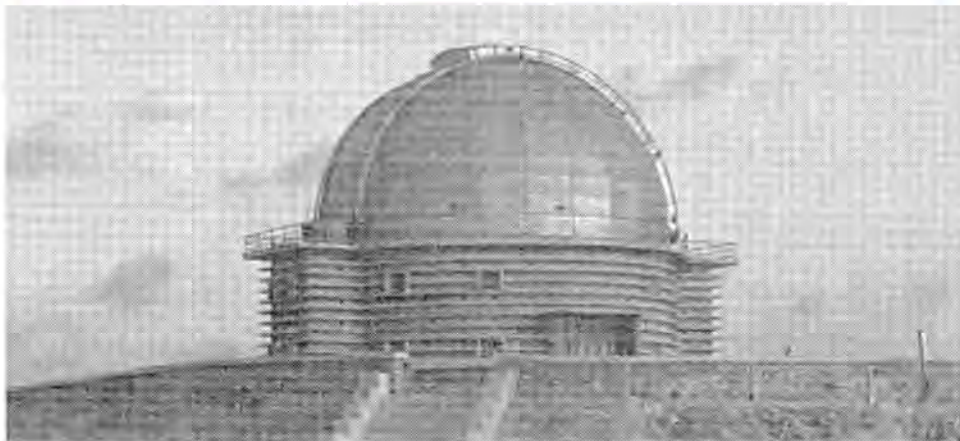
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## Egypt Upgrades Telescope

to peer amid the stars...



The Kottamia 74 inch telescope is the largest telescope in North and Middle Africa and the Middle East. The telescope belongs to the National Research Institutes of Astronomy and Geophysics in Egypt, and began operations in 1964. It is of the conventional type, having a Newtonian (f/4.86), Cassegrain (f/18) and Coude (f/28.9) focus, and stands on a plateau 75 km to the east of Cairo.

This telescope is fitted with a Newtonian camera (22.53 arcsec/mm), photoelectric photometer, Cassegrain spectrograph (gives 100 Å at 48 Å/mm) and a Coude spectrograph (20 Å at 6 Å/mm) The site is generally good and the number of clear nights averages 200 per year.

Due to some problems with the surface of the main mirror, which has been in use for more than 30 years,

and in order to upgrade the telescope, an extensive program has been started with more than two million dollars in support from the Egyptian government. This will include ordering a new Zerodur primary mirror, a large format CCD camera, an autoguiding system, a three channel photoelectric photometer, and a fast grating spectrograph.

The Astronomy Department of the National Research Institute is seeking collaboration with other observatories and universities for exchange of astronomers, joint programs and training grants for young astronomers.

For more information please contact Anas Osman, Astronomy Department of the National Research Institute for Astronomie and Geodesics., Helwan-Cairo, Egypt. FAX 002 02 782683. E-mail: GALAX@FRCU.EUN.EG

## Popularizer Half-Forgotten

Not only the IAU celebrates its 75th anniversary nowadays. As of last year, 75 years have passed since the death of Victor Anestin — Romanian popularizer of astronomy and science in general, who contributed considerably to the dissemination of knowledge in this field to the general public in his native country and beyond.

Born in 1875 in Craiova, he was a contemporary of Camille Flammarion (1842 - 1925). However, despite enormous efforts, he never gained the official recognition and well-deserved fame that was Flammarion's, although Anestin authored and translated about 25 books on astronomy, and managed to publish the first Romanian periodical devoted entirely to astronomy ("Orion") for five years (1907 - 1912). He also made the then-Minister of Education, Spiru Haret (a mathematical astronomer in his own right) instruct the libraries of all high schools in the country to subscribe to it.

Among his more original contributions, the treaty concerning all meteoric phenomena witnessed in Romania between the years 1386 to approximately 1910 (presented to the Romanian Academy) might be mentioned, along with his extensive correspondence with astronomers abroad.

This notwithstanding, after working for most of his 43 years as an underpaid journalist, and after being exploited by his employers, he died so poor that funds had to be collected among the typesetters for his funeral, even after the sale of almost all the masterpieces of his 20,000-volume library.

ANDREI RADU SERBAN  
Center for Astronomical Information,  
Jerusalem

### Politics Triumphs

## The 1958 IAU General Assembly in Moscow

In 1955, from August 29 to September 5, the 9th IAU General Assembly took place in Dublin. A spirit of friendship, good will and mutual understanding reigned during that astronomical forum. Boris V. Kukarin of Moscow University, on behalf of the Soviet Academy of Sciences, invited the next 10th IAU General Assembly to be held in Moscow in 1958 and prolonged applause greeted his suggestion. The Soviet invitation was strongly supported by J. J. Nassau who was a leader of the U.S. National Astronomical Committee.

Dublin's scientific idyll had deep social roots; it was a direct result of unprecedented previous events which began not from Khritchev's Thaw but from the dawn of the Cold War.

In 1948, the 7th IAU General Assembly took place in Zurich. At the last plenary sitting it was recommended that the next 8th General Assembly be hosted in Leningrad in August, 1951. It would be a commemorative event for the re-opening of the well-known Pulkovo Observatory, after reconstruction necessitated by the destruction of the Second World War.

The Soviet top-ranking political figures under Stalin wanted to see a great scientific meeting in the USSR, and they reacted accordingly. All expenditures on the territory of the USSR for foreign participants would be paid by the Soviet Academy of Sciences.

The Zurich decision was a recommendation, but not a final resolution because there were some doubts that foreign astronomers from countries without diplomatic relations with the USSR would get the chance to come behind the iron curtain. So an official request was sent to Moscow, and the IAU Executive Committee received an official statement that all members of the IAU without exception would be welcomed. It was during the presidency of Bertil Lindblad that the Executive Committee decided to agree with the Soviet initiative. On December 14, 1950, 8 months before the Assembly, Bengt Stromgren, who was the General Secretary, informed Alexander A. Mikhaïlov, Pulkovo Director and the Soviet national astronomical leader, that 251 astronomers intended to participate at the Leningrad meeting.

But only one month later, on January, 19, 1951, Mikhaïlov was informed of President Lindblad's decision to cancel this event due to unsuitable international condi-

tions. In the USSR it was the darkest period of Stalin's regime.

For Soviet scientific officials and Communist Party clerks, of course, this was a tremendous shock. In the Soviet Astronomical Journal it was anonymously stated that Prof. Lindblad and Prof. Stromgren were under the influence of aggressive circles in the USA and other capitalistic countries; they were scheming to orchestrate the collapse in cooperation among members of the international scientific community.

There were different reactions to the decision. Fifteen well-known astronomers from France and the Netherlands protested seriously against the cancellation. But the position of the IAU Executive Committee was hard, in spite of the impossibility to quickly change the location of the IAU meeting. That is why the next IAU General Assembly took place in Rome not after 3 years as usual but after 4 years in 1952.

So Pulkovo's misfortune was repeated twice. In August, 1914 a great astronomical international meeting of the Astronomische Gesellschaft was to be held in Saint-Petersburg but the event was interrupted by the beginning of the First World War. And once again the international astronomical congress at Saint-Petersburg was destroyed by the Cold War.

ALEX GURSHTAIN  
Russian Academy of Sciences

### Leiden Revealed



Professor Vladimir Lipunov, from Sternberg Astronomical Institute in Moscow, made several sketches of the enchanting city of Leiden. One is reproduced above, for your viewing enjoyment.



# Industry in the Service of Astronomy

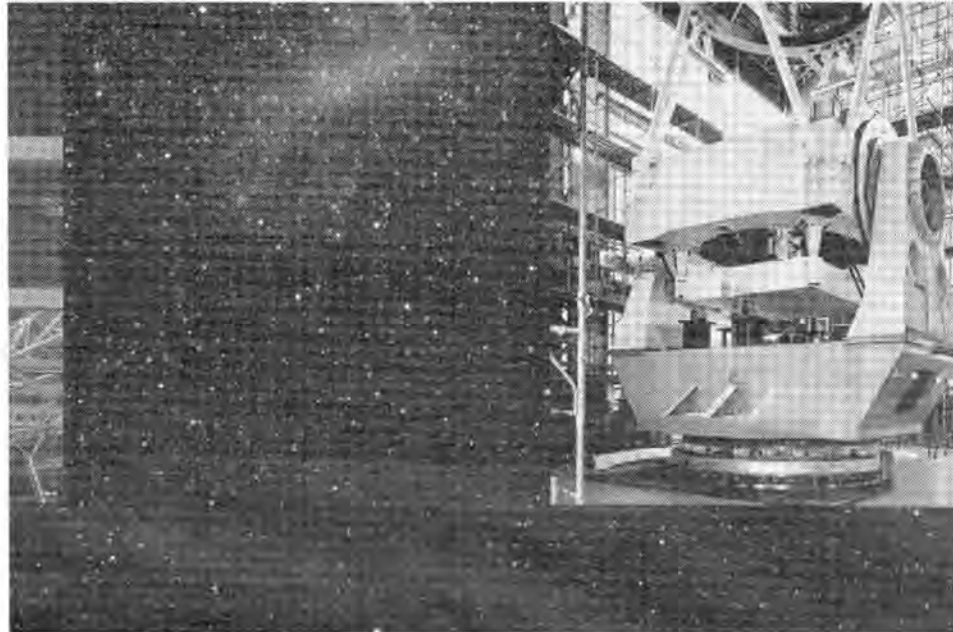
European Industrial Engineering involvement in the astronomical field, began in 1986 almost as a joke, as a sense of challenge, and as a wager against ourselves based on the familiar saying: "The impossible we do immediately. For miracles we require fifteen minutes."

We were offered the possibility to participate in a tender for the design, construction and on-site erection of a rotating building for the European Southern Observatory's 3.5 m NTT telescope for the firm of Messi. The design office of Mecnafer SpA in Venice, a world leader in the design and construction of rail grinding trains, was fully immersed in the design of a huge prototype train, and at first the request to submit a bid appeared of no interest. But just for curiosity's sake, a quick look at the Call for Tender was given.

This look convinced us that the project was very interesting from an engineering point of view, it required a lot of thinking, and that the design was innovative. This is just the sort of project we like. Without too much thinking, it was decided to participate in the bid in cooperation with two Italian companies. A few weeks later, most unexpectedly, the contract was awarded to our firm.

The designers, the engineers, and indeed the whole staff, were fascinated by this mysterious instrument; they were taken by the astronomers' way of thinking and by their special requirements. They studied, designed, built, and erected the building in Chile. This activity left a mark on the group responsible of this project. Their involvement became total; during and outside working hours the subject of their discussion was always the same: the telescopes. Saturdays and Sundays was a good opportunity to meet and discuss what to do and how to do it. Slowly the railway interest started to fade, while the interest for the telescopes grew as if the team was becoming 'telescopes dependent.'

As a result of this new great interest, in 1989 the European Industrial Engineering firm was founded with the aim of initiating a dialogue with the astronomical community, to understand their requirements and to try giving positive answers to their inquires, and to transform their ideas into practical solutions and constructions. EIE's first assignment was the feasibility study of the four buildings for the ESO VLT (4 x 8.2 m telescopes) project. Different solutions were analyzed for the dome rotation system, the effects of the different air conditioning (windscreens, louvers, shutters) and thermal systems, as well



as the economic impacts, etc.

In 1990, EIE, in cooperation with an Italian group (ANSALDO, INNSE, CRIV), started the construction of the TNG 3.5 m National Telescope (Galileo Project) which will be assembled in Las Palmas, Canaries. For this project, EIE is responsible for the plants' design and technical coordination for the construction of all machined structures. The first important activity on the 8 m class telescopes starts in 1991 when, after a very competitive competition with several European companies, EIE, together with two Italian companies (ANSALDO and SOIMI), was awarded the contract for the design, construction and assembly of the four VLT telescopes for ESO.

Today the design activities have been successfully completed; the result is the design of four telescopes with alt-azimuth assembly, about 25 m height, 22 m diameter and a total weight of approximately 430 tons (including mirror units, instrumentation and all sub-assemblies). A hydrostatic bearing system is provided for both axes, which are driven by direct drives (brushless motors) respectively of 9 m (azimuth) and 1.2 m (altitude). For the altitude, a frequency of 8.1 Hz was obtained. The main steel structures and the main subassemblies are now under construction, and in 1995 the first telescope will be erected in Milan, ready for preliminary tests.

The encoders developed by OPTODYNE represent an innovative solution based on a special application of the laser Doppler effect. In 1993, thanks to the experience and the know-how gained during the design of the Very Large Telescope, EIE with a group of Italian companies, was awarded the contract for the design and supply of the four enclosures of the ESO VLT telescopes. In a very short time both the design, including the FEM analysis, and the manufactu-

ring activities were completed, thus allowing us to ship the first elements of the structures to Chile (shipment to occur during the first week of August, 1994). Particular attention was paid to the enclosure shape and this underwent wind tunnel tests and examination.

Again in 1993, EIE was awarded a contract by the French CNRS (Conseil National des Recherches Scientifiques) through the Italian CNR (Consiglio Nazionale della Ricerca), for the design and construction of the 9 m dome for the Themis Solar Telescope, to be installed in Tenerife, Canaries.

EIE experience gained in the astronomical field is considered sufficient by Steward Observatory of Tucson and Arcetri Observatory of Florence, to contract, together with ADS ITALIA, for the design of one of the most interesting telescopes, the Large Binocular Telescope (LBT).

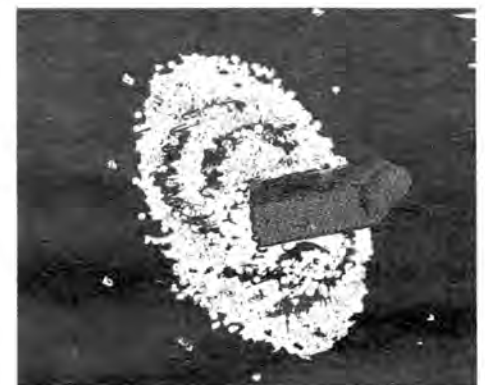
This telescope combines in a single structure two 8.4 m honeycomb mirrors, a weight of about 440 tons, with a prime frequency of 8.5 Hz. Actually EIE, in addition to its commitments in the observatory field and many other engineering sectors, such as civil - steel structural (including stress analysis) - hydraulic, hydrodynamics - electrical and electromechanical - thermodynamic, etc. continues its involvement in the astrophysics sector, putting itself at the service of the International Astronomical Community. Its services are based on industrial costs rather than research costs, and this facilitates innovative projects.

E. PANETTI  
D. PANETTI  
G.P. MARCHIORI

## Hungry for a Milky Way Bar?

Inside the Galaxy there is The Bar!

A full afternoon session of IAU Symposium 169 "Unsolved Problems of the Milky Way" was dedicated to what actually doesn't seem to be a problem anymore. This Symposium, dedicated to the memory of Jan Oort, aims to solve some long-standing problems connected with Galactic



research. That our Galaxy could have a bar was proposed nearly 20 years ago by Peters, and a few more attempts to convince the community followed, but apparently has had a hard time gaining acceptance.

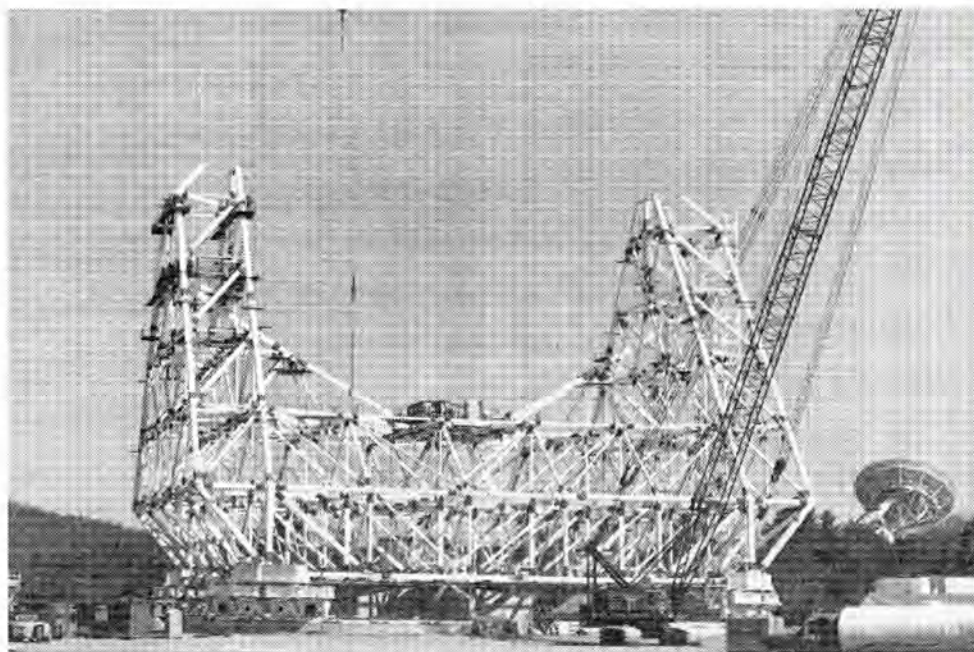
Two independent papers by Binney et al. and Blitz and Spergel in 1991 suddenly revived the subject, and started a series of (re)-analyses of existing and new data which seems to have convinced the Galaxy community.

The most extreme case was a detailed model of the COBE DIRBE data, presented by Dwek, from which it was concluded that the Bar can have an axis ratio of 1:3 in the plane of the Galaxy. All speakers, without exception, concluded that the bar points towards the sun into the first galactic quadrant, making an angle of about 10 - 40 degrees with the line Sun-galactic center.

A slightly different organization was used in this Symposium: each session has a different Principle Organizer, responsible for the selection of speakers, and who also chairs the session. Tremaine chaired the first opening day session (Tuesday) on the shape of disk and halo. The speakers generally agree on a modest flattening of the halo, but the ellipticity of the disk is still uncertain to about 10% (of being axisymmetric). Tuesday was devoted to the galactic center, which is where the most conflict lies. "Nearly all titles end with a question mark," remarked one speaker, "and hence the title of this short piece has one as well."

PETER TEUBEN  
College Park, USA.





The Green Bank Telescope (GBT), a 100 meter diameter radio telescope at the NRAO in Green Bank, West Virginia, is now well along in its construction. The telescope will replace the 300 foot telescope which collapsed suddenly in November, 1988. The photograph shows the alidade structure that rotates in azimuth and supports the reflector. The GBT will have unique offset-parabolic optics to improve its efficiency, and reduce the effects of terrestrial radio interference. The telescope will operate at frequencies from 25 MHz to 50 GHz, and is expected to be in operation in two years.

Visible to the right side of the photo is the NRAO 140 foot telescope.

F. J. LOCKMAN

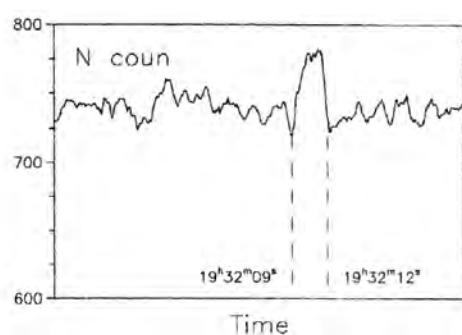
## Io Brightens

The author and V.V. Kleshchonok from Kiev University and I.V. Reut from Riga have observed the light curves of Jupiter's satellites Io and Europa on July 16 - 22, 1994.

Observations were made at the 0.5 m reflector with the help of an electrophotometer with B and V filters at the astronomical station of Kiev University in the village of Lesniki (near Kiev).

Near the time 19:32:09 - 19:32:12 on July 20, we observed a possible three second flash on Io (see the figure). If this is a real, then it should be the reflected light from the giant fireball caused by the impact of one of the secondary nuclei of the desintegrated comet P/Shoemaker-Levy 9 designated as Q1, and we have good data with which to improve the elliptical orbit of the comet and to study its orbital evolution and origin.

KLIM CHURYUMOV  
Astronomical observatory of Kiev



Three second flash on Io?

## The 1995 Meeting of the European Astronomical Society

The European Astronomical Society (EAS) will meet jointly in Catania with the Italian Astronomical Society in 1995, September 25 - 29 to discuss the theme "Progress in European Instrumentation and its Impact on Astrophysics."

EAS meetings replace the European regional meetings of the IAU. The Scientific Organizing Committee, chaired by Franco Pacini (Arcetri) and Marcello Rodono (Catania), will finalize the scientific program following the general guidelines of the EAS Council. Particular emphasis will be given to the scientific use of the present and planned instrumentation, both ground-based and spaceborne, with the aim of conveying their present status and how they promise to meet the astronomers' requirements — and dreams.

Invited general reviews at plenary morning sessions and parallel scientific sessions in the afternoon for invited and contributed papers on the various aspects of astrophysics, from astroparticles and gravitational waves, to solar system research and cosmology, are foreseen. The participation of young astronomers and PhD students will be strongly encouraged by a reduced registration fee and the cheapest possible accommodation. Further information will be given in the EAS Newsletter.

MARCELLO RODONO

## SHOEMAKER-LEVY9 — JUPITER IMPACT

### Special Publication

There have been many inquiries about the possibility to publish very soon, say in 60 or 90 days, a first synopsis and report about the (preliminary) results of the Shoemaker-Levy 9 - Jupiter impacts, I have discussed with Dr. Kolman from Kluwer the possibility to edit and publish a special issue of EARTH, MOON and PLANETS, (an international Journal of Comparative Planetology, Kluwer Academic Publisher, Dordrecht, The Netherlands). There is a happy circumstance that the co-editors are Mike A' Hearn, Therese Encrenaz and Hans Rickman, and I am the Editor-in-Chief. Consequently, I believe that all may go smoothly.

If manuscripts can be submitted before September 9, 1994, the special issue could appear before December, 1994.

Your paper(s) should be submitted in camera-ready form both to  
a) Kluwer Academic Publishers  
Editorial Office Earth, Moon and Planets, Spuiboulevard 50, P.O. Box 17, 3300 AA Dordrecht, The Netherlands, and to  
b) the Editor-in-Chief and the associate editors.

In principle, the length of the manuscripts is not limited. Manuscripts should preferably be prepared with the Kluwer LaTeX file. Camera-ready manuscripts should be submitted on white paper, printed with a laser writer. The text area is 12.5 x 19.5 cm. The text should be typed about 24 mm from the top of the page. Information on the LaTeX style file can be obtained on EDITDEPT@WKAP.NL (please mention camera-ready submission to Moon).

Kluwer can publish a special issue devoted to this subject almost immediately, and would like to offer extra offprints or complimentary copies to the authors (or guest editors) as an extra incentive for them to publish in *Earth, Moon & Planets* (EMP). Since the very next meeting of the editorial board of EMP will be held in the Hague on August 22, I should be very grateful for any response as soon as possible.

V. VANYSEK  
Editor-in-Chief of EMP  
Astronomical Institute, Charles Uni.  
Svedska 8,  
CZ 150 00 Praha 5

## All Questions Answered

Did you notice how empty the meeting rooms were last week? And have you noticed this week a new group of astronomers, haggard and exhausted? They are all suffering from a new, widespread astronomy disease: ISOlag.

As you undoubtedly know, the deadline for the ISO proposals was last Friday, August 19, at 22:00 (local Dutch time). About 1,000 proposals were received from all over the world at ESTEC, the European Space Agency in Holland.

ISO, the Infrared Space Observatory, is a European infrared satellite which will be launched in September of next year. Like IRAS and COBE, it is a cryogenic satellite. It features a 60 cm telescope, and four focal plane instruments: a camera, a photometer and two spectrometers.

It will be used for observations of selected targets, rather than being used for a survey mission. The wavelength range covered is from 2.5 to 200 micrometers.

ISO will solve all the outstanding problems alluded to in this General Assembly: it will discover disks of dust around all kinds of stars, find the dust enshrouded distant galaxies and baby quasars, probe the scars on Jupiter, solve the last mysteries of the galactic center (or of the Orion molecular cloud), and... you name it. The answers to all queries will be given at the

next General Assembly.  
Don't miss it!

CATHERINE CESARSKY  
SACLAY, France



Olaf Kolkman, whose cartoons adorn the *Sideral Times* under the pen name of Kloot, would be happy to sell you an original of one of his efforts.

He has also arranged for a selection of these cartoons to be reproduced in postcard format, and these can be yours for the extremely minimal price of 50 Dutch cents each.

Olaf can be reached in the *Sideral Times* offices. You can also find him via e-mail at o.m.kolkman@astro.rug.nl or kloot@astro.rug.nl.



# Assembly Banquet Blows the Lid Off!

On Wednesday evening, Assembly participants descended to the bowels of the Congresgebouw to torture-test their stomachs, flaunt their ability to dance, and impress their hapless table-mates with witty small talk.

An ample buffet dinner sated the most ravenous appetites (the chocolate mousse was light enough to float on machine oil), and the inoffensive music seduced adventuresome participants to the dance floor so that onlookers could decide on their remaining degrees of freedom. For the benefit of all attendees, the Jan Steenzaal was kept at a toasty 38 C.

The *Sidereal Times* sent its third-string photographic crew to this boffo bash, and the disappointing results are reproduced below.



The new Dean in Groningen, Piet van der Kruit, conspicuously refuses a refill.



Lo Woltjer entertains Jacqueline Bergeron by trying to set fire to his jacket.



These two working women were not invited to the Banquet, but no one had the heart to throw them out.



Prof. Bas Balada, of the University of Amsterdam, left the party early.

John Dickey smiles as Harm Habing and Thijs van der Hulst compete in an informal prune-squeezing competition.







Francesca Matteucci faces a difficult dining decision: shall it be the cucumber salad, or the Captain Iglo fish sticks?

#### Interception Notice!

Would the person who removed the picture of Europe at Night from the ICSU Working Group on Adverse Environmental Impacts Poster PLEASE RETURN IT.

Jerry Ostriker, Virginia Trimble and Renzo Sancisi brace themselves against the breath of a table mate who fancied the raw onion salad.



## Black Holes Threaten Students

One of the highlights of the General Assembly is always the 'Teacher Day' for teachers of the host country at which they can meet astronomers and learn about exciting new discoveries.

Teacher Day 1994 is organized by Commission 46 for the Teaching of Astronomy and by the Netherlands Committee for Astronomy Education, chaired by Henny Lamers of Utrecht University.

"We have chosen to concentrate the Teacher Day for Physics on high-school teachers" says Lamers. "There are no astronomy lectures in our high schools anymore, but many physical topics can be explained and demonstrated beautifully by means of astronomical observations. For instance, the Doppler effect, Newton's laws, nuclear fusion and radiation."

Our original plan was to organize the Teacher Day in the Congress Center in The Hague. However, the preregistration numbers surpassed our most optimistic estimates! We had hoped for 50 to 100 teachers, but the number quickly rose to 185 at which we had to stop the registration because we were at full capacity.

Last Sunday a teacher called Lamers at home to say that he was too late to register, but he was coming to sit at the entrance of the building hoping that one participant would not show up.

The teacher day will be held at Utrecht University. The program includes 3 lectures and 6 workshops where teachers are shown how to use

astronomical observations for demonstrating and explaining principles of physics. The meeting will end with a talk by Bill Sparks (Baltimore) describing "New results of the Hubble Telescope".

HENNY LAMERS  
Utrecht

## Hubble Constant Decided by Vote!

Holland is a very democratic country, so it seems appropriate that astronomers and cosmologists would vote on the value for the Hubble constant, often referred to as the Holy Grail of cosmology.

In IAU symposium S168 on the Big Bang, chair person Virginia Trimble, at the suggestion of the undersigned, asked attendees to raise their hand in favor of any of the following three possibilities: a Hubble constant larger than 75 km/sec/Mpc, a value below 75 km/s/Mpc, or 'don't know yet'.

Earlier that same morning, Sydney van den Bergh and Gustav Tammann respectively presented convincing evidence for a high and a low value for the Hubble constant. Van den Bergh and his colleagues showed observations of Cepheid variables in a galaxy supposed to be near the core of the Virgo cluster. The observations, made with the CFTH telescope at Mauna Kea, seemed to favor a value of about 90 km/s/Mpc.

According to Tammann however, most attempts at determining the Hubble constant have not paid enough attention to observational bias. Tammann's observations of Type Ia supernovae favor a value of at most 55 km/s/Mpc.

To add to the confusion, John Huchra (Harvard-Smithsonian Center for Astrophysics) came up with some viewgraphs of the results of the HST observations by Wendy Freedman and her team on cepheids in M100, also in the Virgo cluster. "But," said Huchra, "we're not giving you a distance yet."

So what was the result of the vote? Only a few attendees favored a high Hubble constant; some thirty percent thought the Holy Grail would be on the lower end, but by far the most votes went to the 'don't know yet' option.

Probably it will take no more than a couple of years before those doubters have made up their collective mind, certainly not if the Hubble Space Telescope keeps providing us with more high quality data of cepheids in a larger sample of Virgo galaxies. I look forward to a new vote in two years time.

GOVERT SCHILLING  
Astronomy correspondent for *de Volkskrant*



## Announcements

### and Tidbits

#### Latest Lunch Listing

Someday, probably in the coming millennium, humans will be freed from the animal necessities of life — eating, breathing, reproduction. But until then, you might as well wallow in your beastly imperatives, and enjoy lunch at the Congresgebouw.

As noted *ad nauseum* in these blurbs, all lunch offerings consist of an ample buffet, featuring a wide range of organic molecules. Soup, luncheon meats, salads, fruit, and breads in forms that only a mother could love are available for your gustatory enjoyment. As usual, drinks are extra.

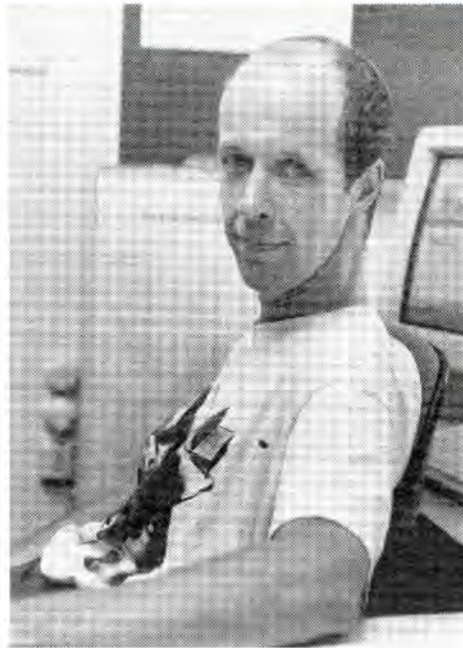
#### Very Important Notice

Please do not cause the organizers unnecessary consternation: take your posters down before leaving the Assembly!

#### ALSO

Empty your pigeon holes of all pigeons and other items before Saturday at noon. Otherwise, your items will be recycled.

ENFORCEMENT COMMISSION



*You have undoubtedly seen this man many times — in the hallways, working in the poster rooms, and dancing aggressively with astronomers having two chromosomes of the same type. He is Theo Jurriens, from Groningen, and he is an indispensable member of the Local Organizing Committee.*

*If you feel that the Assembly has gone well, that the organization has been worthy of the word, then you should thank Theo.*

#### Egging On Astronomers to Scramble Names

Wednesday's talk on the formation of clusters and voids in the universe (IAU symposium S168 on the Big Bang) was given by Estonian astronomer Jaan Einasto. I've always wondered if he is the only astronomer in the world whose family name is an anagram of his home country. Does anyone know of other examples? Is there an Israeli astronomer called Laiser, or a German called Maengry? What about Pinas from Madrid, or Londahl from Amsterdam? Anagram astronomers of the universe, unite!

GOVERT SCHILLING

**The Sideral Times will be published on Saturday of this week!  
There's still time for your article!**

**LOOKING UP LOOKING DOWN**



— THE EARLY DAYS OF DUTCH ASTRONOMY —

## Public Lecture

Civilization arose when people began to specialize — in growing grain, shepherding livestock, or mapping CO<sub>2</sub> in nearby galaxies. Now, in the last years of the 20th century, specialized labor has become so expensive, we've reverted to once more *doing it all ourselves* (gratuitous examples include cutting your spouse's hair, dismantling recalcitrant plumbing, and making a newspaper.) At tonight's popular lecture, George Comello will tell you how you can also do "Astronomy in the Back Yard." For Jan Oort, whose back yard was the Leiden Observatory, this was not an issue. For many of those attending the lecture, it may be.

Learn how you can turn a site now used only for the occasional barbecue and for housing 105 ants into a major observing facility. As is our wont, the presentation will begin at 20:00 in the Museon, which occupies some prime Haagse real estate a mere 500 meters from the Congresgebouw. The cost is only 7.50 per attendee; less than a plate full of poffertjes and a cup of coffee. By special request of Mr. Comello and all the inhabitants of Zwolle, this lecture will be in Dutch.

## Late Posters

- S 169.L.111 Taylor et al., "A Pilot Project for Panoramic Multi-Frequency, Spectral Imaging of the Galaxy."
- S 169.L.112 Haywood et al., "The Vertical Structure of the Galactic Disc."
- S 169.L.113 Haud, "Ellipticity of Outer Regions of Galactic Disks."
- S 169.L.114 Robin et al., "The Thick Disc Population of the Galaxy."
- S 169.L.115 Kan-ya et al., "The Growth of the Velocity Dispersion in the Cold Collapse of Spherical Collisionless Systems."
- S 169.L.116 Froelich, "How Important is Viscous Disc Spreading?"
- S 169.L.117 Jaffe et al., "Two new Views of the Central 300 pc of the Milky Way."
- S 169.L.118 Rhoads, "Near Infrared Star Counts as a Probe of Asymmetries in the Galaxy's Disk."

*Daphne Flapper, a young woman from Groningen, organized the Public Lecture series and exhibition being held at the Museon.*

*Daphne has not worked with astronomers before, and as you can imagine she was at first puzzled by their erratic — one might say eccentric — behavior.*

*In the last few weeks, she has come to appreciate this deviant life form, and has informed the Sideral Times that she would like to keep an astronomer as a house pet, preferably in a formaldehyde-filled jar.*



*Although it is the editor's opinion that most e-mail is not worth the electrons, the following message to Saskia Prins may possibly fire your imagination:*

Wednesday afternoon, the astronomical community at the Observatorio de Roque de los Muchachos at La Palma was awakened by a sea of fire and smoke caused by a forest fire. Local observers report the smoke clouds obscured the Moon, causing a cessation of local lunar research. Although the observatory itself was not in danger, all domes remained closed to avoid settling of soot on the mirrors. As of this morning, the fires were still raging. Note that earlier this month a similar fire persisted for two weeks.

From: Guest20@ing.iac.es  
Date: Thu, 25 Aug 1994 14:51:29 BST  
Subject: Fire !!!!

Hello SP, (I'm writing to you from the WHT dome)

I can't see the fire but it is very smoky up here. For instance the telescopes cannot be seen from the residencia and you can see smoke across a room. Both roads are closed but those who want to stay have been allowed to. It is not threatening any villages I think but it may approach the observatory. As I came up it appeared to be in a very inaccessible ravine and I can't see that they can do much to stop it until it gets nearer to the road.

Tim Marsh

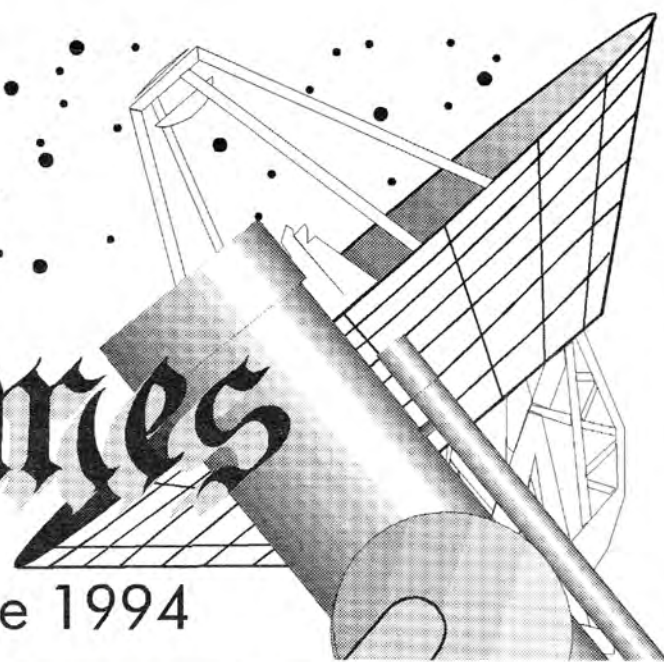


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994

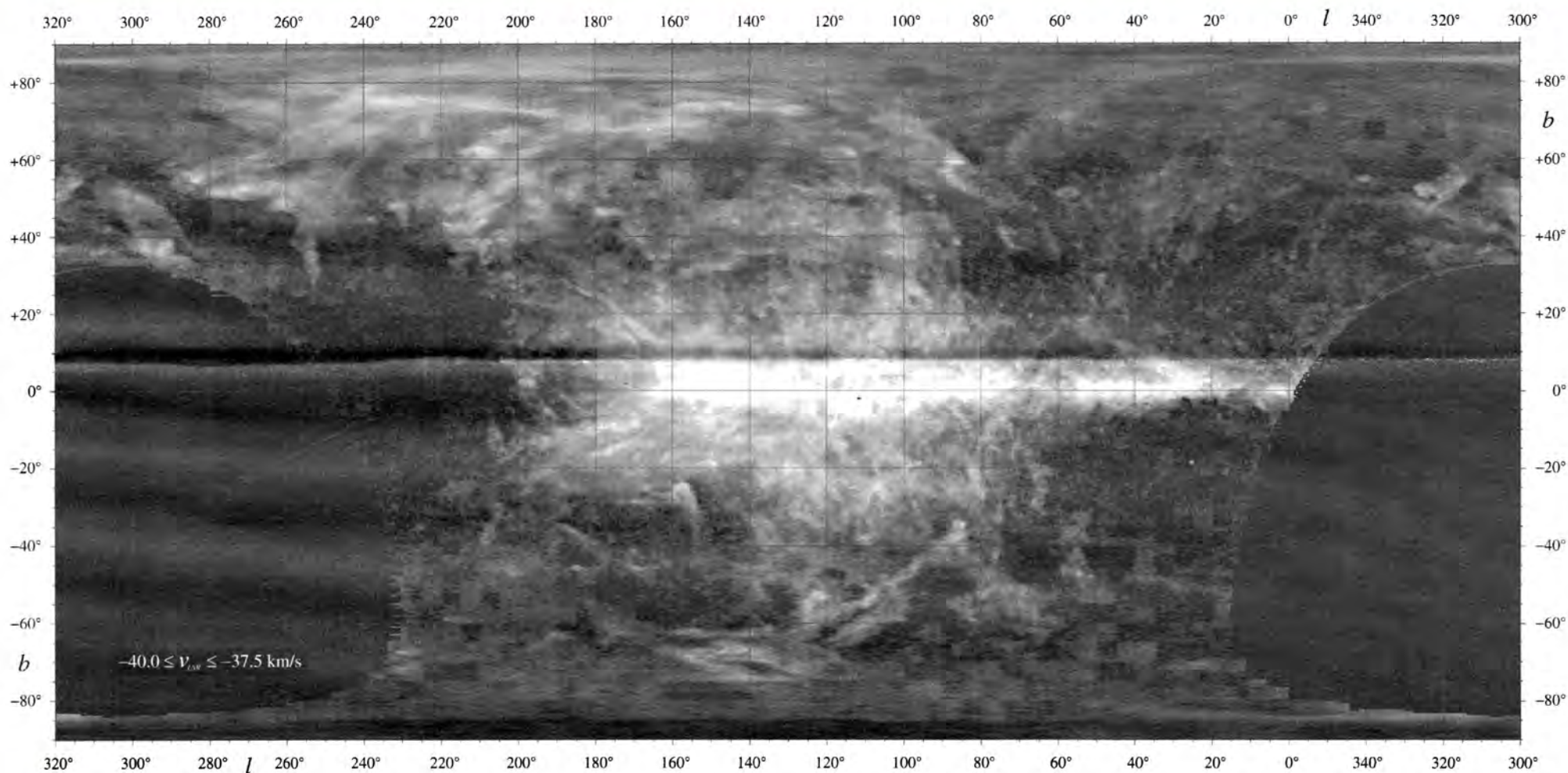


Editor: *SETH SHOSTAK*

Associate Editor: *RENÉ GENEÉ*

No. 10: Friday, 26 August

## Leiden-Dwingeloo HI Survey *Milky Way Finally Well-Mapped*



For five years the Dwingeloo 25 m radio telescope (built circa 1956, beamwidth 36') has been used to make an all-sky survey of galactic neutral hydrogen — but with a difference. The data have been corrected for stray radiation arising in near and far sidelobes.

Such an ambitious program has never before been attempted, reports Dap

Hartmann of Leiden Observatory. Hartmann's Ph. D. thesis reporting the results is now being printed under his personal supervision. The above figure is but one of hundreds, mapping the neutral hydrogen brightness at specific velocities; in this case averaged between -40 and -37.5 km/sec with respect to the local standard of rest, and displayed in galactic coordinates for the whole sky accessible from Dwingeloo.

Plainly visible are great swaths of filamentary structure extending to the galactic poles. The bright region in the galactic plane between longitudes 100 and 140 degrees shows gas in the Perseus spiral arm, but otherwise most of the non-planar gas at these velocities is believed to be local. Why it looks the way it does, or why it moves at these velocities (the so-called intermediate velocity gas at high latitudes) is far from understood.

Hartmann reports that 300,000 profiles were recorded in the survey. Each profile was a 3 minute integration made with 1 km/s bandwidth. The survey provides full velocity coverage from -500 to 500 km/s, and 1,000 maps like the above (but in color) will be published by Cambridge University Press in 1995. A CD ROM will be included.

*continued, page 2*

## X-ray Nova Scorpius Excitement Continues

In a drama so well timed it appears to have been organized by the IAU, the Scorpius X-ray nova has continued to command the frantic attention of researchers during the 22nd General Assembly.

Radio astronomers working south of the equator have interrupted all ongoing programs to observe the dramatic radio outburst which followed the X-ray flare from GRO J1655-40 reported at IAU165 and covered in

Tuesday's edition of the *Sidereal Times*. The radio event has been strong enough (peaking at 7 Jy on Aug 18) to obtain milliarcsec VLBI resolution observations during the outburst. Interest was further heightened by the announcement from Felix Mirabel of superluminal motions in another galactic X-ray variable (*Sidereal Times*, 19 Aug) and the prediction by some participants at IAU165 that the new Scorpius source

would be another example of sudden accretion onto a black hole in a binary system.

The radio outburst has been of short duration, and has been exponentially decaying since August 18, with a half-life of about 3 days. During the outburst, VLBI observations have been obtained using radio telescopes of the ATNF in Parkes, Narrabri and Mopra, the NASA DSN antennas at Tidbinbilla and Goldstone, antennas

in Tasmania and South Africa, and the new VLBA antenna in Mauna Kau. Detailed images won't be available until after the MkII VLBI tapes have been correlated this week at the Caltech/JPL correlator. However a real-time link is in place between Tidbinbilla and Parkes, and the Australian team has been able to watch the source expanding on this one baseline.

*continued, page 2*



*Milky Way mapping, continued*

The sidelobe corrections have greatly enhanced the sharpness seen in HI area maps such as this. "At high galactic latitudes," notes Hartmann, "more than 50% of the total area in the HI profiles is contributed by stray radiation in far sidelobes." The corrected data are a wonderful resource that will allow students of diffuse HI to more accurately determine the nature of this material. Hartmann confesses that upon review of the data "it is difficult to find much evidence for the existence of 'clouds.' The filamentary nature of the gas is most striking."

Once again we learn that the world's oldest radio telescope has been used to carry out a piece of work of stun-

ning importance. Last week it was the discovery of a nearby spiral galaxy in the zone of avoidance in a program that grew out of the completion of the all-sky survey.

It seems almost unbelievable that it has taken over 40 years since the discovery of the 21-cm hydrogen line for this study to have been carried out. Project leader W. B. Burton and Hartmann are to be congratulated on completing this Herculean task.

GERRIT VERSCHUUR  
Rhodes College  
Tennessee

*X-ray Nova Scorpius, continued*

An instant analysis of these data by Dave Jauncey indicates a pair of very elongated (20:1) jets already 500 - 600 milliarcseconds long, and expanding at 10-15% per day!

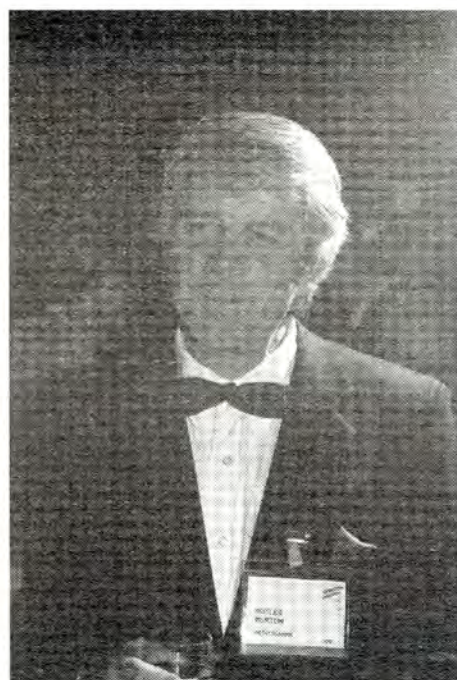
During the intense outburst, Mike Kesteven has used the Australia Telescope compact array to measure accurate HI absorption profiles. These include absorption features going out to the Norma/Scutum arm implying a distance of about 3.5 kpc, so the jets were already about  $3 \times 10^{16}$  cm long and are expanding relativistically.

The Molongolo observations of the total intensity (*Sidereal Times*, 23 Aug) are continuing at 0.843 GHz and Derek McKay has been using the AT compact array since August 15 to

monitor a further 6 frequencies between 1.4 and 9.2 GHz. The outburst has been optically thin since then, with a spectral index of about 0.7.

This IAU General assembly special event was exquisitely timed to ensure that most of the astronomers were on the wrong side of the Earth. Now, in the dying days of the General Assembly, Nova Scorpius is also fading away, and has already become too weak to continue high resolution VLBI imaging. However, as compensation it is now large enough to be resolved with the VLA, which will be able to follow it a little further. Additional details are being reported in the IAU circulars.

RON D. EKERS  
Australia Telescope National Facility



Butler Burton, one of the 8-cylinder powerhouses behind the Dwingeloo-Leiden HI survey.

## Sober Editorial

It has been the penchant of this editor to write in a facile, occasionally humorous style, and to avoid the first person voice. I would like to deviate from these precepts to say something serious and heartfelt.

In particular, I would like to thank those people who have made it possible to produce this paper every day, despite withering deadlines and modest technical facilities.

You already know from the masthead that Rene Genee is the Associate Editor for the *Sidereal Times*. In addition to dealing with the imperatives of the media, Rene has wonderfully organized all aspects of this paper.

Olaf "Whirlpool" Kolkman, a graduate student of astronomy in Groningen, originally came to the paper as a cartoonist. But he has done yeoman's work of every sort, and I note the simple fact that without his tireless efforts, you would not be reading these soporific lines.

Griet Van de Steene, also a graduate student from Groningen, has regularly helped the *Sidereal Times* production team, and has done this without complaint and with tremendous enthusiasm and care.

Finally, I would like to thank our "cub reporters," the eyes and ears of this newspaper. These are fellow astronomers who have taken the time to write articles so that you might know of the goings-on at this Assembly. In particular, excellent contributions were repeatedly received from Paul Murdin, Dave Morrison, Peter Teuben, Rens Waters, Gerrit Verschuur, and Patrick Moore.

To all of these people, working unseen in the small room that houses the *Sidereal Times*, I offer my thanks, and yours.

tion include our Mercury magazine, the Annual ASP Meeting, information packets, and Project ASTRO, an NSF funded program to pair teachers with astronomers for learning experiences that extend far beyond the classroom.

Whatever your role in astronomy - as researcher, educator, or administrator - we welcome your input, your support and your membership.

ROBERT J. HAVLEN  
Astronomical Society of the Pacific

Space here for another Dutch tidbit: It is a well-known (or at least, frequently-repeated) fact that Leiden has the lowest average IQ of any city in The Netherlands. It is not clear whether the university is intended to remedy this situation, or is the cause of it.

## The ASP Not Very Pacific

Most professional astronomers are familiar with the Publications of the Astronomical Society of the Pacific (PASP), but not many IAU members know about the ASP - its history, membership, and the full scope of its programs and activities.

With nearly 6,500 members in over 60 countries, the ASP is *not* confined to the Pacific region. Promotion of astronomy at all levels is of primary importance at the ASP, as members are drawn from the ranks of professionals, amateurs, educators and the public. Examples of the ASP at work can be found at our display in the exhibit area.

Of special interest is a demonstration of the newly Digitized Sky Survey - produced by the Space Telescope Science Institute and distributed by the ASP - and compiled from the ESO/SERC IIIaJ southern plates and the northern POSS E plates.

The entire 101 CD-ROM set will prove to be an essential research tool.

Also available for a special 25% discount are over 60 volumes from the ASP Conference Series Proceedings. If you would like an upcoming meeting proceeding considered for publication, contact [PASP@XRAY.BYU.EDU](mailto:PASP@XRAY.BYU.EDU).

The ASP mail-order catalog attempts to meet the great need of astronomers and educators for quality educational materials. We welcome all suggestions and encourage your assistance in developing products for distribution.

Proceeds from the catalog support development of new materials and educational programs such as our teachers newsletter "The Universe in the Classroom," which is distributed free of charge to over 12,000 educators worldwide.

Other activities towards populariza-

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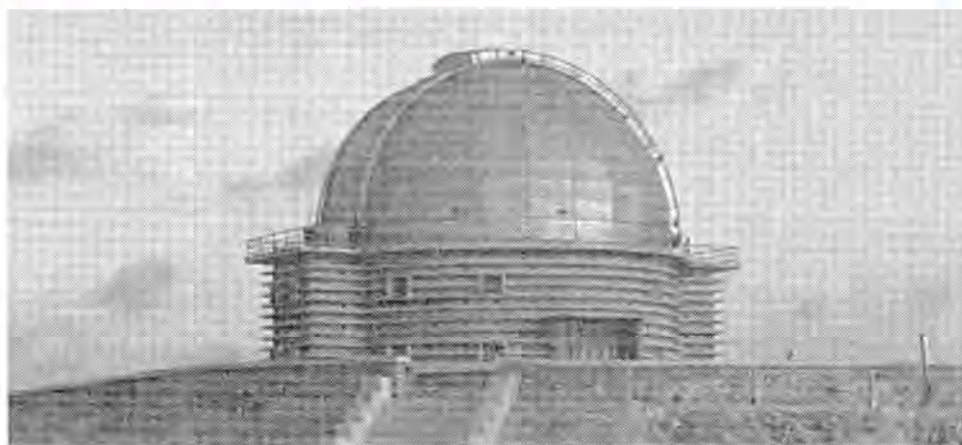
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2332 CA Leiden  
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## Egypt Upgrades Telescope

to peer amid the stars...



The Kottamia 74 inch telescope is the largest telescope in North and Middle Africa and the Middle East. The telescope belongs to the National Research Institutes of Astronomy and Geophysics in Egypt, and began operations in 1964. It is of the conventional type, having a Newtonian (f/4.86), Cassegrain (f/18) and Coude (f/28.9) focus, and stands on a plateau 75 km to the east of Cairo.

This telescope is fitted with a Newtonian camera (22.53 arcsec/mm), photoelectric photometer, Cassegrain spectrograph (gives 100 Å at 48 Å/mm) and a Coude spectrograph (20 Å at 6 Å/mm) The site is generally good and the number of clear nights averages 200 per year.

Due to some problems with the surface of the main mirror, which has been in use for more than 30 years,

and in order to upgrade the telescope, an extensive program has been started with more than two million dollars in support from the Egyptian government. This will include ordering a new Zerodur primary mirror, a large format CCD camera, an autoguiding system, a three channel photoelectric photometer, and a fast grating spectrograph.

The Astronomy Department of the National Research Institute is seeking collaboration with other observatories and universities for exchange of astronomers, joint programs and training grants for young astronomers.

For more information please contact Anas Osman, Astronomy Department of the National Research Institute for Astronomie and Geodesics., Helwan-Cairo, Egypt. FAX 002 02 782683. E-mail: GALAX@FRCU.EUN.EG

## Popularizer Half-Forgotten

Not only the IAU celebrates its 75th anniversary nowadays. As of last year, 75 years have passed since the death of Victor Anestin — Romanian popularizer of astronomy and science in general, who contributed considerably to the dissemination of knowledge in this field to the general public in his native country and beyond.

Born in 1875 in Craiova, he was a contemporary of Camille Flammarion (1842 - 1925). However, despite enormous efforts, he never gained the official recognition and well-deserved fame that was Flammarion's, although Anestin authored and translated about 25 books on astronomy, and managed to publish the first Romanian periodical devoted entirely to astronomy ("Orion") for five years (1907 - 1912). He also made the then-Minister of Education, Spiru Haret (a mathematical astronomer in his own right) instruct the libraries of all high schools in the country to subscribe to it.

Among his more original contributions, the treaty concerning all meteoric phenomena witnessed in Romania between the years 1386 to approximately 1910 (presented to the Romanian Academy) might be mentioned, along with his extensive correspondence with astronomers abroad.

This notwithstanding, after working for most of his 43 years as an underpaid journalist, and after being exploited by his employers, he died so poor that funds had to be collected among the typesetters for his funeral, even after the sale of almost all the masterpieces of his 20,000-volume library.

ANDREI RADU SERBAN  
Center for Astronomical Information,  
Jerusalem

### Politics Triumphs

## The 1958 IAU General Assembly in Moscow

In 1955, from August 29 to September 5, the 9th IAU General Assembly took place in Dublin. A spirit of friendship, good will and mutual understanding reigned during that astronomical forum. Boris V. Kukarin of Moscow University, on behalf of the Soviet Academy of Sciences, invited the next 10th IAU General Assembly to be held in Moscow in 1958 and prolonged applause greeted his suggestion. The Soviet invitation was strongly supported by J. J. Nassau who was a leader of the U.S. National Astronomical Committee.

Dublin's scientific idyll had deep social roots; it was a direct result of unprecedented previous events which began not from Khritchev's Thaw but from the dawn of the Cold War.

In 1948, the 7th IAU General Assembly took place in Zurich. At the last plenary sitting it was recommended that the next 8th General Assembly be hosted in Leningrad in August, 1951. It would be a commemorative event for the re-opening of the well-known Pulkovo Observatory, after reconstruction necessitated by the destruction of the Second World War.

The Soviet top-ranking political figures under Stalin wanted to see a great scientific meeting in the USSR, and they reacted accordingly. All expenditures on the territory of the USSR for foreign participants would be paid by the Soviet Academy of Sciences.

The Zurich decision was a recommendation, but not a final resolution because there were some doubts that foreign astronomers from countries without diplomatic relations with the USSR would get the chance to come behind the iron curtain. So an official request was sent to Moscow, and the IAU Executive Committee received an official statement that all members of the IAU without exception would be welcomed. It was during the presidency of Bertil Lindblad that the Executive Committee decided to agree with the Soviet initiative. On December 14, 1950, 8 months before the Assembly, Bengt Stromgren, who was the General Secretary, informed Alexander A. Mikhaïlov, Pulkovo Director and the Soviet national astronomical leader, that 251 astronomers intended to participate at the Leningrad meeting.

But only one month later, on January, 19, 1951, Mikhaïlov was informed of President Lindblad's decision to cancel this event due to unsuitable international condi-

tions. In the USSR it was the darkest period of Stalin's regime.

For Soviet scientific officials and Communist Party clerks, of course, this was a tremendous shock. In the Soviet Astronomical Journal it was anonymously stated that Prof. Lindblad and Prof. Stromgren were under the influence of aggressive circles in the USA and other capitalistic countries; they were scheming to orchestrate the collapse in cooperation among members of the international scientific community.

There were different reactions to the decision. Fifteen well-known astronomers from France and the Netherlands protested seriously against the cancellation. But the position of the IAU Executive Committee was hard, in spite of the impossibility to quickly change the location of the IAU meeting. That is why the next IAU General Assembly took place in Rome not after 3 years as usual but after 4 years in 1952.

So Pulkovo's misfortune was repeated twice. In August, 1914 a great astronomical international meeting of the Astronomische Gesellschaft was to be held in Saint-Petersburg but the event was interrupted by the beginning of the First World War. And once again the international astronomical congress at Saint-Petersburg was destroyed by the Cold War.

ALEX GURSHTAIN  
Russian Academy of Sciences

### Leiden Revealed



Professor Vladimir Lipunov, from Sternberg Astronomical Institute in Moscow, made several sketches of the enchanting city of Leiden. One is reproduced above, for your viewing enjoyment.



# Industry in the Service of Astronomy

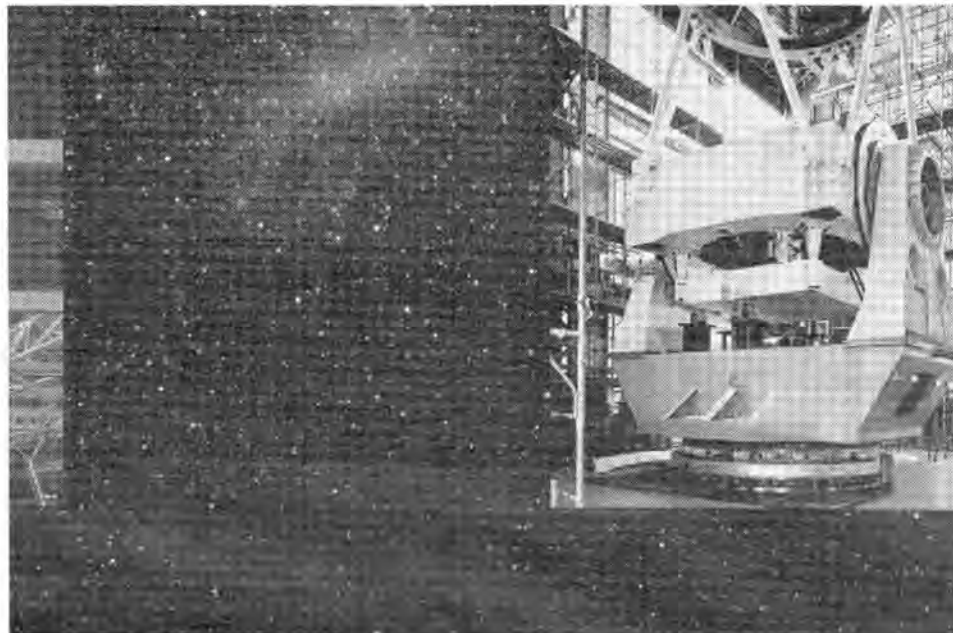
European Industrial Engineering involvement in the astronomical field, began in 1986 almost as a joke, as a sense of challenge, and as a wager against ourselves based on the familiar saying: "The impossible we do immediately. For miracles we require fifteen minutes."

We were offered the possibility to participate in a tender for the design, construction and on-site erection of a rotating building for the European Southern Observatory's 3.5 m NTT telescope for the firm of Messis. The design office of Mecnafer SpA in Venice, a world leader in the design and construction of rail grinding trains, was fully immersed in the design of a huge prototype train, and at first the request to submit a bid appeared of no interest. But just for curiosity's sake, a quick look at the Call for Tender was given.

This look convinced us that the project was very interesting from an engineering point of view, it required a lot of thinking, and that the design was innovative. This is just the sort of project we like. Without too much thinking, it was decided to participate in the bid in cooperation with two Italian companies. A few weeks later, most unexpectedly, the contract was awarded to our firm.

The designers, the engineers, and indeed the whole staff, were fascinated by this mysterious instrument; they were taken by the astronomers' way of thinking and by their special requirements. They studied, designed, built, and erected the building in Chile. This activity left a mark on the group responsible of this project. Their involvement became total; during and outside working hours the subject of their discussion was always the same: the telescopes. Saturdays and Sundays was a good opportunity to meet and discuss what to do and how to do it. Slowly the railway interest started to fade, while the interest for the telescopes grew as if the team was becoming 'telescopes dependent.'

As a result of this new great interest, in 1989 the European Industrial Engineering firm was founded with the aim of initiating a dialogue with the astronomical community, to understand their requirements and to try giving positive answers to their inquires, and to transform their ideas into practical solutions and constructions. EIE's first assignment was the feasibility study of the four buildings for the ESO VLT (4 x 8.2 m telescopes) project. Different solutions were analyzed for the dome rotation system, the effects of the different air conditioning (windscreens, louvers, shutters) and thermal systems, as well



as the economic impacts, etc.

In 1990, EIE, in cooperation with an Italian group (ANSALDO, INNSE, CRIV), started the construction of the TNG 3.5 m National Telescope (Galileo Project) which will be assembled in Las Palmas, Canaries. For this project, EIE is responsible for the plants' design and technical coordination for the construction of all machined structures. The first important activity on the 8 m class telescopes starts in 1991 when, after a very competitive competition with several European companies, EIE, together with two Italian companies (ANSALDO and SOIMI), was awarded the contract for the design, construction and assembly of the four VLT telescopes for ESO.

Today the design activities have been successfully completed; the result is the design of four telescopes with alt-azimuth assembly, about 25 m height, 22 m diameter and a total weight of approximately 430 tons (including mirror units, instrumentation and all sub-assemblies). A hydrostatic bearing system is provided for both axes, which are driven by direct drives (brushless motors) respectively of 9 m (azimuth) and 1.2 m (altitude). For the altitude, a frequency of 8.1 Hz was obtained. The main steel structures and the main subassemblies are now under construction, and in 1995 the first telescope will be erected in Milan, ready for preliminary tests.

The encoders developed by OPTODYNE represent an innovative solution based on a special application of the laser Doppler effect. In 1993, thanks to the experience and the know-how gained during the design of the Very Large Telescope, EIE with a group of Italian companies, was awarded the contract for the design and supply of the four enclosures of the ESO VLT telescopes. In a very short time both the design, including the FEM analysis, and the manufactu-

ring activities were completed, thus allowing us to ship the first elements of the structures to Chile (shipment to occur during the first week of August, 1994). Particular attention was paid to the enclosure shape and this underwent wind tunnel tests and examination.

Again in 1993, EIE was awarded a contract by the French CNRS (Conseil National des Recherches Scientifiques) through the Italian CNR (Consiglio Nazionale della Ricerca), for the design and construction of the 9 m dome for the Themis Solar Telescope, to be installed in Tenerife, Canaries.

EIE experience gained in the astronomical field is considered sufficient by Steward Observatory of Tucson and Arcetri Observatory of Florence, to contract, together with ADS ITALIA, for the design of one of the most interesting telescopes, the Large Binocular Telescope (LBT).

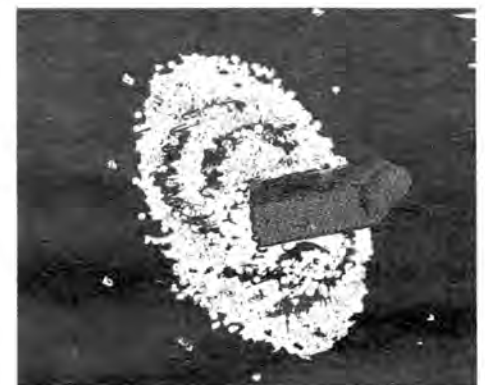
This telescope combines in a single structure two 8.4 m honeycomb mirrors, a weight of about 440 tons, with a prime frequency of 8.5 Hz. Actually EIE, in addition to its commitments in the observatory field and many other engineering sectors, such as civil - steel structural (including stress analysis) - hydraulic, hydrodynamics - electrical and electromechanical - thermodynamic, etc. continues its involvement in the astrophysics sector, putting itself at the service of the International Astronomical Community. Its services are based on industrial costs rather than research costs, and this facilitates innovative projects.

E. PANETTI  
D. PANETTI  
G.P. MARCHIORI

## Hungry for a Milky Way Bar?

Inside the Galaxy there is The Bar!

A full afternoon session of IAU Symposium 169 "Unsolved Problems of the Milky Way" was dedicated to what actually doesn't seem to be a problem anymore. This Symposium, dedicated to the memory of Jan Oort, aims to solve some long-standing problems connected with Galactic



research. That our Galaxy could have a bar was proposed nearly 20 years ago by Peters, and a few more attempts to convince the community followed, but apparently has had a hard time gaining acceptance.

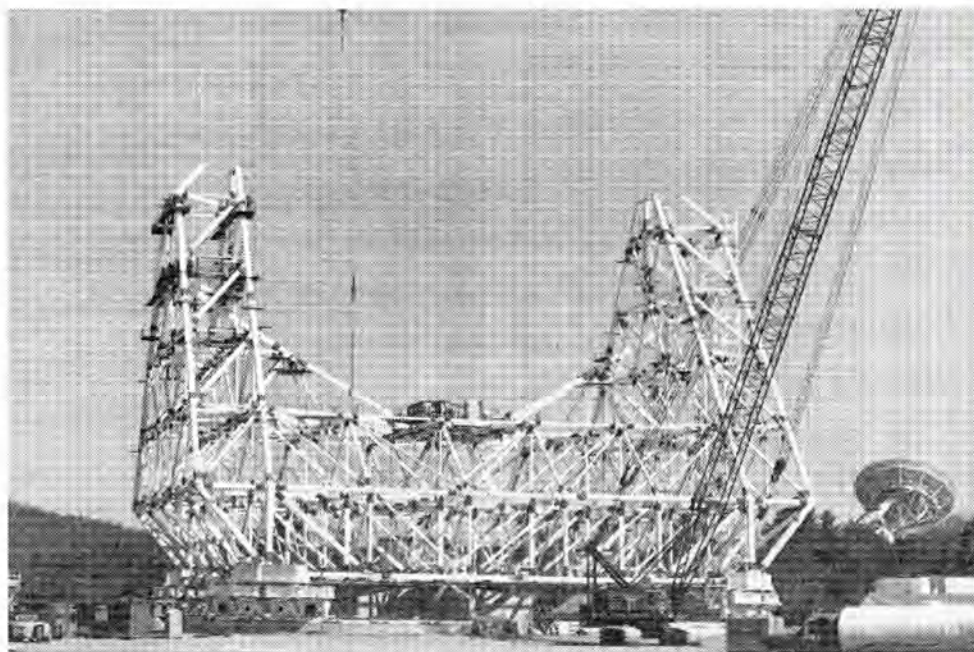
Two independent papers by Binney et al. and Blitz and Spergel in 1991 suddenly revived the subject, and started a series of (re)-analyses of existing and new data which seems to have convinced the Galaxy community.

The most extreme case was a detailed model of the COBE DIRBE data, presented by Dwek, from which it was concluded that the Bar can have an axis ratio of 1:3 in the plane of the Galaxy. All speakers, without exception, concluded that the bar points towards the sun into the first galactic quadrant, making an angle of about 10 - 40 degrees with the line Sun-galactic center.

A slightly different organization was used in this Symposium: each session has a different Principle Organizer, responsible for the selection of speakers, and who also chairs the session. Tremaine chaired the first opening day session (Tuesday) on the shape of disk and halo. The speakers generally agree on a modest flattening of the halo, but the ellipticity of the disk is still uncertain to about 10% (of being axisymmetric). Tuesday was devoted to the galactic center, which is where the most conflict lies. "Nearly all titles end with a question mark," remarked one speaker, "and hence the title of this short piece has one as well."

PETER TEUBEN  
College Park, USA.





The Green Bank Telescope (GBT), a 100 meter diameter radio telescope at the NRAO in Green Bank, West Virginia, is now well along in its construction. The telescope will replace the 300 foot telescope which collapsed suddenly in November, 1988. The photograph shows the alidade structure that rotates in azimuth and supports the reflector. The GBT will have unique offset-parabolic optics to improve its efficiency, and reduce the effects of terrestrial radio interference. The telescope will operate at frequencies from 25 MHz to 50 GHz, and is expected to be in operation in two years.

Visible to the right side of the photo is the NRAO 140 foot telescope.

F. J. LOCKMAN

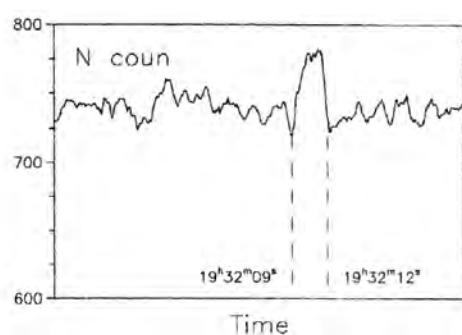
## Io Brightens

The author and V.V. Kleshchonok from Kiev University and I.V. Reut from Riga have observed the light curves of Jupiter's satellites Io and Europa on July 16 - 22, 1994.

Observations were made at the 0.5 m reflector with the help of an electrophotometer with B and V filters at the astronomical station of Kiev University in the village of Lesniki (near Kiev).

Near the time 19:32:09 - 19:32:12 on July 20, we observed a possible three second flash on Io (see the figure). If this is a real, then it should be the reflected light from the giant fireball caused by the impact of one of the secondary nuclei of the desintegrated comet P/Shoemaker-Levy 9 designated as Q1, and we have good data with which to improve the elliptical orbit of the comet and to study its orbital evolution and origin.

KLIM CHURYUMOV  
Astronomical observatory of Kiev



Three second flash on Io?

## The 1995 Meeting of the European Astronomical Society

The European Astronomical Society (EAS) will meet jointly in Catania with the Italian Astronomical Society in 1995, September 25 - 29 to discuss the theme "Progress in European Instrumentation and its Impact on Astrophysics."

EAS meetings replace the European regional meetings of the IAU. The Scientific Organizing Committee, chaired by Franco Pacini (Arcetri) and Marcello Rodono (Catania), will finalize the scientific program following the general guidelines of the EAS Council. Particular emphasis will be given to the scientific use of the present and planned instrumentation, both ground-based and spaceborne, with the aim of conveying their present status and how they promise to meet the astronomers' requirements — and dreams.

Invited general reviews at plenary morning sessions and parallel scientific sessions in the afternoon for invited and contributed papers on the various aspects of astrophysics, from astroparticles and gravitational waves, to solar system research and cosmology, are foreseen. The participation of young astronomers and PhD students will be strongly encouraged by a reduced registration fee and the cheapest possible accommodation. Further information will be given in the EAS Newsletter.

MARCELLO RODONO

## SHOEMAKER-LEVY9 — JUPITER IMPACT

### Special Publication

There have been many inquiries about the possibility to publish very soon, say in 60 or 90 days, a first synopsis and report about the (preliminary) results of the Shoemaker-Levy 9 - Jupiter impacts, I have discussed with Dr. Kolman from Kluwer the possibility to edit and publish a special issue of EARTH, MOON and PLANETS, (an international Journal of Comparative Planetology, Kluwer Academic Publisher, Dordrecht, The Netherlands). There is a happy circumstance that the co-editors are Mike A' Hearn, Therese Encrenaz and Hans Rickman, and I am the Editor-in-Chief. Consequently, I believe that all may go smoothly.

If manuscripts can be submitted before September 9, 1994, the special issue could appear before December, 1994.

Your paper(s) should be submitted in camera-ready form both to  
a) Kluwer Academic Publishers  
Editorial Office Earth, Moon and Planets, Spuiboulevard 50, P.O. Box 17, 3300 AA Dordrecht, The Netherlands, and to  
b) the Editor-in-Chief and the associate editors.

In principle, the length of the manuscripts is not limited. Manuscripts should preferably be prepared with the Kluwer LaTeX file. Camera-ready manuscripts should be submitted on white paper, printed with a laser writer. The text area is 12.5 x 19.5 cm. The text should be typed about 24 mm from the top of the page. Information on the LaTeX style file can be obtained on EDITDEPT@WKAP.NL (please mention camera-ready submission to Moon).

Kluwer can publish a special issue devoted to this subject almost immediately, and would like to offer extra offprints or complimentary copies to the authors (or guest editors) as an extra incentive for them to publish in *Earth, Moon & Planets* (EMP). Since the very next meeting of the editorial board of EMP will be held in the Hague on August 22, I should be very grateful for any response as soon as possible.

V. VANYSEK  
Editor-in-Chief of EMP  
Astronomical Institute, Charles Uni.  
Svedska 8,  
CZ 150 00 Praha 5

## All Questions Answered

Did you notice how empty the meeting rooms were last week? And have you noticed this week a new group of astronomers, haggard and exhausted? They are all suffering from a new, widespread astronomy disease: ISOlag.

As you undoubtedly know, the deadline for the ISO proposals was last Friday, August 19, at 22:00 (local Dutch time). About 1,000 proposals were received from all over the world at ESTEC, the European Space Agency in Holland.

ISO, the Infrared Space Observatory, is a European infrared satellite which will be launched in September of next year. Like IRAS and COBE, it is a cryogenic satellite. It features a 60 cm telescope, and four focal plane instruments: a camera, a photometer and two spectrometers.

It will be used for observations of selected targets, rather than being used for a survey mission. The wavelength range covered is from 2.5 to 200 micrometers.

ISO will solve all the outstanding problems alluded to in this General Assembly: it will discover disks of dust around all kinds of stars, find the dust enshrouded distant galaxies and baby quasars, probe the scars on Jupiter, solve the last mysteries of the galactic center (or of the Orion molecular cloud), and... you name it. The answers to all queries will be given at the

next General Assembly.  
Don't miss it!

CATHERINE CESARSKY  
SACLAY, France



Olaf Kolkman, whose cartoons adorn the *Sideral Times* under the pen name of Kloot, would be happy to sell you an original of one of his efforts.

He has also arranged for a selection of these cartoons to be reproduced in postcard format, and these can be yours for the extremely minimal price of 50 Dutch cents each.

Olaf can be reached in the *Sideral Times* offices. You can also find him via e-mail at o.m.kolkman@astro.rug.nl or kloot@astro.rug.nl.



# Assembly Banquet Blows the Lid Off!

On Wednesday evening, Assembly participants descended to the bowels of the Congresgebouw to torture-test their stomachs, flaunt their ability to dance, and impress their hapless table-mates with witty small talk.

An ample buffet dinner sated the most ravenous appetites (the chocolate mousse was light enough to float on machine oil), and the inoffensive music seduced adventuresome participants to the dance floor so that onlookers could decide on their remaining degrees of freedom. For the benefit of all attendees, the Jan Steenzaal was kept at a toasty 38 C.

The *Sidereal Times* sent its third-string photographic crew to this boffo bash, and the disappointing results are reproduced below.



The new Dean in Groningen, Piet van der Kruit, conspicuously refuses a refill.



Lo Woltjer entertains Jacqueline Bergeron by trying to set fire to his jacket.



These two working women were not invited to the Banquet, but no one had the heart to throw them out.



Prof. Bas Balada, of the University of Amsterdam, left the party early.

John Dickey smiles as Harm Habing and Thijs van der Hulst compete in an informal prune-squeezing competition.







Francesca Matteucci faces a difficult dining decision: shall it be the cucumber salad, or the Captain Iglo fish sticks?

#### Interception Notice!

Would the person who removed the picture of Europe at Night from the ICSU Working Group on Adverse Environmental Impacts Poster PLEASE RETURN IT.

Jerry Ostriker, Virginia Trimble and Renzo Sancisi brace themselves against the breath of a table mate who fancied the raw onion salad.



## Black Holes Threaten Students

One of the highlights of the General Assembly is always the 'Teacher Day' for teachers of the host country at which they can meet astronomers and learn about exciting new discoveries.

Teacher Day 1994 is organized by Commission 46 for the Teaching of Astronomy and by the Netherlands Committee for Astronomy Education, chaired by Henny Lamers of Utrecht University.

"We have chosen to concentrate the Teacher Day for Physics on high-school teachers" says Lamers. "There are no astronomy lectures in our high schools anymore, but many physical topics can be explained and demonstrated beautifully by means of astronomical observations. For instance, the Doppler effect, Newton's laws, nuclear fusion and radiation."

Our original plan was to organize the Teacher Day in the Congress Center in The Hague. However, the preregistration numbers surpassed our most optimistic estimates! We had hoped for 50 to 100 teachers, but the number quickly rose to 185 at which we had to stop the registration because we were at full capacity.

Last Sunday a teacher called Lamers at home to say that he was too late to register, but he was coming to sit at the entrance of the building hoping that one participant would not show up.

The teacher day will be held at Utrecht University. The program includes 3 lectures and 6 workshops where teachers are shown how to use

astronomical observations for demonstrating and explaining principles of physics. The meeting will end with a talk by Bill Sparks (Baltimore) describing "New results of the Hubble Telescope".

HENNY LAMERS  
Utrecht

## Hubble Constant Decided by Vote!

Holland is a very democratic country, so it seems appropriate that astronomers and cosmologists would vote on the value for the Hubble constant, often referred to as the Holy Grail of cosmology.

In IAU symposium S168 on the Big Bang, chair person Virginia Trimble, at the suggestion of the undersigned, asked attendees to raise their hand in favor of any of the following three possibilities: a Hubble constant larger than 75 km/sec/Mpc, a value below 75 km/s/Mpc, or 'don't know yet'.

Earlier that same morning, Sydney van den Bergh and Gustav Tammann respectively presented convincing evidence for a high and a low value for the Hubble constant. Van den Bergh and his colleagues showed observations of Cepheid variables in a galaxy supposed to be near the core of the Virgo cluster. The observations, made with the CFTH telescope at Mauna Kea, seemed to favor a value of about 90 km/s/Mpc.

According to Tammann however, most attempts at determining the Hubble constant have not paid enough attention to observational bias. Tammann's observations of Type Ia supernovae favor a value of at most 55 km/s/Mpc.

To add to the confusion, John Huchra (Harvard-Smithsonian Center for Astrophysics) came up with some viewgraphs of the results of the HST observations by Wendy Freedman and her team on cepheids in M100, also in the Virgo cluster. "But," said Huchra, "we're not giving you a distance yet."

So what was the result of the vote? Only a few attendees favored a high Hubble constant; some thirty percent thought the Holy Grail would be on the lower end, but by far the most votes went to the 'don't know yet' option.

Probably it will take no more than a couple of years before those doubters have made up their collective mind, certainly not if the Hubble Space Telescope keeps providing us with more high quality data of cepheids in a larger sample of Virgo galaxies. I look forward to a new vote in two years time.

GOVERT SCHILLING  
Astronomy correspondent for *de Volkskrant*



## Announcements

### and Tidbits

#### Latest Lunch Listing

Someday, probably in the coming millennium, humans will be freed from the animal necessities of life — eating, breathing, reproduction. But until then, you might as well wallow in your beastly imperatives, and enjoy lunch at the Congresgebouw.

As noted *ad nauseum* in these blurbs, all lunch offerings consist of an ample buffet, featuring a wide range of organic molecules. Soup, luncheon meats, salads, fruit, and breads in forms that only a mother could love are available for your gustatory enjoyment. As usual, drinks are extra.

#### Very Important Notice

Please do not cause the organizers unnecessary consternation: take your posters down before leaving the Assembly!

#### ALSO

Empty your pigeon holes of all pigeons and other items before Saturday at noon. Otherwise, your items will be recycled.

ENFORCEMENT COMMISSION

#### Egging On Astronomers to Scramble Names

Wednesday's talk on the formation of clusters and voids in the universe (IAU symposium S168 on the Big Bang) was given by Estonian astronomer Jaan Einasto. I've always wondered if he is the only astronomer in the world whose family name is an anagram of his home country. Does anyone know of other examples? Is there an Israeli astronomer called Laiser, or a German called Maengry? What about Pinas from Madrid, or Londahl from Amsterdam? Anagram astronomers of the universe, unite!

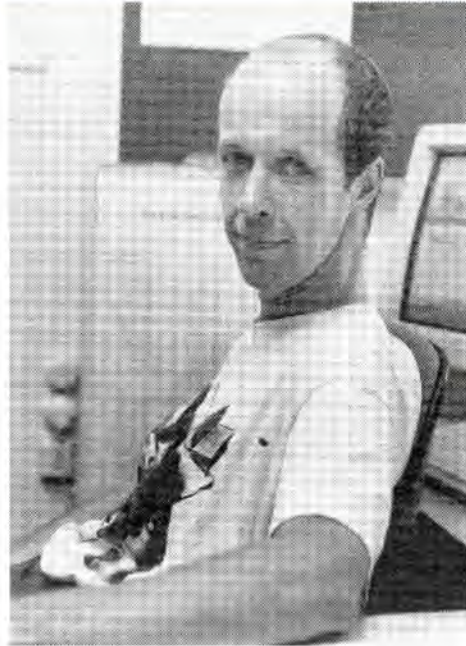
GOVERT SCHILLING

**The Sideral Times will be published on Saturday of this week!  
There's still time for your article!**

LOOKING UP LOOKING DOWN



— THE EARLY DAYS OF DUTCH ASTRONOMY —



*You have undoubtedly seen this man many times — in the hallways, working in the poster rooms, and dancing aggressively with astronomers having two chromosomes of the same type. He is Theo Jurriens, from Groningen, and he is an indispensable member of the Local Organizing Committee.*

*If you feel that the Assembly has gone well, that the organization has been worthy of the word, then you should thank Theo.*

## Public Lecture

Civilization arose when people began to specialize — in growing grain, shepherding livestock, or mapping CO<sub>2</sub> in nearby galaxies. Now, in the last years of the 20th century, specialized labor has become so expensive, we've reverted to once more *doing it all ourselves* (gratuitous examples include cutting your spouse's hair, dismantling recalcitrant plumbing, and making a newspaper.) At tonight's popular lecture, George Comello will tell you how you can also do "Astronomy in the Back Yard." For Jan Oort, whose back yard was the Leiden Observatory, this was not an issue. For many of those attending the lecture, it may be.

Learn how you can turn a site now used only for the occasional barbecue and for housing 105 ants into a major observing facility. As is our wont, the presentation will begin at 20:00 in the Museon, which occupies some prime Haagse real estate a mere 500 meters from the Congresgebouw. The cost is only 7.50 per attendee; less than a plate full of poffertjes and a cup of coffee. By special request of Mr. Comello and all the inhabitants of Zwolle, this lecture will be in Dutch.

## Late Posters

- S 169.L.111 Taylor et al., "A Pilot Project for Panoramic Multi-Frequency, Spectral Imaging of the Galaxy."
- S 169.L.112 Haywood et al., "The Vertical Structure of the Galactic Disc."
- S 169.L.113 Haud, "Ellipticity of Outer Regions of Galactic Disks."
- S 169.L.114 Robin et al., "The Thick Disc Population of the Galaxy."
- S 169.L.115 Kan-ya et al., "The Growth of the Velocity Dispersion in the Cold Collapse of Spherical Collisionless Systems."
- S 169.L.116 Froelich, "How Important is Viscous Disc Spreading?"
- S 169.L.117 Jaffe et al., "Two new Views of the Central 300 pc of the Milky Way."
- S 169.L.118 Rhoads, "Near Infrared Star Counts as a Probe of Asymmetries in the Galaxy's Disk."

*Daphne Flapper, a young woman from Groningen, organized the Public Lecture series and exhibition being held at the Museon.*

*Daphne has not worked with astronomers before, and as you can imagine she was at first puzzled by their erratic — one might say eccentric — behavior.*

*In the last few weeks, she has come to appreciate this deviant life form, and has informed the Sideral Times that she would like to keep an astronomer as a house pet, preferably in a formaldehyde-filled jar.*



*Although it is the editor's opinion that most e-mail is not worth the electrons, the following message to Saskia Prins may possibly fire your imagination:*

Wednesday afternoon, the astronomical community at the Observatorio de Roque de los Muchachos at La Palma was awakened by a sea of fire and smoke caused by a forest fire. Local observers report the smoke clouds obscured the Moon, causing a cessation of local lunar research. Although the observatory itself was not in danger, all domes remained closed to avoid settling of soot on the mirrors. As of this morning, the fires were still raging. Note that earlier this month a similar fire persisted for two weeks.

From: Guest20@ing.iac.es  
Date: Thu, 25 Aug 1994 14:51:29 BST  
Subject: Fire !!!!

Hello SP, (I'm writing to you from the WHT dome)

I can't see the fire but it is very smoky up here. For instance the telescopes cannot be seen from the residencia and you can see smoke across a room. Both roads are closed but those who want to stay have been allowed to. It is not threatening any villages I think but it may approach the observatory. As I came up it appeared to be in a very inaccessible ravine and I can't see that they can do much to stop it until it gets nearer to the road.

Tim Marsh

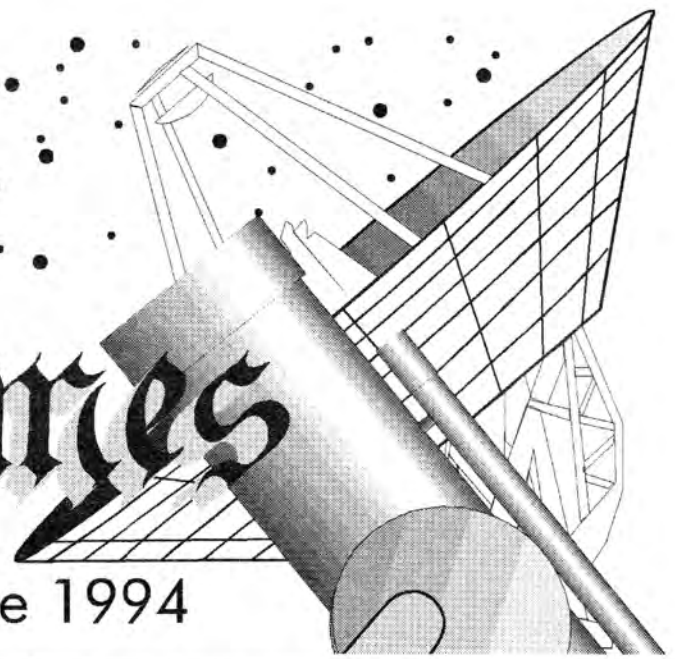


The

# Sidereal Times



XXIInd General Assembly - The Hague 1994



Editor: SETH SHOSTAK

Associate Editor: RENÉ GENÉE

No. 11: Saturday, 27 August

## Last Day in The Hague



### Farewell to Scheveningen and All That

An exciting Assembly rushes to a close. Three to four hundred hours of scientific discussions packed into ten working days — anyone who managed to absorb more than a quarter of all this must have wrought a miracle.

What struck me most at this Assembly? Most of all: the enormous quantity and superb quality of new information, and the speed with which it hits us.

With the 40 year old Dwingeloo Telescope, Renee Kraan-Korteweg and collaborators discovered an obscured galaxy on 4 August; two weeks later optical, infrared and radio images were discussed here. An X-ray nova in Scorpius, discovered on 27 July, was observed throughout the southern hemisphere and within two weeks shown to expand at superluminal speed. Planets with masses similar to that of the Earth, found orbiting around a pulsar in 1992, are now confirmed through their mutual perturba-

tions on the basis of extremely accurate timing measurements.

The enormous advances in positional accuracies achieved by Hipparcos and radio interferometry open new fields of astrophysics. The vast quantity of high-precision photometric information produced by detector arrays not only serves searches for microlensing events in our Galaxy, but has also uncovered many thousands of pulsating and eclipsing variables. There is debate about some of the lensing events claimed: are the background stars truly intrinsically constant? But in a few years' time these searches must constrain speculations about the nature of dark matter.

The ripples in the microwave background first found by COBE two years ago have now been amply confirmed, and detailed information on various scales and wavelengths. Also, the background spectrum now fits a Planck curve to better than one part in  $10^4$ . These Big Bang details will

### Optical Photos of Dwingeloo Galaxy

Vevgeny Goldberg, Elchanan Almozino and Eran Ofek have sent these photos made of the Dwingeloo 1 galaxy, as obtained at the Wise Observatory on the night of August 16 - 17.

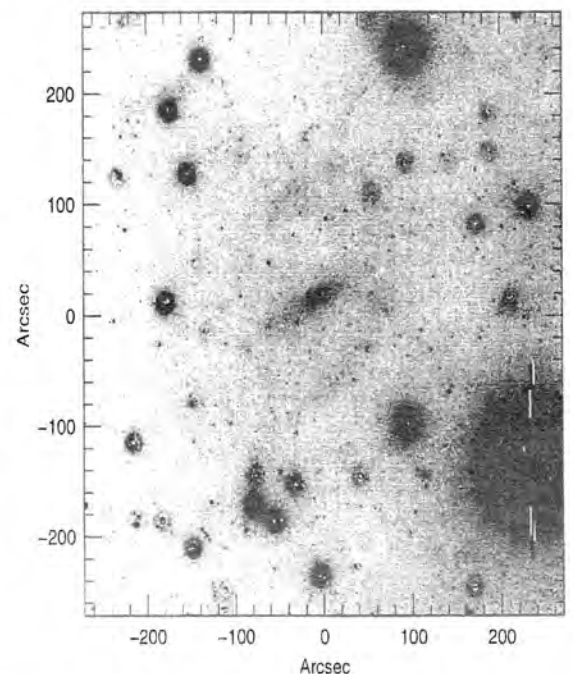
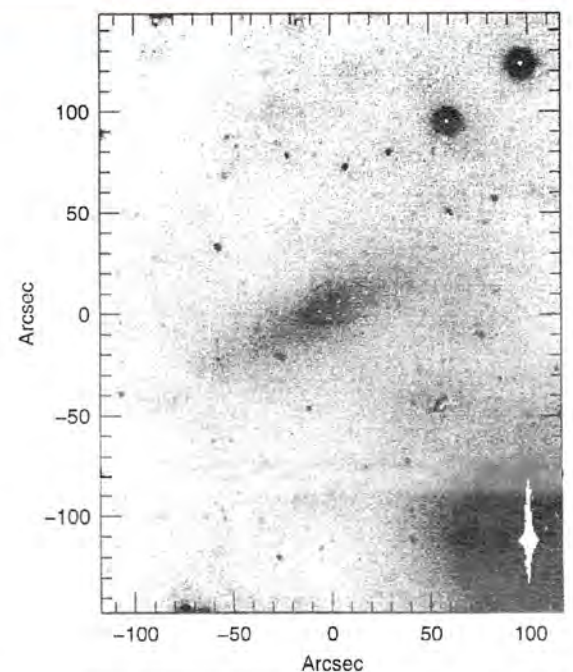
The top photo is an I image, and the lower an R; both have had stars subtracted.

The astronomers in Tel Aviv are continuing to process other data taken with V and H-alpha filters. All images are photometrically calibrated.

This new galaxy, an obscured, nearby spiral lying in the Galaxy's Zone of Avoidance, was reported in *Sidereal Times* for Thursday, 18 August. It was discovered using the venerable 25 meter radio telescope at Dwingeloo in the 21 cm line of neutral hydrogen.

Preliminary estimates, based on the hydrogen line width, yield a distance of 3 Mpc. The object's systemic velocity with respect to the Milky Way is 256 km/sec.

It is apparently one of the larger nearby spirals, although smaller than the Galaxy.



strengthen the basis for galaxy formation scenarios and for an understanding of the wealth of data on stellar populations at hand.

These are just a few headlines; I apologize for the overwhelming amount of exciting news not mentioned here. Let me look ahead and express a few wishes: 1) The great new facilities available now or in the near future will obviously produce an even greater flow of data. The many young astronomers present at this exciting, new-format Assembly are best equipped to channel and digest this flow. May the job market allow them suc-

cessful careers. 2) The opening of national boundaries has made possible participation of many more astronomers from Eastern Europe than before. I hope that further improvements in political and economic conditions will make the next Assemblies accessible to ever more astronomers from East and West, North and South.

TOT ZIENS in Kyoto !

HUGO VAN WOERDEN  
Groningen, The Netherlands



## Notice

If you have delivered any artwork to the *Sidereal Times* that you wish to have back, please come to our offices on Saturday morning.

### Dutch Factoids:

There are more pigs than people in The Netherlands. You might find this hard to believe when trying to find a parking place in Amsterdam, but many of the competitors for these seldom-seen, car-shaped hunks of real estate are also pigs.



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## Schedule

### Large Field Imaging with Array Mosaics for Saturday, August 27

Chair, Cook

#### Morning:

MULTI-FIBER SPECTROSCOPY WITH WIDE-FIELD TELESCOPES, F. G. Watson, Royal Greenwich Observatory

PERFORMANCE OF A 2048 X 2048 PIXEL THREE-SIDE-BUTTABLE CCD DESIGNED FOR LARGE FOCAL PLANES IN ASTRONOMY, J. A. Cortiula, Thomson CSF Semiconducteurs

CCD MOSAIC DEVELOPMENT FOR LARGE OPTICAL TELESCOPES, G. A. Luppino, University of Hawaii, Lawrence Livermore Nat. Labs.

SUMMARY PAPER  
Chair, Guseva, Sandro D'Odorico, ESO

## Bang-Up Idea For Alternative Cosmology

Fred Hoyle, Geoffrey Burbidge and Jayant Narlikar have developed a new cosmological theory. Called the Quasi-Steady State Cosmology (QSSC), details of the new model have been recently published in *Ap. J.* (June, 1993), *MNRAS* (April, 1994), *Astronomy and Astrophysics* (August, 1994) and *Proc. Roy. Soc A* (December, 1994).

This cosmology describes the creation of matter in a field theoretic framework, and leads to a set of Einstein-like equations. One important respect in which this cosmology differs from the steady state cosmology of 1948 is that the creation is confined to the vicinity of highly collapsed objects, instead of occurring homogeneously. The feedback of creation in such "mini-bangs" is to expand the space and generate an expanding universe. Although the universe expands exponentially on a long term time-scale of about 1,000 billion years, it goes through short term cycles of expansion and contraction with periods of about 40 - 50 billion years.

This model correctly describes the large scale cosmological details of expansion, source counts, angular size distribution and ages of galaxies. It offers an alternative explanation of the microwave background being the thermalized starlight of burnt out stars from earlier generations. The correct Planckian spectrum is reproduced as well as the temperature (which is assu-

med rather than deduced in the Big Bang cosmology.)

In QSSC, the created particles are Planck particles having masses of a few tens of micrograms. These decay to baryons which eventually combine into light nuclei giving the correct (observed) abundances.

This cosmology provides many challenges for observers. For example, it predicts the existence of a few, faint blue shifted galaxies. It also suggests looking for very old stars as dark matter.

The cosmology naturally associated with this is particularly attractive. It follows Ambartsumian in arguing that objects which are obviously exploding — radio galaxies, Seyfert nuclei, QSOs — are doing that because creation is taking place in their centers. This is in contrast to the current standard view that everything is due to a central monster consisting of a massive black hole and an accretion disk. The model will have to show how whole galaxies and QSOs can be ejected from parent systems. Even our own Galaxy is creating matter at a very low rate in its nucleus.

Long ago (1929) Jeans suggested that creation in the center of galaxies was taking place. This theory follows up on Jeans' view.

GEOFFREY BURBIDGE  
La Jolla, California

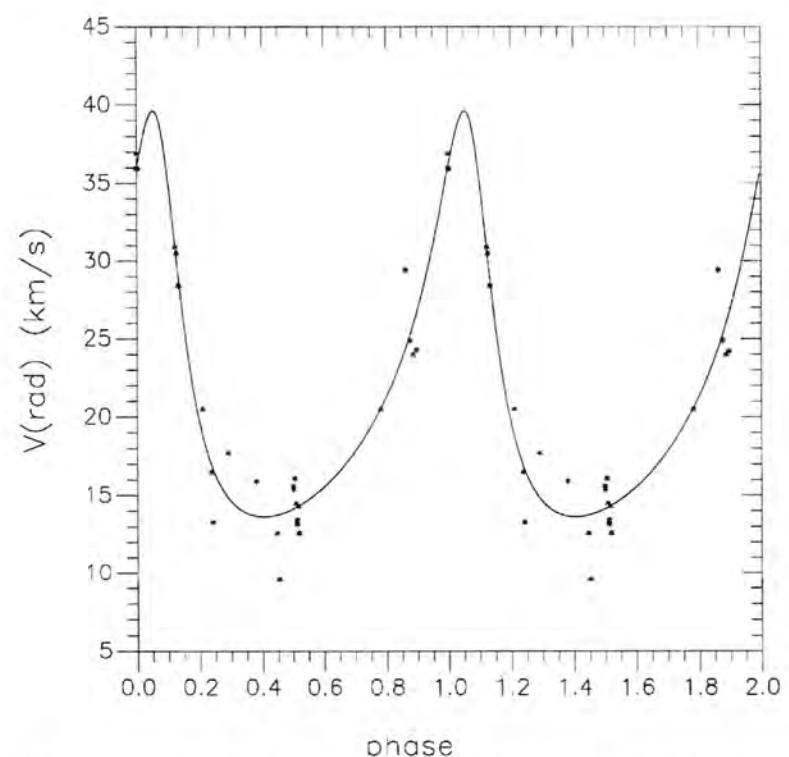
## Iron Missing in Stars?

Several years ago Christoffel Waelkens and his collaborators got very excited when they discovered a bright star (HR4049) that had only lines of H, C, N and O in its optical spectrum. An abundance study by David Lambert then showed that Fe is underabundant by as much as a factor  $10^4$ , making it the most Fe-deficient object known. Since then, Waelkens has found a few more such stars, the record Fe-low now held by HD 52961 at  $[Fe/H] = -5.0$ .

(five in total, of which the Red Rectangle is probably the most famous) are in binary systems with very wide, eccentric orbits, and four out of five have circumstellar or circum-binary dust shells.

The figure shows the radial velocity variations of the central star of the Red Rectangle, with a period of 298 days and eccentricity of 0.45.

The binary nature of these stars offers a challenge to the suggestion that these objects are post-AGB stars.



The initial suggestion that these stars are the most metal poor and hence oldest stars in our Galaxy proved to be wrong. Venn and Lambert pointed out that the abundance pattern in the photospheres of these stars is similar to the gaseous component of the interstellar medium, which is depleted of Fe, Ti, Ca and several other metals due to the formation of dust grains. The elements C, N, O and S have roughly solar abundances. Final proof of the depletion theory in the atmospheres of the Fe-deficient stars came from an observation of zinc in HD 52961 by Hans Van Winckel, which turned out to be roughly solar. This implies that HD 52961 and also the other Fe-depleted stars had metals when they were born. Van Winckel and Waelkens have discovered that the Fe-depleted stars

This is because there is not enough room in the system to accommodate such a large star. The Fe and other metals that are missing from the photosphere are probably stored in the circumstellar dust shell, suggesting that very efficient separation of gas and dust must have occurred, and the "clean" gas must have been re-accreted onto the surface of the star.

Mixing of the Fe-poor surface layer with deeper-lying regions will probably cause a slow increase in the surface metal abundance: Waelkens is eager to submit observing proposals to monitor the increase in Fe abundance in his stars!

RENS WATERS  
Amsterdam

## Pedal Power

The winner in the IAU competition for environmentally correct transport goes to Tadeusz Jarzebowski, a 67 year old astronomer from Wrocław Observatory.

Despite time constraints that forced Jarzebowski to begin in Hannover, he still managed to pedal his way to the

Assembly in four days. En route he either camped in the forest, or lodged in farm houses.

Jarzebowski became enamoured of two-wheeled transport 30 years ago in Utrecht. Since then, he has explored a great deal of Europe by bike, and has used spoke speeders to attend IAU meetings in Trieste and Vienna. His distance record is 6,000 km — Wrocław to Gibraltar and back.

His vehicle is a simple Soviet red bike. Jarzebowski has only good words for this machine, claiming only one flat tire every 2,000 km.



## Interest in Cold Gas Heats Up

The cold clouds in the outer Galaxy have become the topic of intense research interest, sparked by the detections of CO absorption lines.

Studied originally by Marsher and Bania, recent surveys using the IRAM telescopes at 3 mm wavelength were reported by Lucas and Liszt and Lequeux, Allen, and Gilloteau. Meanwhile, the OVRO telescopes have confirmed many of these absorption lines and extended this work to many new lines of sight, through the work of Phillips, de Geus and Kobulnicky, *et al.*

The biggest surprise coming out of all these projects is that there are many CO (0-1) absorption lines seen at velocities which do not show CO (1-0) emission. By integrating very deep with the 30 m IRAM telescope, Allen and his collaborators have detected very weak emission lines corresponding to some of their absorption, and thereby derived excitation temperatures of 3.5 to 5 K. Their controversial interpretation is that these are examples of a new and very abundant species of interstellar clouds, very cold (just two or three degrees K above the cosmic background) and dense.

This picture has become much more compelling with their recent detection of absorption in the CO (1-2) line. This apparently rules out the possibility that all the CO is in the ground state, not because the gas is so cold, but because the density is very low. The (2-1) line shows the same excitation temperature as the (0-1).

Discussion of these results and their interpretation became lively during the Friday morning session of Symposium 169 on Unsolved Problems of the Milky Way. If Allen's interpretation is carried to its extreme conclusion, it is possible that this new molecular cloud population carries as much or more mass than the atomic gas, and reaches far out into the outer Galaxy. It is not enough to flatten the rotation curve all by itself, but could be dynamically significant.

JOHN DICKEY  
Univ. of Minnesota

### Your Horoscope

For all celestial coordinates:

Today, you will read a small newspaper. You will search vainly for insights into your personality, your future, and the possibility that you will soon inherit some really big money. You will look for this despite decades of scientific training, and knowing full well that any such pronouncements are the purest hogwash.

## From the Archives of Adriaan



Adriaan Blaauw today.

Adriaan Blaauw has supplied the *Sideral Times* with the following historical photos, all taken during IAU boat excursions.



A joint photographic effort by Walter Baade (stellar populations) and Wilhelm Becker (star clusters), 1938.



A 1938 fisherman's talk among O.A. Melnikov, Victor Ambartsumian (stellar associations), and Charles Fehrenbach (GPO radial velocities).



Marcel Minnaert (*Solar Spectrum Atlas*) talking to a cigar-smoking Pieter van Rijn (luminosity function), 1938.

Past and present General Secretaries pose in front of the Congresgebouw during the present session. In the back row are Appenzeller, West, Wayman, Andersen and McNally. Front row is Pecker, Mueller, Bergeron and Swings. Adriaan Blaauw is the smiling man nearest to Earth.





Dutch Painters

All rooms in the Congresgebouw are named after Dutch painters (the exception being the restrooms). Some of them were famous during their lifetime and others were not. Today however, their names are familiar to most people. Although you will not find any of their work in this building, you have the opportunity to see some of it in the various museums in The Hague. The Mauritshuis and the Haags Gemeente-museum will be your best bets.

**M.C. Escher** (1898-1972) is known for his graphic work. He made many drawings, which also served as studies. In his prints, of which there are more than 400, he specialized in the interplay between two and three dimensions. This makes them both bizarre and fascinating.

Whenever there is an auction of famous paintings the works of **Vincent van Gogh** (1853-1890) get a lot of attention because of the high prices they fetch. During his lifetime, however, he was virtually unable to sell his paintings and was supported by his brother Theo, an art dealer in Paris.

**Frans Hals** (1580/85-1666), a native of Haarlem, portrayed many of the wealthy citizens of this city. His paintings must have been unconventional at the time because they look rather like snapshots. The impression of a casual glimpse of is the result of a carefully thought-out effect.

The **Maris** family comprised several painters, most of them working in the second half of the nineteenth century. They were representatives of the Haagse School (The Hague School). Landscapes and interiors were depicted in a realistic way in greyish and brownish tones with the occasional outburst of color.

**H.W. Mesdag** (1831-1915), like the Maris family, was also a representative of the Hague School. He painted many seascapes but his most famous work is the Panorama Mesdag, which measures 1,680 square meters. It portrays Scheveningen at the end of the nineteenth century.

It is hard to imagine that **Mondriaan** (1872-1944) started his career painting typical Dutch scenes such as windmills and boats. Most people are only familiar with his abstract work dominated by black horizontal and vertical lines, with a heavy use of the primary colors red, blue and yellow as well as the non-colors, white and grey.

**Paulus Potter** (1625-1654), perhaps better known to Assembly attendees as Paulus Poster, specialized in the painting of animals, a new genre in the seventeenth century. His most illustrious work is the 'Young Bull.' In this painting Potter has rendered a bull in a very detailed way on a life-size scale.

**Rembrandt** (1606-1669) was probably the most famous painter of the seventeenth century, the so-called 'Golden Age'. Many rich Amsterdam citizens had their portraits done by him. In addition, he rendered many biblical scenes. His most famous work, 'The Nightwatch', which hangs in the Rijksmuseum Amsterdam, shows a group of armed men. He is also known for his etchings and drawings.

The phrase: 'a house kept in the style of **Jan Steen**' (1626-1679) would ring a bell with most Dutch people. It refers to a disorderly house, and most paintings by this artist seem to show exactly that. Steen was eager to depict various humorous types of people, and to analyze their weaknesses. In his paintings many hidden meanings can be found. Dogs, for example, often refer to adultery.

About 30 paintings are known from the Delft painter **Johannes Vermeer** (1632-1675). They all are characterized by balanced composition, transparent colors and a clear northern light. Since the Mauritshuis will host an exhibition on Vermeer this autumn, some of his paintings, for example 'Girl with pearl,' are currently being restored while on public display.

From the 1930's onward, **Carel Willink** (1900-1983) developed the so-called magic-realist style. The motifs, mostly ruins and landscapes, are

rendered in an impersonal, detailed and almost photographic way. At first the depicted scenes seem rather normal but a certain threat is often present.

**Vincent van Woerdenstein** (1899-1901), surely one of the lesser-known Dutch artists, specialized in painting house exteriors and factory floors. He expired at a very young age, suffering from lead poisoning and the violence of disappointed clients. His work is seldom displayed, and collectors have eschewed it entirely.

Information supplied via the good graces of **THEO JURRIENS**, and further distorted by the *Sidereal Times*.

Very Important Notice

Please do not cause the organizers unnecessary consternation: take your posters down before leaving the Assembly!

ALSO

Empty your pigeon holes of all pigeons and other items before Saturday at noon. Otherwise, your items will be recycled.

ENFORCEMENT COMMISSION

Deceased IAU Members

The IAU notes with sadness that in the three years since the last General Assembly, the following members have passed away.

- ADAMS A N MR
- ALANIA I F DR
- ALY M KHAIRY PROF
- ANDRLE PAVEL DR
- AREND S DR
- ARGYLE P E DR
- ARNQUIST WARREN N DR
- BAKOS GUSTAV A PROF
- BARRETT ALAN H PROF
- BOBROV M S DR
- BOLTON JOHN G
- BONEV BONU K MR
- BOWEN EDWARD G DR
- BROWN HARRISON DR
- BYSTROV N F
- CARESTIA REINALDO A DR
- CHEN ZUN-GUI
- CHUGAINOV P F
- CIMINO MASSIMO A PROF
- COSTAIN CECIL C DR
- DARIUS JON DR
- DAVIES ROBERT E PROF
- DEERENBERG A J M DR
- DINULESCU NICOLAE I PROF
- DIRIKIS M A DR
- DOMINSKI IRENEUSZ DR
- DOS REIS M PROF
- DROFA V K
- DUBOV EMIL E PROF
- EDMONDS FRANK N JR DR
- EL SHALABY MOHAMED
- ELVIUS TORD PROF EMERITUS
- FURENLID INGEMAR K DR
- GLIESE WILHELM PROF
- GNESVYSHEV M N
- GRATTON LIVIO PROF
- GROTH EDWARD J III
- GROTH HANS G PROF DR
- GURTOVENKO ERNEST A
- HALL JOHN S DR
- HARRINGTON ROBERT S DR
- HASEGAWA HIROICHI DR
- HAYAKAWA SATIO PR
- HENIZE KARL G ASTRONAUT
- HEYDEN FRANCIS J SJ DR
- HILTNER W ALBERT PROF
- HOLDEN FRANK
- HORAK TOMAS B DR
- HORAK ZDENEK PROF DR
- HUGHES JAMES A DR
- IONNISIANI B K
- ISHIDA GORO DR
- ISMAILOV T K
- KAI KEIZO DRKOPAL ZDENEK
- KOSTYLEV K V DR
- KRESAK LUBOR DR
- KVIZ ZDENEK DR
- LACROUTE PIERRE A PROF
- LANDI-DESSY J DR
- LINNEK V P
- LYTTKENS EJNAR DR
- MACHADO JOSE M A B DR
- MAGALASHVILI N L DR
- MANDELSTAM S L PROF
- MATSUSHIMA SATOSHI DR
- MAYALL NICHOLAS U
- MEGRELISHVILI T G PROF
- MERRILL JOHN E DR
- MICZAIKA G R DR
- MIGEOTTE MARCEL V PROF
- MITCHELL RICHARD MR
- MIYAMOTO SYOTARO PROF DR
- MORGAN WILLIAM W PROF
- MORGULEFF NINA ING
- MULDERS GERARD F W
- NARIAI HIDEKAZU PROF
- NIETO JEAN-LUC
- OMER GUY C JR PROF
- OORT JAN H PROF
- PAAL GYORGY DR
- PAVLOVSKAYA E D DR
- PESEK RUDOLPH PROF
- PETROV G M DR
- PODOBED V V
- POPOVIC BOZIDAR PROF DR
- QIAN ZHONG-YU
- QVIST BERTIL PROF
- REUNING ERNEST G DR
- ROACH FRANKLIN E
- ROSSI BRUNO B PROF
- ROTTENBERG J A DR
- RYZHKOV NIKOLAI F DR
- SAKHAROV
- SAWYER-HOGG HELEN B DR
- SERAFIMOV KIRIL B ACAD
- SERSIC J L DR
- SHCHEGOLEV D E
- SHIRYAEN A V
- SIROKY JAROMIR DR
- SITTERLY CHARLOTTE M DR
- SYKES PROF
- SMITH CLAYTON A JR DR
- SMITH HARLAN J PROF
- STOHL JAN DR
- STOYKO ANNA
- SUDA JAN
- SUEMOTO ZENZABURO PROF
- TAUBER GERALD E PROF
- TERRIEN JEAN
- VAIANA GIUSEPPE S DR
- WACHMANN A A PROF DRWALTER KURT PROF DR
- WHITNEY BALFOUR S
- WIETH-KNUDSEN NIELS P DR
- WISNIEWSKI WIESLAW Z
- XANTHAKIS JOHN N PROF
- XIA JIONGYU
- YEN JUI-LIN PROF
- ZLATEV SLAVEY
- ZVEREV MITROFAN S PROF DR

