IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND, U.S.A. MONDAY, AUGUST 1, 1988

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Astronomy Librarians Get an 'Abt' Warning

by Leif J. Robinson

Raindrops pinged against the dome of the historic 26-inch refractor. But the lost opportunity to observe with that historic telescope didn't dampen spirits in Washington, D.C. on the evening of July 26. The event was a U.S. Naval Observatory reception for participants at IAU Colloquium 110—Library and Information Services in Astronomy. This was the "first meeting of its kind," according to Brenda Corbin, USNO librarian. Indeed, this meeting was a microcosm of the IAU itself—130 participants registered from about 30 countries.

In his keynote address, Helmut Abt, Editor of the *Astrophysical Journal*, identified three problems faced by astronomical libraries: inadequate shelf space, increasing cost, and changes in services due to new technologies.

Abt pointed out that journals are doubling in size every decade and that prices are growing 16 percent per year on average. He also said small journals are much less cost-effective than large ones. "To save your budgets," he told the librarians, "campaign against small journals."

Looking at the future, Abt sees a greater standardization of style internationally. Farther down the road, he believes journals will be available on compact disks and in a central computer accessible by all.

see Librarians, page 3

Prof. Jorge Sahade of Argentina, President of the IAU. Photo by Ronald Schorn.

Welcome Message from Jorge Sahade

Dear Colleagues and Friends:

I am very happy at being able to extend, through this first issue of *IAU Today*, a very warm welcome to all the participants of our 20th General Assembly.

Everything is set for us to enjoy the gathering: the local arrangements have been very carefully and thoughtfully planned, and the scientific program is a full and interesting one.

I hope I shall meet many of you personally in the next few days.

Sincerely,
Jorge Sahade, President

Soviet Mars Mission to Look at the Sun

by Aleksandr M. Urnov, Special to IAU Today

On July 7 and 12, two members of a new class of Soviet spacecraft were launched from the Baykonur Cosmodrome on a 190,000,000-kilometer voyage to Mars. The main scientific goal of this *Phobos* mission is the study of small bodies in the solar system. Using both orbiters and landers early next year, the twin craft will closely examine Mars' larger moon to try to determine whether it is a captured asteroid.

The *Phobos* project includes 27 instruments, many of which are installed in both spacecraft. They were designed and built by scientists from more than a dozen countries working in collaboration. Among the most interesting elements of the *Phobos* project are two experiments that will study the composition of the martian moon's surface. They operate in ways that until recently existed only in science fiction. LIMA-D will focus a small laser beam every five seconds for 10 billionths of a second onto *Phobos*' surface, vaporizing a small amount of regolith. A collector on the spacecraft will measure the atomic masses of the liberated ions. DION will do much the same thing using one-second pulses of krypton ions.

Besides taking a close look at Mars' larger moon, the *Phobos* spacecraft will study Mars itself, the Sun, and the interplanetary medium. Some of the earliest scientific data from the mission will come from a device named TEREK, which was turned on successfully at the end of

see Soviet Mission, page 3

IAU Today is published with the help of a generous contribution from Computer Sciences Corporation.

The Call of Baltimore's Inner Harbor

by Ronald A. Schorn

Spectacular reminders of Baltimore's seagoing heritage are only a few steps from the site of the 20th General Assembly. The exciting Inner Harbor area, just one block east of the Convention Center, holds such popular attractions as the USS Constellation, the National Aquarium, the Baltimore Maritime Museum, and the Maryland Science Center.

The Constellation is the oldest surviving vessel of the United States Navy and one of the oldest ships afloat. It was launched in Baltimore on September 7, 1797, as the first of its class. After the Revolutionary War the American fleet was abolished, so this frigate later became the first unit of a "new" navy and the first ship commissioned under the new constitution (which lent its name to the famous sister ship now moored in Boston). The Constellation was nicknamed the "Yankee Racehorse" because of her high speed, excellent sailing qualities, and endurance. She never lost a battle. The Constellation served repeatedly over the years, even as recently as World War II, when she was the relief flagship for Admiral Ernest J. King. During peacetime there were tours of duty combatting pirates in the Caribbean Sea and attacking the African slave trade.

The Constellation was decommissioned for the last time in 1955. She is now a National Historic Landmark and is operated by a nonprofit foundation. Presently the ship is undergoing major restoration, so IAU members and guests who go aboard her will have a once-in-a-lifetime opportunity to see the internal construction. During the G.A., the Constellation will be open to visitors from 10:00 to 18:00 daily. There is an entry fee that helps pay for the vessel's upkeep.

see Inner Harbor, page 3

NOTICE: All Invited Discourses are at 18:00.

IAU NEWS

Five Corporate Donors Support IAU General Assembly

Five large high-technology firms are generously supporting the 20th General Assembly of the IAU as major donors. Here Managing Editor Stephen Cole reports how these companies support research in astrophysics, space exploration, and related fields.

Computer Sciences Corporation

Computer Sciences Corporation, founded in 1959, is a supplier of information systems technology services and software. CSC designs, engineers, integrates, installs, and operates computer-based systems and communications systems. Although CSC's largest customer is the United States government, the company also serves private companies in such fields as communications, publishing, and finance. Services are provided through two hundred facilities including fifty in foreign locations.

CSC, based in El Segundo, California, is committed to supporting modern space observatories and to fostering the highest caliber of astronomical operations and research. There are more than fifty Ph.D.-level astronomers within the System Sciences Division Astronomy Programs who are active in basic research as well as supporting the operational needs of diverse space astronomy programs.

Under contract to NASA, CSC has operated the International Ultraviolet Explorer astronomical observatory since 1978 at NASA's Goddard Space Flight Center. CSC astronomers, computer programmers, and other professional and technical personnel provide services to the IUE including observatory planning and scheduling, operation and calibration of scientific instruments, data reduction and analysis, and scientific interfacing on the international level.

Since 1980 CSC has provided a wide range of software development and observatory systems engineering services in preparation for the launch of the Hubble Space Telescope. After launch CSC will support orbital verification and science verification activities and will conduct day-to-day science operations.

CSC astronomers have also conducted research programs on the IUE, observing a wide variety of astronomical sources. Several CSC researchers have cooperated to perform extensive studies of hot stars with winds using IUE data obtained over several years.

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Digital Equipment Corporation

Digital Equipment Corporation, with headquarters in Maynard, Massachusetts, is a world leader in manufacturing networked computer systems and associated peripherals. Digital is also a leader in systems integration with its networks, communications, service, and software products.

Digital's Computer Integrated Research strategy is a pioneering approach to the research/laboratory environment. With CIR, Digital provides a framework for integrating an entire research organization, from remote data acquisition to laboratories. CIR is based on the VAX architecture and seamless networking.

Digital recently introduced the first comprehensive set of software tools and services for developing application programs to run on supercomputers from Cray Research, Inc. VAX SDE/Science is made up of the new software and services offering, called the VAX SDE/Science Integration Package, combined with existing VAX hardware and software. The system also uses Cray communications products and scientific software from third parties. The package allows researchers to efficiently write new programs or convert existing VAX programs to run on Cray systems, cutting down development time and freeing staff for research.

Since 1982, Digital has supported a variety of National Science Foundation programs and major initiatives, including the NSF supercomputing program which is intended to bolster academic scientific research.

For more than twenty years, Digital has been a leader in developing solutions to real-time laboratory needs. They recently introduced an array of distributed real-time hardware and software products and programs to enable Digital users to tie real-time computer operations into the rest of their organization's environment. At the European Laboratory for Particle Physics (CERN) in Geneva, physicists are using Digital's new VAX Realtime Accelerator and VAXELN in experiments requiring high-speed real-time data acquisition.

Lockheed Missiles and Space Company, Inc.

Lockheed Missiles and Space Company, Inc. is a leader in many state-of-the-art developments for the U.S. civilian space program. Located in Sunnyvale, California, Lockheed is working on major space science projects including the Hubble Space Telescope, the Advanced X-ray Astrophysics Facility, and the Space Infrared Telescope Facility. Lockheed researchers are also active in solar system, near-Earth, and astronomical studies.

Lockheed is a member of three of the four work package teams that NASA selected to perform detailed design and construction of the Space Station. The company is also working on a number of technology development projects that will lead to state-of-the-art Space Station systems.

Lockheed is systems integrator for the Hubble Space Telescope and developed the telescope's Support Systems Module, the structure that encloses the Optical Telescope Assembly and scientific instruments and provides all the essential systems to keep the observatory operating in space. The Hubble Space Telescope, currently in a large clean room at Lockheed's Sunnyvale plant, is due to be shipped to Cape Canaveral later this year.

Researchers from Lockheed's Space Sciences Laboratory were among the first to measure X-ray flares on other stars and to map the Earth's radiation regions. Lockheed is also assisting Stanford University with hardware for the Gravity Probe B space experiment that will perform a fundamental test of Einstein's general theory of relativity.

Martin Marietta

Martin Marietta plays a major role in the development and production of space launch vehicles for both government and private industry and develops spacecraft for Earth-orbit and planetary missions.

The Martin Marietta Astronautics Group is completing work on the Magellan spacecraft that will use radar to map up to 90 percent of Venus with a resolution ten times better than has been obtained by previous missions. Magellan is scheduled to be launched from the space shuttle next year. The spacecraft is due to be shipped from the company's Denver facility to the Kennedy Space Center late this year.

The Astronautics Group is also working on NASA's Tethered Satellite project, which on a future space shuttle mission will be trolled at the end of a 62-mile-long cable to study areas of the upper atmosphere that until now have been accessible only to sounding rockets.

The Manned Space Systems division builds the space shuttle's external tank and has produced more than forty to date. Martin Marietta is also studying NASA's proposed Shuttle-C, a heavy launch vehicle that would use the external tank, engines, and solid rocket boosters of the present space shuttle but replace the manned orbiter with an unmanned cargo carrier.

NASA will be using the Martin Marietta-built Transfer Orbit Stage, an upper-stage vehicle to boost spacecraft after they are launched from the shuttle, on two future space shuttle missions. These spacecraft are the Mars Observer and the Advanced Communications Technology Satellite.

Martin Marietta's family of Titan boosters have a record of 132 successful launches in 137 attempts over the last twenty-two years. The first Titan IV, the company's most powerful Titan configuration, is being readied for launch from Cape Canaveral next year. A commercial version of the Titan has also been developed and will be used to launch communications satellites also beginning next year.

The Perkin-Elmer Corporation

The Perkin-Elmer Corporation, based in Norwalk, Connecticut, is a world leader in the production and development of analytical instrumentation, electro-optical systems for space programs, and semiconductor equipment. The company was founded in 1937 by Richard Perkin and Charles Elmer, who shared an avid interest in astronomy. (Perkin built his first telescope at the age of 11.)

Perkin-Elmer has built some of the world's finest astronomical telescopes, such as the University of Hawaii's 88-inch diameter instrument atop Mauna Kea in Hawaii. It also produced the optics for such space missions as the Hubble Space Telescope and the Einstein X-ray and IRAS (infrared) satellites. Perkin-Elmer equipment on the Hubble Space Telescope includes both the Optical Telescope Assembly and the three Fine Guidance Sensors.

Under NASA funding, Perkin-Elmer continues to advance the state-of-the-art for the optics and sensors required by the next generation of space observatory programs, particularly the Advanced X-ray Astrophysics Facility. The company has completed key technological developments for the concept definition phase and is currently preparing for the final competitive phase for AXAF.

Long-term programs being worked on at Perkin-Elmer include a Far Ultraviolet Spectrometric Explorer, a technology program for the Space Infrared Telescope Facility, and the definition of Space Station precision payload pointing systems, star sensors, and atmospheric and particulate contamination monitors.

IAU NEWS

EDITORIAL

Introducing the Staff of IAU Today

by Stephen P. Maran

I hope that *IAU Today* will help make your experience in Baltimore a memorable one. A volunteer staff of experienced editors, science writers, and astronomers has been working for more than a year to plan a daily newspaper that will announce major events, report on many of the scientific sessions, and provide information of general interest to astronomers.

You will find in these pages reminiscences of many of the General Assemblies since the 1920s, reports on the state of astronomy around the world today, and descriptions of many observatories that welcome visiting astronomers. Most were arranged in advance by Associate Editor, Prof. Virginia Trimble of the University of Maryland and the University of California, Irvine. A frequent contributor to *Nature*, she is well known for her critical review articles on astrophysics. She serves on both the National and Local Organizing Committees for this Assembly.

If *IAU Today* looks well designed and professionally prepared (as we hope it does), we can thank Pamela Hawkins Blondin, Publisher, and Stephen Cole, Managing Editor. Blondin is Director of Society Programs at the American Astronomical Society's Executive Office in Washington, D.C. Cole is Managing Editor of *Astronomy* magazine in Milwaukee, Wisconsin, and has an extensive background in the newspaper business.

Dr. Ronald A. Schorn, our other Associate Editor, is a Texas astronomer experienced in planetary science and radio astronomy. He is Technical Editor of *Sky & Telescope* magazine in Cambridge, Massachusetts, where he chronicles the dramatic discoveries about Supernova 1987A. On weekends and holidays, he can be seen dressed as a farmer-soldier of the American Revolution in parades, battle reenactments, and so-called Living History programs.

Our official photographer, Dr. John Blondin, has set up a fully equipped darkroom in a secluded nook of the Convention Center. When he isn't busy taking photographs at Invited Discourses and other major events or producing flawless enlargements to meet nightly deadlines, he will be logging on to a distant supercomputer to continue his investigations of the hydrodynamics of astrophysical jets. Blondin, a recent Ph.D. from the University of Chicago, is now an NRC Resident Postdoctoral Research Associate under Reuven Ramaty at the NASA-Goddard Space Flight Center in Greenbelt, Maryland.

Terminal case? Publisher Pam Blondin, Editor Steve Maran, and Managing Editor Steve Cole at the special vertical-format, high-resolution monitor used for composing the final pages for IAU Today.

Our ace reporters are Leif J. Robinson and Drs. Richard Tresch Fienberg, Laurence A. Marschall, Jacqueline Mitton, and Jay M.Pasachoff. Robinson is Editor of *Sky & Telescope* and a popular organizer of cruises and tours for the purpose of observing comets, eclipses, and other celestial phenomena. Fienberg earned his Ph.D. in infrared astronomy in 1985 at Harvard University and is now an Associate Editor of *Sky & Telescope*. Marschall is Professor of Physics at Gettysburg College in Pennsylvania and is a Contributing Editor of *The Sciences*. His popular book, *The Supernova Story*, will be published later this year. Jacqueline Mitton, who will be elected to membership in the IAU at the Closing General Assembly, is an editor for the British Astronomical Association, a former frequent contributor to *New Scientist*,and operator of an editorial and writing service in Cambridge, England. Professor Pasachoff, Director of the Hopkins Observatory at Williams College, Williamstown, Massachusetts, is the author of many textbooks in astronomy and physics and a veteran of many professional solar eclipse expeditions.

Dr. Eli Dwek, noted astrophysicist at the Laboratory for Astronomy and Solar Physics at NASA-GSFC, has revealed his true talent for the entertainment of our readers. He has drawn a set of original cartoons that you should look for on page 5 each day. Editorial Assistant Carol Hartley, who lives in Baltimore, can often be found on the MARC railroad line, commuting to and from Washington, where she works for the AAS. Frances Fredrick, Administrative Assistant, has faithfully supervised the activities of *IAU Today* restaurant columnist, Prof. Laurence W. Fredrick of the University of Virginia, for many years in Charlottesville. Dr. Peter B. Boyce, Technical Consultant, is Executive Officer of the AAS. He is responsible for *IAU Today*'s hardware and software for desktop publishing, word processing, and file transfer between laptop and desktop computers.

The Editor, a member of the same NASA-Goddard Laboratory as Dwek, owes a special vote of thanks to James Cornell, Publications Manager at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, and author of several popular books in astronomy. Cornell contributed important suggestions to the design and content of *IAU Today*. With his help and the aid of all of the above, I have been able to concentrate on my most important task: recruiting a fine, professional staff to produce this newspaper for the 20th General Assembly.

INNER HARBOR / from page 1

The Baltimore Maritime Museum currently has two famous ships moored next to the Aquarium. One is the USS Torsk, a World War II fleet submarine that saw service in the Pacific. The Torsk has the distinction of firing the last torpedos and sinking the last warships in that conflict. It holds the world record for the most dives ever made by a submarine – 11,884. Some of the original crew members serve as volunteer guides aboard the boat, and you may meet one of them if you go aboard.

The lightship Chesapeake is tied up astern of the Torsk. Ungainly vessels of this type once anchored in coastal waters where other types of navigational aids were impractical. Their bright red hulls and lantern beacons were always a welcome sight to mariners, but the ships have fallen victim to newer technology. The Chesapeake was turned over to the city of Baltimore in June, 1981. It is still a working vessel, and all its systems are exercised once a month. Both vessels are open from 09:00 to 16:30. IAU members showing a meeting badge will receive a discount from the admission fee.

The Maryland Science Center, featuring the Davis Planetarium, lies at the south end of the Inner Harbor. The center is just a short walk south of Harborplace, the two enclosed glass pavilions that feature 135 specialty shops, markets, restaurants, and sidewalk cafes. Just north of Harborplace, across Pratt Street, is the newly opened Gallery, a multistoried, upscale shopping center. All of these attractions lie within easy walking distance of each other, even on a hot August day, making Baltimore's Inner Harbor an interesting and exciting place to visit.

SOVIET MISSION / from page 1

July. This instrument, mounted on the first orbiter only, will study the solar atmosphere at visible, extreme ultraviolet, and X-ray wavelengths. It was built by the Astronomical Institute of the Czechoslovakian Academy of Sciences and the Lebedev Physical Institute of the Soviet Academy of Sciences, where I work.

TEREK's three channels operate one at a time. The X channel consists of a grazing-incidence telescope with four filters for observations between 5 and 20 Å. The MX channel uses a normal-incidence telescope with a 30-millimeter diameter mirror whose multilayer coatings isolate two spectral regions, between 170 and 180 Å and near 304 Å. The K channel, orcoronagraph, operates from 4000 to 6000 Å. All three channels use CCD detectors.

The *Phobos* mission offers scientists a unique opportunity to observe what we call the "twice invisible" Sun, that is, the part facing away from Earth and any part in the X-ray region. During the seven-month cruise from Earth to Mars, TEREK will obtain long sequences of soft-X-ray images ofthe Sun with about 15 arc-second resolution. It will also observe the solar corona out to a distance of 5 to 6 solar radii. The main scientific objectives of the experiment are to study the structure and evolution of the solar atmosphere over a wide range of temperatures; to measure the physical conditions in active regions, coronal holes, bright points, flares, and transients; to investigate the dynamics of solar flares; to observe the part of the solar surface hidden from Earth; and to measure the polarization of the important He II line at 304 Å. One of the most exciting experiments could be to conduct simultaneous observations with the *Solar Maximum Mission* satellite to obtain "stereo" images of solar structures.

The Soviet and Czechoslovakian scientists who built TEREK look forward to obtaining crucial new information on the nature of the quiet and active solar atmosphere. Like all members of the international *Phobos* team, we have great hope for a successful mission during the months ahead.

LIBRARIANS / from page 1

Concerning the choice to publish in journals subsidized by page charges and those with high subscription rates, Abt warned: "We should not have two journals, one in which you can afford to publish and one that you can afford to read."

Both Eastern and Western countries continue to have problems acquiring each other's publications. That was the tenor of a panel discussion by representatives from Argentina, the People's Republic of China, U.S.A., and U.S.S.R. Currency restriction is one problem, knowledge of a book's existence is another. Vigorous, individual contacts between librarians seem to be the most effective way to keep international lines of communication open

Consider information-retrieval strategies, from indexes and abstract services to online computer searches. What are the best key words; what combinations are most efficient? As Robyn Shobbrook (Anglo-Australian Observatory) noted, there is no internationally accepted keyword list. So, with the help of seven other librarians, she has coordinated the development of the *Thesaurus Rex* to standardize terminology. Such a system – "vocabulary control," in her words – is essential if computers are to search databases efficiently.

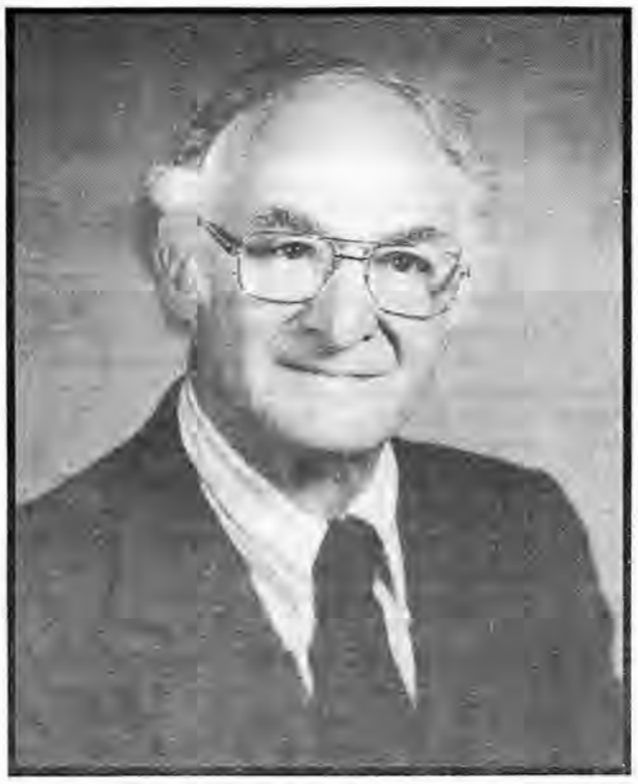
Want millions of items online? Welcome to SIMBAD (*S*et of *I*dentifications, *M*easurements, and *B*ibliography for *A*stronomical *D*ata). According to Joyce Rey-Watson (Harvard-Smithsonian Center for Astrophysics), "SIMBAD is the greatest blessing to befall astronomy for a long time." She expects SIMBAD to become fully operational through CfA in September. Access from the U.S. will be inexpensive, since NASA is underwriting the electronic link to SIMBAD in Strasbourg, France.

Nomenclature "No No" No. 1 - Omitting Signs Is A Minus

by H. R. Dickel, Special to IAU Today

Positions published without the corresponding equinox or epoch are of little value. Please remember that both the "plus" and the "minus" signs are required in positions and positional-type designations for astronomical objects.

IAU PEOPLE



Leo Goldberg. Photo by Ray Manley.

OBITUARY

Leo Goldberg: 1913 - 1987

by Lawrence H. Aller, Special to IAU Today

The Harvard graduate program in astrophysics was initiated by Prof. Donald Menzel in the mid-1930's. Among the most prominent participants and one of the earliest to complete the course of studies was Leo Goldberg, B.S. 1934, A.M. 1937, Ph.D. 1938, who went on to a distinguished career in astronomical spectroscopy, solar physics, space astronomy, and administration. He went to the McMath Hulbert Observatory of the University of Michigan in 1941 where he worked on defense-related problems until the end of World War II. He then went to Ann Arbor where he remained as director of the observatory and chairman of the department until 1960. Here Goldberg organized an efficient team of astronomers and inaugurated a program of research and instruction that placed Michigan among the leading graduate schools in astronomy in the U.S.A. He had a knack of knowing how to place each staff member in a position where he or she would be most effective. Leo was an administrator of extraordinary skill.

Always in the forefront of technical advances such as the lead sulfide cell and vacuum spectrograph, which he and his colleagues exploited so effectively in studies of the solar spectrum, Goldberg was inspired by the challenge of space research. The Michigan administration did not encourage him to develop a viable space research program there, so he went back to Harvard in 1960 as Higgins professor. He was director of the Harvard College Observatory from 1966 to 1971.

Leo Goldberg had been involved deeply in the development of the Kitt Peak National Observatory from its very beginning. Thus, it was not surprising that he was chosen as director in 1971, a post which he retained until 1977 when he relinquished administration for the less frustrating task of the scholar and research scientist. He also rendered outstanding service for NASA, the National Science Foundation, and other government agencies. He received NASA's Distinguished Service Medal in 1973, and in 1985 was appointed to the Martin-Marietta Chair of Space History at the National Air and Space Museum at the Smithsonian Institution.

Understandably, Leo Goldberg played an important role in astronomical organizations, serving as councillor and later president of the American Astronomical Society. He played a very active role in the International Astronomical Union, having attended the 1938 Stockholm, Sweden, meeting the year he received his Ph.D. He played a prominent role in the American National Committee, was chairman of the U.S. delegation to Moscow in 1958, and became president of the IAU at the Sydney, Australia, IAU meeting in 1973.

REMINISCENCES

1925 General Assembly: Cambridge

by Willem J. Luyten, Special to IAU Today

The Cambridge meeting of the IAU in 1925 was really the first general astronomical meeting and, as I remember, its highlights were: one, the several eclipse expeditions had definitely proved that Einstein's prediction of the bending of light rays by the Sun's gravitational attraction was correct, and two, observations of Cepheid variables in the Andromeda spiral had conclusively proved that this object was similar to our own galaxy.

Thus, Einstein's theory of relativity and the concept of "island universes" were firmly established. The spiral and globular nebulae were no longer minor appendages of our own Milky Way System but became objects of similar dimensions and importance.

Only three white dwarfs were definitely known, and what is now known as the H-R Diagram was still portrayed as an inverted figure seven, with a great preponderance of stars on the "giant branch". Stellar evolution was still vaguely thought of as beginning with an M-giant, moving across to the A and B giants, then turning down along what we now call the Main Sequence, and ending with the faintest M and "black" dwarfs. The source of stellar energy, the hydrogen-helium conversion, had hardly made its impact yet.

The epoch-making work on the constitution of the stars had just begun, and the luminosity function was still believed to have its maximum near M = +9 visual. Many of us were still hoping that eventually, the spectroscopic determinations of absolute magnitude would free us from the tedium of trigonometric parallax measurement.

The 100-inch telescope of the Mount Wilson Observatory was still the largest in the world, and we were still, sort of haphazardly, looking for a trans-Neptunian planet. The Laplace theory for the origin of the solar system was definitely in the dog-house, and it was a matter of dogma that one believed the cataclysmic tidal or collision theory for the origin of the Earth. We were looking forward toward the completion of the first real international astronomical undertaking - the "Carte du Ciel."

Naturally, in the sixty-three years since the Cambridge meeting there have been many changes, additions, and improvements in astronomy, but even a rudimentary listing of these would fill several pages.

The greatest of all was what happened in the late 1950s. Until that time astronomy had been exclusively an observational science, and while it is the only science which has a right to speak of universal law, it was not an experimental science.

With the coming of the Space Age all that has changed. We have gone to the moon and brought back rock samples to analyze. We have probed the atmospheres of Venus and Mars, and even the satellite systems of Jupiter, Saturn, and Uranus. Before long we may be able to bring back some gases, and even solids from passing comets, and perhaps even "tow in" some small solar system denizens to analyze them fully on Earth.

The other change I see spells danger for the future, and it seems to be common to all sciences and other lines of human endeavor: it is the general breakdown in ethics, and whether this is caused by the "publish or perish" syndrome is immaterial -- it exists. People taking credit for what others have done, sometimes fifty years earlier, refusals to refer to earlier work, and sometimes even outright fraud. With the enormous dependence of modern science on governmental financial support, this is becoming a greater and greater hazard which, if not taken in hand and corrected pretty soon may well result in the body politic turning its back on science and its malfeasances.

COMMENT

A World of Opportunities in Astronomy

by Lodewijk Woltjer
Reprinted with permission from Sky and Telescope, *August 1988*

As astronomers from many countries gather this month in Baltimore, Maryland, for the triennial General Assembly of the International Astronomical Union (IAU), there appears to be a spirit of gloom in some quarters. Space-program delays, funding shortfalls, scarce jobs, shortages of powerful computers, and other misfortunes concern many scientists. But while it is necessary to take corrective actions--which will be different in different countries--we should not lose sight of the global perspective. Worldwide astronomy is booming, and new and powerful instrumentation promises that this will continue.

In optical astronomy the 10-meter Keck telescope of Caltech and the University of California and the 16-meter Very Large Telescope of the European Southern Observatory are under construction. A 7.5-meter Japanese reflector should get started soon. Together, these instruments will triple the total light-collecting area of the world's large-aperture telescopes. Other giants are on the drawing board, for example, a West German 12-meter, an American-Italian 11-meter, and several 8-meters, and some will undoubtedly be built. The Hubble Space Telescope will add new dimensions in ultraviolet astronomy and high-resolution imaging, while the European Hipparcos satellite will revolutionize astrometry.

Other wavelength domains will see equally great progress. In the radio spectrum the U.S. Very Long Baseline Array, the Australia Telescope, the French-German millimeter interferometer, and a large radio array in India will bring significant increases in sensitivity and angular resolution. The Infrared Space Observatory, now under construction in Europe, will be vastly more sensitive than its predecessor, the Infrared Astronomical Satellite. The nearly completed German-American-British Rosat will make the deepest all-sky survey yet of celestial X-ray emission. Other space-science missions planned by the United States, the Soviet Union, Western Europe, and Japan promise equally exciting advances. Finally, a variety of experiments in gravitational-wave and neutrino detection should come close to bringing these subjects into the mainstream of astronomy.

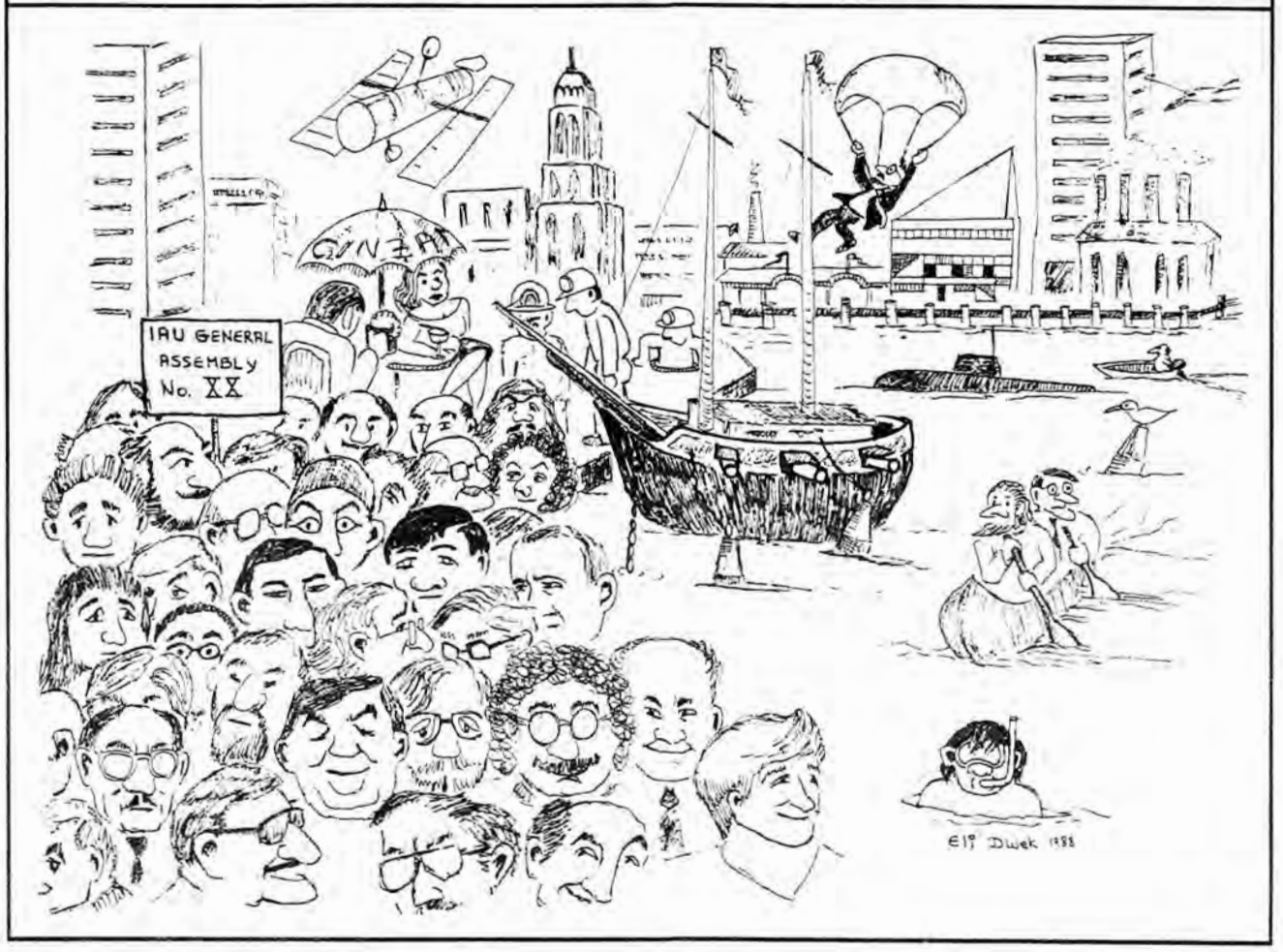
Scientific developments are equally encouraging. Recent work in particle physics, relativity, and cosmology has given some researchers the conviction that a "theory of everything" is around the corner. Even if not, the vistas that have already been opened have profoundly transformed our thinking on cosmology. Galaxy studies have pushed the limits of the "observable" universe well beyond a redshift of one, and galaxy evolution is becoming an observational science. Studies of Supernova 1987A in the Large Magellanic Cloud have given us confidence that our basic understanding of stars, stellar evolution, and element synthesis may not be too far off. Solar and stellar oscillations offer a whole new approach to probing the interiors of the Sun and other stars. Happily, in many of these areas we now know enough so as not to engage in empty speculation, yet not so much that no challenges remain.

Nevertheless, there are real problems. Some are caused by partly unavoidable discontinuities in funding. Major space projects are expensive, and the intervals between them tend to be long. This is most serious since infrared, optical, and X-ray observations require very different types of facilities. While the situation could be improved somewhat by building a larger number of smaller satellites, many celestial

see Opportunities, page 8

IAU ACTIVITIES

ASTRONOMERS WILL USE ANY MEANS TO REACH THE IAU GENERAL ASSEMBLY



IAU SPECIAL EVENT
Baltimore Symphony Orchestra Concert on August 4

A memorable evening of American music featuring works of composers such as Copland, Gershwin and Bernstein awaits Assembly participants on Thursday evening, August 4 in the Meyerhoff Symphony Hall. Reserved seat tickets, which are free to all registered participants, are available at the Symphony booth in the Pratt St. Lobby. The cultural highlight of the 20th General Assembly, this special performance by the Baltimore Symphony Orchestra will feature guest conductor Bruce Hangen, Music Director of the Omaha Symphony , and piano soloist Jose Ramos-Santana. A light summer supper will be served in the Symphony Hall prior to the concert, for those who have purchased a ticket for the supper. Supper tickets are no longer available.

Among the works planned for the performance is George Gershwin's Rhapsody in Blue, probably the most frequently recorded piece of concert music by an American composer and the internationally recognized musical portrait of America. Other works planned for the evening's program include Leonard Bernstein's Overture to Candide and Aaron Copland's Rodeo.

Jose Ramos-Santana is a young pianist who possesses an electrifying magnetism and rapport with audiences and critics alike. He has performed with major orchestras and in festivals throughout the United States and his homeland of Puerto Rico.

The Baltimore Symphony Orchestra recently completed a successful tour of Europe, including performances in Moscow and Leningrad, the first by an American orchestra in the U.S.S.R. in over a decade. The Meyerhoff Symphony Hall, which opened in 1982, is widely acclaimed for its acoustics, its beauty, and its comfort and is considered to be one of the finest modern concert halls in the United States.

Following the afternoon scientific sessions, shuttle buses will provide transportation for Assembly participants from the Convention Center to the Symphony Hall. Admission to the concert is free, but you must obtain a reserved seat ticket in advance. Buses to the supper and concert will leave the Convention Center beginning at 18:00. The last bus (for the concert only) will leave the Convention Center at 19:30. The concert will begin at 20:00.

Shuttle buses will operate a return service after the concert.

THE GALLOPING GASTRONOMER

by Laurence W. Fredrick, Special to IAU Today

RESTAURANT RATING

Average Star ★
Double Star ★★
Supernova ★★★
Starburst Galaxy ★★★★

P. J. CRICKETTS
206 Pratt Street, 244-8900
Rating: ★½

P. J. Crickett's is located diagonally across Pratt Street from the northwest corner of the Convention Center. The decor is late 19th and early 20th century. The building is an old furniture factory from that era, and the restaurant has a number of antique pieces dating from that period (note the stand used by the hostess).

TV, bar, and patio cafe are located downstairs; the dining room is upstairs with pleasant background music most of the time. A lift is available for the handicapped or those who are just plain tired. There is a live band on selected nights so check in advance. The band insists on amplification which makes polite conversation difficult.

There are several specialties--they make claims for their ribs and, of course, anything that comes from the bay or sea will be fresh and good. My entree, sole (both times), was excellent. The true test of a restaurant is not how good the entree is--it is almost always good--but how good the vegetables are, and this depends on who is running the kitchen at the time. They were crisp and tasty on my two widely separated visits.

This is a tourist restaurant: not pushy, but they are geared to getting you in and out. The waiters and waitresses are competent and knowledgeable and have ideas of what you should see and do in Baltimore. Menus can be found in the Convention Center that may have a free beverage coupon. Use it, they don't mind and it gives you a talking point. The drinks are above average for a tourist restaurant.

Dinner with wine will run about $20 to $25 (if you take advantage of the free coupon for the preprandial cocktail). All credit cards are accepted (they even took my almost-local check on one visit).

Welcome Reception: Astronomers Get VIP Access to Aquarium and Science Center

The Welcome Reception of the International Astronomical Union's Twentieth General Assembly will be held simultaneously at the National Aquarium and the Maryland Science Center on Tuesday, August 2 from 19:30 to 22:30. Guests are invited to tour both the Aquarium and the Science Center, and are encouraged to begin at the site indicated on their invitation. Water taxis will be available to transport guests on the scenic harbor between the Aquarium and the Science Center.

For security purposes, no one will be allowed entry to the Aquarium or the Science Center without a proper General Assembly identification badge, so please be sure to register in the Pratt Street Lobby of the Baltimore Convention Center before proceeding to the opening ceremonies and reception.

Food and open bars will be available in the lobby and on the third and fourth levels of the National Aquarium. No food or drink is permitted on the second level. If you would like a place to rest or meet with colleagues, seating is available in the Habitat Theater on the third level.

For the protection of the Aquarium's animal collection, guests are asked to refrain from placing any glasses, napkins or plates on the edges of the holding tanks. The National Aquarium prohibits smoking anywhere in the building, with the exception of the Knott Harbor View Room located on the fourth level.

The "Bay Lady," Baltimore's newest cruise ship, will be docked at the pier on the south side of the Aquarium. You are invited to have cocktails and enjoy harbor breezes aboard the ship. A tent will be located behind the Aquarium where food and drinks will be available for guests at the reception.

At the Maryland Science Center, exhibits, food, and bar will be available to guests on the first, second, and third floors. Enjoy a variety of interesting exhibits while visiting with colleagues. Please note that smoking is prohibited in all areas except the rear lobby on the first floor of the Center.

The spectacular IMAX film "The Dream is Alive" will be shown in the Science Center's IMAX Theater located on the first floor. There will be two showings at 20:00 and 21:30. The theater holds 400 people and seating will be on a first-come, first-served basis. Food and drink are prohibited in both the IMAX and Boyd Theaters.

Volunteer hosts and hostesses will be on hand at the Aquarium and the Science Center to assist guests as needed during the evening.

The Welcome Reception will welcome you not only to the IAU Twentieth General Assembly, but to one of this country's proudest cities. Come and experience some of Baltimore's grandest landmarks. This spectacular evening on the Inner Harbor is guaranteed to leave you with fond memories for years to come.

IAU WORLD

SPECIAL REPORT

The 17/18 March 1988 Total Solar Eclipse

by Jay M. Pasachoff

A total solar eclipse swept across Indonesia and the Philippines on 17 March 1988, ending over the Pacific Ocean on 18 March. The narrow band crossed the Indonesian islands of Sumatra and Borneo and then the Philippine island of Mindanao. The event was the first important total eclipse since 1984.

In the ancient city of Palembang in South Sumatra, viewers, including many Japanese amateurs, were able to observe the eclipse through broken cloud. Twenty kilometers toward the center line, however, a fog came up to prevent scientists from l'Institut d'Astrophysique in Paris, France, and Williams College, Williamstown, Massachusetts from observing totality.

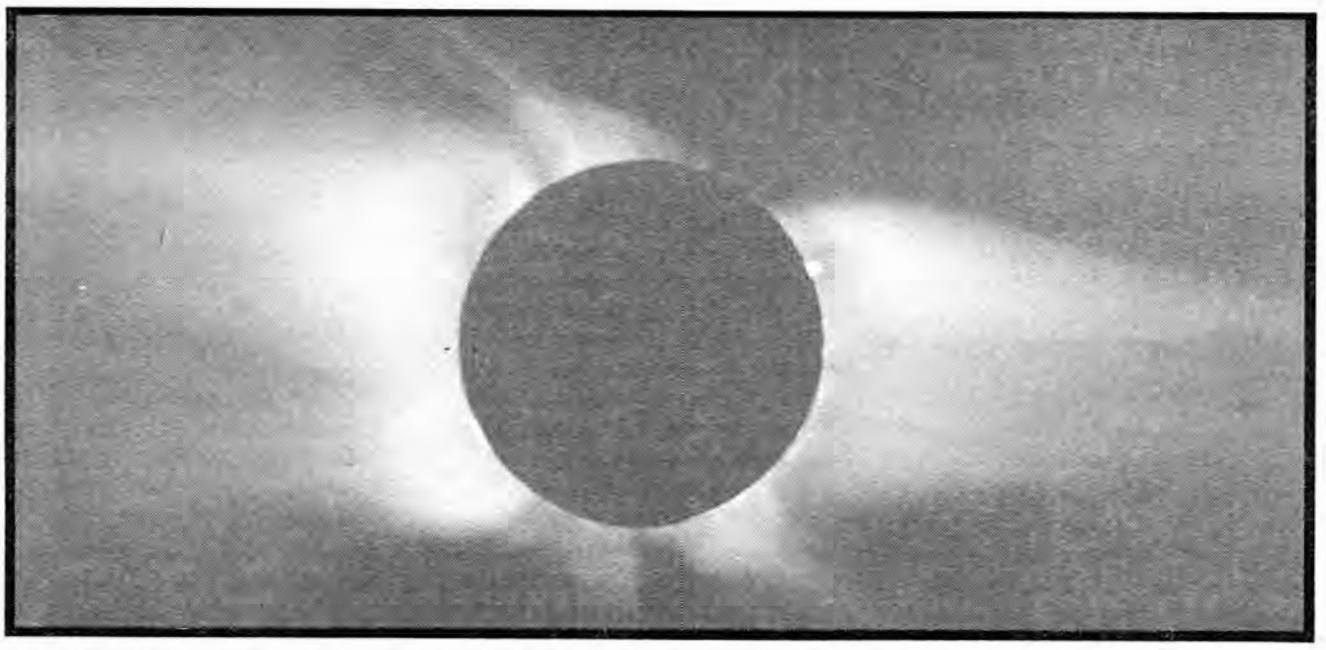
Many observers, including scientists and students from England, observed the eclipse from Bangka Island off the coast of Sumatra. Some carried out timing measurements to monitor possible changes in size of the Sun.

The eclipse was at its longest over land on Mindanao. There too, following predictions, the weather was spotty. The photograph shown was taken by an American team from their city hotel, through thin clouds that prevented photometric measurements from being made. A few kilometers away, scientists, amateurs, and Philippine government officials were clouded out.

Observers on several ships were generally able to station themselves in clear weather to study totality. Scientists from the Tokyo Astronomical Observatory, Japan, made observations from three sites: one in Palembang, Sumatra, one on an island off Borneo, and one on a ship.

Very successful experiments were carried out from the NASA airplane known as the Kuiper Airborne Observatory. Scientists from the University of Hawaii and the National Optical Astronomy Observatories were able to study the eclipse at infrared wavelengths up to 400 micrometers. Earlier on the day of the eclipse, scientists from the University of Colorado, Boulder, Colorado, photographed the Sun in soft X rays (170 A), using a rocket launched from the White Sands Missile Range in New Mexico.

The next total solar eclipse will take place on 22 July 1990, starting at sunrise in Helsinki, Finland, crossing the northernmost Soviet Union, and crossing the American Aleutian islands of Alaska. Astronomical and meteorological circumstances are predicted to be excellent for the following total solar eclipse, to take place on 11 July 1991: totality will last over 4 minutes on the island of Hawaii in the state of Hawaii; the Mauna Kea Observatory lies near the center line of totality, though viewing may be as good or better from sea level. Totality will last almost 7 minutes as the eclipse reaches the coast of Mexico near Baja California; the path of totality will continue down through Mexico to Central and South America.



17 March 1988 total eclipse. Photo by High Altitude Observatory, National Center for Atmospheric Research.

FACILITIES

The Karl Schwarzschild Observatory at Tautenburg

by Siegfried Marx, Special to IAU Today

The Karl Schwarzschild Observatory was founded in 1960 at Tautenburg, a small village not far from Jena, the home of the Company Carl Zeiss and of the Friedrich Schiller University. Tautenburg is in the southern part of the GDR, and the Observatory is about 350m above sea level. The site is less than ideal, image sizes being normally greater than or equal to 2 arcseconds and the usable observing time about 600 hr/yr. The KSO is part of the Central Institute of Astrophysics of the Academy of Sciences of the German Democratic Republic, whose headquarters are at Potsdam.

The main instrument of the KSO is a fork-mounted 2-meter telescope, manufactured by Carl Zeiss Jena. It is unique in providing a Schmidt system as well as Cassegrain and Coudé foci. The spherical main mirror weighs about 2.3 tons and is made of SITALL, a glass ceramic from the Soviet Union.

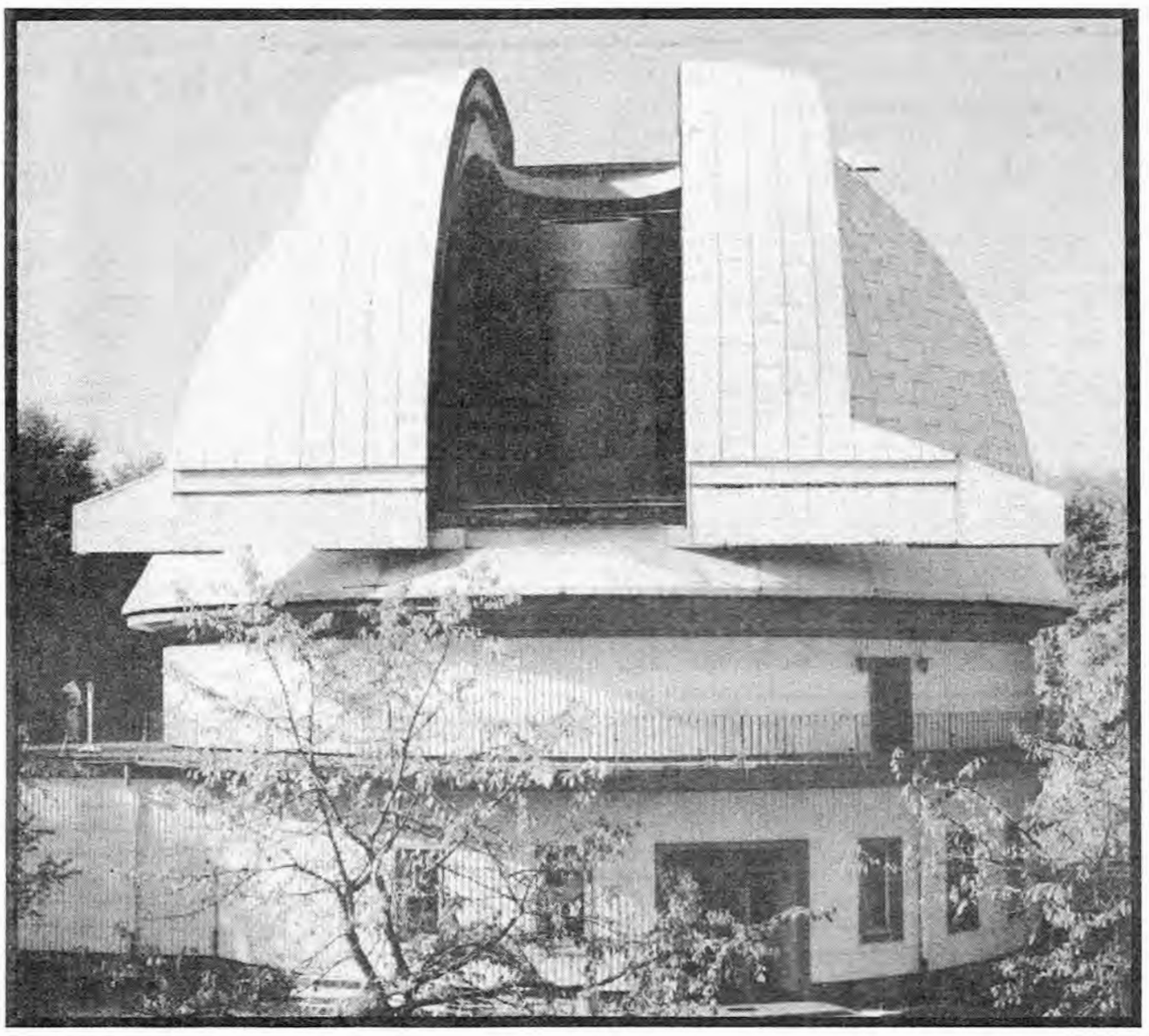
The Cassegrain system has a focal length of 21 m and provides a 3 arc-minute field of view. Two spectrographs yield reciprocal dispersions of 3-14 and 1-7.5 nm per mm, spectra being recorded on photographic plates with an image converter. The Coudé focal length is 92 m and its field of view also about 3 arc-minutes. The four Schmidt cameras of the Coudé spectrograph yield reciprocal dispersions of 0.2 to 2.4 nm per mm. Exposure times are metered automatically and plates exposed with an image converter.

The Schmidt system, with a correcting plate free aperture of 134 cm, is the largest in the world. Its 3.5° square field is imaged on 24 cm plates at a scale of 1.15 mm per arc minute. A second correcting plate has been polished as an objective prism giving a dispersion of 250 nm per mm at H gamma. Filters for UBVR photometry are available, and the exposure time is normally monitored to a background density of 0.6 to 0.8.

Normally the Schmidt mode is used during dark time and the spectrographic modes during the light run, but optical systems can be interchanged in only one hour. About 6000 Schmidt plates and 4000 spectrograms have been exposed so far.

The main measuring instruments are an iris photometer and a recording photometer. The former was manufactured in-house. On the first plate of a field, one adjusts the positions of the objects to be measured. Their coordinates are stored, and subsequent plates of the field measured automatically. The recording photometer was constructed by Carl Zeiss Jena and is connected with a computer for automatic measurement of spectrograms.

Visiting observers are very welcome at KSO, though no special support is currently available. To request observing time, send the proposed observing program to the Office of the Director, Karl Schwarzschild Observatory, Tautenburg, GDR 6901, in time for the meetings of the program committee in early May and early November.



Dome of the Karl Schwarzschild Observatory at Tautenberg. It shelters a 2-meter telescope which, uniquely in the world, can also function as a 52" Schmidt telescope.

IAU WORLD

FACILITIES

Haute Provence Observatory in Southwestern France

by Sergio A. Ilovaisky, Special to IAU Today

The Observatoire de Haute-Provence (OHP) was created in 1937 as a national facility for French astronomers, although the first plans for a privately financed observatory date from as early as 1923. The first astronomical observations were made in 1943 with the 1.20m telescope and the first research paper dates from 1944. The facilities were made available to foreign visiting astronomers in 1949. The Observatory is owned by the Centre National de le Recherche Scientifique (CNRS) and is funded by the CNRS and the Institute National des Sciences de l'Universe (INSU).

OHP is situated in southwestern France on a plateau at 650m altitude, near the village of St. Michel l'-Observatoire, Alpes de Haute-Provence (southern French pre-Alps) at +44° latitude and 5.7° East longitude. It is located 90 km East of Avignon and 100 km North of Marseille and the nearest towns are Forcalquier (12 km) and Monosque (17km).

On the average, astronomical observations are possible 60% of the time (best seasons are summer and autumn). The yearly breakdown (based on 20 years of statistics) is: 170 nights are rated as excellent, 50 nights with occasional cloud and 70 nights partly cloudy. Image quality is usually around 2" but can reach 1" at times. Seeing degrades severely when the Mistral cold wind blows from the northwest (on the average 45 days/year, mostly in winter). However, Mistral winds usually clear up the sky and subsequent good weather spells follow. On the average, extinction at OHP is roughly twice that for ESO at La Silla.

Telescopes, Instrumentation and Detectors

1.93m This telescope, built by Grubb-Parsons and operating since 1958, has Newton, Cassegrain (f/15) and Coudé foci. Currently available instruments are: a long-slit Cassegrain spectrograph (Carelec) and all-reflecting optics (dispersions of 260, 130, 33 and 17 Å/mm), a fixed high-resolution (R = 9400 and 35500) spectrograph (ISIS) in the Coudé room fed by a fiber-optic bundle from the Cassegrain focus (dispersions between 1.6 and 16 Å/mm), and a Cassegrain Focal Reducer for direct imaging (at f/2.5, f/4 and f/8 ratios). An all-purpose Cassegrain adapter allows offset TV-guiding with the focal reducer, while both Carelec and ISIS have their own guiding systems. All instruments are computer-controlled and use either of the two RCA, thin, back-illuminated 512x320 CCD chips available. A thick, front-illuminated Thomson CCD with low read-out noise is being tested. On-line image display and pre-processing is available using IHAP software from ESO. The telescope pointing is digitized, the coordinates are remotely displayed and a pointing model is being prepared. An auto-guider is also available to observers.

1.52m Built by REOSC, and operating since 1967, this telescope has only a Coudé focus. It is almost a twin of the 1.52m ESO telescope (which has in addition a Cassegrain focus). Currently available is a Coudé photographic spectrograph, also built by REOSC, which gives dispersions of 31, 20, 12 and 7 Å/mm. A new high-resolution digital spectrograph (Aurélie) is now being built and should start operating in 1989. It will feature a 3" entrance aperture, an efficient Bowen-Walraven image slicer, will have resolutions from 34,000 to 120,000 and will employ a linear Thompson CCD detector (2,048 pixels of 13 micrometers) now being developed at the Observatory. The spectograph will be micro-computer controlled but pre-processing with IHAP will be available via a link to the 1.93m HP computer.

1.2m This telescope, the first installed at St. Michel, operates since 1943. It has only a Newton focus (f/6). It is now used with a radial-velocity/classification spectrograph (Marly) giving dispersions of 40 and 80 Å/mm and using photographic plates in combination with various filters. It includes an auto-guider. A CCD camera system is now being built for direct imaging and photometry using UBVRI filters. It will also include an upgraded, remotely controlled auto-guider. Image display and reduction facilities using IHAP will be available on-line to users.

60/90cm Schmidt Built and operated in collaboration with the University of Liége in Belgium, it operates since 1970 but was entirely upgraded in 1974. It has a 4.6° field of view, uses 16x16cm plates and features an automatic plate-loading system. The plate scale is 98.8"/mm and the magnitude limit is ~20. It can be used in combination with one of two prisms. The first yields a dispersion of 400 Å/mm at 4340Å and the second is a Fehrenbach direct-vision objective-prism for radial velocity work giving a dispersion of 200 Å/mm at 4225 Å.

80cm This is the oldest telescope in use at OHP. It was first used at Forcalquier for site testing in 1932 and was later moved to St. Michel in 1945. The first foreign visiting astronomers ever to come to St. Michel used it in the summer of 1949. It features Newtonian and Cassegrain (f/15) foci. It is now used for instrument tests and can accommodate visitor equipment for special needs. It may be soon replaced by a modern, fork-mounted 1m telescope with an f/8 Ritchey-Chrétien focus.

Other, specialized telescopes are also located at OHP (1m Swiss telescope with Coravel radial-velocity spectrometer, solar-patrol telescope, radial-velocity objective-prim telescopes, equatorial tables). Night assistants are available at the major telescopes. A geophysical research station (Lidar atmospheric laser sounder) is also located on the observatory grounds.

Observing Time Requests and Financial Support

Observing time is scheduled on the semester system (January-June, *Deadline:* Sept. 1 and July-December, *Deadline:* March 1) and Observing Time request forms are available from OHP directly or from INSU in Paris. The French national programs committee (CFGT, which also deals with proposals for the 3.6m CFH and 2m Pic-du-Midi telescopes) sets priorities but scheduling is done locally. Although full financial support for travel and accommodation expenses is provided by the CNRS for all French visiting astronomers, no such support is normally available for foreign visitors.

General Facilities

Apart from the two HP-1000F 16-bit minicomputers used for data acquisition, instrument control (1.93 and 1.20m telescopes) and on-line processing (IHAP software with Ramtek image displays), an off-line image processing IHAP station is available on the 1.93m computer. In one of the main buildings there is also a VAX 11/750-compatible 32-bit minicomputer for image processing (MIDAS software with a DeAnza image display station) and general computing needs.

Other facilities include an astronomical library and a photographic laboratory. There is also an engineering bureau, a machine shop, and optical and electronics laboratories, where instruments are designed, built and serviced.

A Guest House (Maison Jean-Perrin) offers room and board facilities to visiting astronomers during their observing runs. A small resident staff of seven astronomers carry out their own research programs and help in introducing visitors to the available facilities. The entire Observatory staff, including research, technical, administrative and Guest House personnel is close to 100.

View of Haute Provence Observatory towards the southeast. From right to left: 1.93m dome, GPO dome, 1.52m dome, three domes for small instruments, 1.2m dome, 80cm dome, solar patrol telescope building, Maison Jean-Perrin and 1m Swiss telescope. In the foreground are several buildings, including the geophysical research station. Copyright CNRS.

IAU BULLETINS

Dormitory Bus Schedule

	Dorms to Convention Center		Convention Center to Dorms
	Every 20 minutes	On the Hour	Every 30 minutes
Aug. 1	12:00 - 17:00	----------	17:00 - 22:00
Aug. 2	07:30 - 09:30	10:00 - 17:00	17:00 - 22:30
Aug. 3	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 4	07:30 - 09:30	10:00 - 17:00	17:00 - 19:00
Aug. 5	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 6	07:30 - 09:30	10:00 - 20:00	----------
Aug. 7	08:00 - 12:00	13:00 - 20:00	----------
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street amd Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Special Events

Baltimore Symphony Orchestra concert: Reserved seat tickets are available at the Symphony Booth in the Pratt Street Lobby. The Symphony was acclaimed on its May 1987 tour of Vienna, Frankfurt, Munich, Leipzig, London, Moscow, and Leningrad.

Reserved Seating for the Symphony Concert: If you purchased the supper that will be served before the Symphony, you will find a voucher in your registration envelope for a reserved seat. This is not your reserved seat ticket for the concert hall. Please exchange the voucher at the Symphony booth for your reserved seat.

CRUISE TICKETS AVAILABLE FOR AUGUST 7

Tickets are still available for the Annapolis cruise on Sunday, August 7. This promises to be one of the highlights of the GA, and tickets can be purchased at the registration desk.

Convention Notices

Closing Banquet Ticket Sales: The cut-off time for sale of Closing Banquet tickets is Thursday, August 4 at 14:00.

Poster Boards: All material posted is under the supervision of the Commission Presidents and the General Secretary. Boards for scientific poster sessions are supervised by the General Secretary. Before posting anything, contact the IAU Administrative Office, Room 321.

Smoking: Please do not smoke in any meeting room.

Leftover Items: All papers not removed from the meeting rooms will be collected and thrown away at the end of each day. All personal items left in the meeting rooms will be taken immediately to the Lost and Found area, in the corridor beyond Hall A.

Brown Bag Breakfasts: The concession stand in Hall D will open daily at 08:00.

Mail Services – Communications

Mailboxes: All Members and Invited Participants are assigned a mailbox. Individual names are arranged within the country listed as your mailing address in the IAU Membership roster. Registered Guests share a mailbox with their sponsors. Within each country, there may be as many as three sections; names are alphabetized within each section. On-site registrants are in the last two sections. Labels will be printed on August 2 (to accommodate registrants from July 27-August 2) and August 5 (for those who register from the 3rd through the 5th). Remember to check all three sections to find a colleague's mailbox.

Mail: Mail for the Secretariat, *IAU Today*, or the LOC should be placed in the corresponding mailboxes in Hall C. It will be collected several times each day.

Federal Express: The Federal Express branch office closest to the Convention Center is at 36 S. Charles St., between Baltimore and Lombard Streets, in the Charles Building. Telephone: 792-8200. Weekday hours: 08:30 - 19:45. Saturday: 09:00 - 17:00.

U.S. Post Office: The branch office closest to the Convention Center is at 111 N. Calvert St., at the corner of Calvert and Fayette Streets. Weekday hours: 08:00 - 17:00; telephone: 625-1496

The Communications Office in the Pratt Street Lobby will sell U.S. postage stamps only.

Telex and Telefacsimile (Fax) Services: Services are offered at the Communications Office in the Pratt St. Lobby. Telex charges are available in that office. For telefacsimile services, the charge is $.50 within Maryland, $2.00 per page within North America and $3.00 per page internationally (page count includes cover sheet). Local telefacsimile services are free.

Alternatively, when the Communications Office is closed and you want to send a telex through Western Union, call 1-800-325-6000. The charges may be placed on a major US credit card or your home telephone number. Western Union's US domestic rate: $12.95 for the first 10 words, and $0.55 for each additional word. Overseas rates vary greatly. Ask the operator for a cost quote.

PROGRAM CHANGES, COMMISSION BUSINESS ANNOUNCEMENTS, ETC. FOR POSSIBLE PUBLICATION IN IAU TODAY MUST BE SUBMITTED THROUGH THE GENERAL SECRETARY'S OFFICE.

Travel

City Buses: A map of all routes is available at the Baltimore Information Desk. Exact change is needed for the fare, which is $0.90. If you need to transfer to another bus, give $0.10 more to the driver on the first bus and use the pass he gives you on the second bus; if you need to transfer to a third bus, ask for a pass on your second bus. For schedule and route information, see the Baltimore Information booth in the Pratt Street Lobby or call the Mass Transit Administration at 539-5000.

Message from Omega World Travel: Omega World Travel warmly welcomes the IAU General Assembly to Baltimore. Gloria Bohan, President of Omega Travel, would personally like to thank The Johns Hopkins University for selecting Omega as the official travel agent.

Omega will be on hand to assist you with your travel needs at our Travel Booth in the Pratt Street Lobby. If you should need to change your air flight arrangements, these changes may result in an air fare increase. In addition, many tickets may have been issued in other countries and Omega is not able to reissue or exchange these tickets. A ticket issued for travel in the USA by Omega, may be exchanged for a new ticket, subject to cancellation penalties. Tickets issued by other companies must be reissued by the airline and are subject to the airline cancellation penalty. However, we will be happy to assist you with the optional tour program and any travel-related questions.

Commuter Trains to Washington, D.C. from Camden Station:. Camden Station is one block from the Convention Center. The MARC commuter trains depart from Baltimore, Monday through Friday, at 05:40, 06:35, and 07:42. The trip takes 55 minutes.

In the evening, they leave Washington, D.C.'s Union Station at 17:00, 17:35, and 18:25. Prices are $9.00 round trip; $32.50 weekly rate (Monday through Friday). If you cannot return to Baltimore at those scheduled hours, you may ride the Amtrak line, using the original round trip ticket plus an extra $1.00. But you will be stopping at Pennsylvania station, at 1500 N. Charles Street, rather than the Camden station where you boarded in the morning. No seat reservation is necessary. Telephone: 1-800-325-7245, 1-800-872-7245 or 237-3402 (Camden station) or 291-4246 (Penn station)

Tour Updates

Washington, D.C. Tour: each bus requires a minimum of 30 people. You must sign up the day before by 14:00. The decision to run the bus will be made at that time.

Tour Itineraries

Baltimore by Land and by Sea, Wednesday, August 3, will include a Patriot Cruise and stops at Fort McHenry, Shot Tower and a lunch at Lexington Market. On the same day, the **Washington, D.C. Tour** will stop at the Capitol Building, Lincoln Memorial, Vietnam Memorial and the Smithsonian complex, where lunch will be served.

Annapolis Adventure on Thursday, August 4, will stop at the Maryland State House and the US Naval Academy, with lunch at the City Dock Area.

A tour of **Scenic and Historic Baltimore** on Friday, August 5, will visit the Walters Art Gallery, the Peabody Library, and the Maryland Historical Society/Baltimore Museum of Art with lunch at Haussner's Restaurant.

On Sunday, August 7, the **Observatory Tour of Washington, DC** will visit the US Naval Observatory, NASA-Goddard Space Flight Center, and the Mall adjacent to the Smithsonian. Lunch will be served.

Longwood Gardens is the site of a tour, with lunch, on Monday, August 8, and on Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania** with lunch at Divine's Carousel.

Acknowledgements

The LOC staff wishes to thank Metromedia Paging Services of Baltimore for their contributions of the pagers on which we will rely for effective communication through the General Assembly.

We also thank Standard Copier Machines, Inc. (SCMI), of Baltimore for loaning a Ricoh telefacsimile machine to the local organizers for use during the General Assembly. Fax services are available in the communications office.

OPPORTUNITIES / from page 4

objects can be detected only with large collecting areas.

Here is where international cooperation can help: agreements for exchanging observing time or instrumentation can provide the continuity that researchers need. IAU meetings provide welcome opportunities for discussing such agreements.

In ground-based astronomy the situation is not very different. Exchanges of observing time between unique facilities in the Northern and Southern Hemispheres could be particularly useful. Sharing telescopes among nations could help solve funding problems, which remain severe in some places. Perhaps astronomers would be less reluctant to close down facilities that are no longer competitive or cost effective if they knew they could gain access to others elsewhere.

Especially troublesome to young astronomers is the lack of job opportunities in many countries. It is not clear that this is due to an inadequate total number of positions. But large fluctuations in the annual availability of new jobs and insufficient numbers of retirements make finding a job difficult for those just starting their careers. Could better ways be found to induce inactive scientists to vacate their research positions? Again, such concerns crop up in different countries at different times, and the mobility fostered by IAU meetings could play a role in alleviating them.

Astronomers face many other problems as well. For example, given the increasing rate of data acquisition, how are we going to decide what to preserve in archives? And how will we insure the quality of what is archived?

But none of our present difficulties should obscure the fact that prospects for fundamental and spectacular progress between now and the IAU General Assembly in the year 2000 are excellent indeed.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. **TUESDAY, AUGUST 2, 1988** **2**

20th General Assembly Opens Today

by Stephen P. Maran

The 20th General Assembly of the International Astronomical Union begins at 14:00 today with the Inaugural Ceremony in Hall A of the Baltimore Convention Center. According to Prof. Arthur F. Davidsen of The Johns Hopkins University, who is co-chair of the Local Organizing Committee, more than 2,000 IAU members, invited participants, and guests are expected to attend.

Officers of the IAU, the LOC, and the University, which is the host institution for the General Assembly, will be joined in the inaugural program by officials of the United States government, the State of Maryland, and the city of Baltimore.

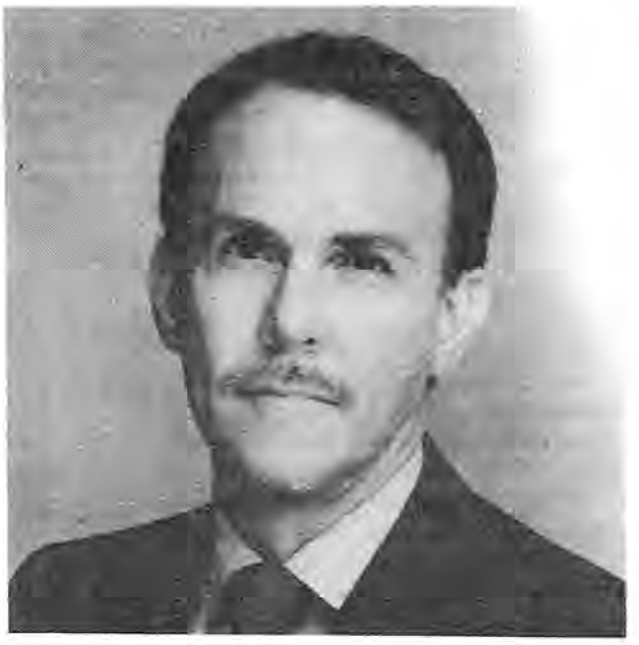
Dr. Davidsen and co-chair Prof. Riccardo Giacconi (Space Telescope Science Institute) will greet the attendees on behalf of the LOC; the National Organizing Committee chair, Prof. Frank Drake (University of California, Santa Cruz) will extend a welcome from the NOC.

The Inaugural Ceremony will be addressed by Prof. Jorge Sahade of Argentina, President of the IAU; Dr. William Graham, Science Advisor to the President of the United States; the Honorable Kurt L. Schmoke, Mayor of the City of Baltimore; and President Steven Muller of The Johns Hopkins University. Lieutenant Governor Melvin Steinberg of the State of Maryland will read a proclamation by Governor William Donald Schaefer.

Also participating will be representatives of the two principal U.S. funding agencies for astronomical research. Dr. Bassam Shakhashiri, Assistant Director for Science and Engineering Education, will represent the National Science Foundation, and Dr. Noel W. Hinners, Associate Deputy Administrator (Institutions), will represent the National Aeronautics and Space Administration. Dr. Hinners is also Chief Scientist of NASA.

The Annapolis Brass Quintet, an internationally acclaimed musical group, will provide a suitable counterpoint to greetings, speeches, and the proclamation. They will perform a new work by composer Elam Ray Sprenkle, which was specially commissioned for the IAU by Dr. Davidsen.

An Extraordinary General Assembly to conduct important IAU business will follow the Inaugural Ceremony after a 10-minute intermission.



Dr. William R. Graham, Science Advisor to U.S. President Ronald Reagan, will speak at today's Inaugural Ceremony.

ANNOUNCEMENTS FROM THE GENERAL SECRETARY

Changes in the Schedule of Scientific Sessions, with Late Additions

New Meetings:

- Session on the formation of a "European Astronomical Society" (M. Huber), Aug. 10, during lunch 12:45 - 13:45, Room 202.
- Session on QUASAT (B. Burke), Aug. 8, Sessions 1, 2, Room 202.
- Meeting of the Working Group on Interstellar Medium Nomenclature (Commission 34; H.R. Dickel).

Schedule Changes:

- **Commission 4:** 4/2 = 16/7, Report of IAU/IAG/COSPAR Working Group on Cartographic Coordinates, now scheduled for Aug. 8, Session 4, Room 313.
- **Commission 7:** Business meeting, now on Aug. 4, Session 1, Room 202.
- **Commission 12** (E. Hiei): Add sessions — Aug. 3, Working Group on Solar Eclipses, Session 2, Room 202. Aug. 6, Working Group on Solar Eclipses, Session 1, Room 202.
- **Commission 16:** Meetings on Aug. 3 are cancelled. 16/7 = 4/2, Report of IAU/IAG/COSPAR Working Group on Cartographic Coordinates, now scheduled for Aug. 8, Session 4, Room 313.
- **Commission 40:** Working Group on the Protection of Frequencies, now scheduled for Aug. 4, Session 1, Room 309.

Clarification:

- All Invited Discourses are at 18:00.

World's Astronomy Educators Gather at Williamstown

by Jay M. Pasachoff

"The Teaching of Astronomy," IAU Colloquium 105, brought 162 participants to Williamstown, Massachusetts, during 26-31 July. Attendees came from 31 countries on six continents. The meeting celebrated the 150th anniversary of Williams College's Hopkins Observatory, the oldest extant astronomical observatory in the United States.

IAU Colloquium 105 unified several strands of astronomy education, including teachers at schools, colleges, and universities; authors of textbooks and of popular books; planetarium staff, popularizers on television and radio; developers of teaching-training programs, and those developing computer and other materials for teaching astronomy. John R. Percy of the University of Toronto, Canada, chaired the Scientific Organizing Committee and this reporter, who is the U.S. national representative to Commission 46, chaired the Local Organizing Committee. The meeting was sponsored by IAU Commission 46 on the Teaching of Astronomy. Cecylia Iwaniszewska of Poland, Chair of Commission 46, welcomed the group.

A theme of the meeting was the spread of astronomy through the developing countries. Feng Ke-Jia of China, Teresa Lago of Portugal, and J. V. Narlikar of India participated in a panel on the curriculum for the training of astronomers around the world. Also, A. Aiad of Egypt, H. S. Gurm of India, Y. Vanichai of Thailand, and G. Vicino of Uruguay described the state of astronomy education in their countries. Silvia Torres-Peimbert of Mexico moderated another panel, consisting of Sam Okoye of Nigeria, Mazlan Othman of Malaysia, Alexis Troche-Boggino of Paraguay, and Luis Rodriguez of Mexico, that discussed the needs of the developing countries. They concluded that there is a general lack of prepared astronomers in addition to material resources such as libraries and instruments.

The meeting heard about many projects that are already under way. M. Gerbaldi, L. Bottinelli, and L. Gouguenheim of France discussed their "Comité de Liaison Ensignants Astronomes (CLEA)," and Phil Sadler and Darrel Hoff of the United States discussed Project STAR ("Science Teaching through its Astronomical Roots") and the materials it is developing. The question of how much so-called geometrical astronomy should be taught, given the general lack of understanding by students of such basic material as the reasons for the seasons, was discussed, for the time allotted to such teaching necessarily subtracts from time allotted to more astrophysically oriented topics.

Owen Gingerich (Harvard University) gave an illustrated lecture on astronomy textbooks over the ages,

see EDUCATORS, page 7

IAU Today **is published with the help of a generous contribution from Computer Sciences Corporation.**

JOINT DISCUSSION II

Formation and Evolution of Stars in Binary Systems

by Robert C. Smith, Special to IAU Today

Binary and multiple star systems are very common and contain some of the most exciting objects in our Galaxy, from the binary pulsar to SS433. The most detailed stellar evolution calculations, however, tend still to be for single stars. The structure of the IAU, with separate commissions for stellar constitution (35) and close binary stars (42), has sometimes contributed to keeping the two communities apart. The Joint Discussion on the formation and evolution of stars in binary systems, to be held 3 August in Room 317, will attempt to bring them together in a fruitful meeting with several other commissions.

Speakers will attempt to pick out the highlights of a very broad and active subject, from the formation of binary systems through the early stage of interacting evolution to the final stages. The scene will be set by Prof. David Latham, who will describe new observational clues on binary formation. Surprisingly, the characteristics of binaries in the halo seem to be indistinguishable from those in the disk. Thus, environment and metallicity seem to have little influence on binary formation. What are the results for other stellar populations and for stars in clusters? Other questions will be tackled by other speakers: What about stars that don't form with stellar companions; what is the evidence that they have planetary

see FORMATION, page 7

IAU NEWS

Astronomers Register Smoothly Monday Afternoon

by Ronald A. Schorn

The first of more than 2,000 members and guests expected for the 20th General Assembly of the IAU began registering at 14:00 yesterday in the Baltimore Convention Center. The registration staff started work much earlier, however, for they started setting up their booths at 08:00 on Sunday in preparation for the anticipated burst of activity. A brief shower just before the building doors opened dampened sidewalks outside, but not the spirits of the participants.

Peter B. Boyce (American Astronomical Society), who is the liaison between the Local Organizing Committee and the registration staff, said that "things are running smoothly thanks to the efforts of our hard-working staff and two years of intensive planning." Registrar Carolyn Jones (Johns Hopkins University) is in charge of the process at the Convention Center. She is being assisted by Kirsten Frazier. To insure a smooth flow of members and guests, the LOC has hired Galaxy Conference Services, a professional firm with wide experience in the field. In addition, numerous volunteers are helping with the registration.

Among the first to register on Monday afternoon was Theodore R. Gull of NASA's Goddard Space Flight Center, who was buying banquet tickets for himself and Mrs. Gull. Gull is an exhibitor as well as a member of the IAU. He is associated with the ASTRO mission, an astronomical payload that will fly attached to the space shuttle. Next in line were Kochu and Rama Menon of the University of British Columbia, Vancouver, Canada.

Hundreds of people registered rapidly on Monday, including Miriam Howard (left foreground).

IAU TODAY

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COLLOQUIUM 111

Using Pulsating Stars to Tackle Basic Problems

by Norman R. Simon, Special to IAU Today

The study of pulsating stars has applications to many areas of astronomy. However, up to now, pulsation meetings have usually focused on the objects that one investigates (Cepheids, Miras, compact variables, etc.), while the applications were treated only peripherally. In IAU Colloquium 111 (August 15-17, Lincoln, Nebraska) the major emphasis will be on such applications and, in particular, on three fundamental problems: 1) stellar evolution; 2) morphology and history of the Galaxy; and 3) comparison of the Milky Way with other galaxies.

Stellar pulsations have long been used as a major independent test of the theory of stellar structure and evolution. They can provide information on physical processes such as convection and opacities, and test the evolutionary tracks on the H-R diagram in stages ranging from the main sequence to white dwarfs. In addition, pulsating stars constitute the best means of finding the distances and ages of globular clusters and of pinning down the cosmic distance scale. The comparison of galactic and extragalactic populations can also be made advantageously using pulsating stars. While at present we do not understand stellar pulsation precisely enough to accomplish any of these ends with the desired accuracy, we may be on the verge of achieving this. An important point to note is that this discipline is a mature one, well developed enough that we can accurately assess our shortcomings. Thus, further advances can serve to supply a suitable base to anchor inquiries into fields that are presently less well understood.

In Colloquium 111 we will bring together those in the area of stellar pulsations with colleagues whose focus has been not mainly on pulsations but rather on the fundamental problems mentioned above. We hope to inspire an animated dialogue between the pulsation specialists and workers in other fields. Our major goal is a deeper integration of pulsation studies with the mainstream of astronomy.

Invited speakers cover a broad range. They will treat the evolution of medium and low mass stars and discuss stellar opacities and mass loss. The ubiquitous Baade-Wesselink technique will be reviewed. Classical Cepheids and RR Lyrae stars will receive special scrutiny. The metallicities and ages of globular clusters will be treated in the context of our understanding of galactic morphology and history. Observations of pulsating stars in other galaxies will be described and related to the general question of stellar populations. The various talks will emphasize not only what is known in given areas but also what is not known. In this way we hope that the colloquium will serve as a springboard for future work.

Cooperation with Amateur Astronomers Urged

by Leif J. Robinson

A revolution is taking place, sparked in large part by affordable technology and rapid information transfer.

For decades amateurs have contributed to the growth of modern astronomy, particularly in such fields as variable stars, planets, occultations, and comets. Often, a professional has guided these labors of love. But as the number of amateurs increases, and as their capabilities grow—yes, amateurs now use CCDs, do state-of-the-art calculations, and develop innovative instrumentation—there is a need for improved dialogue with the professional community.

The IAU recognized this need as early as 1969, when it allowed the International Union of Amateur Astronomers to become a formal partner. Alas, according to Luigi Baldinelli (Italy), the group has been ineffective. Last year the IAU sponsored Colloquium 98 on amateur-professional cooperation. (The proceedings are being edited by England's Storm Dunlop and will soon be available.)

Building on this foundation, the IAU sanctioned a meeting of amateurs and professionals on July 31 at the Space Telescope Science Institute. Taking time from his hectic schedule, IAU General Secretary Jean-Pierre Swings addressed the group. "I very much like the word 'cooperation'," he said. Many hours of deliberation followed, resulting in the following proposal that will be submitted to the IAU executive committee.

"It is evident that additional communication and cooperation between amateur and professional astronomers is needed. We therefore propose that a Working Group, perhaps under Commission 5, be established within the IAU to foster this cooperation. There is much amateur work which is of value to professionals today, and this input will grow. Making this work readily available would benefit astronomy as a whole. We urge that a statement to this effect be disseminated at the 20th General Assembly, and subsequently published by national and international astronomical organizations both amateur and professional."

The proposal was signed by 25 participants, 10 of them IAU members. If this proposal is adopted, the Working Group would propose to interact directly with commission presidents to explore new ways in which amateurs can serve the international community while receiving guidance and support.

There will soon be other opportunities to exchange ideas. Patrick Moore (U.K.) announced that the British Astronomical Association is planning for the summer of 1990 a meeting dedicated to advances in amateur astronomy. A similar gathering is being organized by U.S. astronomers Stephen Edberg and Norman Sperling, to take place in Baja California in conjunction with the 1991 total solar eclipse.

IAU NEWS

COMMISSION 46

Project STAR's for Teachers

by Jay M. Pasachoff

Project STAR, an innovative curriculum-development program for high school astronomy, was a subject of intense interest when teachers from the local region met with IAU astronomers yesterday. The meeting was sponsored by IAU Commission 46, The Teaching of Astronomy. Eighty schoolteachers, planetarium specialists, science-training center and museum personnel, and others met with 20 members of Commission 46 at the Omni International Hotel. Jean-Pierre Swings, General Secretary of the IAU, welcomed the group.

The session was arranged by Harry Shipman (University of Delaware), who also spoke on Supernova 1987A. Attendees came from Pennsylvania, Virginia, Delaware, Maryland, and the District of Columbia. Most of them have had no formal astronomy training, making sessions like this especially important to them.

Project STAR, "Science Teaching through its Astronomical Roots," is a program sponsored by the U.S. National Science Foundation. It is arranged by Irwin Shapiro of the Harvard-Smithsonian Center for Astrophysics and directed there by Philip Sadler. The project was described at the meeting by Darrel Hoff. One of Project STAR's tenets is that students' heads are often full of misinformation, and that it is insufficient to teach them new ideas. Old, incorrect conceptions must first be dealt with directly and eliminated. Project STAR has developed units for teacher use and activities using low-cost materials. Two groups of high school teachers have tested the units and activities, and workshops are planned to spread the results across the United States.

Guy Consolmagno of Lafayette College gave a "Spacecraft Tour of the Planets" to area teachers Monday at the Omni International Hotel.

Among other presentations, Guy Consolmagno (Lafayette College, Easton, Pennsylvania) gave a "Spacecraft Tour of the Planets." He used images obtained by spacecraft from several nations to tie together our new conception of the solar system. Andrew Fraknoi of the Astronomical Society of the Pacific, San Francisco, California, described "Available Resources for Astronomy Teaching." He reviewed textbooks, slide sets, videos, and other teaching aids of which people should be aware. He described a newsletter, "The Universe in the Classroom," which is circulated to tens of thousands of teachers in North America.

Henny Lamers (Laboratory for Space Research, Utrecht, The Netherlands) discussed recent astronomical observations of phenomena that can be interpreted as protoplanetary disks. He analyzed the probabilities of the existence of other solar systems on the basis of the current observations.

The teachers also were told of contemporary solar research, with an emphasis on results gleaned from observations of total solar eclipses. This reporter tried to tie together observations from ground-based observatories using coronagraphs, space satellites such as the Solar Maximum Mission, and eclipse expeditions, to show how the results are complementary in providing information about coronal structure.

The meeting was organized in cooperation with the Division of Continuing Education of the University of Delaware, which arranged in-service credits for teachers attending.

COLLOQUIUM 114

Active Debate Expected at White Dwarf Meeting

by Virginia Trimble

White dwarfs are stars whose time has come, according to Gary Wegner (Dartmouth College, Hanover, New Hampshire), organizer of Colloquium 114. Some 45 scheduled speakers and about 100 other participants clearly agree. They've had a long wait, whether you think in terms of the 126 years since Alvan G. Clark spotted the first white dwarf (Sirius B) with his newly ground 18.5-inch objective or in terms of evolutionary time scales. In the latter case, the waiting time has been the main sequence lifetime of stars of sufficiently low mass to leave cores below the Chandrasekhar limit, followed by the cooling time down to the faintest luminosity we see.

Just what that smallest mass and faintest luminosity are will be among the topics actively debated at the Colloquium, on August 15-19 at Dartmouth College. Whether the mass cut between white dwarf progenitors and neutron star progenitors is 7 or 5 or 10 solar masses is of considerable importance in predicting the galactic supernova rate and in understanding the amount of mass loss that must occur at various stages in stellar evolution. Italo Mazzitelli, Franca D'Antona, and Volker Weidemann will review these topics.

The cooling time is of concern because we see very few white dwarfs fainter than 0.0001 the brightness of our Sun. This could be trying to tell us the age of the galactic disk in a new and independent way, if the faintest stars are just as faint as time has permitted. Or it may be telling us something new about the equation of state and opacity of cool degenerate matter. James Liebert and Conard Dahn will hunt for the faintest white dwarfs, while Detlef Schönberner, Giora Shaviv, E. Garcia-Berro, and others attempt to explain what these dim stars mean.

Two days of the Colloquium will be devoted to what we do or don't understand about the surface compositions of single white dwarfs and those in binary systems. The photospheric abundances appear to reflect very complicated interactions between what came out of the planetary nebula (or subdwarf) phase and the processes of accretion, diffusion, convection, and nuclear burning. It is not clear that these account for all the combinations we see, particularly the difficult case of cool white dwarfs with metals in their atmospheres (presumably accreted from the interstellar medium) but with no hydrogen (which should have come with the heavier elements).

As for the binary white dwarfs, the main unanswered question seems to be, where are they? Yes, there are many cataclysmic variables, and a few white dwarf pairs, but the number of known white dwarf visual companions lags far behind statistical expectations, and we have no firmly established case of a close degenerate pair of the kind widely invoked to produce Type I supernovae. R. Saffer, David Tytler, and Edward L. Robinson will describe some of the searches. Believe it or not, there's lots more.

Avoid Applying Awkward Acronyms

The proliferation of lists of celestial objects based on different criteria and on data from different wavelength domains has produced a large variety of acronyms for identical objects. To keep the confusion to a minimum, the use of "The First Dictionary of the Nomenclature of Celestial Objects" is mandatory. See *Astron. Astrophys. Suppl.* Ser. 52, No. 4, 1983 and Ser. 64, 329, 1986. Examples and common problems, prepared by Dr. Helene R. Dickel, who chairs the IAU Commission 34 Working Group on Interstellar Medium Designations, are appearing in various issues of *IAU Today.*

Nomenclature "No No" No. 2: Don't Cloud The Literature

by H. R. Dickel, Special to IAU Today

Never use "LMC" to refer to anything but the Large Magellanic Cloud. The IAU has adopted "LMC" as a "constellation" name. Don't use "LMC," for example, to abbreviate "Large Molecular Cloud."

EDITORIAL

The Era of Great Discoveries Is Now

by Stephen P. Maran

New and future telescopes (see story on page 6) in space and on the ground offer tantalizing possibilities to unveil the universe in greater detail, at greater distances, and at earlier times. Yet, on the eve of the first scientific sessions of the 20th General Assembly, astronomers are already making discoveries almost undreamt of a decade ago.

In rapid succession we have seen the discovery of the giant luminous arcs and the apparently related phenomenon of an Einstein ring, the detection of a pulsar that is seemingly blasting its companion star into nothingness with a steady stream of radiation or particles, and the observation of an increasing number of what appear to be quasars and galaxies at very large redshifts, so large that the observations may bear directly on the origin of galaxies and perhaps of the universe itself.

In the solar system, several groups have just independently discovered an atmosphere on Pluto much more extensive than previously believed. Elaborate computer calculations with a digital "orrery," projecting the motions of the outer planets over more than 800 million years, now lead to the conclusion that Pluto is in a chaotic orbit. At some future time, therefore, it may fly off in another trajectory. This implies that in some sense the solar system itself may be chaotic, not a stable natural world system as imagined since historic times.

It is not just the prospect of the telescopes of the near future but the telescopes, computers, and brains of today that are making this the most exciting era ever for the practice of astronomy.

Session on Women in Astronomy Scheduled for August 8

by Vera Rubin, Special to IAU Today

A session entitled "Women Worldwide in Astronomy" will be held on Monday evening, August 8, at 19:30. Astronomers from China, France, India, Mexico, the U.S.S.R., and South Africa will discuss the present and past roles of women astronomers in their countries. The program will conclude with an open discussion chaired by Prof. Margaret Burbidge.

The session is open to all interested IAU participants and guests, and we hope that many will come and contribute to a lively evening. Note that the session will follow the Invited Discourse, and refreshments will be available to ward off starvation. Please contact Dr. Deidre Hunter or Vera Rubin for more information. The location of the session will be announced in *IAU Today.*

IAU PEOPLE

REMINISCENCES

French Hospitality Welcomed 1935 Paris General Assembly

by Sir William McCrea, FRS, Special to IAU Today

Looking back over more than half a century many features of that Paris meeting come vividly to mind. There was the extreme warmth of the French hospitality, matched only by the extreme warmth of the French weather. Eddington, who was knowledgeable on the subject, when he presided over the session on stellar interiors, seemed to believe that they were unlikely to be much hotter than Paris in July. Another thing of which one is firmly convinced is that in 1935 the day was much longer than in 1988; after a full morning of honest concentration at scientific sessions, there was time for expeditions to observatories, for sight-seeing, for some splendid receptions and for a summer evening stroll round the city.

In those relatively early days of the Union, proportionately more time than now was still devoted to its original purposes of discussing and agreeing upon international cooperation in organizational concerns like standards and observing programmes. In 1935, for instance, it was decided to adopt the term *Universal Time* for GMT reckoned from midnight. Again, there was much discussion of arrangements for observing the solar eclipse of the following year, which turned out to be almost certainly the most extensively observed eclipse there ever was.

Broadly observational matters must consequently have occupied the greater part of the attention of the Assembly. In any case, in theoretical fields there was around 1935 something of a lull. For example, I recall at the meeting no particular discussion of the expanding universe and cosmology. In stellar constitution, early in 1935, the controversy over the astrophysical consequences of relativistic degeneracy had reached its height. But, as a matter of history, whatever view astrophysicists took about it, this was not *at the time* leading to further fundamental developments in astrophysical theory. Thus, so far as my recollection goes, there was in Paris just one memorable afternoon devoted to theoretical problems. Sir Arthur Eddington presided and participants included S. Chandrasekhar, G. Lemâitre, E.A. Milne, H.N. Russell, H. Shapley. It ranged over many topics of stellar constitution, most of them raised in a fascinating informal talk by Russell. Among other things, he expounded reasons for concluding that between known stellar and planetary masses, there must be a maximum radius for a cold body. He expected this to be little more than the radius of Jupiter. With characteristic insight, Eddington himself called attention to recent laboratory discoveries about reactions between protons and other atomic nuclei, and their potential significance for energy generation in stars; this was 3 or 4 years before the identification by von Weizsäcker and H. Bethe of the particular reactions that are important in the context.

Prof. Sir William H. McCrea, circa 1972.

The President of the Union was American astrometrist Frank Schlesinger. Besides the individuals just mentioned, there were many others whose names were, or became, household words in astronomy, but it would be invidious to select any here. At the time there were, I think, some 24 member countries, all of these, as well as several non-member countries, being effectively represented, even though the total of participants (about 300) was no more than nowadays come to a single symposium. In those times translators were needed more than now. Some astronomers exhibited remarkable talent in this regard. M. Minnaert (Utrecht) was outstanding; he understood all languages so well that he seemed scarcely to notice which particular one was being spoken, so that occasionally he proceeded to "translate" into the language used by the speaker himself. At the end of the Assembly J.H. Oort (Leiden) succeeded F.J.M. Stratton (Cambridge) as General Secretary of the IAU; Stratton had held the office with great distinction for the past 10 years.

The Assembly was formally opened in the presence of the President of the Republic (Monsieur Lebrun) who with Madame Lebrun later received the members at a Garden Party at the Palais de l'Elysée. Glittering receptions were given also by the City, by the Observatory of Paris, by the Societé Astronomique de France (in the Eiffel Tower) and by the French National Committee. For most of these, to the best of my recollection, everyone appeared in evening dress.

HISTORICAL PERSPECTIVE

The Ghost in the Host: Haunting History at Johns Hopkins

by Richard C. Henry,
Special to IAU Today

Your host institution for this Twentieth General Assembly of the International Astronomical Union – the first in the U.S.A. in thirty-one years – is The Johns Hopkins University, which was founded in 1876 as, effectively, the first university in the United States, that is, the first academic institute with substantial graduate study and research leading to the Ph.D. degree.

The five initial faculty members included Henry Rowland, whose brilliant work on solar spectroscopy, using his diffraction gratings, made him an outstanding astronomer, as well as a physicist. The softball team of our Hopkins graduate students today, is called "The Rowland Ghosts," and Rowland's spirit has animated the Department of Physics (and, since 1984, "Physics and Astronomy") ever since. Rowland, who had no advanced degree, was famous for optical instrumentation, for benign neglect of graduate students, for a healthy ego, and for a deep feeling for physics--all characteristics that proudly persist.

Rowland, who had no advanced degree, was famous for optical instrumentation, for benign neglect of graduate students, for a healthy ego, and for a deep feeling for physics – all characteristics that proudly persist.

In 1884, the Hopkins astronomy effort was augmented extraordinarily when Simon Newcomb accepted a professorship. The University possessed (and still does) a 9.4-inch Charles S. Hastings refractor, as well as a transit instrument.

Then in 1890, Joseph Sweetman Ames obtained his Ph.D. under Rowland, and joined the faculty, becoming President of the University in 1929. He was a brilliant administrator and became Chairman of the National Advisory Committee for Aeronautics (which later became NASA) the same year that he became president of the American Physical Society; NASA's Ames Research Center honors his memory today.

In 1901, Rowland was succeeded by R. W. Wood, who also had no advanced degree but whose book *Physical Optics* defined the field.

The campus was originally located in downtown Baltimore, on Howard Street. In 1915, the University began its move to its present location, and in 1929, Rowland Hall was completed (despite the fact that the "Hall effect" was discovered at Hopkins, the building is in fact named only for Rowland).

In 1989, Rowland Hall will be abandoned, and the Department of Physics and Astronomy will be located in a large new building that is under construction adjacent to the Space Telescope Science Institute. The Institute's Director, Riccardo Giacconi, is also a Professor in the University Department, and is a Co-Chairman of the Local Organizing Committee for the present IAU General Assembly.

The other Co-Chairman is Professor Arthur Davidsen, Director of the Center for Astrophysical Sciences (CAS), an entity within the Department that draws together astrophysical research efforts across the campus. Davidsen and his colleagues continue the tradition of physical optics, applied to astrophysics, that Wood's successors, John Strong (now at Amherst) and William G. Fastie carried on so brilliantly, Strong in balloon astronomy, and Fastie with a host of projects including an Ebert spectrometer sent aboard Apollo 17 to the Moon.

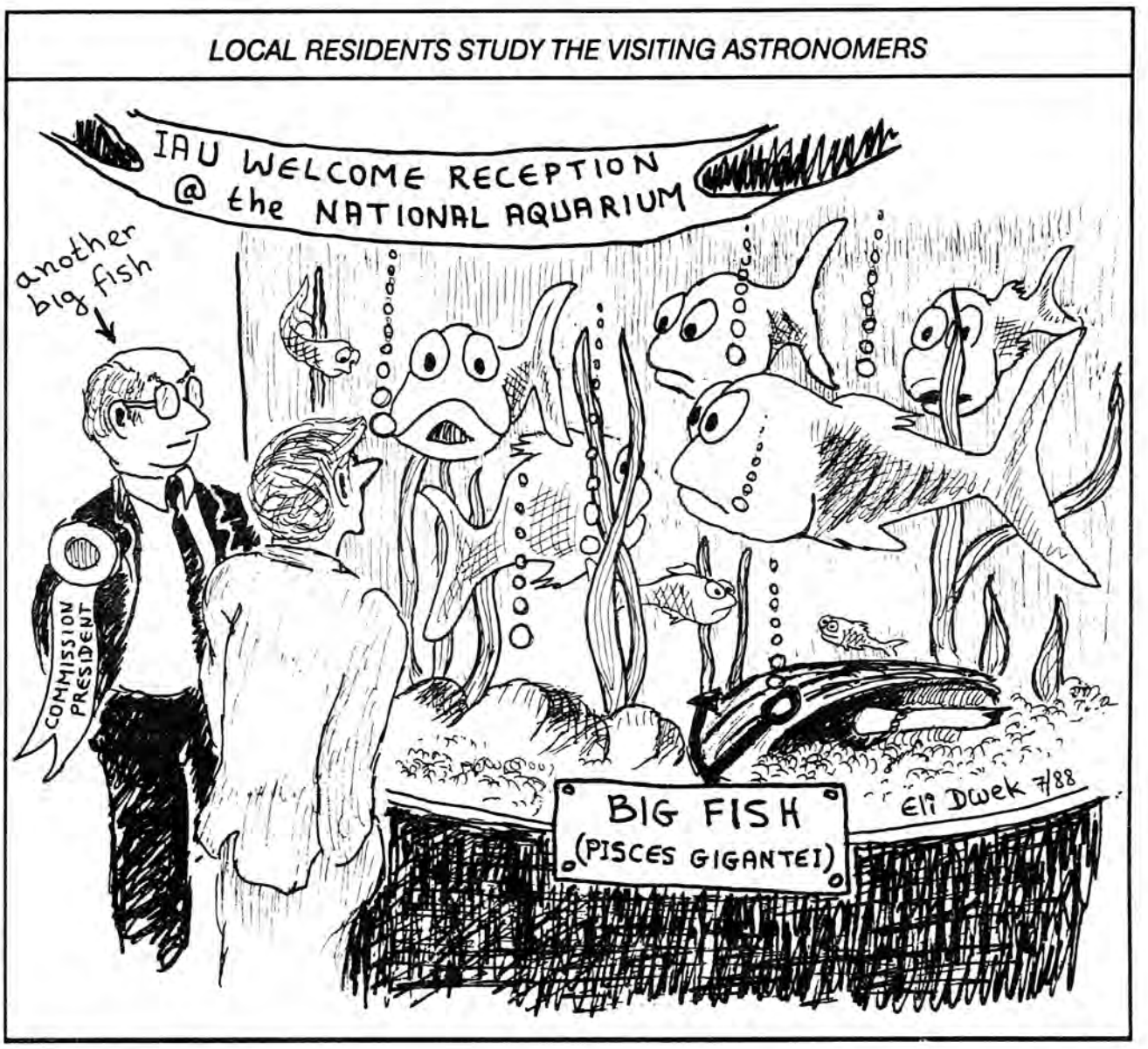
Hopkins astronaut Sam Durrance will operate the Hopkins Ultraviolet Telescope (HUT) aboard the shuttle in 1989, a reminder that Hopkins had a successful ultraviolet astronomy experiment (UVX) aboard an earlier shuttle flight. Younger Hopkins scientists such as J. Kriss, W. Blair, R. Kimble, C. Bowers, D. Morrison, and A. Uomoto, join senior colleagues Knox Long, Paul Feldman, Holland Ford, and Warren Moos (who will become CAS's second director next month) in pressing the observational exploration of the cosmos, while Colin Norman, Julian Krolik, and Alex Szalay bring theoretical understanding to the Hopkins scene.

The third leg of the Hopkins triad is to be ground-based observing, with Rosemary Wyse and Allan Sandage. With the Carnegie Institution of Washington and the University of Arizona, Hopkins plans an 8-meter telescope, "Magellan," at Las Campanas a decade hence. Rowland would be proud; I hope that his ghost is with us today!

IAU ACTIVITIES

IAU T-SHIRTS AVAILABLE. Dedicated LOC staff would gladly give you the shirts off their backs. Unfortunately, that limited offer has expired. But members, guests, and invited participants are eligible to purchase attractive souvenir T-shirts of the 20th General Assembly, shown here by Harold Screen and Karen Weinstock. Photo copyright 1988, Robert Smith.

LOCAL RESIDENTS STUDY THE VISITING ASTRONOMERS



COMMENT
General Assembly Kinematics

by Virginia Trimble

The world is full of things I don't understand (including galaxy formation, peculiar A stars, and the solar neutrino problem). But high among them ranks the kinematics of astronomers at international meetings.

Frankly, being in a foreign country where you don't speak the language, haven't mastered the currency, and can't read the maps can be a little scary. But, somehow, once you see another astronomer in the airport transit lounge, it's all okay. He may not speak the language either. It may even be Prof. Hjalmar Sciatti who, to first order, doesn't seem to speak any language at all and whose colloquia you normally avoid like the plague. For the moment, though, you are buddies, and, if you ever manage to find the Vigan Bhavan, you will automatically stand in the registration line together.

In this sense, the astronomical community is still a small town or extended family. And one of the purposes of the General Assembly is to welcome our new members to it.

By the third day of the meeting, most of us will have staked out our favorite seats in the main lecture halls and be looking askance at anyone who dares to trespass thereon. (Mine is the front left corner, and I'll thank you to keep out of it.)

Even earlier, we will have marked out our paths from hotel to conference center to food and back so reliably that we will repeatedly encounter the same few people no matter how many participants there may be. This General Assembly hasn't even started yet as of the time of writing, and I have already run into Hubert Reeves (Paris) three times. Perhaps we will eventually be going in the same direction, and have a chance to say more than ciao!

"Origin of Comets" Earns Prize

The first Arthur Beer Memorial Prize for the best contribution to *Vistas in Astronomy* in a two-year period is being awarded during the General Assembly for the paper, "The Origin of the Comets," by Drs. Mark E. Bailey (Manchester University), Victor Clube (Oxford University), and William M. Napier (Royal Observatory, Edinburgh).

THE GALLOPING GASTRONOMER

by Ethan Schreier,
Special to IAU Today

Rio Lisboa
4700 Eastern Avenue,
522-5092
Rating: ★★★

Reviewing restaurants in Baltimore is an exercise in relativity. If one starts from the perspective of major cities in the United States (e.g., New York or Boston) or of countries that take food seriously, then one can get quite negative. This applies not only to "high class" restaurants, where often the prices but rarely the food can reach the standards of many other cities, but also to Baltimore's vaunted "ethnic" restaurants. Thus, for example, most visiting Italian astronomers, not to mention U.S. astronomers who have spent any time in Italy, rapidly give up on the vast majority of restaurants in Baltimore's Little Italy and cook at home. Then again, if you know where to look, you can indeed survive eating out.

It is in the ethnic restaurants where you stand the best chance of finding reasonable and sometimes very good food, if you are willing to work on it a bit. This involves not only bravely trying new restaurants, but being willing to ask for what you want. One occasionally finds a proprietor who is actually happy when a customer wants "real" food—who asks for extra garlic or hot peppers or rare meat in dishes which are normally watered down, under-spiced, and overcooked for the American taste.

One such place is the Rio Lisboa, Baltimore's Brazilian/Portuguese restaurant. When I first tried it last year, it was good (for Baltimore) but not too exciting. Recently, I went in and decided that I wanted a spicy seafood dish, and asked whether that was possible. Negotiations proceeded rapidly and amicably, and I ended up with a large plate of clams, scallops, mussels, shrimp, and fish, not at all overcooked, in a rich spicy broth containing small hot peppers, and an extra dish of the hot peppers in oil on the side. All this was served with a salad (not interesting) and with unlimited quantities of rice, black beans, and chopped raw vegetables.

That meal was so successful that I tried again, this time with a party including a physicist who has visited Brazil several times. Appetizers included linguica (not spicy, but still quite good) and good shrimp in garlic sauce. We discovered it was possible to get not only good seafood dishes and typical stew-type meat dishes, but well-seasoned broiled lamb chops, rare as requested, as well as good steak, similarly cooked. These latter were served with fried potatoes as well as the traditional rice and beans (perfect for your average starving graduate student or postdoc). This time, the request for well-spiced food led also to a very hot chopped vegetable side dish. I should also mention that the sangria can be made with either red or white wine, and is not sickeningly sweet. We did not have any other wine, but did have several of the traditional rum with crushed lime drinks (ask for them without sugar). Definitely one of the best meals I've had in a Baltimore restaurant.

Other than isolated examples such as the above, it is better to appreciate Baltimore for what it does have, and not expect a vast selection of wonderful restaurants. For example, piles of steamed crabs with pitchers of beer can be obtained in several well-known spots. Part of the experience is watching the huge mass of crab debris grow, while you go through pitcher after pitcher of beer. Or get barbecued ribs at the Cafe Tattoo or the Corner Stable (Timonium, Maryland, is the original location, but there is a second branch on Charles Street in Baltimore).

Several of the Chinese, Indian, and Thai restaurants are quite good. Finally, if you do want a good "continental" meal, try Cafe des Artistes in the Mt. Washington village section. On several occasions, it has served up quite respectable good meals, along with a good selection of wine.

IAU WORLD

FACILITIES

New Telescopes View the Sky

by Jay M. Pasachoff

Several new ground-based telescopes to study the optical, infrared, and submillimeter spectrum have recently come into use or are planned. This new generation of telescopes will carry ground-based astronomy into the next century.

The 4.2-m William Herschel telescope, the third-largest single-mirror optical telescope in the world, saw first light in 1987. Located at the Roque de los Muchachos Observatory on La Palma in the Canary Islands at an altitude of 2400 m, it is a classical Cassegrain with a paraboloidal Cer-Vit primary mirror of f/2.5. Its mounting is altazimuth, with two Nasmyth foci. With changes easy to make among the Nasmyth and Cassegrain foci, at least three instruments can be on standby each night. The United Kingdom and the Netherlands have built the telescope.

Also in 1987, the 15-m James Clerk Maxwell Telescope went into operation at an altitude of 4200 m at the Mauna Kea Observatory in Hawaii. It was built by the U.K. in partnership with the Netherlands, and is being run in collaboration with the University of Hawaii. It is the largest telescope in the world for submillimeter observations. It will operate between wavelengths of 0.3 and 1 mm. The dish is composed of 276 curved panels, each of which is remotely controllable. It will observe through a membrane of woven polytetrafluoroethylene; at wind speeds over 70 km/h observing can be carried out through the closed shutters.

At the European Southern Observatory's station at La Silla, Chile, the New Technology Telescope should also go into use this year. It has a Zerodur mirror of 3.58-m diameter though only 24 cm thick.

Now under construction by the California Association for Research in Astronomy, including the California Institute of Technology and the University of California, is the 10-m Keck Telescope. Several of the 36 hexagonal segments that will make the main mirror have been prepared, as have mounting and control units. The enclosure on Mauna Kea has been largely constructed.

An alternative way of providing large aperture for optical observing is the lightweight, spincast mirrors being prepared by Roger Angel and his group at the University of Arizona. This spring, a 3.5-m mirror was cast, preparatory for subsequent much larger mirrors. The 3.5-m mirror will be used in a remotely controlled telescope in New Mexico by the Astrophysical Research Consortium. Future telescopes that may use the Angel mirrors include a 6.5-m upgrade of the existing Multiple Mirror Telescope and the 11-m equivalent aperture Columbus Project.

The largest project in the near future will be the Very Large Telescope (VLT) of the European Southern Observatory. It will consist of four 8-m telescopes adjacent to each other on a site yet to be selected in Chile, probably either the 2,400-m La Silla site or a new site at 2700 m at Cerro Paranal. The first of the four telescopes may be in operation in 1994. The member nations of ESO have approved the project and its funding. The VLT will be usable as individual telescopes, as a set of telescopes used together to give an equivalent aperture of 16-m, or as an interferometer.

Star trails over the dome of the 4.2-m William Herschel Telescope, Roque de los Muchachos Observatory, La Palma, Canary Islands.

REGIONAL ASTRONOMY

First Astronomical Facility for Colombia

by Kevin P. Marshall, Special to IAU Today

The Colombian Congress is at present studying a project, worth about US $1 million, which for the first time in its history will allow professional astronomical observations to be undertaken in Colombia.

The project calls for the building of a telescope 30 - 40 inches in aperture within the department of Antioquia which will come under the stewardship of the Universidad de Antioquia. Especially attractive is the Multi Mirror Telescope concept as conceived by Preston Polytechnic and Manchester University in England, whereby seven 14-inch mirrors are combined to produce the equivalent of a 40-inch instrument, at a fraction of the cost of a more conventional design. Ancillary equipment will include a photometer and a spectrometer, hopefully with a CCD detector.

Despite the fact that the project will come under the stewardship of the Universidad de Antioquia, other universities will also be active participants. The main areas of interest will be variable stars, especially Cepheids, cataclysmic variable and long period Mira-type stars, and spectral classification. Down to a magnitude of +12 there are about three million stars within reach of a modest telescope and spectrograph, yet less than four percent of the MK types have been classified.

Apart from the purely academic side of the observatory, the educational stimulus given to students, both undergraduate and postgraduate, will surely be great.

All going well, funds should be forthcoming this year after which site inspection will begin. Although Colombia cannot be said to be an ideal place for astronomy, we are optimistic that a reasonably good site can be found. With any luck, by the mid 1990s Colombia should be able to boast a really good astronomical facility.

Ten years ago such a project as the one now under study would have been unthinkable in Colombia. The dramatic change in spirit has largely come about through the work and enthusiasm of local, often very small, groups of amateurs. These amateurs, together with university staff, have organized astronomy encounters, not only at regional but also at national level. In August 1985 an international astronomical symposium was celebrated in Medellín. It is mainly due to this kind of "unofficial" work that universities and government officials became interested in beginning professional astronomy in Colombia.

Although there are as yet no plans to initiate undergraduate degrees in astronomy, the subject will form a new and exciting part of existing physics courses. The proposed telescope will, of course, be ideal for those students who wish to pursue astronomy and astrophysics at the postgraduate level.

Patrick Moore of the U.K. inaugurates Colombia's first international astronomical gathering in 1981. The author and his wife, Consuela, are behind and on either side of Moore at the microphone.

Turkish Astronomy Continues to Make Advances

by Dilhan Eryurt-Ezer, Special to IAU Today

In the last few decades, astronomy has advanced considerably in Turkey, with active research and teaching concentrated in five universities – Ankara, Istanbul, Ege, and Bogazici and the Middle East Technical University in Ankara.

We hope to create a national observatory with a one-meter telescope. Site testing between 1982 and 1986 has established that Bakirlitepe mountain, at 2500 meters but close to the coastal resort Antalya, is comparable with the world's best observatory sites. Astronomers in Turkey would welcome contributions and collaborations of every kind with individuals and institutions in other countries in furtherance of this project.

Of the existing, university-based programs, three (Ankara, Ege, and the Middle East Technical University) currently offer Ph.D. degrees in astronomy or astrophysics. Each has awarded one or two degrees per year over the past decade or so.

A national observatory at Bakirlitepe mountain would be comparable with the world's best observatory sites.

Both observational and theoretical research is actively pursued. Both Istanbul and Bogazici provide continuous monitoring of the solar photosphere in white light and the chromosphere through H-alpha and Ca K filters to keep track of flares, surges, filaments, coronal asymmetry, and correlations among these phenomena. Another important area of research concentration, at Ankara and Istanbul, is regular photometry of interacting binaries and variable stars. The main theoretical groups, with interests in binary and variable stars as well as stellar structure and evolution in general, are at Ege and the Middle East Technical University. This latter also has the most extensive university computing facilities available in Turkey, and is in the process of constructing a university observatory, largely for teaching purposes. Foreign students are welcomed.

IAU PEOPLE

Frank Edmondson: No. 1 at Age 76 and Still Going Strong

by Richard Tresch Fienberg

When invitations to the 20th General Assembly were mailed to more than 6,000 IAU members last spring, Frank K. Edmondson was the first to respond. "The reason was a very practical one," says the retired Indiana University professor. "I looked at the prices of the hotels and said to my wife, Margaret, 'We want a double room at the Omni, where a double and single are at the same rate and lower than any other hotel.' I sent my registration in the day after the forms arrived," he chuckles, "just to be sure we'd get a room at the Omni!"

The Edmondsons recounted their long association with the IAU during an interview yesterday. This is Prof. Edmondson's twelfth General Assembly. Except for the 1985 meeting in New Delhi, India, he has attended every one since the 1952 gathering in Rome, Italy. Mrs. Edmondson does not lag far behind: the Baltimore meeting is her eleventh General Assembly since 1955.

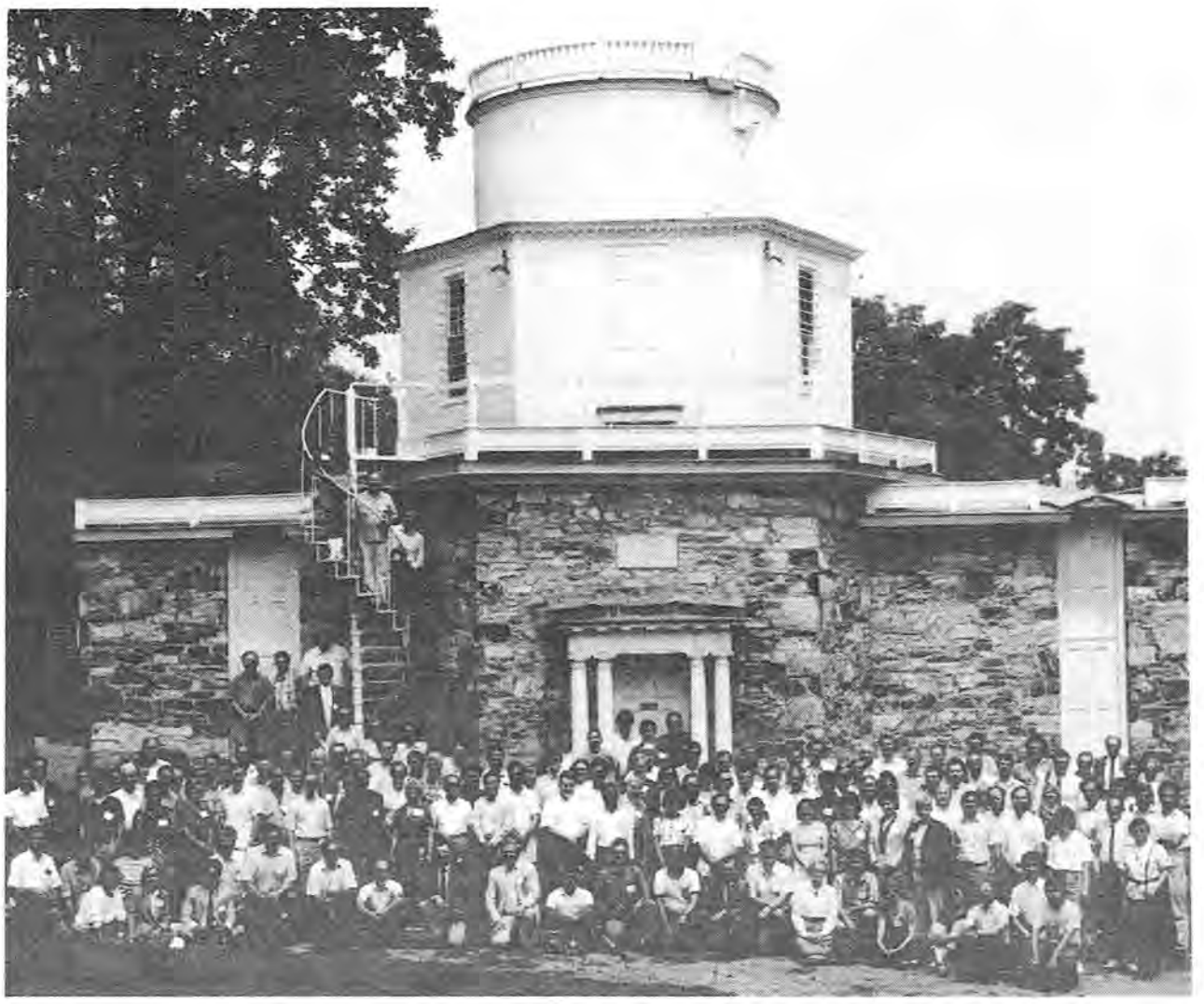
Tomorrow, Prof. Edmondson will speak to Commission 41, History of Astronomy. He will describe an important role played by the Ford Foundation in creating the European Southern Observatory more than 25 years ago. Prof. Edmondson also plans to attend sessions of Commission 20 relating to his life-long interest, asteroids. But the main reason the Edmondsons have come to Baltimore, they say, is "to meet a lot of old friends, both personal and professional."

An important contributor to establishing the U. S. national optical observatories, Prof. Edmondson was President of the Association of Universities for Research in Astronomy, Inc. (AURA) from 1962 to 1965, and Treasurer of the American Astronomical Society from 1954 to 1975. He is presently writing a history of AURA and the observatories it operates on Kitt Peak and Cerro Tololo. Of this he says with eyes sparkling, "It's mainly detective work, aided by an occasional miracle."

Prof. Edmondson met his wife at Lowell Observatory in Flagstaff, Arizona, where he was employed taking plates for Clyde Tombaugh. Margaret Russell was spending the summer there with her father, Henry Norris Russell. "I had one date with her," recalls Prof. Edmondson, "and we were engaged the next day. I'm glad I became an astronomer, because otherwise I wouldn't have met Margaret!"

Local Organizing Committee co-chair Arthur F. Davidsen, noting that yesterday was Frank Edmondson's 76th birthday, said he would mark the occasion at the informal reception in the Convention Center. Prof. Edmondson was there, offering this advice to young astronomers: "Don't be discouraged by today's job situation or grant-support situation. If you're deeply interested in astronomy, stay with it."

Margaret and Frank Edmondson. Photo by Richard Tresch Fienberg.



Participants in IAU Colloquium 105 in front of the Hopkins Observatory of Williams College, Williamstown, Massachusetts, the oldest extant astronomical observatory in the U.S.

EDUCATION / from page 1

including Copernican times, and Norman Sperling (U.S.) discussed that country's introductory textbooks since the 19th century. Sperling showed graphs of the relative amounts of material in different categories over time, such as the sharp decline in the positional astronomy category relative to stellar astrophysics over the last century.

Exhibits and poster sessions included 165 items from the Astronomical Society of the Pacific and a display of The Travelling Telescope, a project of Commission 46. An 8-inch telescope equipped with a spectrograph and photometer is available for periods of up to several months.

Participants in the Colloquium enjoyed the rolling countryside of New England's Berkshire Mountains. The Clark Art Institute and the Chapin Library of Rare Books arranged a special exhibition, "Urania Observed," of prints (by Trouvelot and others), paintings of Donati's Comet and other subjects, rare books (Bode and Bayer atlases, for example), and objects such as a 19th-century silver tankard that is engraved with planets and a comet. The final day ended with a concert of the Boston Symphony Orchestra at their summer home, Tanglewood. Percy and Pasachoff are editing the proceedings for Cambridge University Press.

Support for Colloquium 105 came from the Perkin-Elmer Corp., the U.S. National Science Foundation, the IAU, The Royal Astronomical Society, The Royal Astronomical Society of Canada, and the American Association of Physics Teachers.

FORMATION / from page 1

mass companions? What clues to the formation process come from pre-main-sequence binaries and how common are such stars? Is there direct evidence for disks in regions of star formation, and are they related to binary formation?

Binaries are believed to form in at least three different ways. An initial gas cloud may fragment during collapse, forming two or more stars. Alternatively, a rapidly rotating protostar may be formed that splits in two as a result of rotational instabilities. The analytical theory of this process has a long history and speakers will describe both the current mathematical status of fission theory and recent progress in numerical simulations. A third way of forming binaries is by capture in regions of high star density, such as near the centers of globular clusters. Are globular cluster X-ray sources formed in this way? What is the further dynamical evolution of close binaries in clusters? We hope to have a film showing the dynamical evolution of triple systems.

After binary systems have formed they undergo a period of "undistributed" evolution, whose length depends on the initial masses and orbital period. Prof. Johannes Anderson will describe this quiet phase as a backdrop to the dramatic later phases when the stars swell up and start to interact. The well-known Algol systems, the subject of a separate symposium after the General Assembly, are the classic examples of the effects of mass exchange in early post-main-sequence evolution. What happens later? Can mass and angular momentum be lost in a common envelope phase, so that wide binaries with orbital periods measured in years become interacting systems that could fit inside the Sun and whip around one another in a few hours? How can we understand the formation of degenerate stars in binaries? Are they just the cores of red giants that have lost their hydrogen envelopes? Why are the millisecond pulsars spinning so fast? Speakers will attempt to answer these and other questions.

The last session of the Joint Discussion will concentrate on cataclysmic and related binaries. Novae, once thought to be one-time events, are now believed to recur, but how often? Do they "hibernate" between outbursts? Magnetic cataclysmics ("polars") show a strange peak in their orbital period distribution. Is it significant? Does it tell us anything about their evolution, or about the masses of the magnetic white dwarfs? Can accretion onto a white dwarf from a companion trigger a supernova explosion?

Whatever the answers to all these questions, there will certainly be disagreement and lively discussion. Prof. Virginia Trimble has bravely agreed to try to summarize the whole day.

IAU BULLETINS

Air & Space Museum Open to IAU Participants

BY David DeVorkin, Special to IAU Today

If you are planning to visit the Washington Mall and the Smithsonian's many museums, you should know that the National Air and Space Museum will offer *free* admission to its Samuel P. Langley IMAX Theater and Albert Einstein Planetarium productions to anyone wearing an IAU name badge throughout the General Assembly.

The planetarium, on the second floor mezzanine, is showing "State of the Universe," an artistic tour of cosmic exotica. Planetarium shows start every morning at 10:50 (except for Tuesday and Thursday when the first show is at 12:50) and repeat every 40 minutes. The last show is at 18:50.

The IMAX theater is showing five films: "The Dream is Alive" depicts life aboard the space shuttle and its views of Earth; "To Fly!" is a celebration of flight; "On the Wing" explores analogies between natural and artificial flight; "Living Planet" reveals the wonders of the natural world; and "Flyers" is a fictionalized dramatic recreation of the life and times of a stunt flyer. Showings begin at 9:25 daily and run approximately every half hour.

If you wish to attend any of these presentations, show your IAU badge at the ticket booth in front of the IMAX theater on the first floor of the museum and you will be issued a ticket. You may also obtain planetarium tickets at the IMAX theater booth.

It is best to obtain tickets early in the day because many showings fill quickly. If the ticket line is very long, go (quietly) to the left-hand window marked "Reservations" and they will issue you a ticket.

Dormitory Bus Schedule

	Dorms to Convention Center		Convention Ctr. to Dorms
	Every 20 minutes	On the Hour	Every 30 min.
Aug. 2	07:30 - 09:30	10:00 - 17:00	17:00 - 22:30
Aug. 3	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 4	07:30 - 09:30	10:00 - 17:00	17:00 - 19:00
Aug. 5	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 6	07:30 - 09:30	10:00 - 20:00	----------
Aug. 7	08:00 - 12:00	13:00 - 20:00	----------
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street amd Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Special Events

Baltimore Symphony Orchestra concert: Reserved seat tickets are available at the Symphony Booth in the Pratt Street Lobby. The Symphony was acclaimed on its May 1987 tour of Vienna, Frankfurt, Munich, Leipzig, London, Moscow, and Leningrad.

Reserved Seating for the Symphony Concert: If you purchased the supper that will be served before the Symphony, you will find a voucher in your registration envelope for a reserved seat. This is not your reserved seat ticket for the concert hall. Please exchange the voucher at the Symphony booth for your reserved seat.

Convention Notices

Poster Boards: All material posted is under the supervision of the Commission Presidents and the General Secretary. Boards for scientific poster sessions are supervised by the General Secretary. Before posting anything, contact the IAU Administrative Office, Room 321.

Closing Banquet Ticket Sales: The cut-off time for sale of Closing Banquet tickets is Thursday, August 4 at 14:00.

Smoking: Please do not smoke in any meeting room.

Leftover Items: All papers not removed from the meeting rooms will be collected and thrown away at the end of each day. All personal items left in the meeting rooms will be taken immediately to the Lost and Found area, in the corridor beyond Hall A.

Brown Bag Breakfasts: The concession stand in Hall D will open daily at 08:00.

Program changes, commission business announcements, etc. for possible publication in *IAU Today* must be submitted through the General Secretary's office.

Mail Services – Communications

Mailboxes: All Members and Invited Participants are assigned a mailbox. Individual names are arranged within the country listed as your mailing address in the IAU Membership roster. Registered Guests share a mailbox with their sponsors. Within each country, there may be as many as three sections; names are alphabetized within each section. On-site registrants are in the last two sections. Labels will be printed on August 2 (to accommodate registrants from July 27-August 2) and August 5 (for those who register from the 3rd through the 5th). Remember to check all three sections to find a colleague's mailbox.

Mail: Mail for the Secretariat, *IAU Today*, or the LOC should be placed in the corresponding mailboxes in Hall C. It will be collected several times each day.

Federal Express: The Federal Express branch office closest to the Convention Center is at 36 S. Charles St., between Baltimore and Lombard Streets, in the Charles Building. Telephone: 792-8200. Weekday hours: 08:30 - 19:45. Saturday: 09:00 - 17:00.

U.S. Post Office: The branch office closest to the Convention Center is at 111 N. Calvert St., at the corner of Calvert and Fayette Streets. Weekday hours: 08:00 - 17:00; telephone: 625-1496

The Communications Office in the Pratt Street Lobby will sell U.S. postage stamps only.

Telex and Telefacsimile (Fax) Services: Services are offered at the Communications Office in the Pratt St. Lobby. Telex charges are available in that office. For telefacsimile services, the charge is $.50 within Maryland, $2.00 per page elsewhere within North America, and $3.00 per page internationally (page count includes cover sheet). Local telefacsimile services are free.

Alternatively, when the Communications Office is closed and you want to send a telex through Western Union, call 1-800-325-6000. The charges may be placed on a major U.S. credit card or your home telephone number. Western Union's U.S. domestic rate: $12.95 for the first 10 words, $0.55 for each additional word. Overseas rates vary greatly. Ask the operator for a cost quote.

CRUISE TICKETS AVAILABLE FOR AUGUST 7

Tickets are still available for the Annapolis cruise on Sunday, August 7. This promises to be one of the highlights of the General Assembly, and tickets can be purchased at the registration desk.

Travel

City Buses: A map of all routes is available at the Baltimore Information Desk. Exact change is needed for the fare, which is $0.90. If you need to transfer to another bus, give $0.10 more to the driver on the first bus and use the pass he gives you on the second bus; if you need to transfer to a third bus, ask for a pass on your second bus. For schedule and route information, see the Baltimore Information booth in the Pratt Street Lobby or call the Mass Transit Administration at 539-5000.

Commuter Trains to Washington, D.C. from Camden Station:. Camden Station is one block from the Convention Center. The MARC commuter trains depart from Baltimore, Monday through Friday, at 05:40, 06:35, and 07:42. The trip takes 55 minutes.

In the evening, they leave Washington, D.C.'s Union Station at 17:00, 17:35, and 18:25. Prices are $9.00 round trip; $32.50 weekly rate (Monday through Friday). If you cannot return to Baltimore at those scheduled hours, you may ride the Amtrak line, using the original round trip ticket plus an extra $1.00. But you will be stopping at Pennsylvania station, at 1500 N. Charles Street, rather than the Camden station where you boarded in the morning. No seat reservation is necessary. Telephone: 1-800-325-7245, 1-800-872-7245 or 237-3402 (Camden station) or 291-4246 (Penn station)

Message from Omega World Travel: Omega will be on hand to assist you with your travel needs at our Travel Booth in the Pratt Street Lobby. If you should need to change your air flight arrangements, these changes may result in an air fare increase. In addition, many tickets may have been issued in other countries and Omega is not able to reissue or exchange these tickets. A ticket issued for travel in the U.S.A. by Omega, may be exchanged for a new ticket, subject to cancellation penalties. Tickets issued by other companies must be re-issued by the airline and are subject to the airline cancellation penalty. However, we will be happy to assist you with the optional tour program and any travel-related questions.

Tour Updates

Washington, D.C. Tour: each bus requires a minimum of 30 people. You must sign up on the day before by 14:00. The decision to run the bus will be made at that

Tour Itineraries

Baltimore by Land and by Sea, Wednesday, August 3, will include a Patriot Cruise and stops at Fort McHenry, Shot Tower and a lunch at Lexington Market. On the same day, the **Washington, D.C. Tour** will stop at the Capitol Building, Lincoln Memorial, Vietnam Memorial and the Smithsonian complex, where lunch will be served.

Annapolis Adventure on Thursday, August 4, will stop at the Maryland State House and the US Naval Academy, with lunch at the City Dock Area.

A tour of **Scenic and Historic Baltimore** on Friday, August 5, will visit the Walters Art Gallery, the Peabody Library, and the Maryland Historical Society/Baltimore Museum of Art with lunch at Haussner's Restaurant.

On Sunday, August 7, the **Observatory Tour of Washington, DC** will visit the U.S. Naval Observatory, NASA-Goddard Space Flight Center, and the Mall adjacent to the Smithsonian. Lunch will be served at the Mall.

Longwood Gardens is the site of a tour, with lunch, on Monday, August 8. On Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania** with lunch at Divine's Carousel.

Acknowledgements

The LOC staff wishes to thank Metromedia Paging Services of Baltimore for their contributions of the pagers on which we will rely for effective communication through the General Assembly.

We also thank Standard Copier Machines, Inc. (SCMI), of Baltimore for loaning a Ricoh telefacsimile machine to the local organizers for use during the General Assembly. Fax services are available in the communications office.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. WEDNESDAY, AUGUST 3, 1988

3

Dignitaries Address Inaugural Ceremony

by Laurence A. Marschall

Baltimore Mayor Kurt L. Schmoke, calling astronomy "the stuff of dreams and youthful fascination," welcomed participants to the Inaugural Ceremonies of the 20th General Assembly yesterday afternoon in the Baltimore Convention Center. Baltimore, he said, was being "treated to something special," and he wished the IAU members all success in their forthcoming scientific endeavors. The Mayor was joined by Lieutenant Governor Melvin A. Steinberg, who read a proclamation by Maryland Governor William Donald Schaefer, designating August 2-11 as IAU Days in Maryland.

Departing from his prepared speech, Steinberg expressed pride in the recent advances of astronomy, optimism about the future, and support for science as a bridge between the nations. His sentiments were echoed by Dr. William R. Graham, Science Advisor to U.S. President Ronald Reagan, who mentioned the present U.S. administration's support for astronomy, and who linked such astronomical successes as the International Ultraviolet Explorer and the Infrared Astronomical Satellite to the type of international cooperation fostered by the IAU. By "combining our resources, human and physical," said Graham, "we can further accelerate the pace of our long adventure in scientific discovery."

Joining in the welcoming ceremonies were Prof. Jorge Sahade of Argentina, President of the IAU; President Steven Muller of The Johns Hopkins University; Prof. Arthur Davidsen of The Johns Hopkins University; Prof. Riccardo Giacconi of the Space Telescope Science Institute; Prof. Frank Drake of the University of California, Santa Cruz; and Dr. Noel W. Hinners of the National Aeronautics and Space Administration.

The Honorable Kurt L. Schmoke, Mayor of the City of Baltimore, called upon participants of the IAU 20th General Assembly to explore Baltimore and meet its young people.

Sahade Blasts Celestis Project

by Leif J. Robinson

In his speech officially opening the 20th General Assembly yesterday, IAU President Jorge Sahade said that all things are not "rosy" in astronomy. He called attention to increasing sky pollution and specifically cited as a potential major offender the Florida-based Celestis Corp. Celestis intends to place into orbit bright canisters of cremated human remains.

JOINT DISCUSSION I

Electrifying the Journals

by Stephen P. Maran

New and future techniques for electronic publishing and for easy electronic access to astronomical databases will be discussed in today's Joint Discussion I. JD I, on Documentation, Data Services and Astronomers, is sponsored by IAU Commission 5 and was planned by a Scientific Organizing Committee headed by Dr. George A. Wilkins of the Royal Greenwich Observatory. It's a novel

see ELECTRIFYING, page 3

IAU Today **is published with the help of a generous contribution from Computer Sciences Corporation.**

INVITED DISCOURSE

International Cooperation Hallmark of Halley Effort

by Stephen P. Maran

This evening's Invited Discourse on the "Last Apparition of Comet Halley" is representative of the strong international and multidisciplinary cooperation that characterized the scientific community's response to the long-awaited appearance of the famous comet. Speakers from the Federal Republic of Germany and the Union of Soviet Socialist Republics, Richard West and Vassily I. Moroz, will jointly deliver the Discourse, summarizing key findings and conclusions from the work of more than 1,000 astronomers in many nations of the world, dozens of telescopes and analytical instruments, and five space probes.

Dr. West, the distinguished Danish astronomer and well-known former Secretary General of the IAU, is head of the Information and Photographic Service at the European Southern Observatory headquarters in Munich. An astrometry specialist for the International Halley Watch, he will discuss the groundbased observations made of Comet Halley since October 1982, when it was first detected since last photographed in 1911. Drawing upon the results from spectroscopy and photometry, as well as astrometry and other methods, he will describe the comet's development, the spectacular events that occurred both near the nucleus and in the tail, and will provide an update on the unique data obtained in April and May of this year when the departing comet was already more than 1200 million kilometers from the Sun.

Dr. Moroz, noted infrared astronomer, is Head of the Department of the Planets and Small Bodies of the Solar System at the Institute of Space Research of the Academy of Sciences of the U.S.S.R. in Moscow. He will report on space observations by the probes VEGA-1, VEGA-2, Giotto, Suisei, and Sakigake. From close-up imagery obtained by the VEGAs and Giotto, astronomers learned the size, shape, albedo, and topographic distribution of active phenomena on the cometary nucleus. As he will explain, besides confirming Fred L. Whipple's dirty snowball model for the nucleus (1950), the high-resolution images illuminated previously unknown or unestablished properties of the nucleus, including its very low albedo and strong surface inhomogeneities, the high temperature characterizing at least part of its surface in March 1986, and the presence of organic matter.

Colleagues around the world are as likely to know Richard West for his cometary work as for his role in the development and use of Schmidt telescopes, his interest in the future very large telescopes, and his work in fostering international cooperation through the IAU and ESO. He has applied Schmidt and other telescopic techniques in survey and astrophysical investigations, as well as astrometry, to the study of comets, galaxies, planetary nebulae, binary stars, and most recently, to Supernova 1987A.

We all know Vassily Moroz through his many publications on the exploration of Mars and Venus. His infrared observations of Comet Halley are the latest in a long line of experimental space research. That work ranges from studies of Martian carbon dioxide and clouds with Mars-3 to investigations of the atmosphere and cloud layer of Venus with Venera 9, 10, 11, 12, 13, 14, 15, and 16. Although Moroz is inextricably associated with the infrared spectrometry of these planets, he has not hesitated to descend into the ultraviolet in his work.

IAU TODAY is published daily, August 1-11, 1988, except Sunday, August 7. Back issues are available at the GA Information Booth in the Pratt Street Lobby.

IAU NEWS

SYMPOSIUM 136

Galactic Magnetosphere Excites Audience

by Mark Morris, Special to IAU Today

A general recognition of the important role played by the magnetic field at the center of our Galaxy was an important aspect of the first IAU symposium to be devoted to the galactic center. Symposium 136, on July 25-29 at the University of California, Los Angeles, was attended by about 140 people, including many of the most active investigators of the galactic center. The results reported on the central magnetic field were only a few of the many impressive recent observational advances in radio and infrared astronomy that have stimulated much activity and produced impressive imagery, obtained in both spectral lines and the continuum.

Perhaps the most substantial change since previous gatherings on the galactic center is the almost universal acknowledgement that the magnetic field there is uniform, strong, has a special geometry, and may be dynamically important. The Very Large Array radio telescope has revealed a variety of filamentary structures within the inner 50 parsecs having a predominant orientation perpendicular to the galactic plane, and evidence suggests that these filaments define magnetic lines of force. The "Radio Arc" is the clearest example of such filaments, and at least two magnetohydrodynamical models for the Arc were presented, one involving induced large-scale currents and the other involving magnetic loops expanding away from the central gas disk. In any case, it appears that the large-scale field is poloidal and that its apparent rigidity, in the face of the surrounding tumultuous interstellar medium, implies a strength of at least a milligauss. Dynamos that might generate such a field were considered, but at present there is no satisfactory dynamo theory. One intriguing possibility is that the dynamo might be linked to explosive events occurring at the nucleus.

Recent infrared polarization studies of the inner 5 - 10 parsecs also enable one to determine the magnetic field direction on the basis of the field's alignment of thermally emitting grains. In this way the circumnuclear disk appears to be planar and possibly toroidal in character. An infalling stream of matter (the northern arm of Sgr A West) has its magnetic field aligned along its length.

Only a few more of the major issues discussed at the symposium can be mentioned here. This account, therefore, is necessarily incomplete and somewhat biased concerning the predominant importance of these issues to the future development of the field of galactic center research.

The Central Mass Distribution

The distribution of starlight determined from near-infrared observations has long been used as an indicator of the radial mass distribution in the Galaxy. However, it is now supplemented with kinematical information about both stars and gas, and the mass distribution has been followed to the innermost parsec. Stellar information comes from direct observations of molecular bands in individual late-type giants, and from VLA searches for characteristic OH spectra from OH/IR stars. The velocity dispersions as a function of radius can, with some assumptions, yield the enclosed mass. Observations of the gas tend to give an enclosed mass in terms of orbital velocity, although the evidence from spectroscopy of gas is subject to uncertainty about nongravitational effects such as magnetic fields and winds. Nonetheless, stars and gas appear to give consistent results: an enclosed mass which goes as $R^{1.2}$ down to about the inner parsec, where the enclosed mass appears to level off at about 4×10^6 solar masses. One can not yet conclude that a compact object is present, however, since it is possible to imagine a stellar cluster that gives the inferred gravitational field. Such a cluster would have what many consider to be unlikely characteristics, so many of the symposium participants felt that a compact object is implied. If more stars within a parsec can be measured, and if the inner limit of the enclosed mass distribution can be improved by only a factor of two, then the situation should be clarified.

A Central Black Hole?

Recent observations suggest that some nearby galaxies have unseen masses that substantially exceed the upper limit to the mass of any such component in our galactic nucleus. Perhaps out of pride, we would like to endow our galactic nucleus with a black hole, and few at the symposium questioned the hypothesis that a black hole is present there. The debate centered on its mass, with one camp arguing that it cannot exceed a few hundred solar masses and the other maintaining that the evidence favors a value of a few million solar masses.

The considerable uncertainty in the likely mass of a central black hole is due partly to the ambiguity about which of the observable entities lying within the central few arcseconds should be identified as the black hole candidate. There is the apparently unique, compact, nonthermal radio source Sgr A*, which has no known infrared counterpart and which shows no proper motion in VLBI studies, with an upper limit to its transverse motion of about 40 km/s. It is tempting to identify Sgr A* with an accretion disk/magnetosphere around a massive black hole, although the lack of infrared emission may be a problem. Alternatively, there are the several components of the closely adjacent but distinct infrared source IRS16, which, like Sgr A*, is consistent with the position of the dynamical center of the Galaxy. IRS16, however, also appears to define the luminosity center of the Galaxy. High spatial resolution photometry and recent lunar occultation experiments reveal that at least three of the 4 or 5 separate components of IRS16 are unresolved on a linear scale of a few times 10^{16} cm. It remains to be determined (and many are trying) whether these are curious stellar objects or something else. Interest in the components of IRS16 is compounded by the presence of very wide, near-IR emission lines of H and He, perhaps indicative of a massive wind.

see MAGNETOSPHERE, page 7

COMMISSION LEADERS' RECEPTION. Prof. Daiichiro Sugimoto (Japan), President of Commission 35, on Stellar Constitution, is shown at the University Club in Baltimore on August 1. There, the University of Maryland hosted a reception to honor the Presidents and Vice Presidents of Commissions. Dignitaries and faculty of local institutions also attended.

OBITUARY

Bengt Strömgren: 1908-1987

by Bengt Gustafsson, Special to IAU Today

Bengt Strömgren started early as a scientist. His father, Elis Strömgren, was director of Copenhagen University Observatory and encouraged his young son to observe comets and minor planets, and calculate orbits and ephemerides. At 17, Bengt made pioneering experiments with photoelectric registration of star transits. In 1929, at the age of 21, he received his Ph.D. from Copenhagen University; his thesis was on the determination of parabolic orbits of comets.

Bengt Strömgren's interests from 1929 were, however, mainly in astrophysics. Niels Bohr and the vigorous scientific activity around him in Copenhagen gave important inspiration. Strömgren's initial astrophysical contributions were in the theory of stellar structure. In 1932 he showed, independently of Eddington's simultaneous demonstration, that hydrogen must be a major constituent of stars.

In 1936 Strömgren accepted an invitation from Otto Struve to join the University of Chicago as an assistant professor. In his recollections, published in *Annual Reviews of Astronomy and Astrophysics 1983*, he characterized his 18 months in Chicago and at Yerkes Observatory as a particularly happy period in his scientific life. He long recalled his discussions with S. Chandrasekhar and W. W. Morgan and the stimulus provided by Struve's discovery of large areas in the Milky Way that radiated very faintly in the Balmer lines. In a famous analysis of the ionization of interstellar hydrogen by stars, Strömgren demonstrated that the transition zone between fully ionized and neutral hydrogen in a gas cloud around a hot star was quite thin, and thus the "Strömgren Spheres" were well defined. In a later stay at Yerkes (1947-48) he returned to the problems of interstellar gas.

In 1938 Strömgren returned to Copenhagen University to take up a full professorship, and two years later he succeeded his father as the director of the Observatory. He now modeled the solar photosphere, with the newly

see STRÖMGREN, page 8

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IAU NEWS

COLLOQUIUM 113

First Meeting on Luminous Blue Variables Set for August 15-18

by Kris Davidson, Special to IAU Today

The brightest, most massive evolved stars are LBVs – Luminous Blue Variables. Famous examples are eta and AG Carinae, P Cygni, S Doradus, and the Hubble-Sandage variables in M31 and M33. Some notable modern additions to the class are R71 R81, and R127 in the LMC, and Ofpe/WN9 stars. LBVs are usually between 10^5 and $10^{6.5}$ times as luminous as the Sun. Sometimes "hypergiant" refers to the same stars.

During the past decade we have begun to comprehend the unity of the LBV phenomenon. LBVs now appear relevant to such diverse topics as mass loss, surface composition, and evolution of massive stars in general; turbulent hydrodynamics near the Eddington Limit; origins of Wolf-Rayet subtypes; statistics of formation of the most massive stars; and the physical basis for using red supergiants as extragalactic distance indicators.

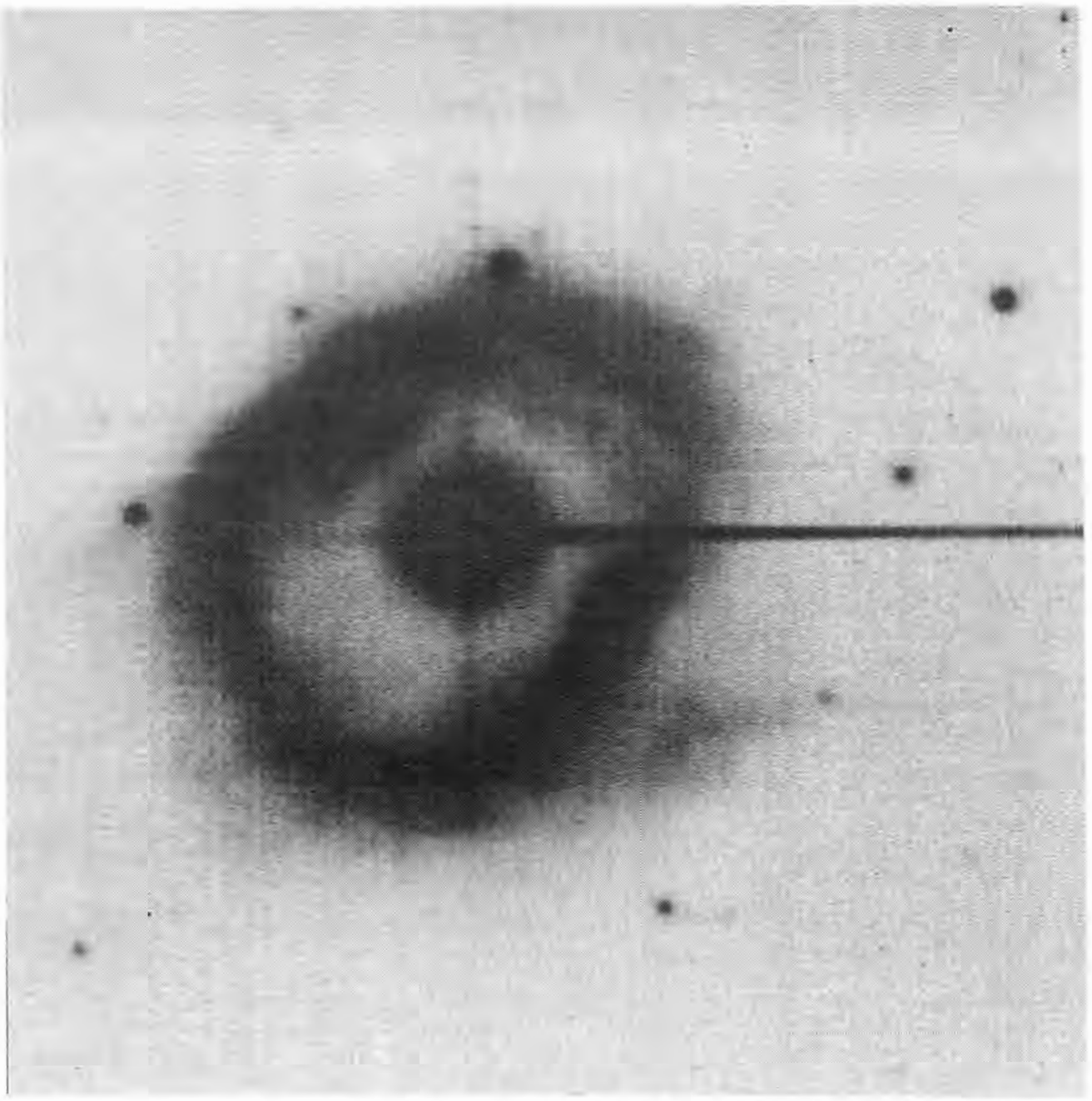
LBVs appear to mark the upper boundary of the HR diagram for stable stars. This is clearly related to the Eddington Limit, but there is an unexpected richness of behavior; the physics of the situation is non-trivial and has scarcely been explored yet. LBVs naturally have strong stellar winds with fairly large, quasi-steady mass loss rates. But something else also happens: occasionally a giant eruption occurs at the surface of an LBV, causing very rapid mass loss and a very high visual-wavelength luminosity for several years. In some cases the resulting ejecta can be observed for centuries after the events.

The first recorded LBV eruption that we know about was that of P Cygni in the early seventeenth century. The outburst of eta Carinae around 1840 was truly spectacular. It attained an absolute visual magnitude close to -14 and involved the loss of perhaps two solar masses, yet left the star intact! Outbursts comparable to that of P Cygni have been observed in several extragalactic LBVs in recent years. Various studies in the topic prior to 1986 can be found in the proceedings of two meetings: *Instabilities in Early-Type Stars* (Reidel 1987, ed. H.J.G.L.M. Lamers and C. de Loore) and *IAU Symposium 116, Luminous Stars and Galaxies*, (1986, ed. C. de Loore and A. Willis).

IAU Colloquium 113, to be held August 15-18 at Val Morin, Quebec, will be the first such meeting devoted specifically to LBVs. Some of the expected matters of controversy, or at least of enigma, are these:

- What is the physical mechanism behind the eruptions? Does radiative or turbulent pressure dominate? Are LBVs non-linear systems that switch between modes with different mass loss rates?
- Do some yellow or red hypergiants exhibit LBV-like behavior? Is LBV an appropriate name?
- Precisely what is the evolutionary relation between LBVs and Wolf-Rayet stars? Is eta Carinae, for instance, in a pre-WR stage or perhaps a pre-SN stage?
- Do LBVs generally exhibit bipolar morphology? If so, is this evidence for close binaries, or for rapid rotation? In this sense are LBVs analogous to B[e] stars?
- How much does the upper boundary to the HR diagram depend on initial chemical composition?
- Do LBVs tend to occur as components of wide multiple systems? Why are there no obvious LBVs in 30 Doradus?

By their nature, such questions betoken a relatively "fresh" topic in astrophysics, possibly on the threshold of being discovered.



AG Carinae and its surrounding nebulae in [NII] λ6584 light. This star is underluminous for an LBV – only about 150,000 solar luminosities (in the HR diagram AG Carinae is very close to the location of Sk-69 202). The ring of ejecta is about 30 arcseconds or 0.35 pc in diameter and perhaps 3000-4000 years old.

Nomenclature "No No" No. 3: Don't Put An "N" To It

by H. R. Dickel, Special to IAU Today

Avoid that common practice of misusing "N" to mean "NGC." The IAU has ruled against this usage, which conflicts with "N" for "Henize emission-line object" and with "N" for "Nova."

Indian Inter-University Centre Topic of August 5 Lunch Session

by Jayant V. Narlikar, Special to IAU Today

The proposed activities of the new national Inter-University Centre for Astronomy and Astrophysics will be described at a lunchtime session on August 5 (12:45-13:45) in Room 202. IUCAA was recently set up by the Government of India in Poona, about 100 miles southeast of Bombay. It will conduct basic research and will also feature an extensive visitor program.

Baltimore High Flyers Observed Near Convention Center

by Leif J. Robinson

If you happen to be at the intersection of Charles and Baltimore streets, keep your eye on the sky. You might see a Peregrine Falcon, the world's most celebrated and cosmopolitan bird of prey.

These falcons were once common throughout the eastern United States. In urban areas they adopted high-rise buildings for nesting, as an alternative to traditional cliff-face sites. After World War II, however, Peregrine populations crashed. The culprit was DDT. The use of this pesticide was banned about 20 years ago, the environment slowly recovered, and Peregrines were reintroduced at many sites. This was made possible due to a breeding project carried out at Cornell University. The Baltimore birds are very special, since it was here that the first successful nesting took place after the Peregrines were extirpated.

On two successive evenings I've noticed these birds leaving the left green parapet on the large brick building behind the Bank of Baltimore as you look east along Baltimore Street. They are easy to identify, for they are large and have long, pointed wings. Don't confuse the Peregrines with the smaller pigeons, which also reside on that building. Incidentally, pigeons are the Peregrine's favorite food.

ELECTRIFYING / from page 1

subject for a Joint Discourse at a General Assembly, but one that ultimately will concern almost everyone in astronomy.

New techniques for the submission of scientific papers, including electronic mail, desktop composition, and the ubiquitous floppy diskette, will be described from the perspective of an editor of a successful journal. Other invited speakers are expected to include a highly qualified publisher, who will attempt to explain some crucial economic issues in astronomical publishing. Still others will cover bibliographic databases, services that can provide journal abstracts, IAU Telegrams or Circulars, and similar material online.

There will be reports on astronomical data centers, new programs for archiving observational data at major international observatories, and the changing role of astronomical libraries. How, for example, do we maintain a historical record when it depends not just on journals and written correspondence but on unpublished tapes, disks, and the like. How can they be intelligently indexed and conserved? Who in the future will have the right apparatus to playback those tapes?

We are able today to decipher Babylonian cuneiform with details of an ancient apparition of Halley's Comet. Will future generations be able to read our records and data tapes of the 1986 apparition with comparable ease?

IAU PEOPLE

REMINISCENCES

1938 General Assembly: Stockholm, Sweden

by Yngve Öhman, Special to IAU Today

Exactly 50 years ago the International Astronomical Union was assembled in Stockholm. On that occasion Sweden happened to show its best face, as far as weather is concerned. Many tourists found their way to Sweden that summer, and as Local Secretary at the meeting I was glad, therefore, that hotel reservations had been made 10 months in advance, and for about 400 persons.

The organizing committee was lucky in other aspects as well. Prof. Jan Oort was the General Secretary of the Union that year. His very good personal relations for many years with the Director of the Stockholm Observatory, Prof. Bertil Lindbald, as well as with several other Swedish astronomers, were of very great value.

On August 3 the Union was welcomed in the Concert Hall of Stockholm, a building nowadays shown in connection with the Nobel ceremony in international TV programs. Speeches were made by Prof. von Zeipel on behalf of the Swedish National Committee of Astronomy, by Prof. Lindblad as President that year of the Royal Swedish Academy of Sciences and by Prof. Esclangon, President of the Union. Other members of the Executive Committee on that occassion were Dr. Adams, Prof. Banachiewicz, Prof. Bergstrand, Dr. Spencer Jones and the General Secretary himself. Prof. Bianchi could unfortunately not attend because of illness.

In the afternoon the same day the Second Chamber Hall in the House of Parliament opened its doors for the General Assembly. In the same large building many rooms would be used during the following days for the meetings of various commissions, joint meetings, etc.

Already the same evening the Town Council of Stockholm had invited the members of the Union and guests to an excellent supper in the Town Hall. This beautiful building is also well known from international TV programs in connection with the Nobel ceremonies. Many of the IAU members seemed to feel "at home."

August 4 was the first day of real work for the various commissions and groups. In the afternoon, the whole assembly could admire rooms in the Royal Castle at a reception given by His Majesty The King. The Duce of Västerbotten represented His Majesty.

August 5 was a day of work again, but only in the morning. The Union was invited to lunch at the Grand Restaurant in Saltsjöbaden and later on to a walk, uphill, to the Stockholm Observatory, located there since 1931.

The visit to the Stockholm Observatory gave even the Local Secretary a chance to discuss scientific problems. I remember particularly a demonstration in my office of the first useful birefringent prominence filter made according to my design a year before by Steeg & Reuter in Bad Homburg (*Nature*, Jan. 1938; *Bergstrand Festskrift*, Sept. 1938). Dr. Lyot was my first visitor, having presented the first theoretical studies of such filters already in 1933 (*Comptes Rendus*). His idea had been to construct a very narrow filter, which could possibly replace spectroheliographs or spectrohelioscopes. At the Assembly in Zürich ten years later he demonstrated a very useful instrument of this kind. Meanwhile improved prominence filters using, as in the Steeg & Reuter instrument, Polaroid films as polarizers, had been constructed and tried by J.W. Evans, E. Pettit and others. Later, an alternative solution was found by Solc.

August 6 was a day of work again, with joint meetings, etc. In particular, such a meeting on solar phenomena attracted great interest. I dare say, that the "prize-winner" was the same Dr. Lyot, who showed for the first time a movie of active prominences. The film had been obtained on the Pic du Midi with the use of his coronagraph and an ordinary red filter made with glass. In the afternoon, the participants were invited to visit the Open Air Cultural Museum "Skansen" in Stockholm. The beautiful old houses clearly appealed to the visitors, and so did the performance of dances in national costumes. In the evening there were joint meetings again in the House of Parliament and interesting lectures were presented by Prof. Bok, Prof. Lindblad and Prof. Shapley. The discussions continued until late.

Sunday, August 7 was a day of recreation. Most participants took part in an excursion in the archipelago aboard the large steamer *Brynhild*.

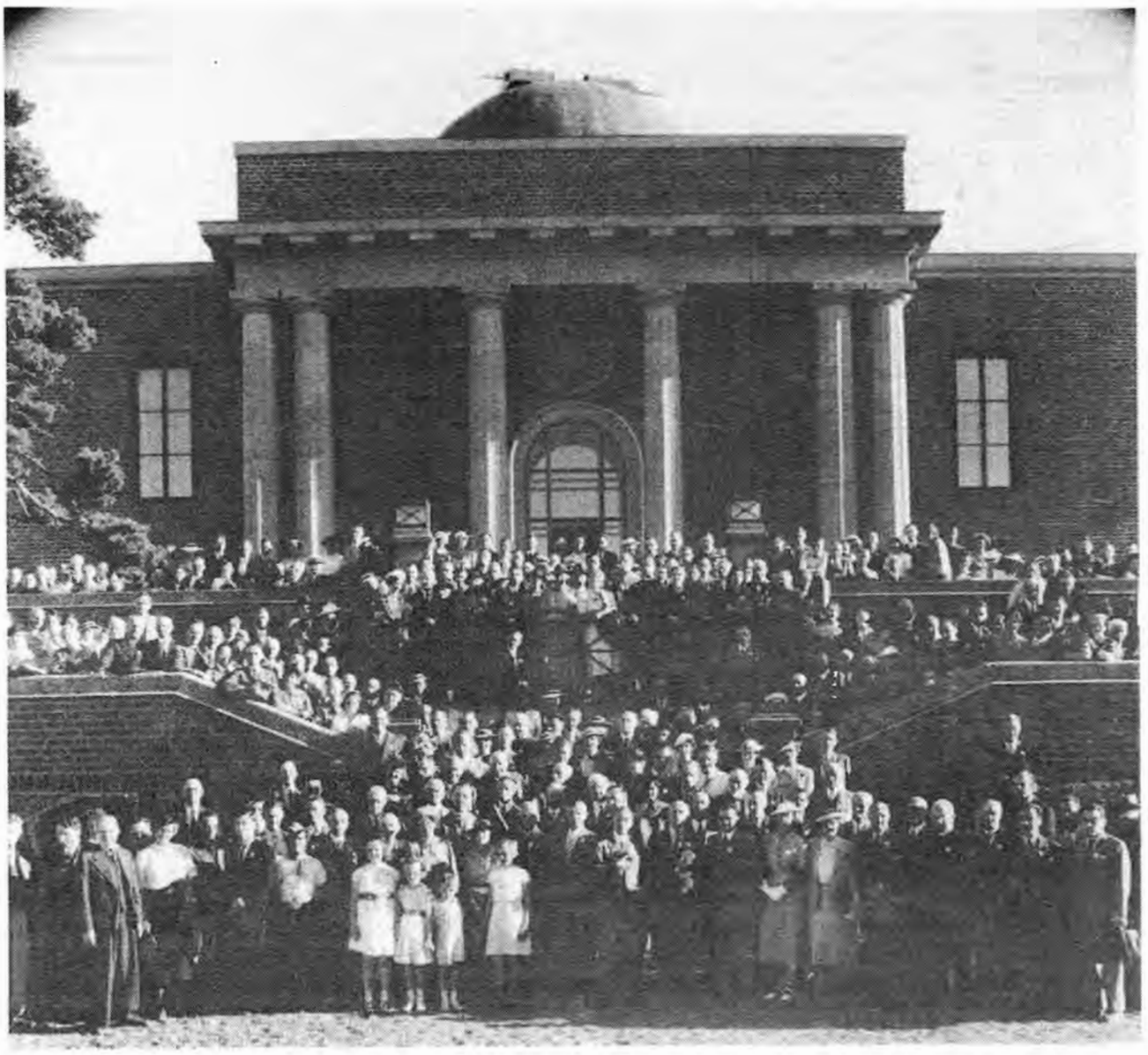
On August 8 the whole Assembly made an excursion by train to the university town of Uppsala, about 70 km north of Stockholm. An exhibition arranged at Uppsala Observatory attracted great interest, and the visitors were reminded of the pioneering work by A. Celsius and O.P. Hjorter, who detected disturbances in the Earth's magnetic field appearing together with auroras. After lunch, the congress paid a visit to Old Uppsala with its remains from the time of the "vikings." An unexpected wedding ceremony in and outside the old church added glamour to this day.

August 9 was a day of work again in many commissions. Interesting lectures were presented by Prof. Unsöld, Prof. Redman and others. In the evening the Swedish National Committee of Astronomy welcomed the participants to a concluding banquet at "Hasselbacken", and with Prof. von Zeipel as Host. A very spiritual speech was made by Prof. Stratton using not less then eight languages. Finally Prof. Esclangon expressed thanks to Swedish institutions and colleagues.

On August 10 the Assembly had its final meeting. Sir Arthur Eddington was elected President and the new Vice Presidents were Profs. Abetti, Brunner and Fabry. Brunner invited the Union to Zürich for the next Assembly, an invitation accepted with great enthusiasm. Finally thanks were expressed again by Prof. Esclangon and by Prof. Leuschner and Mrs. Jackson.

I dare say that the Assembly was a very successful one. But still many of the participants may have feared for the near future. And, in fact, very bad years were coming. The planned Assembly in Zürich could not be held until 1948. We do hope that such delay shall never be needed again for the Union.

We deeply regret that Professor Öhman passed away in June. We are fortunate to have the opportunity to publish one of his last astronomical articles.



Above: The author, Prof. Yngve Öhman, 1961.

Left: Attendees at the Sixth General Assembly of the IAU are shown assembled in front of the main building of the Stockholm Observatory in Saltsjöbaden on August 5, 1938.

IAU ACTIVITIES

THE GALLOPING GASTRONOMER

RESTAURANT RATING

Average Star ★
Double Star ★★
Supernova ★★★
Starburst Galaxy ★★★★

Sabatino's
901 Fawn Street, 727-9414
Rating: ★★★★

by Mary Saffell, Special to IAU Today

Sabatino's Italian Restaurant sits in the heart of Baltimore's "Little Italy" section at the corner of Fawn and High streets, east of the Convention Center. It is one of a handful of Italian restaurants that are synonymous with Little Italy. The menu is extensive, the prices are reasonable, and the best feature of the restaurant is its homestyle cooking of the regular pasta dishes. And always ask what the specials are for the day.

If you have a robust appetite, start with a stuffed artichoke or stuffed mushrooms or, if you prefer something lighter, ask for a plate of fresh sliced tomatoes with sweet onions topped with fresh Italian spices and oil and vinegar.

On the regular menu, the simpler the dish the better. One dish that is outstanding (and reminiscent of my grandmother's cooking) is the ravioli with cheese. The cheese mixture is made with imported Italian ricotta, mozzarella, eggs, and parsley; the pasta is made on the premises. Simple you say? Maybe so, but your palate will say "delicioso." The bread that is served is hearty enough to mop up your dish at the end of the meal (accepted practice here).

Other superb dishes include osso buco, sausage and peppers, roast pork, chicken cacciatore and veal marsala. The salads are wonderful and at their best when served with vinegar and real olive oil.

Sabatino's has a good selection of robust and inexpensive Chiantis. Their house wines are quite a good buy as well.

If you have room, the special desserts include cannoli, tortone, or tartufo. If you have never had a cannoli, indulge yourself and enjoy this unusual confection of sweet ricotta cheese surrounded by a delicate, thin, crisp shell. If your constitution requires something a little less substantial, try the fruit and cheese dessert.

Sabatino's extensive menu offers selections for the hearty as well as light appetites. Its location in Little Italy will give you a respite from the modern Convention Center and take you into the narrow streets of a traditional Italian-American neighborhood that was established at the turn of the century.

The Nomenclature Nook

by Hélène R. Dickel and M.C. Lortet, Special to IAU Today

Many acronyms found in the astronomical literature have multiple meanings. For example, for the letter "C" there are eight entries listed in "The First Dictionary of the Nomenclature of Celestial Objects," (Fernandez, Lortet, and Spite, *Astron. & Astrophys. Suppl.* 52, No. 4, 1983). Among the listings are C referring to "Case" as in Case Observatory and C referring to "cluster" as in open cluster of stars. The recommended acronyms for these two examples are "Case" and "OCL." The letter C can also mean "central" source or may designate the third brightest component of an object (stellar or non-stellar). Two further examples are C for "catalog" as in IRC (Infrared Catalog) and a lower case c for infrared "compact," as in IRc.

Test your nomenclature skills: Can you guess what the following abbreviations stand for?

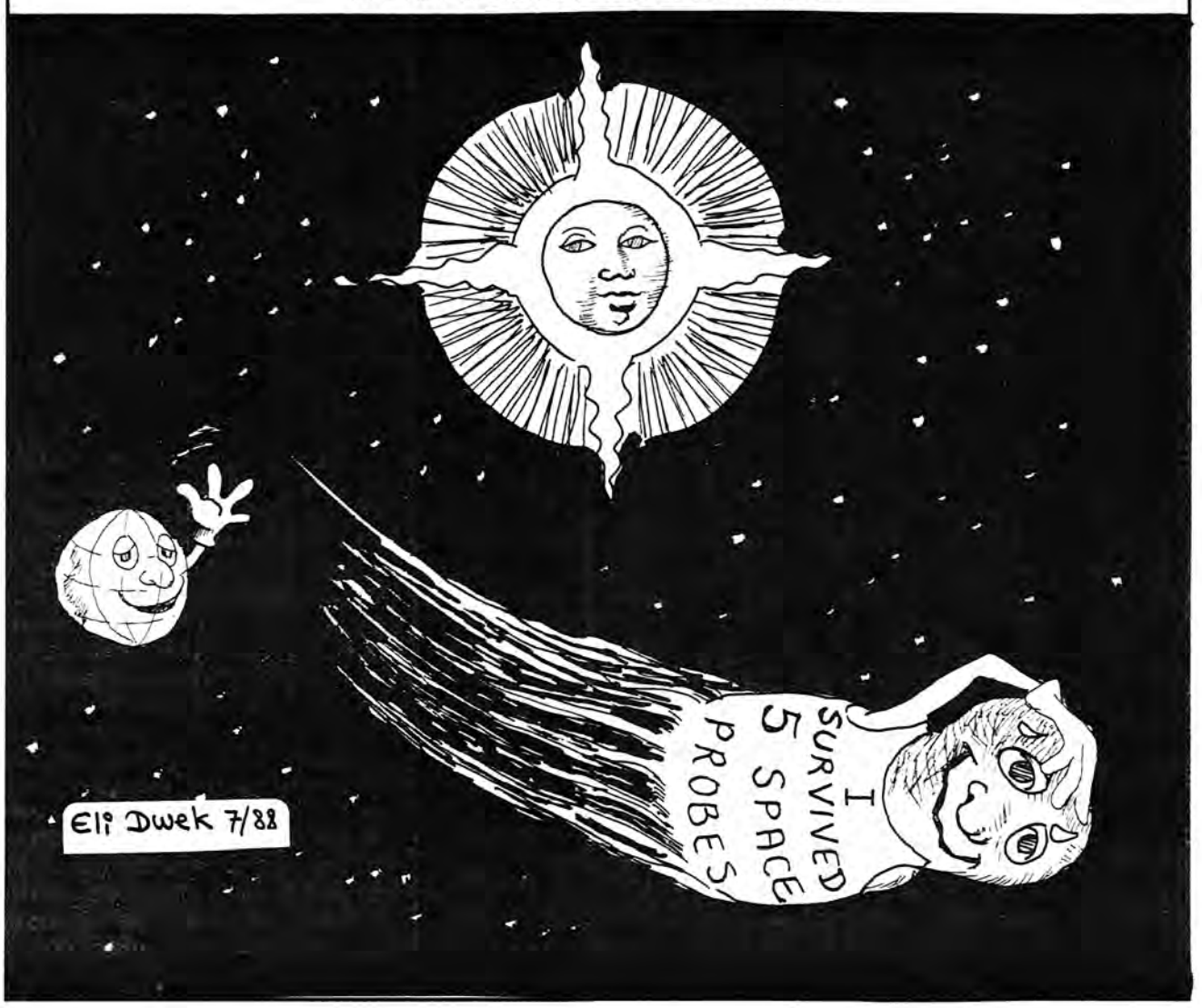
P CL C/ GCL GLC

Can you identify these objects? The databases cannot.

I+I02I6 II2I6 III22I6 HOI39-68 HOII (GB 790 325) HCL2 (hint: as in the title "The Physical and Chemical State of HCL2").

Send your answers to the "Clearing House" on astronomical designations, mailbox of M.-C. Lortet (under France) by 09:00, Thursday, 4 August 1988. Look under "The Nomenclature Nook" in future issues of *IAU Today* for the answers from "The First Dictionary..." and the literature plus solutions from our readers.

HALLEY'S COMET HAS HAD ENOUGH



COMMENT

Astronomy Is Looking Around As Well As Up!

by Jacqueline Mitton

It's a good feeling – being proposed for membership in an exclusive club. But when you've had a passion for astronomy since the age of 7 and the "club" is the IAU, the sense of satisfaction is something really special.

As a person who now specializes in communicating astronomy to the wider world, acceptance into the network of professional astronomy is particularly significant for me Not so many years ago, I suspect the situation would have been very different. But attitudes have changed. Scientists now recognize the importance of putting across what they do to the public at large. The logic is simple: if the people don't appreciate what you do, they won't vote you funds.

Astronomers are in an enviable position when it comes to capturing the public imagination, and that's important if you can't immediately point to practical benefits for humankind. It's a science that is readily accessible: there are lots of things you can say about the universe without long words, jargon, and fancy mathematics. Kids are fascinated by it – and how many countries are swamped by so many scientists that they don't need to use every trick to kindle the spark of enthusiasm for science?

But it's not easy for science writers and editors to track down the stories unless researchers themselves give a helping hand. We don't often have the time or the facilities to plough through the primary journals to unearth the exciting news. So, the information specially prepared for the press and the public can be one of the most important ways of ensuring that important work gets publicity outside the immediate circle of professional colleagues.

A well-written press release, particularly one with an attractive picture, can be a life-saver for a busy writer or editor with column-inches to fill. And in a competitive world, good public relations are important for any research institute.

An important group of people on the receiving end of the flow of astronomical information are the amateur astronomers. How many professionals realize the dedication and sophisticated instrumentation that today's amateurs have to offer? They're raring to go, thrilled if they can contribute to a worthwhile research program. Many amateurs that I know are professional scientists in other fields by day. In fact, I sometimes wonder where they find their energy! The high quality of their work continues a long tradition. One organization that coordinates amateur work worldwide, the British Astronomical Association, celebrates its centenary in 1990. Many of the long-term observational records compiled by amateurs, on planets and variable stars for example, now constitute unique databases that document decades of change.

COMMENT

It's All in the Bag

by Laurence A. Marschall

A meeting is measured by the excellence of its papers, the beauty of its venue... and the quality of its portfolios. By this latter standard, say many IAU members, the 20th General Assembly fares quite well indeed. The blue-and-white canvas bags given to every registrant are, according to one pleased participant, "an order of magnitude better than standard vinyl folders." "I won't put this away on a shelf, like the dozens of others I've gotten at past symposia", said another. Only a few inveterate carpers voiced any dissatisfaction: "They should have used rip-stop nylon", complained one sweat-soaked registrant.

It is rumored that complaints about vinyl folders sticking to xeroxed material prompted the Local Organizing Committee to purchase the cloth bags this year. The added expense has also been justified on the basis that the durable portfolios are likely to outlast at least a few of the theoretical and observational results presented at this week's commission meetings. "We'd like to give the members of the IAU something more durable than astrophysics," said an LOC source.

IAU WORLD

FACILITIES

The Westerbork Synthesis Radio Telescope in the Netherlands

by P.C. van der Kruit, Special to IAU Today

The Westerbork Synthesis Radio Telescope (WSRT) is located in the northern part of the Netherlands and is operated by the Netherlands Foundation for Radio Astronomy (NFRA) with financial support from the Netherlands Foundation for Scientific Research (NWO). Its headquarters are at Dwingeloo. The WSRT is available to observers from all countries and telescope time is awarded on the basis of merit of the scientific program. The following is a short summary of the instrument and the receiver characteristics.

The WSRT consists of 14 dishes of 25 m diameter on an east-west baseline. Ten are fixed and spaced by 144 m and 4 movable dishes are on railtracks, two at the eastern end of the row of fixed telescopes and two some 1.3 km further east. The standard manner of observing consists of making correlations between all possible pairs of a fixed and a movable dish. In four 12-hour observing periods, all interferometer spacings from 36 to 2772 meters in 18-m increments can be obtained. For a single 12-hour observation the increment is 72 m, and increments of 12 m (6 x 12h) and 9 m (8 x 12h) are also possible. It is also possible to record correlations between the fixed telescopes to provide a set of redundant baselines.

The WSRT consists of 14 dishes of 25 m diameter on an east-west baseline.

The available frequencies (wavelengths) are 327 MHz (92 cm), 610 MHz (49 cm), 1420 MHz (21 cm) and 4990 MHz (6 cm). Each dish has two perpendicular dipoles that can be set parallel or at 45° between the fixed and movable telescopes. The backends are:

- Digital Continuum Backend (DCB), allowing continuum observations in 8 independent 5 or 10 MHz bands, giving a maximum observing band of 40 and 80 MHz at 21 and 6 cm respectively;
- Extended Digital Line Backend (DXB), allowing eight possible total bandwidths from 10 MHz in factors of two down to 0.078 MHz. For bandwidths of 1.25 MHz or less, the DXB allows 20480 complex channels (number of interferometers times frequency channels times polarizations times bits). For larger bandwidths BW this reduces to 25600/BW.

Continuum Observations. The continuum mode employs the DCB at 6 and 21 cm; at 49 and 92 cm the DXB is used, since the protected bands are too small. Standard continuum observations provide all Stokes parameters, but I-Q and I + Q can also be obtained for a set of 48 redundant baselines. The latter is useful for high dynamic range observations; the WSRT's regular geometry allows many interferometer pairs that sample the same information. This information can be used to correct for atmospheric and telescope related errors, resulting in a significant gain in dynamic range (about 10,000 : 1).

Some characteristics of the system are:

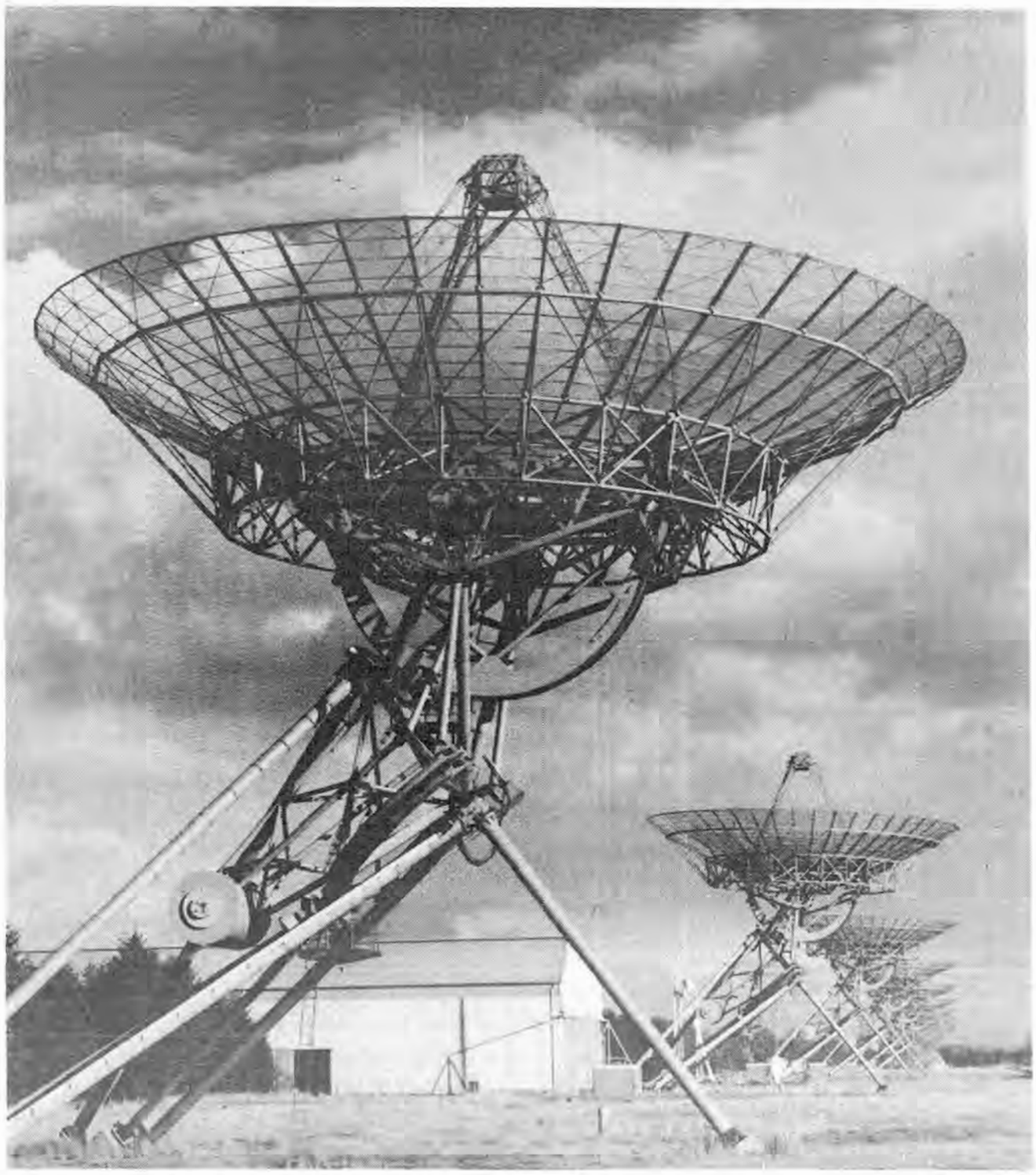
Wavelength (cm)	6	21	49	92
Fieldsize (degrees)	.17	.6	1.4	2.6
Maximum bandwidth (MHz)	80	40	2.5	2.5
R.A. synthesized beam (")	3.7	13	30	55
Sensitivity (mJy/beam)	.06	.06	.4	.7

The sensitivity is the r.m.s. noise level after 12 hours integration. For a single 12-h observation at 49 and 92 cm, the achievable noise will be confusion limited at a level of approximately 2 and 3 times the given theoretical value.

Line Observations. The r.m.s. noise is determined by the number of interferometers (NI), polarizations (NP), channel width (df) in kHz and the integration time (t) in hours by (for 2-bit correlation):

$$S_{rms} = A/\sqrt{(NI \times NP \times df \times t)} \text{ mJy/beam.}$$

Here A = 500 for 6 cm, 275 for 21 cm, 550 for 49 cm and 850 for 92 cm. Thus for 21 cm we have for t = 12 h, NI = 40, NP = 2 and df = kHz and r.m.s. noise of 2.8 mJy/beam.



Westerbork Synthesis Radio Telescope.

There are certain observations for which the WSRT is especially suited. These are: (i) Long wavelengths (49 and 92 cm), useful for spectral index studies. (ii) Polarization: the WSRT uses dipole feeds, allowing accurate measurements of circular polarization. Especially at 6 and 21 cm the instrumental polarization across the primary beam is low. (iii) Line polarization, *e.g.*, for Zeeman observations at 21 cm. (iv) Wide-field mapping at 6 and 21 cm through reduction of bandwidth smearing by the division of the total band in 8 channels. On the other hand, the WSRT cannot observe below 6 cm, has no "snapshot" mode, unlike the VLA, and suffers from degradation in (declination) resolution and UV coverage at low and negative declinations.

The WSRT is especially suited for observations at long wavelengths (49 and 92 cm) and for accurate measurements of circular polarization.

The single frequency front-ends are scheduled for particular periods. These cycle through the year typically as follows: 21 cm (4 - 5 months in spring and summer), 6 and 49 cm (2 - 3 months each in early spring or fall), 92 cm (about 3 months in late fall and winter).

Observing time can be obtained by sending a proposal to the Chairman of the Program Committee at Sterrewacht, P.O. Box 9513, 2300 RA Leiden. Information on the format and a blank copy of the required proposal cover sheet can be obtained from the PC Chairman or the Telescope Scheduler (address below). The Program Committee normally meets 3 or 4 times each year, usually some time before the start of each frequency period. Deadlines are announced in the PC minutes. Interim allocations for urgent proposals are also possible. Allocations are made on the basis of referee reports.

Normally all observations are carried out by the Telescope Group in Westerbork on the basis of a request sheet and calibrated by the Reduction Group in Dwingeloo. Standard calibration does not make use of the redundant baseline information. Further reduction can be done in Dwingeloo or at the observer's home institute in AIPS. The task WSLOD reads WSRT UV-data into AIPS and will be incorporated into AIPS; copies of the source code are available from Dwingeloo. The task ASCAL may be able to take advantage of the redundant spacing information.

The WSRT also participates in the European and global VLBI networks in about four sessions throughout the year. More information can be obtained from the WSRT Telescope Scheduler at Radiosterrenwacht, Schattenberg 4, 9433 TA Zwiggelte, The Netherlands.

IAU PEOPLE

My First General Assembly: Interviews with Seven First -Timers

by Leif J. Robinson

Why do astronomers travel thousands of miles to attend a meeting of the International Astronomical Union? What, especially, motivates first-timers? To find out, I chatted with wearers of the "Green Badge" from several countries. My basic questions were: "Why did you come, and what do you hope to accomplish?"

Janardhan Padmanabhan, Physical Research Department, Ahmedabad, India: "I've not yet gotten my Ph.D.; I have about three years to go. I was selected to attend as a young astronomer. I'm here on a National Science Foundation grant."

Vladimir Zharov, Sternberg Institute of Astronomy, U.S.S.R.: "I work for the time service, and especially study variations in the Earth's rotation. We observe with classical instruments, but I want to know more about VLBI – that's why I'm here. Also, I want to report on a laser gyroscope, which we want to create, but it is necessary to solve very complicated problems. It will be located in the Caucasus. We want to determine variations of the Earth's rotation on scales from some minutes to some years."

Mikio Nagasawa, Tokyo Astronomical Observatory, Japan: "I perform numerical experiments to simulate supernova explosions and the process of star formation. I will make a short contribution at the session dealing with supernovae. Of course, I'm interested in many fields of astrophysics, so this is a good opportunity to get acquainted with those fields. This is my first opportunity to visit a foreign country."

Keith Butler, Munich Observatory: "I came to experience the meeting – the idea of seeing all the astronomers in the world was interesting. Also, I was invited to give a talk on atomic data for abundance analyses of hot stars at Commission 36."

Janardhan Padmanabhan of the Physical Research Department in Ahmedabad, India.

Sylvia Becker, Munich Observatory: "I work in the same department as Keith, but I still have another two years to go on my Ph.D. I came for the chance to see and meet people."

Leonardo Bronfman, University of Chile: "I got my Ph.D at Columbia University, where I worked with Patrick Thaddeus. My specialty is radio astronomy – molecular clouds and galactic structure – that's what I'm doing in Chile. The 15-meter SEST [Swedish ESO Submillimeter Telescope] at La Silla is a great instrument and provides exceptional opportunities, for it is unique in the Southern Hemisphere. I came to the IAU because I wanted to know how the organization runs, both scientifically and politically. I was invited to attend, which I appreciate."

Günter Lustig, University of Graz, Austria: "This is the first meeting in my astronomical life and my first time in the U.S. For the last 10 years I've worked in solar physics, particularly concerning the rotation of the Sun using sunspots as tracers. In Austria we have a medium-size solar observatory at Kanzelhöhe, about 200 km south of Graz, where we have material about sunspots since 1942. I think coming to the IAU is the only way to meet many, many colleagues from all over the world, not only those who work with the Sun but those from all of astronomy."

How the Local Organizing Committee Did It

by Virginia Trimble

Is red, white, and blue too patriotic? Does the "20" have to be in roman numerals? What if it rains and the canvas gets wet? This was your Local Organizing Committee at work a year or so ago, settling the burning issues of the appearance of the General Assembly logo and the conference portfolios. No, that wasn't quite all we did. But in accordance with traditional committee practice, the amount of time devoted to discussing each issue was roughly proportional to the reciprocal of the cost.

The Baltimore LOC, co-chaired by Arthur F. Davidsen (Johns Hopkins University) and Riccardo Giacconi (Space Telescope Science Institute) actually began meeting even before the 19th General Assembly in Delhi. Over the next 3.5 years, some 20 astronomers participated in its deliberations, gently guided by our Executive Coordinator, Karen Weinstock, and Harold Screen, a Hopkins business officer, who managed to keep us out of trouble with the law, at least so far.

No one kept track of the number of telephone hours put in, but while some of us were collecting competitive bids from bus companies, others were negotiating with hotels, printers, caterers, carpenters, and the Convention Center. What did we need; how much was it going to cost; and how could it possibly be made to cost less? Your special sympathy should be extended to the brave subcommittee who previewed the menus for the closing banquet and other social events.

Perhaps the hardest part was guessing how many astronomers and guests to plan for. Registration fees taken in are, of course, linear in the number of participants. Some of the costs are not, and the original estimates said that we would break even at 2,000 and be able to have pastries with coffee at 3,000. You will find evidence of one of our errors at the front desk, where extra copies of the portfolio are on sale at cost.

We never managed to get the entire LOC together in one room at one time. But here are (standing, left to right) Knox Long, David DeVorkin, Albert Boggess, Stephen Holt, Frank Kerr, Robert Harrington, Paul Feldman, John Graham, George Miley, Larry Fredrick, Richard Henry, Virginia Trimble, Herbert Gursky, and (sitting, left to right) Peter Boyce, Donald Shapero, Karen Weinstock, Arthur Davidsen, Harold Screen, and Stephen Maran (Missing: Riccardo Giacconi).

MAGNETOSPHERE / from page 2

Molecular Clouds and Star Formation

In the inner 200 parsecs, there are about 10^8 solar masses of molecular gas. This constitutes an enormous reservoir from which stars might form; indeed, several sites of star formation are known in that region. Nonetheless, according to some conferees, star formation is currently proceeding in the galactic center at an exceptionally slow pace, especially in the inner 50 parsecs. The usual clues, masers and compact HII regions, are few and far between, although it was recognized that the maser surveys are very incomplete. The challenge to theorists is to determine whether strong, uniform magnetic fields can effectively inhibit star formation.

The Circumnuclear Disk

Much recent work has gone into understanding the 3 to 10 parsec toroid of dust and gas surrounding and orbiting the galactic nucleus. This circumnuclear disk is characterized by turbulent velocities of about 50 km/s and magnetic fields on the order of 10 milligauss. One of the remarkable features of this disk is the clear hole in the center, where most of the gas and dust have been evacuated. The mechanism for the evacuation of the hole needs to be clarified; maybe it is a temporary feature. The luminosity of the dust ring places important constraints on the luminosity of the central source of luminous radiation. This luminosity is 10^7 solar luminosities, but if much of the radiation escapes without being absorbed by the torus, the luminosity might be correspondingly larger. This high value places strong constraints on single-star models for its origin.

IAU BULLETINS

STRÖMGREN / from page 2

discovered H^- absorption and carried out a pioneering chemical analysis of the Sun. The theoretical study of stellar atmospheres was developed further and culminated after the war when young scientists like E. Schatzman, J. C. Pecker, and A. Underhill came to Copenhagen to work with Strömgren.

In 1950 Strömgren accepted an offer of an appointment as professor of the University of Chicago and director of Yerkes and McDonald Observatories. He left Chicago for The Institute for Advanced Study at Princeton in 1957 and finally returned to a new professorship at Copenhagen University ten years later. He simultaneously held a chair at Nordita (Nordic Institute for Theoretical Atomic Physics). He and Sigrid gracefully and generously resided in the Danish House of Honour at Carlsberg.

After 1951 Strömgren worked systematically to establish his ubvyβ photometric system. From an early stage of his work he had a number of applications in mind: age determination for early-type stars with determination of their birth places in the galactic disk; three dimensional mapping of interstellar reddening (with F dwarfs); study of the metallicity-age distribution in the solar neighborhood and elsewhere in the Galaxy; investigation of the dependence of this distribution on the kinematical stellar properties (with F and G stars); estimations of the relative abundance of He from studies of stars on the ZAMS of clusters, etc. Strömgren was very actively pursuing this research until his death.

Bengt Strömgren maintained a life-long interest in detailed and hard long-range goals. His work is characterized by thoughtful and systematic development of methods, numerical and observational, and it was always directed towards important astronomical problems. The extent to which his efforts led to fundamental improvements in numerous fields of astronomy is remarkable. His work contributed significantly to astrophysics becoming an exact and solid science in this century.

To young astronomers who met Strömgren, he seemed almost a revelation. His keen interest, broad knowledge, and clear judgement made every short discussion with him rewarding. "When you visit a foreign institute you should not forget to talk to the young astronomers", he once said. "They will learn more from you and you will learn more from them."

Bengt Strömgren undertook important expert commissions and administrative duties in Denmark, in other countries and in international organizations. He was an active, influential President of the ESO Council from 1975-77. From 1948 to 1952 he served as the General Secretary of the IAU, and 1970-73 as its President. His diplomatic, wise and firm leadership were of great importance and strengthened the Union considerably, not the least during the difficult years after World War II.

SYNCHRONIZE WATCHES! IAU participants can ensure on-time arrival at scientific sessions by setting their watches by the U.S. Naval Observatory clock in the exhibit area. Jim DeYoung of the U.S.N.O. checks the clock's power supply. Photo by Ronald A. Schorn.

Program changes, commission business announcements, etc. for possible publication in IAU Today must be submitted through the General Secretary's office.

Dormitory Bus Schedule

	Dorms to Convention Center		Convention Ctr. to Dorms
	Every 20 minutes	On the Hour	Every 30 min.
Aug. 3	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 4	07:30 - 09:30	10:00 - 17:00	17:00 - 19:00
Aug. 5	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 6	07:30 - 09:30	10:00 - 20:00	----------
Aug. 7	08:00 - 12:00	13:00 - 20:00	----------
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street amd Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Special Events

Baltimore Symphony Orchestra concert: Reserved seat tickets are available at the Symphony Booth in the Pratt Street Lobby. The Symphony was acclaimed on its May 1987 tour of Vienna, Frankfurt, Munich, Leipzig, London, Moscow, and Leningrad.

Reserved Seating for the Symphony Concert: If you purchased the supper that will be served before the Symphony, you will find a voucher in your registration envelope for a reserved seat. This is not your reserved seat ticket for the concert hall. Please exchange the voucher at the Symphony booth for your reserved seat.

Travel

Commuter Trains to Washington, D.C., from Camden Station: Camden Station is one block from the Convention Center. The MARC commuter trains depart from Baltimore, Monday through Friday, at 05:40, 06:35, and 07:42. The trip takes 55 minutes.

In the evening, they leave Washington, D.C.'s Union Station at 17:00, 17:35, and 18:25. Prices are $9.00 round trip; $32.50 weekly rate (Monday through Friday). If you cannot return to Baltimore at those scheduled hours, you may ride the Amtrak line, using the original round trip ticket plus an extra $1.00. But you will be stopping at Pennsylvania station, 1500 N. Charles Street, rather than Camden station, where you boarded in the morning. No seat reservation is necessary. Telephone: 1-800-325-7245, 1-800-872-7245 or 237-3402 (Camden station) or 291-4246 (Penn station)

Message from Omega World Travel: Omega will be on hand to assist you with your travel needs at our Travel Booth in the Pratt Street Lobby. If you should need to change your air flight arrangements, these changes may result in an air fare increase. In addition, many tickets may have been issued in other countries and Omega is not able to reissue or exchange these tickets. A ticket issued for travel in the U.S. by Omega, may be exchanged for a new ticket, subject to cancellation penalties. Tickets issued by other companies must be re-issued by the airline and are subject to the airline cancellation penalty. However, we will be happy to assist you with the optional tour program and any travel-related questions.

Convention Notices

Poster Boards: All material posted is under the supervision of the Commission Presidents and the General Secretary. Boards for scientific poster sessions are supervised by the General Secretary. Before posting anything, contact the IAU Administrative Office, Room 321.

Closing Banquet Ticket Sales: The cut-off time for sale of Closing Banquet tickets is Thursday, August 4 at 14:00.

Smoking: Please do not smoke in any meeting room.

Leftover Items: All papers not removed from the meeting rooms will be collected and thrown away at the end of each day. All personal items left in the meeting rooms will be taken immediately to the Lost and Found area, in the corridor beyond Hall A.

Brown Bag Breakfasts: The concession stand in Hall D will open daily at 08:00.

CRUISE TICKETS AVAILABLE FOR AUGUST 7

Tickets are still available for the Annapolis cruise on Sunday, August 7. This promises to be one of the highlights of the General Assembly, and tickets can be purchased at the registration desk.

Tour Updates

Washington, D.C., Tour: each bus requires a minimum of 30 people. You must sign up on the day before by 14:00. The decision to run the bus will be made at that time.

Tour Itineraries

Baltimore by Land and by Sea, Wednesday, August 3, will include a Patriot Cruise and stops at Fort McHenry, Shot Tower, and a lunch at Lexington Market. On the same day, the **Washington, D.C., Tour** will stop at the Capitol Building, Lincoln Memorial, Vietnam Memorial and the Smithsonian complex, where lunch will be served.

Annapolis Adventure on Thursday, August 4, will stop at the Maryland State House and the U.S. Naval Academy, with lunch at the City Dock Area.

A tour of **Scenic and Historic Baltimore** on Friday, August 5, will visit the Walters Art Gallery, the Peabody Library, and the Maryland Historical Society/Baltimore Museum of Art with lunch at Haussner's Restaurant.

On Sunday, August 7, the **Observatory Tour of Washington, D.C.** will visit the U.S. Naval Observatory, NASA-Goddard Space Flight Center, and the Mall adjacent to the Smithsonian. Lunch will be served at the Mall.

Longwood Gardens is the site of a tour, with lunch, on Monday, August 8. On Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania,** with lunch at Divine's Carousel.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. **THURSDAY, AUGUST 4, 1988** **4**

Brown Dwarfs, Planets Too Were Crucial Objects in JDII

by Jay M. Pasachoff

"The inescapable conclusion is that there must be a lot of objects in the field in the one-tenth solar mass range on down to brown dwarfs," Ben Zuckerman of the University of California at Los Angeles reported to Joint Discussion II yesterday. He was describing his discovery 10 days ago, jointly with Eric Becklin of the University of Hawaii, of a second warm object that is spatially resolved from a white-dwarf star.

Brown dwarfs and extra solar planets were discussed at length in the opening session of JD II. David Latham (Center for Astrophysics, Cambridge, Massachusetts) reviewed the observations that bear on binary-star formation. He described the program at the CfA's 155-cm telescope in Massachusetts that has led to the measurement over the last 7-8 years of 15,000 radial velocities of 1500 stars. The program has already led to the solution of 80 spectroscopic orbits, with more pending.

Latham described his observations of HD 114762, a solar-type star 90 light years away. From his radial velocity studies, he and his colleagues have fit a period of 84.17 days and an amplitude of 533 m/s. The object "might be about ten Jupiters but it might be a little less than that," though uncertainty in the orbital inclination permits a substantially greater mass. Ten Jupiters is the approximate dividing line between brown dwarfs and planets.

Latham reported that the CORAVEL group in Geneva has already confirmed his period using independent data, obtained at the Haute Provence Observatory in France. Their independent analysis gives a period of 83.89 days and an amplitude of 726 m/s.

Bruce Campbell (University of Victoria, Canada) described his gas cell technique for precision measurements of stellar radial velocities. Using a hydrogen fluoride absorption cell to superimpose many narrow spectral lines onto the stellar spectrum allows him to minimize or eliminate the observational errors introduced by flexure and other instrumental effects. The standard error is thereby reduced by nearly 100 from previous techniques, yielding a velocity amplitude resolution of 13 m/s. "This opens the possibility of detecting companions to solar-type stars at a lower level than previously detectable," Campbell said.

Of the 18 stars that Campbell and co-workers have been closely monitoring over several years, nine stars have shown velocity trends that suggest a possible companion in the 1-10 Jupiter mass range. The only case for which Campbell may have seen a full period or more, however, is gamma Cephei, for which a 1.6 Jupiter-mass companion is proposed.

Campbell's techniques and Latham's are complementary, with Campbell's optimized for high resolution on bright stars, and Latham's able to observe much fainter stars, although with less precision. Latham supports his "planet" detection with the observation that, "we have watched the object through 30 of its years," so there is no doubt of the period. Since the object is at the distance from its star that Mercury is from the Sun, the planet is "hotter than an oven," and so could not support life as we know it.

IAU Today **is published with the help of a generous contribution from Computer Sciences Corporation.**

David W. Latham (Harvard-Smithsonian Center for Astrophysics) headlined a packed press conference on brown dwarfs and extrasolar planets.

Zuckerman in his search for white-dwarf companions has studied about 100 white dwarfs with Becklin. About 10 have spatially resolved companions or infrared excesses. One byproduct of their observations is improved colors for Gleise 569B, which show it to be a normal M7 or M8 star, too luminous and too hot to be a brown dwarf. Their famous object, G29-38, earlier reported to be a brown dwarf or, possibly, a "bizarre dust cloud," just returned to the night sky last month. The similar object that they reported yesterday is spatially resolved from its companion white dwarf, so that there is "no chance that it is a dust cloud." They are separated by 5 arcseconds corresponding to hundreds of astronomical units.

JOINT DISCUSSION III

Supernova 1987A in the Large Magellanic Cloud

by Virginia Trimble

SN 1987A is undoubtedly the greatest supernova since Kepler, who studied the last naked-eye one in 1604. The detection of a neutrino burst has provided direct evidence for core collapse as the energy source of Type II supernovae, and the detection of nuclear-decay-gamma-ray lines from Co^{56} has confirmed that supernovae are sites of nucleosynthesis. Speakers at today's Joint Discussion will attempt to make clear why the things we understand happened the way they did. These include many aspects of the progenitor star, the light curve, and spectral evolution. Other topics, including a variable soft-X-ray source, the nature and cause of extensive mixing within the ejecta, asymmetries and extended structure, and the evidence, if any, for a pulsar, are not well understood.

Of the two main types of supernova, SN Is occur among relatively old stars and are thought to be powered entirely by nuclear reactions (primarily deflagration of C and O to Fe-peak elements). Type IIs, on the other hand, happen only among young, massive stars and have been blamed on the energy released when a Chandrasekhar-mass iron core collapses to neutron star density or beyond. About 1 percent of the released binding energy gets deposited (we don't know quite how) in the star's envelope. This gives rise to things we see: light curves and spectra at all wavelengths, an expanding remnant, and shocks where circumstellar material gets in the way. Prof. Hans Bethe (Cornell University) has generously agreed to review our current understanding of SN IIs in general.

How does SN 1987A fit into this picture? Rather well, in fact. Very few of the neutrinos released at core collapse were stopped in particle detectors. The total energy implied is indeed the energy we expect from neutron star formation. The early light curve, spectra, and radio emission were initially puzzling – too faint and too fast-changing to match SN IIs. And the star that exploded was a blue rather than a red supergiant. These oddities all turn out to fit together. Several speakers will explain why the star was blue and how the associated compact en-

see SUPERNOVA, page 3

Curved Wavefronts are Made for Taylor

by Richard Tresch Fienberg

Before long, researchers may be able to measure trigonometric parallaxes for millisecond pulsars as far as several thousand parsecs away. Prof. Joseph H. Taylor of Princeton University described how at the 20th General Assembly's first Joint Commission Meeting yesterday.

Most pulsar timing observations treat the incoming radio signals as plane waves. "Of course, they aren't really plane waves," Taylor explained. "They're spherical wavefronts, and if the pulsar isn't very far away, the curvature of the wavefronts is important." By observing the difference between the actual pulse arrival times and those expected for plane waves at each of two points around the Earth's orbit, it should be possible to extract parallax information.

Using this principle, Taylor and colleagues have already put lower limits on the parallaxes of two millisecond pulsars. Timings of PSR 1855+09 and PSR 1937+21 suggest distances of at least 300 pc and 3 kpc, respectively. In the former case, the distance derived from dispersion measurements is around 400 pc. "So, we're not far from being able to determine its parallax directly," Taylor said. The present uncertainty in this object's timings is about 300 nanoseconds. "I think if the timing data can be made three times better," he continued, "we probably will see parallax effects." The Princeton astronomer also described pulsar proper-motion measurements with precisions as high as 1 milliarcsecond per year. Such work challenges the accuracy of the best astrometric models.

Taylor's remarks came during the first session of JCM1, a day-long meeting on the observational and theoretical aspects of pushing astrometry to a routine accuracy of one milliarcsecond or better. Among the questions considered: Are today's theories and computational procedures consistent with the accuracy now being achieved observationally? Can a single reference system serve both terrestrial and celestial position measurements? Some 150 astronomers attended JCM 1, and

see WAVEFRONTS, page 3

IAU TODAY is published daily, August 1-11, 1988, except Sunday, August 7. Back issues are available at the GA Information Booth in the Pratt Street Lobby.

IAU NEWS

Excess Emission Brings Cosmic Background to the Fore

by Ronald A. Schorn

"We now have a number of very interesting problems, the answers to which are still open, but we can see the possibility of exciting new data that may shed light on these puzzles," Gianfranco De Zotti (Padova) said in an interview. Dr. De Zotti gave a wide-ranging review of recent developments concerning the cosmic background radiation to open yesterday's second session of Commission 33 (Cosmology).

Among the exciting new developments is the spectrum of the background obtained by Toshio Matsumoto (Nagoya) and colleagues last February. To avoid the serious contaminating effects of emission from Earth's atmosphere, they used a rocket-borne detector to observe in six channels at wavelengths spaced from 100 micrometers to 1 mm. The three channels with the longest wavelengths were probably free of significant emission from interstellar dust. The results revealed an excess emission in the submillimeter spectral range, a finding that currently has no widely-accepted explanation. Matsumoto pointed out to Commission 33 that there are two separate but related problems in explaining this result: the nature of the energy source and the physical process involved. In turn, there are two possibilities for each of these puzzles. The needed energy may have a "baryonic" origin such as supernova explosions or radiation from purported massive "Population III" stars, or it may be produced by a "non-baryonic" mechanism such as cosmic strings or decaying particles.

Matsumoto told the audience in the crowded room that "more experiments are needed" in three general catagories. They are the study of spatial fluctuations of the background at spectral wavelengths less than 1 mm, near-infrared spectroscopy of the diffuse radiation at wavelengths from 1 to 5 micrometers, and observations of spatial fluctuations in the diffuse X-ray background with satellites such as GINGA and ASTRO D.

Progress in the study of small-scale fluctuations in the cosmic microwave background was reported by Rogier A. Windhorst (U. S. National Radio Astronomy Observatory). He described the first results of a survey of several small areas of the sky – 9 arc minutes on a side – to very low flux levels with the Very Large Array at wavelength 6 cm. These areas are the Palomar ultra-deep survey fields. The survey, which has several objectives, began in 1987, and is scheduled for completion in 1991. The first 100 hours of observations have now been reduced. Windhorst told me that "it is possible that we are close to a real detection" of small-scale fluctuations. However, to be conservative, he presented upper limits, which ranged from a few parts per thousand at a scale of 12 arcseconds to several parts per hundred thousand for those on scales of 60 arcseconds.

Soviet Satellite Slated for 1992 Launch

N.S. Kardashev (Moscow) informed the audience that full approval has been given for a Soviet satellite to study the cosmic background. The payload is scheduled for a launch in 1992 and will be placed at the Lagrangian point in the Earth-Sun system that lies some 1.5 million km opposite the Sun. This location will give the maximum possible freedom from interference by the Sun, Earth, and Moon. There will be five liquid-nitrogen cooled receivers operating at wavelengths from 1.5 mm to about 1 cm.

How Binaries Form

by Laurence A. Marschall

Astronomers have long suspected that many – if not most – stars are members of binary or multiple systems, but they are still struggling to understand how such systems are born. Do they arise through the process of cloud collapse and fragmentation that produces single stars? Or by the fission of rapidly rotating objects? Or by a capture of one star by another?

At the Joint Discussion II on the Formation and Evolution of Stars in Binary Systems yesterday, all three possibilities were considered. Alan Boss of the Carnegie Institute of Washington reviewed the promising results of recent calculations carried out by researchers in the U.S. and Japan. Boss used computer graphics to illustrate the point that collapsing clouds can form ringlike structures that later fragment into smaller pre-stellar blobs. Heirarchical fragmentation, it seems, stops when the fragments are lighter than about 0.01 solar masses, making the fragmentation process an unlikely source of brown dwarf companions and planetary systems less massive than this.

Fission scenarios, which might be an alternate source of close binaries, appear to be inadequate to the task. Richard H. Durisen (Indiana University), discussing a series of 3-D hydrodynamic simulations, concluded that binary fission was unlikely to occur in nature. "What's remarkable", he noted, "is the robustness of these calculations," under a wide range of initial conditions.

Capture processes, in contrast, have a significant role to play. Frank Verbunt (Max-Planck Institute), referring to the recent discovery of short-period X-ray binaries and pulsars in globular clusters, described a number of possible binary formation mechanisms which involve close stellar encounters. In the cores of globulars, where star densities are exceptionally high, tidal capture and three-body exchange interactions will enrich the population of binaries during the lifetime of the cluster. Verbunt noted that capture processes are the best way to produce the exotic binaries that produce X-rays and millisecond pulsars.

In the brief time allotted for questions, Robert Mathieu (University of Wisconsin) requested more specific guidelines for observers. The theorists, he remarked, had established that binaries can form, but had given no further information about what observable quantities would be useful for testing alternate formation scenarios. "This is a very young field," responded Joel Tohline (Louisiana State University), "we are just beginning to understand qualitatively how the process can take place in nature." Another joint meeting on binary formation on August 9 at 09:00 will deal with these theoretical and observational matters at greater length.

IAU TODAY

The daily newspaper of the
20th General Assembly of the
International Astronomical Union.

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Proposal for an IAU Resolution

The following proposal for an IAU resolution is submitted by the Swedish National Committee for Astronomy with the approval of the IAU officers.

The International Astronomical Union,
recognizing
(a) the importance of world-wide collaboration in the exploration of the Solar System and in the observation of astronomical objects by satellite telescopes,
(b) the value of astronomy and space research for all mankind as activities associated with and symbolizing peaceful endeavours and not preparations for war,
(c) the significance for astronomy and its public support that its peaceful character prevails;
noting
(a) the growing strategic military importance of methods and technology used in, or being of great interest to, astronomical research,
(b) the increasing threat against free research and free exchange of information that this military importance creates;
deplores
the increasing military involvement in space,
and urges
the maintenance of the integrity of space for peaceful scientific purposes.

COLLOQUIUM 104
Solar and Stellar Flares

Bernhard M. Haisch, Special to IAU Today

In August 1984, my friend and colleague Marcello Rodono spent several days visiting me to discuss flare star research in San Francisco. As often seems to happen in life, the most consequential decision was the one made at the last minute and on the spur of the moment: somewhere between my house on the coast and the San Francisco airport, where Marcello's plane was waiting, I said something impetuous like, "Marcello, what would you think of having an IAU meeting on flares out here?" He replied with something like, "Oh, why not?" Within a few minutes it was settled, and he was on his way back to Italy. Years later his Sunday afternoon tourist photo of the Golden Gate Bridge would serve as the model for the Italian artist sketching our IAU Colloquium flyer.

IAU Colloquium 104, "Solar and Stellar Flares," will be held August 15-19 at Stanford, California. The meeting will take place on the Stanford University campus, and is sponsored by the Lockheed Palo Alto Research Laboratory; the University of Catania, Italy; and Stanford University. Financial support for the meeting is being provided by the NASA *Solar Maximum Mission* program and by Lockheed. Assistance to participants is coming from NASA, ESA, and the IAU.

This IAU Colloquium brings together solar physicists and stellar astronomers, of both theoretical and observational persuasion, to explore the flare phenomenon from all possible perspectives. In fact, one talk rather nicely epitomizes this sought-after unity: J. Schmitt will present "A Solar Flare Observed by Einstein and SMM." (Yes, that observation was carried out!)

Among the other topics to be discussed are solar and stellar magnetic fields and atmospheric structures, high-energy radiation and particles, and energy release.

The proceedings will be published as a special edition of *Solar Physics*; this will also be marketed as a book. We expect more than 250 participants from around the world.

PALOMAR SKY SURVEY II. Dr. Robert J. Brucato, Assistant Director of the Palomar Observatory, will be available outside Room 314 tommorrow at the 15:30 coffee break in the Commission 24 sessions on Star Catalogs to discuss the distribution of the Palomar Observatory Sky Survey II.

IAU NEWS

Books Bound to Cost More, Publisher Says

by Leif J. Robinson

"From 1965 to about 1980 there was a downward spiral in the size of the book market," said Simon Mitton, editorial director for science, technical, and medical publishing at Cambridge University Press. He made this remark at Joint Discussion I, on Documentation, Data Services, and Astronomers yesterday. As a result, the "guaranteed" market for technical books – people or institutions willing to take anything offered – has shrunk to only about 550 libraries and, depending on the popularity of the subject, 100 to 1,000 individuals. Because of such a small number of buyers, Mitton noted, technical books are – and will remain – expensive.

Mitton went on to itemize the budget for a typical technical book: 25 percent for manufacturing, 10 percent for fees and royalties, 35 percent for bookseller discounts, and 25 percent for marketing and distribution. "This leaves only 5 percent for the publisher," he said. Translated into actual cost, this profile yields $75 to $120 for a 400-page typeset monograph. A manuscript delivered as camera-ready copy would have a list price between $50 and $80.

What is the market for scientific books? According to Mitton, a monograph will sell about 1,000 copies, conference proceedings 400-1,000, graduate texts 2,500 (over three years), undergraduate texts 5,000, and mass-distribution works 10,000 to 100,000. "If it were not for the great strength of the amateur market," Mitton said, his press "could not afford to serve the professional community as it does."

The future, at least as far as book prices are concerned, does not look promising. Mitton pointed out that the application of new technologies has reduced manufacturing costs dramatically. "We have come through a very good period," he reflected. To illustrate this point, Mitton pointed out that typesetting expenses have fallen by a third over the past decade. Unfortunately, a continued reduction is unlikely to prevail, so costs are bound to increase.

Creating a Durchmusterung of the Magellanic Clouds

by Klaas de Boer, Special to IAU Today

At tomorrow's session of the Working Group on the Magellanic Clouds of Commission 28, a plan will be presented to create a "Durchmusterung" of the Clouds. A Durchmusterung is a catalog complete to a given magnitude and listing good positions, with some information on the nature of objects. The plan foresees the mapping of both Clouds and parts of the Bridge region, the determination of accurate positions of millions of objects, spectroscopy at fair resolution of all brighter stars, and surveys of the literature to produce references to names used earlier.

This plan had its roots in earlier meetings. During IAU Symposium 108 in 1983, which was devoted to the Magellanic Clouds, it was stated that new atlases could be very important in further investigations. Most of the existing catalogs are limited to specific objects and the atlases are in some way incomplete. Most do not cover the total fields of these two irregular galaxies. A Durchmusterung reaching a few magnitudes deeper than the older ones (the BD goes to magnitude 10) is feasible today due to the availability of much larger telescopes and the significantly enhanced photon detectors.

Various groups are contemplating similar plans, which will be discussed in the session. Hopefully an appropriate level of coordination can be achieved as an outcome of the meeting.

It seems feasible to define fields in the Magellanic Clouds that ought to be studied in detail. These fields might be a set of Magellanic Cloud Selected Areas, similar to the Kapteyn Selected Areas of the Milky Way.

The potential use of a Durchmusterung goes beyond the visual. The Magellanic Clouds were mapped at far-infrared wavelengths by IRAS, and new radio surveys are likely to be presented during the session. It is expected that ROSAT will find many new X-ray sources soon after launch in 1990, for which optical counterparts will have to be identified.

A Clear Day Dawning for Imaging from the Ground

by John David, Special to IAU Today

Joint Commission Meeting 3, High Angular Resolution from the Ground, will be held tomorrow in Room 307 to inform participants of the capabilities and potential of high resolution imaging from the ground. The recent rapid advances in instruments and techniques across the spectrum from radio to optical wavelengths have resulted in an upsurge of interest in the field that makes this meeting timely.

There are several major instrumental developments under way; our intention is to alert astronomers to the opportunities that now exist and to those that will arise within the next few years. JCM3 is aimed at the non-specialist and consists of a series of invited talks in four sessions: 1. "Introduction, Principles and Problems;" 2. "Imaging at Radio Wavelengths;" 3. "Imaging at Optical and IR Wavelengths;" and 4. "Astrophysical Potential."

CRUISE TICKETS AVAILABLE

Tickets are still available for the Annapolis cruise on Sunday, August 7. This promises to be one of the highlights of the General Assembly, and tickets can be purchased at the registration desk.

Japan Opens a National Astronomical Observatory

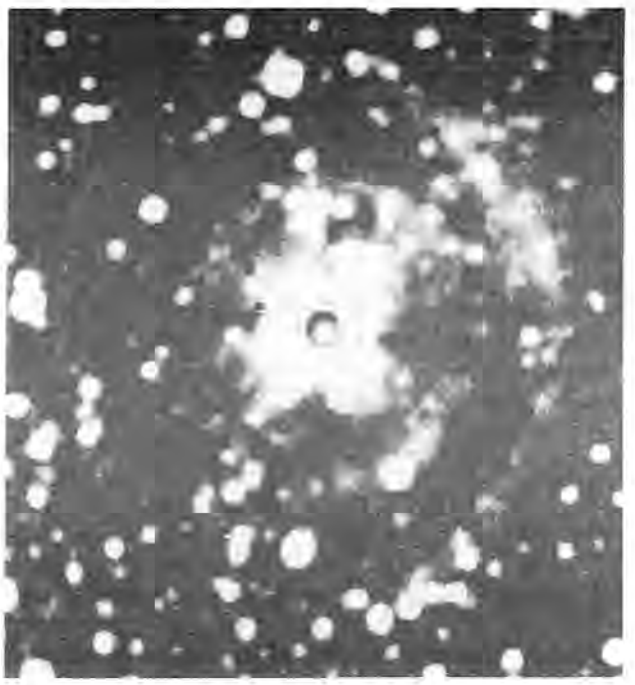
by Yoshihide Kozai, Special to IAU Today

The National Astronomical Observatory of Japan was established on July 1 as an inter-university organization open to researchers in astronomy and related fields. It combines Tokyo Astronomical Observatory (University of Tokyo), the International Latitude Observatory, and the Solar Radio Astronomy Branch of the Research Institute of Atmospherics (Nagoya University). This reorganization aims at strengthening Japan's astronomical research in response to the recent rapid development of astronomy.

The new observatory is composed of six divisions (Optical and Infrared Astronomy; Solar Physics; Astrometry and Celestial Mechanics; Theoretical Astrophysics; Radio Astronomy; and Earth Rotation) and eight research facilities (Mizusawa Astrogeodynamics Observatory, Norikura Solar Observatory, Okayama Astrophysical Observatory, Dodaira Observatory, the Solar Radio Facility of Nobeyama Radio Observatory, World Solar Data Center, the Cosmic Radio Facility of Nobeyama Radio Observatory, and the Astronomical Data Analysis Center).

The National Astronomical Observatory will provide research opportunities to all who study astronomy, participate in astronomy education in graduate courses, promote domestic as well as international cooperation in astronomy, and advance programs for constructing major observational facilities. We hope that this new organization will extend the frontier of astronomy farther, thereby contributing to the progress in astronomical research in the world. Our address is: National Astronomical Observatory, Mitaka, Tokyo 181, Japan.

SUPERNOVA / from page 1



Light echo from Supernova 1987A. Las Campanas Observatory photo by Arlin Crotts (McDonald Obs.).

velope structure accounts for when and how the energy got out for us to see it.

Some previous SN IIs have faded more slowly than the emerging shock energy alone can account for. They were suspected of making small amounts of Ni^{56}. This radioactive isotope decays to Co^{56}, then to Fe^{56} (half-life 77 days), with the emission of gamma rays at 0.847 and 1.238 MeV as the Fe^{56} settles down into its ground state. About 0.075 solar masses of Co^{56} have now been seen in SN 1987A, directly via the gamma rays and a transient infrared Co II line as well as through its effects on the optical light curve and hard-X-ray flux. These data and their interpretation will be brought up to date for us by representatives of the teams collecting and analyzing data from the MIR, GINGA, and Solar Maximum Mission satellites and the Kuiper Airborne Observatory.

Have we understood everything we have seen? No, at least not yet. Among the puzzles to be addressed at the JD are the transient appearance of a close, bright, companion object and other evidence for asymmetric and extended structure. Another mystery is the highly variable (apparently thermal) soft-X-ray emission, which turned on long before the ejecta ought to have encountered material to shock. And, unless these X-rays are coming from a pulsar-driven nebula at the center (and leaking out through exceedingly fragmented envelope material), then the neutron star has not contributed anything since the neutrino burst.

WAVEFRONTS / from page 1

many of them will take up millisecond pulsar timing again tomorrow morning, when Commission 31 gathers in Room 107.

Also at JCM 1, Peter Bender (University of Colorado) reviewed the latest results in lunar laser ranging. He told how milliarcsecond precision has brought researchers to the brink of detecting fluctuations in the Moon's free librations. Such a result, long awaited, might help confirm that the free librations originate from turbulent motions within a fluid or nearly fluid lunar core.

Gill Medal Awarded to D.S. Evans

The David Gill Medal, awarded for general merit in astronomy by the Astronomical Society of Southern Africa, was presented to David S. Evans (U. Texas, Austin) yesterday afternoon at the Marriott Hotel in Baltimore. Evans went to South Africa from England in 1946 and, according to the citation, "for 22 years was involved in many of the most important developments in southern African astronomy."

IAU PEOPLE

REMINISCENCES

Zurich, 1948: First Post-WWII General Assembly

by Edith A. Müller, Special to IAU Today

Forty years ago this month, the IAU held its seventh General Assembly at the Federal Institute of Technology (ETH) in Zürich. Sir Harold Spencer Jones presided. Since the previous General Assembly, ten extremely difficult and sad years had elapsed. Most international contacts among astronomers were interrupted during World War II. But thanks to the great efforts of Jan Oort, IAU General Secretary since 1938, the work and spirit of the IAU were kept alive throughout those terrible years. Astronomers from many parts of the world gathered again to talk about their science, to renew old contacts and friendships, and to build new ones.

Some 300 astronomers from about 30 countries and some 100 accompanying persons came to Zürich. It was like a big family reunion, a happy congenial gathering. It was most inspiring to see and hear astronomers in animated discussions walking along the halls or standing in front of a black board in a lecture room: astronomers such as M. Minnaert with A. Unsöld, G. Abetti with A. Danjon, K. O. Kiepenheuer with D. Menzel, O. Heckmann with E. Hubble, and A. Mikhaylov with O. Struve.

At that time I was a "two-year-old baby astronomer" with a Ph.D. in mathematics. A member of the small staff of the Federal Observatory in Zürich, I belonged to the Local Organizing Committee for the meeting. During the meetings I often was assigned to the reception desk to help astronomers solve the various problems they might have. Thus I got to meet a great number of astronomers personally. What a chance for a baby-astronomer!

One of my tasks with the LOC was to help plan the ladies program. I organized a visit to the Lindt & Sprüngli chocolate factory in Kilchberg. At the end of the visit we were guided to an enormous table full of chocolates of all kinds which none of the visitors had seen for many years. We were invited to taste them and this we did with the greatest pleasure; within a few minutes the chocolates had disappeared.

Busy with LOC duties, I was unable to attend many scientific sessions, so my recollection of those discussions are fragmentary, like snapshots. Here are some highlights of my snapshots.

Bernard Lyot installed at the Zürich Observatory telescope his birefringent filter which revealed the whole chromosphere and some prominences in H-alpha. This was a tremendous improvement to the previous method. Numerous astronomers came to admire the chromosphere with its faculae, filaments, and prominences.

Many discussions followed the report on B. Edlén's important work on the identification of a number of coronal lines as due to highly ionized forbidden transitions of metals such as Fe, Ni, and Ca, which led to the conclusion of a hot corona, its temperature rising up to one million degrees.

The presentation of the extension of the solar spectrum up to almost 12 micrometers in the infrared and down to 2000 Å in the ultraviolet caused some sensations. Lead sulphide cells were used as sensitive infrared detectors as reported by Leo Goldberg and Marcel Migeotte, the latter having discovered in the infrared solar spectrum the existence of methane in the Earth's atmosphere. The ultraviolet spectrum was recorded by Richard Tousey *et al.* at the Naval Research Laboratory, and by J. A. Van Allen, J. J. Hopfield *et al.* at The Johns Hopkins University, making use of German V2 rockets launched to heights above the ozone layer from the White Sands Proving Grounds. These experiments were the first steps toward astronomical observations from space. The low dispersion spectra were on display at the IAU exhibition in the ETH. The strong Mg II doublet around 2800 Å was barely resolved but the strong central emission was clearly visible; so was the steep drop of the continuum intensity in the ultraviolet. The interpretation of these observations stimulated much controversy.

A full-day symposium on the abundances of the chemical elements was chaired by Otto Struve. Several key speakers gave summaries on abundance results derived for various astronomical objects such as the Sun, different types of stars, planetary nebulae, and the interstellar medium, making use of better observations, improved theories of spectral line formation, and new results on the continuous absorption coefficients in solar and stellar spectra. Since quite different astronomical sources

Above: Edwin P. Hubble (left), who told the 7th General Assembly about the final construction of the 200-inch telescope, enjoyed the official banquet with Mildred and George McVittie.

Left: Jan Oort (left) sitting with A. Mikhaylov at the official banquet in the Zürich Congress House, August, 1948.

showed very similar abundances, it was concluded that there exists a normal abundance distribution in the Universe. The attempts to explain the deviations from the "normal abundance" in various types of stars made most stimulating discussions.

A spectacular advance came from the use of radio waves, (1) by the development of receivers to record radio emissions from astronomical objects, and (2) by radar echo observations of nearer objects such as the Moon and meteors. The discussions were mostly limited to the newly developed radio equipment. The actual impact of radio observations on our knowledge of the Universe occurred after the Zürich meeting.

Carl Seyfert reported on some spiral galaxies having relatively small but very bright nuclei. The spectra of the nuclei showed extremely broad emission lines which Seyfert compared with planetary emission bands, and which he interpreted as Doppler shifts caused by hot, rapidly moving gas. As it turned out, the Seyfert galaxies were the first ones showing evidence of powerful internal activity. In the same Commission on extragalactic nebulae with Edwin Hubble presiding, a long discussion took place on the methods for establishing a distance scale and on the unsolved puzzle of the large differences between the absolute magnitudes of globular clusters in the Milky Way, the Magellanic Clouds, and M31. With the greatest interest we learned from Hubble about the final stages of the construction of the 200-inch telescope. In the next year, observing with the great telescope was to start.

A report by F. Stratton, first President of Commission 38 on the Exchange of Astronomers, produced great interest among astronomers, especially younger ones. The Commission was created by the IAU Executive Committee in March 1946 due to Stratton's strong initiative. Its aim was, and is, to facilitate the exchange of astronomers and, thus, to promote international cooperation and understanding. By the time of the Zürich General Assembly. the newly created commission, with the financial support of UNESCO, had been able to assist seven astronomers in meeting their travel expenses with a fellowship to work at an observatory in another country.

Like all LOCs of scientific meetings we had our share of problems and excitement until the very end of the G.A. There were persons who had lost their suitcase or valuables and persons needing hotel accommodation but who had not announced their coming. In those days tourist offices and travel agencies were not so common. The LOC had to find rooms for the participants – not an easy task. The summer months are the season of greatest tourism, and Zürich was a great attractor for post-war tourists.

The greatest problem for us was a group of astronomers who arrived three days after the meeting began, without announcing their coming, and requested accommodation for all of them in the same hotel. After extensive unsuccessful hunting, we finally found several rooms in the most expensive hotel in town available on the following day. What to do? The only possibility was the house for homeless people of the Salvation Army! It must have been quite an experience for those astronomers who spent their first night in Zürich at the home for the poorest people and the following nights in the most elegant place where only the very rich usually stay!

Another embarrassment was the missing flags at the Congress House where the official banquet took place. It was the habit of hotels and restaurants to put up the flags of the countries of their guests. Therefore, without informing the LOC, the Congress House only put up the flags of the countries whose participants were present at the opening of the General Assembly as it was reported in the local newspapers. Those who arrived later did not find their flags flying.

Fortunately, the flag crisis and many other problems were solved eventually, including the big question, "Whose hat is this?" After the meeting ended, we learned that a man's hat was found in a lecture hall at the ETH. In those days many men wore hats, so it was not easy to figure out to whom it belonged. All we knew was where the hat was found, what meeting was last held in that hall, and that the hat came from a shop in London. Doing some puzzling and guessing we established to whom the hat might belong. So we packed it into a parcel and sent it off to the person we thought to be the owner of the hat. What surprise the owner had when his lost hat arrived after his return home. We had guessed correctly!

The General Assembly in Zürich remains in my memory as an international gathering of astronomers during which an extraordinary warm, helpful, and cooperative atmosphere reigned. It left a profound impression on me of the wonderful and peaceful spirit of the IAU, a spirit which I sincerely hope will always prevail throughout future years.

IAU ACTIVITIES

THE GALLOPING GASTRONOMER

Caesar's Den
223 South High Street, 547-0820
Rating: ★★★★
by Laurence W. Fredrick

Caesar's Den is located in a section of Baltimore known as Little Italy which is just east of the Inner Harbor area. A short walk from the Inner Harbor brings you to this culinary concentration and you find yourself trying to choose from among dozens of large and small restaurants. I chose Caesar's Den because it looked a bit more authentic than the rest.

This restaurant is different – you sense it immediately. Perhaps it is the lighted lamps on each side of the door or the pink tablecloths with garnet-colored napkins, or perhaps it is the fact that the waiters are professionals. It is a small restaurant seating about eighty guests downstairs. The upstairs section seats about eighty more and is available on weekends and holidays. Reservations are advised, especially on Friday and Saturday nights.

The chef's specialty is veal; veal dishes take up a whole page of the simple menu. I opted for the "catch of the day," and received what was, without a doubt, the best serving of flounder I have ever had. It was done perfectly and served almost smothered in a light tomato cream sauce. My mouth still salivates when I recall the flounder in Caesar's Den.

This was preceded by a small, but adequate, tossed salad and pasta called Fusilli Filetto. This pasta was not on the menu, but good restaurants have it or they are not really Italian. This lovely restaurant will serve half-orders of pasta so you can leave room for the main course..

The wine list is not extensive, nor is it terribly expensive. The house wines and others are from Italy. My favorites from Frascati are listed. The mixed drinks are honest.

At the end (unless you want your salad last) there is the lavish dessert cart. Try the Tartufol or, if you really want to treat your taste buds, try the Fugadelli.

The background music is not intrusive and is predominantly Italian (heavy on opera), although some Mexican music was thrown in. The interior is not very exciting – the usual fake oils of Italian seascapes. The kitchen is another story – immaculate, with every pot in its place. The chef takes great pride in having the "best" kitchen in the world. Quite a claim, and I rate Caesar's Den as the second-best restaurant in Baltimore.

Local Man Rings Up Contributions for A View of Saturn

by Jacqueline Mitton

Herman Heyn's handout proclaims that he's "Bringing you a bevy of celestial wonders, including Venus, Mars, the rings of Saturn, mountains of the Moon, the Big Dipper – and more." All this is provided in anticipation of voluntary contributions that are dropped in a hat strategically mounted on the tripod of his 8-inch sidewalk telescope.

Heyn, Baltimore's Street Corner Astronomer, was positioned conveniently to the Convention Center on Tuesday evening as IAU participants left the Welcome Reception. For those members and Invited Participants suffering withdrawal symptoms from leaving their telescopes at home, he offered a fine live view of Saturn and its rings.

Herman Heyn's enthusiasm for bringing the wonders of space to the downtown street corner is evident. Look for him tonight or on future evenings in Baltimore.

Michigan Astronomers' Reunion

A reunion of University of Michigan astronomers will be held tomorrow night at Obrycki's Crab House, 1729 E. Pratt Street. at 20:00. Please leave a note in Richard Bochonko's mailbox (Canada) indicating the number and names of your party who wish to attend.

SUPERNOVA EXPERTS PONDER THEIR DISCOVERY

A blue supergiant... Nowadays you can't even trust the theorists anymore.

Publishers Press Forward

Canadians Prepare New Handbook

by Roy L. Bishop, Special to IAU Today

More than twenty astronomers have contributed to the preparation of the 1989 edition of a classic observer's guide to the sky. Used by most major observatories in the Western Hemisphere and by thousands of amateur astronomers, educators, and students, the *Observer's Handbook* has an 80-year tradition. For information on price and availability, contact the Royal Astronomical Society of Canada, 136 Dupont Street, Toronto, ON, M5R 1V2, Canada.

Revising *Astrophysical Quantities* is Problem of Astronomical Proportions

To revise the current edition of the famous reference work, *Astrophysical Quantities*, an increase in size of at least 50 percent may be required, and data tables must come from as many authoritative sources as possible.

Experts in a position to provide advice and data should contact Dr. Jacqueline Mitton, 8A Canterbury Close, Cambridge CB4 3QQ, England. With Simon Mitton, she is advising Athlone Press on preparations for the Fourth Edition of *AQ*.

New Review to Debut

by L. Woltjer, Special to IAU Today

The *Astronomy and Astrophysics Review* will be started in 1989 to publish critical reviews of the worldwide astronomical literature that are reasonably complete and balanced. It will encompass all subjects in astronomy and astrophysics and boundary areas with other fields. Developments in atomic, molecular, or particle physics directly relevant to astronomy may be included as well as cosmic-ray physics, solar system studies, and relevant computational procedures. All important fields will be reviewed periodically with the frequency a function of the level of activity. Within about six years, the collected volumes should present a view of the important developments in all of astronomy. The relatively rapid publication schedule aims at four issues per year.

Reviews will be commissioned by this author (c/o Observatoire de Haute Provence, F-04870 Saint-Michel l'-Observatoire, France), as Editor, with assistance from Associate Editors M.C.E. Huber (ESTEC), P. Lena (Meudon), P.G. Mezger (Bonn), F. Pacini (Florence) and S.R. Pottasch (Groningen). Subscription information (including a special rate for individuals) and sample copies may be obtained for the U.S. from Springer-Verlag, attention: Margo Martin, 175 Fifth Ave., New York, N.Y. 10010, and elsewhere from Springer-Verlag, attention: Ludwig Kuhn, P.O. Box 10 52 80, D-6900 Heidelberg 1, Federal Republic of Germany.

Nomenclature "No No" No. 4: Get The Name Right Before The Star Explodes

by H. R. Dickel, Special to IAU Today

Don't use "NS," "S," "Sand," "Sk," and/or "SK" indiscriminately to refer to objects in the lists of stars in the Large and Small Magellanic Clouds by Nicholas Sanduleak. Those four acronyms actually stand for just two publications. Use "The First Dictionary of the Nomenclature of Celestial Objects" to determine which is which and what acronym to use.

EDITORIAL

He Preferred to be a Physicist

by Stephen P. Maran

The noted science writer Dietrick E. Thomsen died last Saturday, on his 52nd birthday, in New Brunswick, New Jersey. He was a valued colleague who was already looking forward to covering this General Assembly for *Science News* magazine before he was stricken with lung cancer less than one year ago.

Thomsen received the 1987 Glenn T. Seaborg Award for "that person who has done the most to acquaint the public with important new scientific developments" and the 1981 Klumpke-Roberts Award of the Astronomical Society of the Pacific, for contributions to better understanding and appreciation of astronomy.

A fixture in the Press Room at meetings of the American Astronomical Society and other professional organizations, he had an advanced knowledge of physics and astrophysics and could often be heard explaining the more technical presentations of the scientists to his fellow writers. After writing and editing for *Physics Today*, the magazine of the American Institute of Physics (1960-1967), he came to *Science News* where he served for the past 20 years. Senior Editor and Physical Sciences Editor of *Science News*, he wrote in their pages last March 5, that "on the whole, I prefer to be a physicist."

All who value the importance of interpreting the advances achieved in the physical sciences to the public and to our fellow scientists will miss Dietrick Thomsen.

IAU WORLD

FACILITIES

Asiago Astrophysical Observatory in Northern Italy

by Lucio M. Bruson, Special to IAU Today

Have you ever seen Giotto's painting of the comet adopted as a symbol of the International Halley Watch? You can get this opportunity when observing at the Asiago Observatory, which houses the combined facilities of the Padova Astronomical Observatory and the Institute of Astronomy of the University on two sites about 90 km north of Padova in northern Italy.

The main telescope is the 182-cm reflector at Cima Ekar, opened in 1973. It has a Cassegrain focus (f/9, scale 12.6"/mm) and an auxiliary Nasmyth focus which can support instruments up to 300 kg. Intensified TV camera guiders permit direct guiding on objects as faint as 17 m on dark nights. The Cassegrain camera reaches m_{pg} = 21 in 60 min on 103a-O plates in good seeing. A full range of standard emulsion is kept in stock. The CCD camera covers a 2' x 2' field with a Thomson TH7882 chip. Its pixel size is 23 x 23 μm; the conversion factor about 9 electrons per ADU; operating temperature 140 K; peak quantum efficiency 40 percent at R; readout noise about 20 electrons r.m.s.; and the resolution 0.28"/pixel. A large set of interference filters is available.

Two spectrographs are available at the Cassegrain focus. The echelle spectrograph uses cross-dispersers with reciprocal dispersion of 5-10 Å/mm, optimized near H-alpha. Available detectors are a CCD camera and photographic plates with one or two-stage Varo tubes. The medium resolution Boller & Chivens spectrograph can operate with either a Bowen camera or Dioptric Blue Galileo camera with dispersions of 173 to 22 Å/mm, depending on grating and spectral order. A CCD camera is also available for this spectrograph.

Asiago Astrophysical Observatory

The Observatory houses three other research telescopes. The 122-cm reflector has Newtonian and Cassegrain foci and is equipped with a camera, a nebular spectrograph, a fast photometer, and a prism spectrograph. The two Schmidt telescopes (corrector plate diameters 67 cm and 40 cm) can be used for direct imaging or for objective prism spectroscopy, with UV-transparent prisms.

Weather conditions at Asiago are typical of pre-alpine regions, with best observing conditions from September to January. Seeing is typically 2-3 arcseconds and about 50 percent of nights are usable during the year. The mean surface sky brightness is 21.6 mag/sq. arcsecond in B, with the eastern sky much darker than the western, owing to light pollution.

Application forms for observing times at Asiago are contained in the Observatory Handbook available from the director's office (Inst. di Astronomia, Univ. di Padova, I-35100 Padova, Italy). Applications are reviewed quarterly and must arrive at least two months before the start of the calendar quarter in which time is requested.

A number of supporting facilities are available, including night assistants on the main telescopes, moderate quantities of free photographic materials, guest rooms, the Palomar, ESO, and ESO/SRC Sky Surveys, a microdensitometer, and assorted computing and data reduction hardware and software. Any staff member of the observatory can provide more detailed information on technical subjects or allocation procedures.

REGIONAL ASTRONOMY

Finland: An Astronomical History Over 300 Years Old

by Mauri J. Valtonen, Special to IAU Today

When the first Finnish university began at Turku in 1640, astronomy was one of the major subjects. Teaching was done by Simon Kexlerus, who taught both mathematics and astronomy, each one hour a day. He also calculated the Finnish almanac.

One of the major scientific problems of the 18th century was the determination of the size and the shape of the earth. An astronomy position called "observer" was created in the University for this research, and Jacob Gadolin was appointed to the office in 1748. His major achievement in the field of geodesy was the establishment of a geodetic triangulation chain between Finland and Sweden across the Åland archipelago.

The first Finnish astronomer of international reputation was Anders Lexell, a professor of mathematics at Turku. He later moved to St. Petersburg, where he carried out most of his life's work as astronomer of the Russian Academy of Sciences. Lexell is best remembered for calculating the orbit of Uranus, establishing its status as a planet. He also discovered an unusual comet that left the solar system after several close encounters with Jupiter, just as Lexell predicted.

A plan to build an astronomical observatory for the University of Turku was started by G.G. Hällström, professor of physics. It was completed in 1819, and was equipped with the best instruments available, including a meridian circle. The observations were carried out initially by H.J. Walbeck. After his death, a young German astronomer, Friedrich Argelander, was invited to Turku, and he accepted the appointment in 1823, partly because his family origins were in Finland. Argelander's stay, which lasted until 1831, proved fruitful. He is remembered, among other things, for making the first accurate determination of the motion of the sun relative to the neighboring stars, using observations made at Turku.

A terrible event in the history of Turku took place at night between the 4th and the 5th of September, 1827. Argelander was carrying out his observations, but he had to stop working before the night was over. His observation diary tells why: "These observations were interrupted by a fire, which burnt to ashes almost the entire city, but which, thanks to God, left the observatory unharmed." Fires also started at the observatory, but Argelander and the janitor were able to extinguish them.

However, the rest of the university was lost, and the university was moved to Helsinki, which became the new capital city of Finland. A chair of astronomy was founded in the University of Helsinki for Argelander and a new observatory was completed there in 1834. However, Argelander returned to Germany in 1837, to start an observatory at Bonn.

For some decades, the observatory in Helsinki was the only institute of astronomy in Finland. Its main activity was participation in a large international project of positional astronomy, Carte du Ciel. In addition, the observatory was famous for celestial mechanics. Karl Sundman, professor of astronomy in the early 1900s, was well known for his pioneering studies of the three-body problem.

The second astronomy center was created in 1924 when Yrjö Väisälä, professor of physics in the new University of Turku, began to teach astronomy. Väisälä held the chair for 35 years. In 1952, a Finnish research laboratory, the Astronomical Optical Institute, was founded in Tuorla, 12 km from Turku.

The city burnt to ashes, but the observatory was unharmed.

It has been attached to the Department of Physical Sciences of the University of Turku since 1975.

The third astronomy center began at the University of Oulu in 1964. The chair of astronomy was created in 1970 and it has been held by K.A. Hämeen-Anttila all along. The Helsinki University of Technology has been involved in a radio astronomy programme for many years under the leadership of Martti Tiuri. The Metsähovi radio astronomy observatory (40 km from Helsinki) became an independent department of Helsinki University of Technology this year.

The observing facilities in Finland are modest. The Metsähovi 14-m radio telescope, operating mainly at 22, 37 and 90 GHz is the major facility in radio astronomy. Besides Helsinki University of Technology, which owns and operates the telescope, it is used by the Universities of Helsinki and Turku. In addition, a telescope for studying the decametric radio emission from Jupiter exists in the University of Oulu.

The largest optical telescopes are in Turku (Tuorla): a 70-cm Schmidt telescope and a 103-cm photometric telescope. These are used primarily to study quasar variations. Smaller optical telescopes exist at the Universities of Helsinki (Metshovi), Turku and Oulu.

The current year marks a major improvement in the observing facilities of Finnish astronomers. A new Swedish-ESO submillimeter radio telescope started its scheduled operation in La Silla, Chile, and Finnish astronomers are taking part in the observing within our 5 percent quota of the telescope time. Later this year, a Nordic 2.5-m optical telescope will be completed in La Palma, the Canary Islands. Finland had a major share in the construction of this telescope, since the optics were made at the University of Turku. The telescope is designed to be a high accuracy instrument such that 80 percent of light of a point source is collected within 0.4 arcseconds. Finland has a 25 percent share of the Nordic observing time in this telescope.

Finland has also recently become an associate member of ESA. This, together with cooperative agreements

see FINLAND, page 8

IAU PEOPLE

Astronomers Dock at Welcoming Reception

by Jay M. Pasachoff

Astronomers were welcomed to Baltimore on Tuesday evening by a reception held simultaneously at the National Aquarium in Baltimore and the Maryland Science Center. IAU Members, Invited Participants, and guests streamed into the Science Center on the west side of the Inner Harbor. After enjoying exhibits, bars, food, and conversation, many rode water taxis to continue the festivities at the Aquarium.

As E. Margaret Burbidge (La Jolla, California), Roger Cayrel (Paris, France), and others in one boatload taxied across the water, a breeze provided welcome relief from the evening's high temperatures.

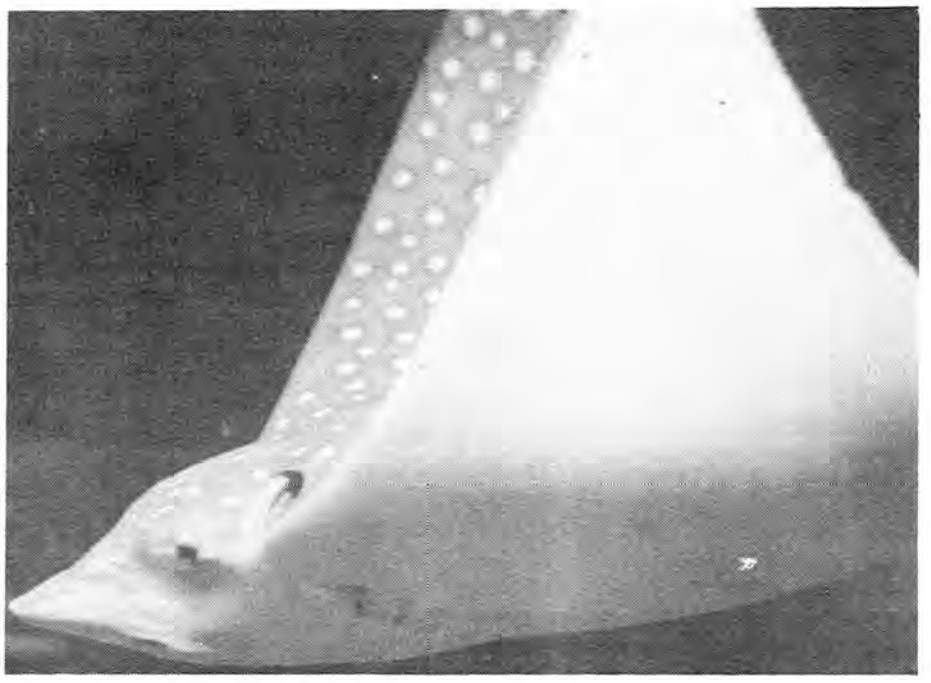
At the Aquarium dock, volunteers directed the celebrants to the stairs that lead to the entrance. A sign there announced the firm no-smoking policy. The Local Organizing Committee had been warned that indoor smoking would set off a fire alarm, requiring that the building be evacuated. Fortunately, there was neither fire nor false alarm.

A lavishly stocked bar at the Aquarium entrance stalled many of the visitors, though most eventually found their way farther inside. The dazzling modern design of the National Aquarium in Baltimore, with its giant central multistory fish tank, was the centerpiece of the display. The name of the facility was a compromise worked out when the citizens of Washington, D.C., refused to allow the National Aquarium there to be closed when the new facility in Baltimore opened in 1981. Including the words "in Baltimore" allowed both facilities to co-exist peacefully. The astronomers found the Aquarium almost empty compared with the usual crowds, which average about 1.4 million people per year.

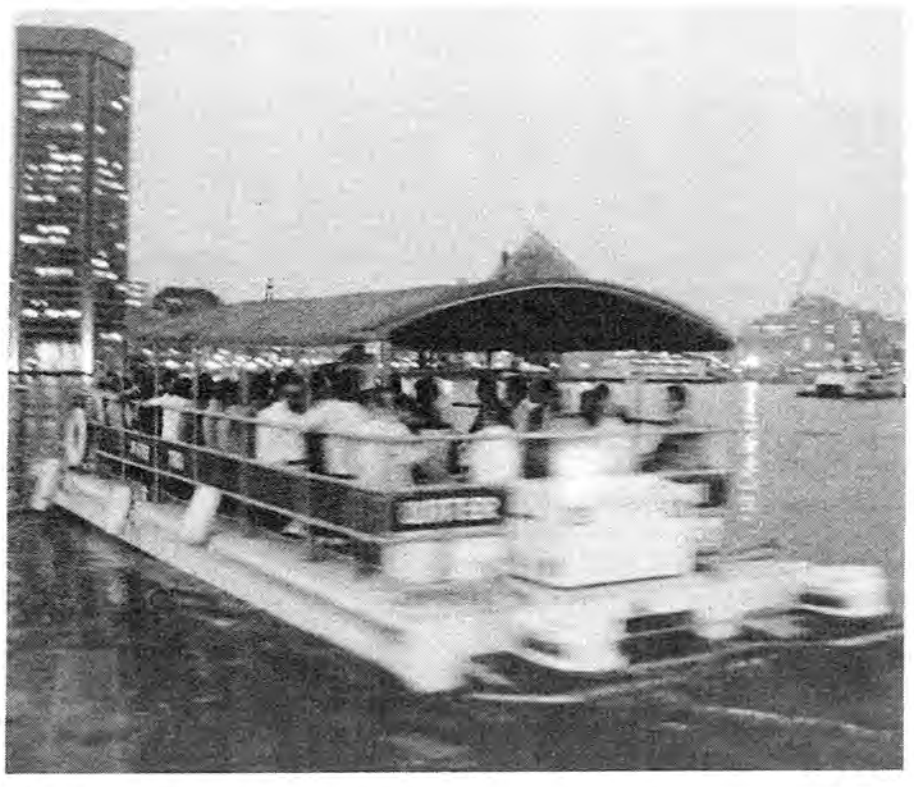
Passing dioramas showing pond life and shoreline life, astronomers reached a second level of the Aquarium. Standing there, Gustav Tammann (Switzerland) told this reporter about broadsides with views of comets that were published in Germany, Switzerland, and France around 1500 and 1900.

The third level of the Aquarium provided the fullest selection of food. Those who had dinner before the reception regretted having done so when they reached this floor. Although some attendees were seemingly unaware of it, a well-appointed motor yacht was moored around the corner from the Aquarium. Aboard this ship a spectacular array of pastries greeted those who found it. The reception ended at 22:30 with the Aquarium's closing announcements repeated over the loudspeakers alternately in male and female voices. Some astronomers, like Howard and Harriet Poss of Temple University (Philadelphia), lingered outside on the quay, wondering perhaps how future G.A.s will top this occasion.

Astronomers look down, for once, at Aquarium Reception.



"Cosmic" ray starred at last night's event.



Splash, splash, splash went the taxi . . .

E.M. Burbidge (La Jolla), R. Cayrel (Paris) enjoyed a balmy Baltimore evening.

IAU BULLETINS

Shuttle Bus Service to Meyerhoff Symphony Hall

Bus service will be provided to Meyerhoff Symphony Hall from 18:00 to 19:30 every 20 minutes from Loyola Dormitory and from the Convention Center Pratt Street Entrance with stops at all hotel boarding points as shown below. Only supper ticket holders will be permitted to board between 17:00 and 18:00.

Stouffer: NE corner of Pratt & Calvert
Brookshire: NW corner of Lombard & Calvert
Omni International: SE corner of Fayette & Liberty
Lord Baltimore: SE corner of Fayette & Liberty
Marriott: SW corner of Eutaw & Lombard
Holiday Inn: SE corner of Howard & Lombard
Days Inn: SE corner of Howard & Lombard
Sheraton: NW corner of Charles & Conway

Return service will be provided to all hotels and the Loyola Dorms at the conclusion of the event.

Buses will be identified by the IAU Shuttle Sign in the front window with the route number on the passenger loading side. Loyola Dormitory is serviced by Route 1. The downtown hotels are serviced by Route 2.

Dormitory Bus Schedule

	Dorms to Convention Center		Convention Ctr. to Dorms
	Every 20 minutes	On the Hour	Every 30 min.
Aug. 4	07:30 - 09:30	10:00 - 17:00	17:00 - 19:00
Aug. 5	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 6	07:30 - 09:30	10:00 - 20:00	----------
Aug. 7	08:00 - 12:00	13:00 - 20:00	----------
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street and Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Closing Banquet Tickets

The sale of Closing Banquet tickets will cease at 12:00 today. You must purchase a ticket in order to attend this spectacular event. Tickets are available in the Pratt Street Lobby.

Convention Notices

Poster Boards: All material posted is under the supervision of the Commission Presidents and the General Secretary. Boards for scientific poster sessions are supervised by the General Secretary. Before posting anything, contact the IAU Administrative Office, Room 321.

Smoking: Please do not smoke in any meeting room.

Leftover Items: All papers not removed from the meeting rooms will be collected and thrown away at the end of each day. All personal items left in the meeting rooms will be taken immediately to the Lost and Found area, in the corridor beyond Hall A.

Brown Bag Breakfasts: The concession stand in Hall D will open daily at 08:00.

Special Events

Baltimore Symphony Orchestra concert: Reserved seat tickets are available at the Symphony Booth in the Pratt Street Lobby. The Symphony was acclaimed on its May 1987 tour of Vienna, Frankfurt, Munich, Leipzig, London, Moscow, and Leningrad.

Reserved Seating for the Symphony Concert: If you purchased the supper that will be served before the Symphony, you will find a voucher in your registration envelope for a reserved seat. This is not your reserved seat ticket for the concert hall. Please exchange the voucher at the Symphony booth for your reserved seat.

Tour Itineraries

Annapolis Adventure on Thursday, August 4, will stop at the Maryland State House and the U.S. Naval Academy, with lunch at the City Dock Area.

A tour of **Scenic and Historic Baltimore** on Friday, August 5, will visit the Walters Art Gallery, the Peabody Library, and the Maryland Historical Society/Baltimore Museum of Art with lunch at Haussner's Restaurant.

On Sunday, August 7, the **Observatory Tour of Washington, D.C.** will visit the U.S. Naval Observatory, NASA-Goddard Space Flight Center, and the Mall adjacent to the Smithsonian. Lunch will be served at the Mall.

Longwood Gardens is the site of a tour, with lunch, on Monday, August 8. On Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania,** with lunch at Divine's Carousel.

Daily Washington, D.C., Tour

A daily trip to Washington, D.C., is offered as an alternative to the scheduled tours listed above. In order to go on the tour, you must sign up at the tour desk by 14:00 on the day before you want to go. There is a minimum number of 30 participants required for each daily tour to Washington; if fewer people have signed up, the tour will be cancelled for that day.

Mail Services – Communications

Mailboxes: All Members and Invited Participants are assigned a mailbox. Individual names are arranged within the country listed as your mailing address in the IAU Membership roster. Registered Guests share a mailbox with their sponsors. Within each country, there may be as many as three sections; names are alphabetized within each section. On-site registrants are in the last two sections. Labels will be printed on August 2 (to accommodate registrants from July 27-August 2) and August 5 (for those who register from the 3rd through the 5th). Remember to check all three sections to find a colleague's mailbox.

Program changes, commission business announcements, etc. for possible publication in IAU TODAY must be submitted to the General Secretary's Office.

LOC STAFF MEMBERS. The LOC staff offered to form a human pyramid for this photo but could not agree on who would stand on the bottom. Their occupations range from administrator and financial analyst to secretary and professor. Seated (left to right) are Pamela Hawkins Blondin, Mary Lis, Karen Weinstock, Harold Screen, Carolyn Jones, and Barbara Dreyfus. Standing (left to right) are Carol Hart, Jana Nadarajah, Charles Tolbert, Yan Sun, Lenore Danielson, Jane Smith, Marguerite Ingalls, Hammond Rice, Kristen Frazier, Majorie Felser, Janet Krupsaw, Doris Sunderland, and Oneeka Williams. Photo copyright 1988 by Robert Smith.

FINLAND / from page 6

with the Soviet Union in space research, has started the first Finnish space astronomy projects. They include fly-by experiments on the Soviet *Phobos* mission, participating in the Soviet VLBI project "Radioastron," and observing energetic particles with the SOHO satellite of ESA.

The lack of modern observing facilities has biased Finnish astronomy toward theoretical work in the past. The main areas of theoretical research are dynamics of Saturn's rings (Oulu), light scattering in planetary surfaces (Helsinki), stellar structure and atmospheres (Helsinki), stellar dynamics (Turku/Helsinki), radio galaxies (Turku) and cosmology (Turku/Helsinki). Finnish theoretical astronomers have good contacts with Nordita, the Nordic research institute of theoretical physics and astrophysics.

International cooperation in astronomy is usually arranged through the Academy of Finland. It offers grants for visitors at various levels from post-graduate students to professors. These are handled through the inviting Finnish institute or colleague. In addition, there are exchange programs between Finland and many countries. There is a determined effort going on to increase the number of visiting foreign scientists in Finland. Thus, it is a good time to think about spending a period in Finland, working either with the Finnish national facilities or with the new international telescopes.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. FRIDAY, AUGUST 5, 1988 5

Stellar Winds Blow Through Nebular Sessions

by Richard Tresch Fienberg

What role do stellar winds play in the formation and evolution of planetary nebulae? This question was debated in yesterday morning's sessions of Commission 34. And depending on whom you choose to believe, winds are either a crucial factor in the development of planetaries, or they are almost inconsequential.

Prof. Mario Perinotto (Institute of Astronomy, Florence, Italy) demonstrated from observational data that about half of all planetary nebula central stars with detectable spectra are losing mass via winds. These stars' spectral lines exhibit classical P Cygni profiles. High-resolution observations from the International Ultraviolet Explorer indicate terminal velocities between about 1,000 and 4,000 km/s, values typical of "fast" winds.

The P Cygni features in some planetaries show an unusual "narrow component signature" that startled some members of the audience. In one illustration, Perinotto showed a broad C IV line from the central star of NGC 6543, on which are superposed two much narrower lines – a C IV doublet – with their own P Cygni profiles. "This is interpreted as due to another P Cygni system formed maybe in the area of the visible nebula," he said.

Dr. Sally Heap (NASA-Goddard Space Flight Center) obtained the remarkable IUE spectrum that Perinotto displayed. She explained to this reporter in an interview how the narrow components almost certainly arise in the nebulosity close to, but expanding away from, the central star. "For the first time," Heap asserted, "we see a planetary nebula in absorption. Now we can treat planetaries like the interstellar medium, using absorption-line spectra to derive their physical characteristics."

The widespread presence and crucial diagnostic value of stellar winds do not necessarily imply that outflows strongly affect the surrounding nebulosity. Studies of stellar mass loss suggests that the typical rate for planetary nebula central stars is 10^{-9} to 10^{-8} solar masses per year. Unless this is maintained for at least 10^4 years, fast winds probably can not transfer enough momentum or energy into the nebulae to have much of an effect on their dynamics or evolution.

But Perinotto's conclusions stood in contrast to a presentation by Prof. Bruce Balick (University of Washington). Balick described a scenario by which planetary nebulae can reach their diverse forms. Called the "wind-shaping model," it invokes interactions between slow (10 km/sec) and fast stellar winds and the surrounding remnant red-giant envelope.

With an extensive series of high-dynamic-range CCD images of planetary nebulae, Balick demonstrated that the various morphologies predicted by the wind-shaping model are actually observed. He also presented hydrodynamical calculations which suggest that the basic features of the model are sound. He hopes to build a more convincing case for wind shaping by including radiative energy losses from the winds in future calculations.

INVITED DISCOURSE

Maarten Schmidt and the Rise and Fall of Quasars

by Virginia Trimble

Maarten Schmidt discovered quasars in 1963. This is quite often the only thing elementary astronomy students learn about Schmidt or, for that matter, about quasars. We know better! In tonight's Invited Discourse, "The Rise and Fall of Quasars," Prof. Schmidt will bring us up to date on his discovery, particularly statistical data that seem to be trying very hard to reveal when (and perhaps why) quasars first appeared in the universe and what has become of them lately.

In the meantime, there is also a good deal more to be said about the discoverer. Maarten Schmidt is a native of Groningen, the Netherlands, where he was born on 28 December 1929, and a graduate of Leiden University, where he earned a Ph.D. in 1956. His Dutch colleagues and friends still call him Maart, but you should attempt this only if you have a good Dutch "R" in your repertoire of phonemes.

Since 1959, Schmidt has been permanently associated with the California Institute of Technology, where he is now the Francis L. Moseley Professor of Astronomy. Along the way, he served terms as Executive Officer for Astronomy and Chairman of the Division of Physics, Mathematics, and Astronomy at Caltech, Director of the Hale Observatories, and President of the American Astronomical Society.

Schmidt has also along the way garnered an impressive array of awards and honors. These include the Warner Prize and Russell Lectureship of the AAS, the Halley Lectureship and Gold Medal of the Royal Astronomical Society, the Schwarzschild Lectureship of the Astronomische Gesellschaft, honorary degrees from Yale and Wesleyan Universities, and memberships in the U. S. National Academy of Sciences (as Foreign Associate) and Koninklijke Nederlandse Akademie van Wetenschappen (as Correspondent). Through all this, he has some how managed to keep not only his sense of humor, but also an affection for bow ties and most of his hair.

Maarten Schmidt. Photo by A. Fraknoi.

Schmidt's career as an observational astronomer began at the age of 13, with the spotting of a double star in Lyra through a homemade Galilean telescope. This

see SCHMIDT, page 7

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Cosmic Dust Sweeps to Center Stage Today

by Stephen P. Maran

Joint Discussion IV on "The Cosmic Dust Connection in Interplanetary Space: Comets, Interstellar Dust, and Families of Minor Planets," takes place today, thanks to eight supporting Commissions of the IAU and a Scientific Organizing Committee chaired by Prof. J. Mayo Greenberg of the University of Leiden.

The great hope of astronomers is that what we now observe in comets and asteroids and their debris which orbit the Sun can tell us how our solar system was formed.

Interplanetary dust is produced by comets and asteroids. It produces the familiar zodiacal light, the famous gegenschein, and the annual Perseid meteor shower that will signal the end of the General Assembly next week. For decades, earthbound scientists tried in vain to gather specimens of this precious cosmic detritus by collecting fresh rainfall from the roofs of buildings and by similar techniques. Rockets were fired and balloons were launched as better methods became available. Now samples can be routinely collected by high-flying jet aircraft and distinguished from the accompanying particulate debris of the stratosphere by well-established analytical techniques.

Remote sensing has progressed as well. Space probes counted dust particles as they swept through Comet Halley and determined the chemical composition of many of them, identifying separate, previously unknown classes of cometary grains. The 1983 infrared survey by the IRAS satellite discovered dust bands in the solar system apparently produced by collisions in the asteroid belt. Radar counts meteors and helps determine the orbits of particle streams whether it is cloudy or clear or whether the Moon is full or new. Some interplanetary dust particles appear to be more primitive – more representative of the formative stages of the solar system – than any samples of extraterrestrial matter yet obtained.

Laboratory studies of isotopic abundance patterns and other physical and chemical properties of interplanetary dust particles as well as components of certain carbonaceous chondrite meteorites suggest to some workers that these specimens contain interstellar matter, perhaps even interstellar dust. The evidence suggests in some cases the products of dust formation in red giant stars; in other cases there is evidence for the products of chemical evolution in interstellar space.

It is beginning to appear that some of the most important clues to this problem are to be found in relating the properties of these small solar system bodies to the clouds of microscopic solid particles that permeate the space between the stars and which are to be found most concentrated where stars are born. A remarkably successful marriage between laboratory experiments and astronomical observations has led to a new understanding of the chemical evolution of these small interstellar particles. We now know that they are largely made of complex organic material. The discovery that the dust of Comet Halley is also largely organic rather than rocky is one of the major achievements that has given impetus to the cosmic dust connection. What similarities or differences are there between presolar dust, comet dust,

see COSMIC DUST, page 7

SCHEDULE CLARIFICATION

- Invited Discourse 2, "The Rise and Fall of Quasars," will begin at 18:00 tonight in Hall A.

IAU NEWS

Supernova 1987A Still Packs Them In

by Ronald A. Schorn

Yesterday's Joint Discussion III on SN 1987A opened to a large audience in cavernous Hall A. W. David Arnett (University of Chicago) began the event with a "prologue," which, he noted, came after the events instead of before. In his review, Arnett pointed out some of the results already obtained from the study of this historic modern supernova. For example, the rest mass of the neutrino is probably less than 10 electron volts. Further, there is good agreement between theoretical predictions and the observed energies, number, and spread of arrival times of neutrinos from the explosion. On the other hand, there is no evidence for a very luminous young pulsar that some investigators surmised might have shown up in the first days after the blast.

L. Alexeyeva (U.S.S.R.) summarized the few but precious neutrino detections from the supernova. After a short review of the detectors involved (Baksan, IMB, Kamiokande II, and LSD or Mont Blanc), she discussed the sparse data, and pointed out that all possibilities must be at least considered. For example, the first events from Baksan, IMB, and Kamiokande II are usually assumed to have occured at the same time, but this might not be so. Alexeyeva concluded with a most interesting result. Since June 1980, the Baksan detector has been "live" for a total of 6.6 years, and during that time there have been no events that could be interpreted as the result of the core collapse of a massive star. Subject to a number of assumptions, this result leads to an upper limit of 0.35 core collapse in the Galaxy per year.

Hans Bethe (Cornell University) presented a thorough review of the evolution of our understanding of core collapse from its beginnings to the present. It is a fascinating tale, strewn with brilliant insights as well as many false leads. Bethe favors the mechanism wherein a supernova is produced without the aid of later heating by neutrinos, but he noted that it is still hard to show that an explosion occurs. The issue, he said, is "still in doubt."

Hans Bethe, Giancarlo Setti, participated in JD III on Supernova 1978A.

A talk by Robin Catchpole (South African Astronomical Observatory) took us out to the exterior of the supernova. He discussed the light curves of SN 1987A in various bands and their interpretation. He made the interesting point that amateur observations were critical for the first phases of this event, for work by professionals came only later. Catchpole stressed the dangers of relying on a single light curve made in a single wavelength band. This procedure can be misleading, for the supernova has behaved very differently in different spectral regions.

Astronomers were very lucky with SN 1987A, which was detected early, was circumpolar in the southern hemisphere, and wasn't too bright to observe with modern detectors, at least once some heroic measures were taken. The well-observed bolometric light curve can now be explained fairly well. The decline in brightness over the first seven days was due to the dissipation of energy deposited in the progenitor star's outer regions by the shock wave associated with the initial explosion. From day seven to day 88 there was a slow rise in brightness, followed by a more rapid fall until day 122. During these two intervals the release of radioactive energy controlled the light curve.

At day 122 the brightness decline slowed as the supernova entered the phase where radioactive decay of carbon-56 dominated – the so-called radioactive tail. Since day 256, SN 1987A's luminosity has faded faster than expected from radioactive decay alone. This is probably because some gamma and X-rays are leaking out of the expanding debris and do not, therefore, contribute by down-conversion to radiation at longer wavelengths. The audience was eager to hear of the latest observations from the SAAO, taken just a night or two ago. At that time the supernova had an apparent visual magnitude of 8.56 and was still departing from the "linear" decay curve at an increasing rate – there is no sign of a pulsar as yet.

David Branch (University of Oklahoma) surveyed the development of the supernova's visible-light spectrum, commenting that "the only good thing about a photospheric spectrum is that radiation and matter are closely

see SUPERNOVA, page 7

Getting the Jitters from the Stars

by Laurence A. Marschall

Astronomers can now determine the velocities of stars as well as if not better than a highway patrolman can clock speeders. At yesterday's session of Commission 30 devoted to Radial Velocities of High Precision: Status and Vistas, researchers from five groups reported technical progress on techniques that yield precisions better than 10 meters/second (36 km/hr) on bright stars of spectral type G and later.

It is a far cry from the IAU General Assembly of 1979, noted Bruce Campbell (University of Victoria), when his lone report on such technology was met with silent incredulity. Then the question was whether the method could be made to work; today astronomers are trying to make sense of a growing body of high precision radial velocity data.

Campbell noted that five types of radial velocity variability have so far been recognized. All K giants seem to be variable at the 10 to 100 km/sec level. Alan W. Irwin (University of Victoria) described four years of observations of Arcturus, which seems to show both short term periodicities of several days and long-term periodicities of at least several years. Though the cause of the variations is unclear, K giants are evidently poor choices for radial velocity standards or for planetary search efforts.

Two bright mid-F subgiants, Campbell noted, seem to show smaller, irregular, variations. He also mentioned observations of the short-term radial velocity oscillations of Delta Scuti stars, the enhanced radial velocity variability of chromospherically active stars, and the discovery of a number of long period, low amplitude velocity variables, including several possible brown dwarf and planetary candidates (see *IAU Today*, issue 4, page 1).

All of the methods discussed at the meeting involve superimposing a set of comparison lines directly on a high-dispersion stellar spectrum to provide an absolute wavelength scale. Campbell's group passes starlight through a chamber containing hydrogen fluoride gas before sending it on to a conventional spectrograph. The gas produces narrow, reproducible lines, but it is ex-

see JITTERS, page 7

The Globular Clusters Festival

by Giusa Cayrel de Strobel, Special to IAU Today

It's not surprising that three astronomers had the same idea – to make globular clusters the focus of scientific sessions at this General Assembly. After all, globular clusters are important tools in galactic and extragalactic research. They are used for determining distances of galaxies, they put constraints on the age of the universe, they tell us about stellar evolution and early nucleosynthesis, and they are one of the most interesting cases of the N-body problem.

Tomorrow morning's sessions of Commission 37, arranged by Thomas Lloyd Evans, are devoted to the abundance spread within globular clusters. The principal specialists of this subject will give us their interpretations of metal-poor and metal-rich clusters and of the most peculiar of the nearby globulars, Omega Centauri.

Joint Commission Meeting 5 on August 8 will concentrate on what can be done nowadays in high signal/noise spectroscopy of individual stars in globular clusters. The great progress in high resolution spectroscopy of very faint objects has allowed us to obtain in recent years a wealth of new results on abundances. But we need the attention of specialists in several fields to fully interpret them. The Baltimore Assembly is a splendid occasion to start that process.

Finally, on August 9, JCM 7, Star Clusters in the Magellanic Clouds, will give us an overview of the globular clusters in the Magellanic Clouds. These objects give us our only opportunity at present to study young globulars and to infer from them the early phase of evolution of globular clusters in our own galaxy. JCM 7 was arranged by Pierre Demarque.

Together these three events comprise a veritable globular cluster festival. Please come and enjoy this fascinating subject with us.

IAU SCHEDULE CHANGES

Please note the following meetings:

Commission 8 plans an Astrolabe lunch meeting (S.V. Debarbat) tomorrow, immediately following the second morning session. Interested persons are welcome; please rendezvous at the cafeteria in Hall D.

Videotape presentation of lunar and asteroidal occultations and solar eclipses (D. Dunham), today, 15:30-16:00, Room 203.

Discussion on publishing the results of the 29 May 1983 Pallas occultation (D. and J. Dunham); August 10, 15:30-16:00, Room 202.

IAU TODAY

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IAU NEWS

V.I. Moroz

Moroz Mentions Mars Missions

by Jay M. Pasachoff

"It is time to return to Mars," said V. I. Moroz (Moscow) at an IAU press conference held yesterday morning. He referred not only to the twin probes that were launched to Phobos and its parent planet, Mars, last month, but also to proposed future unmanned missions. There are implications for manned missions as well.

"We think Mars will be the first planet that is visited by astronauts," Moroz said, and he hopes for a landing in the year 2005 or 2010. "People in my country think that it is important to start testing systems to be used in unmanned missions." Such systems, including rovers, satellites, balloons, and penetrators, will be tested in missions beginning in 1994.

In answer to a question as to the participation of American astronauts in a future manned mission, Moroz said, "Why not?" He added that "we prefer the participation of American scientists and scientists from any other country in both manned and unmanned missions." Moroz explained that such missions would be so expensive that it is best to share costs.

The Phobos mission is "the start of our new line of the study of Mars. For the next 10 to 15 years, Mars is the main goal of our planetary studies," the Soviet astronomer declared. The Phobos mission is an international program involving scientists from 30 countries. The two probes have slightly different payloads. Originally it had been suggested that one of the spacecraft might be sent to Deimos, but that is not now planned.

Moroz's own research aboard the Phobos mission will apply infrared radiometry to the surfaces of Phobos and Mars and will include a study of Mars' middle atmosphere by study of the solar spectrum. Dust in Mars' atmosphere would prevent looking at the lower atmosphere. Both experiments are in collaboration with French scientists.

The most spectacular part of the Phobos mission will be when the spacecraft approach to within 50 or 100 m of Phobos and vaporize part of the surface with a laser beam. The clouds created will be analyzed with mass spectrometers. A similar experiment will be carried out with an ion beam.

Such a complicated method of studying the surface of Phobos, instead of landing, is a result of Phobos' low gravity. "Our engineers said it was dangerous to land," explained Moroz. Still, two small stations will be placed on the surface of Phobos. One is a mobile unit with a few days' life that will hop from place to place and so sample a few positions. The other is long lived – about one year in duration – but will remain at a fixed site.

Why go to Phobos instead of to Mars directly? "Small bodies can tell us more about the origin of our solar system than big planets," Moroz said. Phobos, further, is more convenient to visit than an asteroid.

ID1: Comet Halley Findings Summarized

West Recounts Ground-based Observations

by Richard Tresch Fienberg

"Never before have so many astronomers been mobilized for the observation of a single object, and never before has such rich material been obtained with so many different methods." With that, Richard M. West of the European Southern Observatory effectively summarized the impact of the International Halley Watch during the famous comet's most recent apparition. "More than 1,000 astronomers and several hundred amateurs from more than 50 countries actively participated in the IHW," he said.

West spoke on Wednesday evening at the first Invited Discourse of the 20th General Assembly. He described scientific highlights gleaned from the more than 115,000 astrometric, photometric, and spectroscopic observations (22 gigabytes' worth!) that comprise the IHW archive. He told how unprecedented infrared measurements allowed astronomers to infer the temperature, production rate, particle size, and composition of dust in the coma. He showed photographs of a major disconnection event in the tail that occurred just after the comet passed through a magnetic sector boundary in early March 1986. And he made a surprise announcement during his description of how extremely high quality spectra allowed the resolution of the isotopic lines of ^{12}C and ^{13}C. "I just heard," he said, "that the ratio which is derived is slightly less than what you have elsewhere in the solar system – very interesting."

West demonstrated that the ground-based part of the IHW is not over yet. He presented a deep CCD image in which the nucleus shines dimly within an asymmetric inner coma and a more spherical outer coma some 300,000 kilometers across. When the picture was taken last spring, the still-active comet was a remarkable 1.2 billion kilometers from the Sun. West expects observations to continue with large reflectors and perhaps the Hubble Space Telescope for two or three more years, as astronomers studying Comet Halley "carry cometary research farther into the outer reaches of the solar system than ever before attempted."

Moroz Brings Space Data Down to Earth

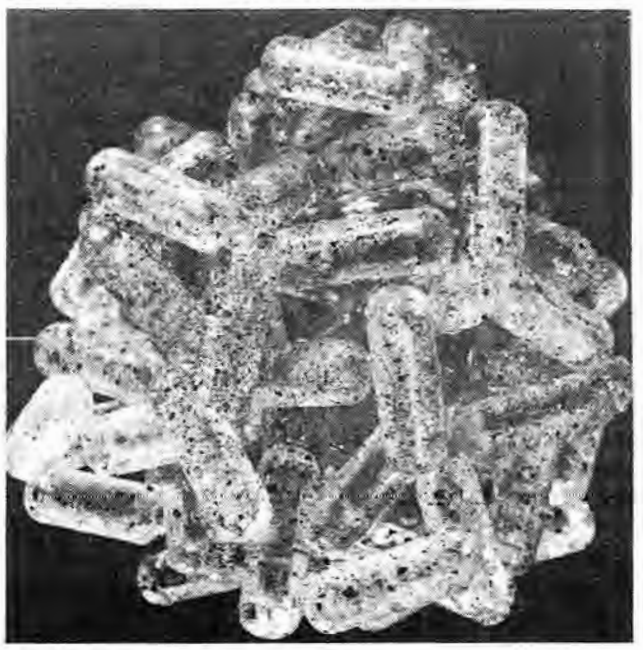
by Jacqueline Mitton

Vassily I. Moroz was the second speaker at the Invited Discourse on Halley's Comet, focussing on the results obtained by the six space probes used to study the comet in 1986. A series of color-coded images showed the Vega views of the nucleus over a range of distances.

Advanced image processing has made it possible to deduce the three-dimensional structure of the nucleus with increasing confidence. Moroz likened the nucleus to a potato. (A model is on view in the ESA exhibition.)

The nucleus of Comet Halley may be the blackest known object in the solar system. Vega 1 measured temperatures as high as 100° C and the image processing revealed surface structure: some areas are a great deal more active than others. The rotation of the nucleus remains a problem, as the periods derived from ground-based and space observations seem at first look to be inconsistent. Several possible explanations for this discrepancy involving precession and rotation around various axes have been advanced.

Moroz went on to describe many more of the multitude of results that flowed from the superb international effort that went into the first direct investigation of a cometary nucleus, including spectroscopy, properties of the coma and interactions with the solar wind.



Model for interstellar dust grains features cores with two outer layers. Tiny particles in the outer mantles produce far-UV extinction. Photo by Loek Zuyderduin.

Multi-wavelength Observers Will Band Together

Thierry J.-L. Courvoisier, Special to IAU Today

A discussion of multi-wavelength observations will be held today at 09:00-12:30 in Room 104. Here, Dr. Courvoisier provides a short introduction to the scientific justification for such studies.

The opening of much of the electromagnetic spectrum to astronomical observations in the last decades has shown that most celestial objects emit substantial amounts of radiation in more than one spectral domain. Valuable information on the emitting regions is therefore available in very different regions of the spectrum. A prime example are the quasars which radiate roughly the same amount of energy in each decade of frequency from the far infrared (or radio domain for radio loud objects) to the X-rays and gamma rays. Other examples can be found in the X-ray emission of the sun and cool stars, the far infrared emission of galaxies, the visible emission of low mass X-ray binaries and many others. The understanding of the physics of the emission regions in all these objects greatly benefits from multi wavelength observations. In some cases, like active galactic nuclei, such an understanding will be quite impossible without a very extensive coverage of the complete spectrum.

Many objects emitting in different spectral domains are variable in time. The variability timescale can be very different, from seconds (e.g., in X-ray bursters) to the timescales of stellar formation in galaxies. The study of phenomena on such different timescales requires different types of observations, ranging from independent observations in different wavelength bands at different epochs to the simultaneous observations from the radio domain to the X-rays required to study rapid variations in the energy distribution and polarization of BL Lac objects. All these programs have the organization needed to merge together the skills needed to aquire, reduce and analyze data from widely different instruments.

Several groups have formed in the last years to use the possibilities of coordinated multi-waveband observations. They have reported their findings at various conferences now in the process of being published. These findings illustrate the power of the method of investigation used. A specific example is the correlation between the X-ray and infrared emission in active galactic nuclei: Studies of samples of nuclei show in general a very good correlation between the luminosities of the different components. On the other side, a muli wavelength study of 3C 273 in the last years has shown that on a more detailed scale, the different components vary quite independentely. Both results are not contradictory, but show that different relationships between the emission components exist on different timescales.

A very different example of the power of coordinated multi-wavelength observations is given by the study of accreting compact binaries. In these sources, X-rays are generated in the compact source and parts of this radiation is reprocessed into other wavebands in the outer regions of the system. The coordinated study of both types of emission allows to establish the location of the reprocessing material and for example the study of the corona around the accretion disk.

IAU PEOPLE

Charlotte Moore Sitterly

REMINISCENCES: COMMISSION 14

The 4th General Assembly at Cambridge, 1932

by Charlotte M. Sitterly, Special to IAU Today

My first acquaintance with the IAU was in 1932 at the meeting held in Cambridge, Massachusetts. Prior to this I had helped to assemble material for delegates from Mt. Wilson. The material dealt with standards of wavelength and was based on the work of Drs. Charles E. St. John and Harold D. Babcock at the Mt. Wilson Observatory.

In 1928, at Mt. Wilson the first revision of Rowland's table of solar wavelengths was published. In 1931, I had access to the beautiful sunspot observations made at Mt. Wilson. The observed Zeeman effect recorded on these spectra for atomic lines provided the material that I used for my doctoral thesis.

Later, solar observations were in the infrared region and the identifications were greatly extended. A critical appraisal of laboratory analyses of atomic spectra was required for identification of the solar lines. Here was the inspiration for preparing the first *Multiplet Table of Astrophysical Interest*. The demand for this table has persisted through the years.

The 1932 meeting was surprisingly informal; W.F. Meggers presided. He and C. C. Kiess reported on their work at the National Bureau of Standards. I was the "audience." Kevin Burns soon became an active contributor. Gradually the membership increased. Although Commission 14 had carried on quietly in the Union, it provided essential data needed world-wide. During my tenure as President, I was impressed not only by the never-ending demand for tables and data analyses of atomic spectra, but also, by the broad scope of these demands in other Unions, namely the International Unions of Physics and Chemistry.

For a brief period I reported to Commission 12, the solar commission, on the Multiplet Tables of Laboratory Data and their usefulness in identifying solar lines. This Commission is now primarily concerned with solar activity and solar phenomena.

My present allegiance to the Union is to provide astrophysicists with current relevant laboratory data on atomic spectra. These data are required for the correct interpretations of all stellar spectra of many types provided by nature to challenge us in our never-ending effort to explore the universe.

Editor's Note: Author Charlotte Moore Sitterly, distinguished compiler of multiplet tables and other fundamental reference works, will celebrate her ninetieth birthday on *September 24. We wish her many happy returns of the day!*

REMINISCENCES

The 8th General Assembly: Rome 1952

by Leonida Rosino, Special to IAU Today

Not many of the astronomers who participated in the first General Assembly of the IAU in Rome in 1922 were still present when, thirty years later, the IAU returned to Rome to hold its 8th Assembly in September 1952, the second after the ruinous war which had caused the paralysis of nearly all international relations for more than seven years. Only 300 astronomers met in Zurich in 1948 for the 7th Assembly, but at Rome there were more than 600, from 34 different nations, a clear indication of the rapid revival of astronomy after the tragic interval of the war. New discoveries, new instruments and techniques, and new ideas were already indicating the trend of future astronomical researches.

After the Inaugural Ceremony, which took place at the Campidoglio in the "Sala degli Orazi e Curiazi," in the presence of the Minister for the Public Instruction and of the Mayor of Rome, the scientific work continued at the University, under the auspices of the National Council of Researches. All the most famous astronomers of the epoch, Otto Struve, Bertil Lindlad, Harlow Shapley, Walter Baade, Bengt Strömgren, Giorgio Abetti, A. Danjon, Ira S. Bowen, Carl D. Shane, V.A. Ambartsumian, Georges Lemaître, Jan H. Oort and others were present, taking an active part in the presentation and discussion of research results.

I remember, among the most important things discussed in the meeting were (1) questions concerning stellar populations, just introduced by Baade, and their implications for our knowledge of the origin, dynamics, and evolution of the stars in this and other galaxies; (2) the announcement that Baade and his associates (Arp, Baum, and Sandage) operating with the new 200-inch telescope on Palomar Mountain, had been able to trace the main sequence in the extended color-magnitude diagram of the globular clusters, typical representatives of population II; and (3) the revision of the scale of extragalactic distances, which were more than doubled after Baade's discovery of the existence of two separate period-luminosity relations, one for the classical Cepheids of population I and one for those in population II, previously confused together.

A sumptuous, torchlit reception was held in the Campidoglio, with a view of the ruins of imperial Rome.

The introduction of the "stellar associations" was another fundamental point discussed by Ambartsumian. There were many exciting discussions of the techniques of observations, including the increasing development of radio astronomy and the use in optical research of the first image tubes of Lallemand. At the same time there was growing interest in theories of the internal construction and evolution of the stars and the formulation of new stellar models.

The Assembly concluded its work on September 13, with the election to the Presidency of Prof. Otto Struve, heir to a dynasty of famous astronomers, who had given such important contributions to the development of astrophysics.

Let me now direct a few words to the social events that played a non-negligible part in this meeting. The participants had the possibility of visiting the most significant monuments of ancient Rome, from the Forum to the Catacombs. They were also invited, with their guests, to a sumptuous evening reception in the Campidoglio, all illuminated by torches, in view of the ruins of imperial Rome, under the equestrian monument of the Emperor Marcus Aurelius. It was really an unforgettable event.

A few days later, all were conducted to visit the summer residence of the Pope, located near the Vatican Observatory, at Castelgandolfo, on the Alban Hills, near Rome. They were personally recieved by the Holy Father Pius XII, who gave an admirable address, speaking of the researches and discoveries which had led to wider knowledge of the universe and to their philosophical and religious implications. The reception, which deeply impressed most of the participants, was followed by an excursion on the "Castelli Romani."

The final dinner took place at Ostia, where the astronomers and their guests, after having visited the ancient ruins of the Roman port, had the opportunity of tasting the best Italian food and the delicious local wines. The evening ended with dances and the friendly goodbyes of the participants.

OBITUARY

Donald H. Sadler: 1908-1987

by George A. Wilkins, Special to IAU Today

Donald Sadler was the last General Secretary of the IAU to serve for two terms (1958-64), and he instigated the present system whereby each General Secretary first serves a three-year term as Assistant Secretary General and then acts as advisor to his successor for a further term. This is only one of the many ways in which Sadler's flair for efficient administration has been of subsequent benefit to the Union and to the community that it serves. Many of the other procedures that he instituted then, and when he was chairman of the Local Organizing Committee for the 1970 General Assembly in Brighton (U.K.), are still in use today.

Sadler joined the staff of Her Majesty's Nautical Almanac Office in 1930, shortly after graduating from Cambridge University with first-class honors in mathematics, and he took charge in 1936, following the sudden departure of the previous superintendent, L. J. Comrie. During World War II, he was responsible for a computing service for the Admiralty, as well as for the continued production of almanacs and tables for navigation. These contributions were recognized in 1948 by the Thorlow Award of the U.S. Institute of Navigation and by the Order of the British Empire.

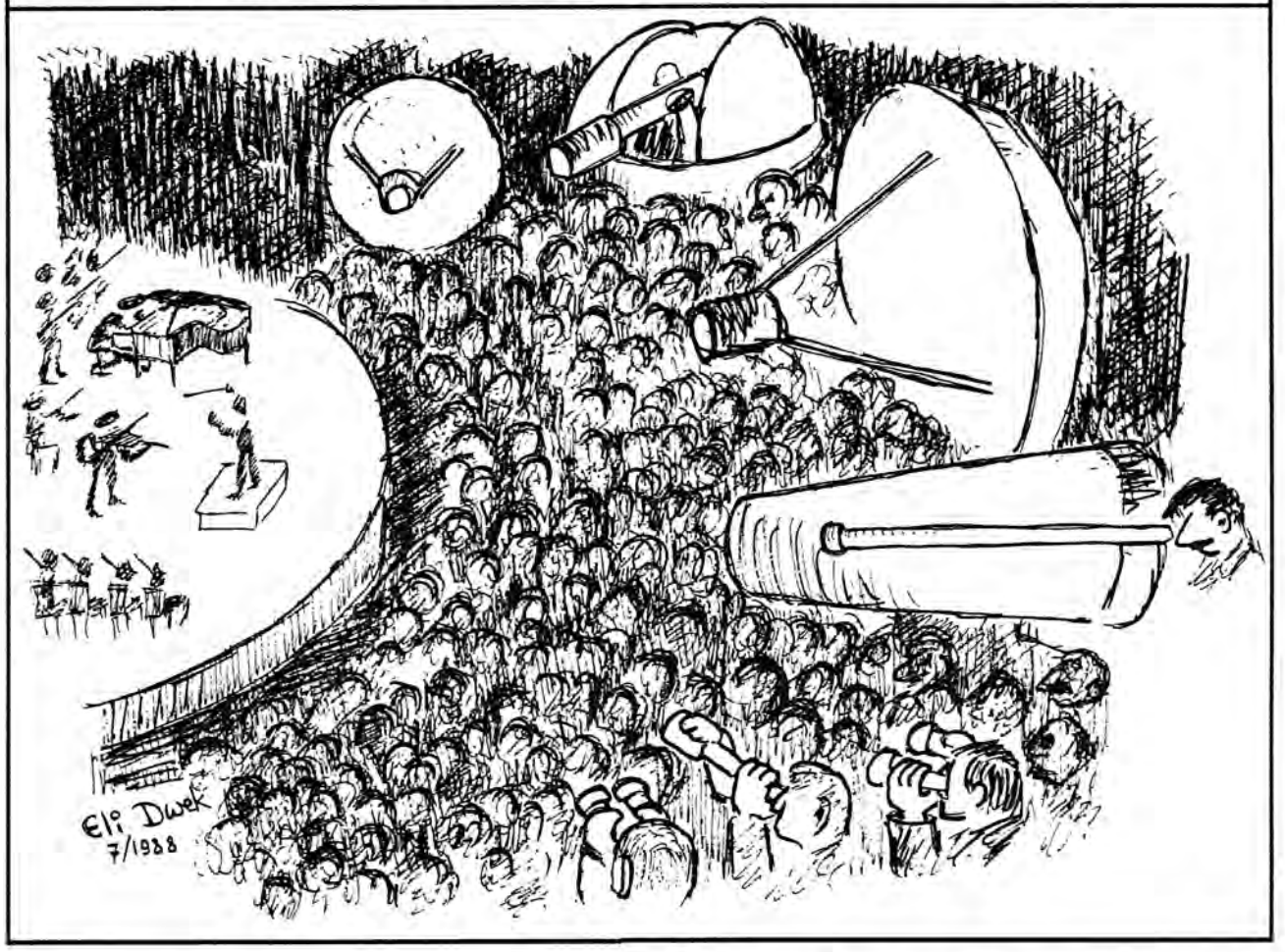
During the war, Sadler also continued to act as Secretary of the Royal Astronomical Society. He later played a major role in setting up the Royal Institute of Navigation. Both the R.A.S. and the R.I.N. have benefited from his continuing involvement in their activities, and he served as President of both societies. In 1972, he retired from R.G.O. (of which the Almanac Office became a part in 1949), but he remained active up to his death. His contribution to the second volume of the history of the R.A.S. was published posthumously.

Sadler's main areas of expertise were in numerical analysis and navigation, and, in particular, in the compilation and printing of mathematical, astronomical, and navigational tables. He insisted on very high standards in both accuracy and presentation, and, at a time when computers were peopie and not electronic devices, he designed methods of computation to ensure that the final results could be obtained with the minimum of effort consistent with negligible risk of undetected error. He took great care over the design of the printed page and insisted on very high standards of printing. He developed the first IAU Style Manual for use in editing the Transactions.

Sadler also served as President of Commission 4 from 1952 to 1958. His proposal for an international astronomical emphemeris was never fully adopted, but considerable changes took place as a result of this stimulus, and a lot of wasteful duplication of effort was eliminated.

IAU ACTIVITIES

ASTRONOMERS ENJOYED THE BALTIMORE SYMPHONY ORCHESTRA



COMMENT

Financing a General Assembly

by Virginia Trimble

Why is the registration fee so high when all I get is a canvas folder and some coffee? You may have asked yourself that question several times in planning for your trip to Baltimore. You may even have asked a member of the Local Organizing Committee or a session chairman who invited you to speak. I hope our answers were at least polite, though I cannot promise.

Well, what do you get? The real budget and which inputs correspond to which outputs are so complicated that only our wonderful business manager, Harold Screen of The Johns Hopkins University, understands the details. Very roughly, though, equal grants of $270,000 each from NSF and NASA have covered basic expenses – rental of the Convention Center facilities and audio-visual equipment (at about $50,000 each), security, many of the necessary coordinating and consulting services ($83,000, for instance, for the company handling registrations), coffee, and the compulsory subsidy for 400 young astronomers from all over the world. Hotel rooms, dormitories, and tours for the registered guests are budgeted separately and do not enter into this equation.

But a conference with only these basics would be very bleak indeed – not just no parties, but also no telephones, no programs or newspapers, no mail boxes, and no signs to tell you where things are. And none of these amenities comes free. For instance, the carpeting and draperies that make quiet conversation and walking possible in the Convention Center run to about $3 per person per day.

In fact, income would fall very short indeed of equaling outgo without the generous donors whom you will find highlighted in the first issue of *IAU Today* and mentioned on the programs of the events that they have sponsored. And now, if you will get out your pocket calculator, you can think of your registration fee as having bought you an $18.50 portfolio (including the contents), $17.60 in coffee breaks, $30.25 in carpeting and other amenities, a $40.35 opening reception (this includes admission to both the Aquarium and the Science Center as well as the food and drink and water taxies), a $30.30 symphony concert, a $15 evening of American music, and a $45 closing banquet (after subtracting the $10 ticket cost). Oh yes. There are also ten 79-cent newspapers. We hope you won't (don't) want your money back on those.

THE GALLOPING GASTRONOMER

RESTAURANT RATING

Average Star ★
Double Star ★★
Supernova ★★★
Starburst Galaxy ★★★★

by Laurence W. Fredrick

The Sandalwood
Holiday Inn Inner Harbor, 752-2771
Rating: ★

Normally I do not bother with hotel restaurants, but often in your travels you are stuck with them. You must eat somewhere and if you are famished and caught in your hotel by a drenching rain you will eat there.

The Sandalwood is one of a "string" of restaurants, not a chain in the usual sense of the word. The decor is a bit modern using clashing colors and stainless steel railings, etc., similar to the way traditional restaurants use brass. All Sandalwood restaurants, like this one, have slightly elevated dining areas in the center, which clearly were originally meant to be dancing areas.

The menu of this particular Sandalwood is extensive and, not wishing to burden myself with some heavy cranial effort, I asked for the special of the day or whatever the chef might think is exceptional. My waiter couldn't help me in either respect, so I was on my own. In the end I went for the scallops and received about what I expected – no surprises. The food was okay, not great, but okay. The salad was better than I expected, but the rest was so-so. Even dessert was an ordinary cheese cake.

The wine list is pretentious. It seems not to have been well planned but you should be able to get almost any of the better wines. The mixed drinks come from the lounge and are more generous than at most places.

The service was a bit casual. (I am always puzzled when I run into this. If you are trying to make a living as a waiter, why not do a good job?)

Try this place for breakfast, I can recommend it. It is a buffet so you can pig-out, and eat enough to cover lunch as well, for one set price. The lack of good service doesn't much matter then, because you are serving yourself, even with coffee (which was good, by the way).

The Nomenclature Nook

by Hélène Dickel and M.C. Lortet, Special to IAU Today

Here are the answers to Wednesday's list of acronyms and objects. In addition to the meanings taken from the *First Dictionary of Nomenclature of Celestial Objects*, the "quality of the acronym" is also provided as follows:

S systematic designation, that is unlimited in number
E the acronym absolutely should be explained and supplemented by at least another name (or coordinates).
O old or obsolete
Z the acronym is absolutely to be avoided!

Acronym	*Quality*	*Possible Meanings*	*Comments on Use*
P	O	pulsar	use PSR
	Z	Parkes	use PKS
	Z	Cape Photographic Durchmusterung	use CPD
	Z	Petite Vitesse	
	E	Pennsylvania	use Koch
	E	first author's initial) (Pike and Drake)	use PD
	E	author's initial (Parenago)	
	E	author's initial (Prager)	use variable star nomenclature
CL	E	Cygnus Loop	use Cygnus Loop
	E	Clark Lake	
Cl	E	"cluster" of stars or "cluster" of galaxies	
GCL	S	globular clusters	recommended
	E	cluster of galaxies	IAU needs a new acronym
		Galactic Center Lobe	PAS Japan 39 573, 1987
GLC	Z	erroneously used for globular cluster	use GCL

General Comments: Do not abbreviate an existing acronym. When creating a new acronym, use at least two letters and consult *The First Dictionary* . . . for possible conflicts before proceeding further.

Designation	*Object*	*Explanation or reference of use*
GB 790 325	GB 790325	Gamma-ray burst on 25 March 1979
I+I0216	IRC+10216	Astron. & Astrophs. 126, L17, 1983
II216	IC 1216	first Index Catalog N = 1529 objects
III2216	IC 2216	second Index Catalog
HOI39-68	1E 0139-68	Einstein X-ray source, H for HEAO 1 satellite
HOII	Holmberg II	a galaxy, roman numeral
HCL2	Heiles Cloud 2	Astron. & Astrophys. 176, 299, 1987

Proliferation Poses Potential Problems

The proliferation of lists of celestial objects based on different criteria and on data from different wavelength domains has produced a large variety of acronyms for identical objects. To keep the confusion to a minimum, the use of "The First Dictionary of the Nomenclature of Celestial Objects" is mandatory. See *Astron. Astrophys. Suppl.* Ser. 52, No. 4, 1983 and Ser. 64, 329, 1986. Examples and common problems, prepared by Dr. Hélène R. Dickel, who chairs the IAU Commission 34 Working Group on Interstellar Medium Designations, are appearing daily in *IAU Today*.

Nomenclature "No No" No. 5 : Just for the "L" Of It

by H. R. Dickel, Special to IAU Today

Don't use "L" as an acronym in an object name without checking "The First Dictionary of the Nomenclature of Celestial Objects." Unfortunately, "L" has been used for objects from at least six different publications. Always use at least two letters when you create a new acronym, and check the First Dictionary to avoid duplication.

IAU WORLD

FACILITIES

The Anglo-Australian Observatory at Siding Spring

by Russell Cannon, Special to IAU Today

Fresh from the 1986 publicity surrounding Comet Halley and almost a repeat performance with SN1987A last year, not to mention the professionally more satisfying successes in breaking the quasar redshift record several times since August 1986, it came as a slight surprise to be invited to contribute to the *IAU Today* series on observatories which were perhaps not so widely known as they should be. However, it seems that this is a welcome opportunity to let astronomers know a bit more about what the AAO does and, in particular, what facilities we can offer to overseas astronomers.

Founded in 1974 for the express purpose of operating the 3.9-m (150-inch) Anglo-Australian Telescope (AAT), the AAO has this year expanded its activities by taking over the operation of the UK 1.2-m (48-inch) Schmidt Telescope (ST) formerly run by the Royal Observatory, Edinburgh. Both telescopes are located on Siding Spring Mountain, one of the peaks in the spectacular Warrumbungles National Park some 400 km or 250 miles north west of Sydney. This site had been developed during the 1960s by astronomers from Mount Stromlo Observatory, anxious to escape from the rapidly increasingly light pollution of their home base near Canberra. The AAO also has a base in the Sydney suburb of Epping, which houses the main instrumentation laboratories, computing facilities and library as well as the administration office.

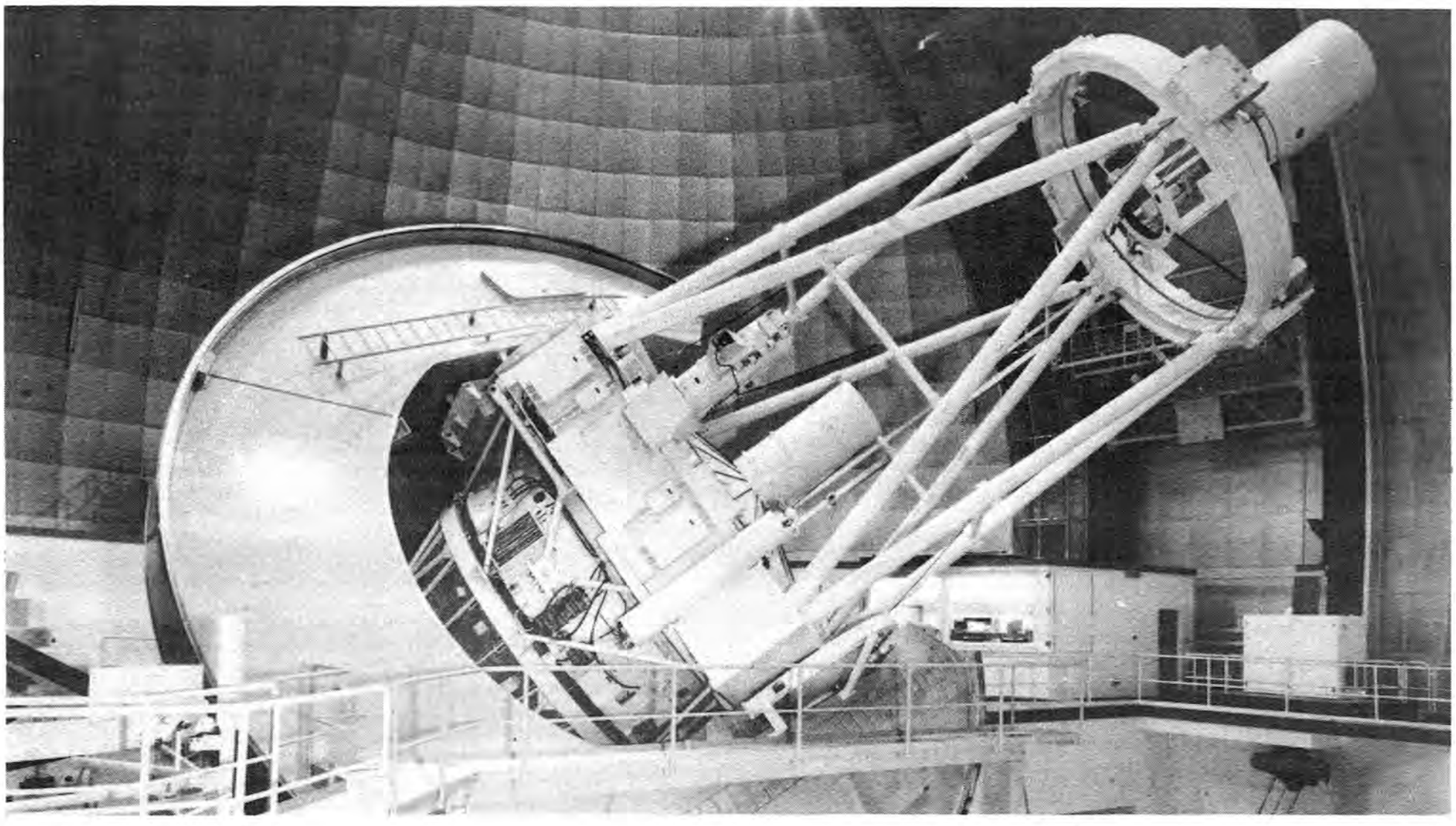
The AAT was built and is operated as a bi-national telescope, with the British and Australian governments paying equal shares of the costs and taking equal shares of the observing time. It is controlled by a Board of three eminent persons from each country, not all astronomers, who determine the financial and policy guidelines within which the Director must work. The scientific program is determined by two separate national committees which allocate observing time, although the Director is left with a certain amount of discretionary time, which was put to good effect during the recent dramatic outburst of SN1987A, and by another committee which advises on future instrumentation plans.

Observing time on the AAT is oversubscribed typically by a factor of four, but recent instrumental advances, notably in multi-object spectroscopic systems, mean that vast amounts of data can be acquired in only a few nights. While the AAT was built to satisfy the needs of British and Australian astronomers, both time assignment committees regard scientific excellence as the principal criterion for selecting programs, so foreign astronomers can and do win time on the AAT. One piece of practical advice for foreign applicants is to try to set up a collaborative program with an established user of the AAT; this helps not only with the writing of successful proposals, which seems to demand a different style in every culture, but also increases the chances of making good use of the time since there is little opportunity to become familiar with a complex modern instrument in only a couple of nights. Not that the actual observing should discourage anyone; there is always a very experienced Night Assistant controlling the telescope, usually accompanied by a staff astronomer who is an expert on the instrument in use. The AAO has excellent computer facilities with good software for data reduction, and visitors are strongly encouraged to stay long enough after their observing to carry out at least the initial stages of data analysis. Those who require only one or two observations should consider the Service Observing opportunities offered on the AAT; some time each quarter is set aside for urgent or exploratory observations, and for targets of opportunity. Applications for such observations are vetted by small sub-committees of the usual time allocation panels.

There is no space here to describe all of the different instruments available on the AAT; these cover imaging, photometry, spectroscopy and polarimetry at all wavelengths from 300 nm in the ultraviolet to 13 micrometers in the mid-infrared, working at prime, Cassegrain and Coudé foci. The most recent additions are the Fabry-Perot imaging spectrometer Taurus II, an automatic fibre positioner, Autofib, for multi-object spectroscopy, a very efficient multi-slit Low Dispersion Survey Spectrograph and the high dispersion UCL Coudé Echelle Spectrograph. An infrared array camera is under construction. The facilities of the AAO are described in a set of manuals, copies of which are available in most major astronomical libraries. Anyone unable to find the necessary information is invited to write to the Director, who can also give more information on application procedures. The AAO itself has no funds available to assist observers, but we are always willing to try to help scheduled observers to raise travel and subsistence money from national and international funding agencies. All of the observatory's facilities are freely available to visiting astronomers, whether they come for a few night's observing or spend a sabbatical year at the

Australia to Take Half Share in U.K. Schmidt Telescope

At a brief ceremony in Edinburgh on Wednesday, June 15, the Chairman of the Anglo-Australian Telescope (AAT) Board, Prof. R. Wilson of University College, London, and the Chairman of the UK Science and Engineering Research Council (SERC), Prof. Bill Mitchell, signed an Agreement handing over control of the UK 1.2-m Schmidt Telescope (UKST) to the AAT Board. Following earlier amendments to the Australian Act of Parliament under which the AAT is operated and an exchange of letters between the relevant Government ministers, this concludes negotiations for the Anglo-Australian Observatory (AAO) to take over responsibility for and operate the Schmidt Telescope, thereby giving Australian astronomers a half-share in the use of that telescope.



3.9-m Anglo-Australian Telescope

IAU WORLD

The New Argentinian Facility for Ground-based Observations

by Hugo Levato, Special to IAU Today

At the end of 1986 a new national facility for ground-based astronomical observations was dedicated in Argentina. The new institution, Complejo Astronómico El Leoncito, is the result of an agreement between the national universities of La Plata, Cordoba and San Juan and the National Research Council of Argentina (CONICET).

The observatory operates a 2.1-m Boller & Chivens telescope. The geographical location is San Juan Province in western Argentina. The site is remote, 220 km from the administrative offices in the city of San Juan. There are about 300 useful nights per year. The sky is not polluted by lights or other factors. A state law has been passed by the Congress to protect the site and its sky as an astronomical reservation. There are mechanical and electronic shops at the observatory, along with lodging facilities for the technical staff and visiting astronomers. A commercial line provides electrical power but there is also an observatory power plant. Other services include water supply, communications, computing facilities, and a library.

The observatory is now in the process of completing its auxiliary instrumentation, which currently consists of a Boller & Chivens Cassegrain spectrograph with the standard camera for direct photography of the spectra, an RCA two-stage image tube, and a Reticon array. The spectrograph provides a dispersion range between 30 and 300 Åper mm. A precision offset guider module, jointly with a plate holder module is available for direct photography with a 45 arcminute field.

There is also available a photopolorimeter through a collaboration with the Vatican group at Arizona and a photon-counting system through an agreement with the Observatorio Nacional de Rio de Janeiro, Brazil.

Dome of the new 2.1-m reflector in Western Argentina. Photo by Hugo Levato.

Projects for the provision of a CCD and an echelle spectrograph fed by optical fiber have been already funded by CONICET. These instruments are expected to become available during the second semester next year.

The observatory is opened to collaborations with other institutions to increase the observing capabilities or to install new telescopes at the site.

COSMIC DUST / from page 1

asteroidal debris (meteorites) and interplanetary dust? Are comets and asteroids compact or fluffy like snowballs or something in between? To what degree are the properties of solar system objects dependent on their initial composition or their dynamics and evolution? These are the questions for which we seek answers and which will be addressed by experts in all of these areas, drawn from a diversity of laboratories and observatories around the world.

It is worth noting that the cosmic dust connection may well bear on the ultimate question of the origin of life. Could the complex organic molecules of the presolar interstellar dust have been preserved in comets and brought to Earth to provide the primordial prebiotic soup out of which life emerged?

SCHMIDT / from page 1

result does not seem to have been published anywhere, but his first widely cited paper appeared less than 10 years later, in 1951. It reported work with his advisor, Jan Oort, indicating that comets age very quickly, virgin ones having noticeably stronger dust tails than do others (*BAN* 11, 259). Schmidt soon turned from optical studies to the infant discipline of radio astronomy, demonstrating the density enhancements associated with coronal streamers through their effect on the polarization of background radio sources (*BAN* 12, 61, 1953).

This involvement with radio astronomy led to the work on star formation rates and galactic structure and evolution for which Schmidt was best known in pre-quasar days. His 1965 model of the galactic rotation curve and gravitational potential (most readily found in Vol. 5 of the Kuiper compendium, *Stars and Stellar Systems*) remains a standard to which more recent models are compared. It was built upon detailed studies of galactic 21-cm radio emission (*BAN* 13, 15, 1956) and the galactic properties implied thereby (*PASP* 73, 103) as well as upon careful consideration of the kinematics of globular clusters (*BAN* 13, 247, 1957) and Cepheid variables (R.P. Kraft & Schmidt, *ApJ* 137, 249, 1963). In the field of galactic evolution, Schmidt's conclusion that star formation rates scale with the square of gas density (*ApJ* 129, 243, 1959) is both frequently cited and frequently confirmed. And he was among the very first to understand the importance of what is now called the G dwarf problem – the fact that the solar neighborhood has far fewer metal-poor stars than it would if star formation and nucleosynthesis had proceeded hand-in-hand over the age of the galaxy (*ApJ* 137, 758, 1963). Attempts to resolve this discrepancy still dominate discussions of galactic chemical evolution.

The discovery of quasars in 1963 occurred as part of a relatively new project, Schmidt's continuation of Rudolph Minkowski's program to identify radio sources. Inevitably, the direction of his research changed, though not the impressive quantity or quality. The years since 1963 have seen an average of 5.7 papers per year carrying his name as author or co-author.

The most widely cited of these (*ApJ* 151, 393, 1968) reported a new method for doing statistics on objects in samples with complicated completeness limits. Applying the method, called V/Vmax, to quasars, Schmidt showed that they occur preferentially at large distances, and so were commoner in the past. An application to halo stars (*ApJ* 202, 22, 1975) showed that the method could also be used to derive luminosity functions from incomplete data. Its power, especially for investigating the faint end of the stellar luminosity function, is only just beginning to be appreciated.

It is safe to say that the rise of the quasars was just one point along the curve representing the rise of astronomer Maarten Schmidt, and that no fall is in sight for either the discovery or the discoverer.

JITTERS / from page 2

tremely corrosive and poisonous. Geoffrey Marcy (San Francisco State University) described his experiments with a more benign absorber, iodine gas, in conjunction with the new Hamilton spectrograph at Lick Observatory.

William Cochran, (University of Texas) and Robert S. MacMillan (University of Arizona) separately reported on devices which employ the regularly-spaced lines produced by Fabry-Perot interferometers. Myron A. Smith (National Optical Astronomy Observatories) described his use of terrestrial absorption lines from the earth's atmosphere in observations of stellar spectra with the McMath Solar Telescope on Kitt Peak.

These techniques yield velocity changes for an individual star, not absolute measurements of its velocity with respect to an inertial frame. They require very high signal-to-noise ratios, and they are so far limited to naked-eye stars. Nevertheless the exposure times discussed seldom exceeded a few minutes and some of the work has been done on telescopes of less than one-meter aperture.

The results reported were so impressive that the standing-room-only crowd broke into applause at the close of the session. It was clear that high precision radial velocities promise new insights into both the atmospheric dynamics of individual stars and the nature of low-mass binary companions. For the most "well behaved", constant velocity stars, observers reported measurement errors as low as 2-3 km/sec. Cochran showed two radial velocity curves of Arcturus measured independently by his group and by the MacMillan group. The observations, made on the same nights, could be superimposed almost exactly. "My hands were shaking as I compared the data for the first time," Cochran admitted. The crucial elements in the further success of such high precision radial velocity techniques, several speakers suggested, were more investigation of systematic errors in the measurements and continued funding for operations and development.

SUPERNOVA / from page 2

coupled.' Luckily, a good general understanding of what went on can be gathered after the first few days by making some simple assumptions. For example, a blackbody model works pretty well until the remnant enters the nebular phase. The simple picture is fine for tasks such as line identification. However, other studies, like the determination of accurate abundances, require the full non-LTE treatment, where there are still problems with details. Branch believes that "SN 1987A will be a good warmup exercise, after which we can go on to determine abundances in Type Ia and Ib supernovae."

Nino Panagia (Space Telescope Science Institute) reviewed observations from the IUE satellite. He also warned "how dangerous it is to assume that one spectral band gives you the truth," and showed how the ultraviolet light curve differed from that in other spectral regions. Currently, SN 1987 exhibits strong emission lines that are unresolved at IUE's highest dispersion and probably arise in the remnants of a stellar wind produced by the host star in an earlier red giant phase. Panagia told his listeners that efforts have been made to detect the light echo from the ultraviolet burst produced when the shock wave first broke through the progenitor star's surface. The UV feature should lie outside the equivalent visible-light structure, and "real action" has been observed at the appropriate position. However, Panagia cautions that the result could be due to scattered starlight. Only if future observations show that the feature is expanding will we be sure that it is a real light echo.

IAU NEWS

Hipparcos Satellite Will Do Double Duty

by Leif J. Robinson

Hipparcos, as all good astronomers should know, is the revolutionary astrometry spacecraft developed by the European Space Agency in cooperation with 21 institutions. Now likely to be launched in July, 1989, it will measure the positions of some 100,000 pre-selected stars to an accuracy of 2 milliarcsecond – 20 times better than present accuracy. From these observations an unprecedented number of high-quality parallaxes and proper motions will be derived.

Less well known is the role Hipparcos will play in studying double stars. This function was the major discussion topic at the second session of Commission 26 yesterday. Some 13,000 double and multiple stars will be on Hipparcos' initial observing list, and, of course, many others will be serendipitously discovered as the mission progresses. According to Jean Dommanget of Belgium, "Hipparcos will make the field of double stars better known. Studies of Hipparcos' data will contribute greatly to our knowledge of stellar masses, the evolution of double systems, and galactic dynamics. These data should also significantly improve the now-very-uncertain statistics concerning the frequency of binary systems."

Hipparcos will be able to observe double stars down to separations of a few hundredths of an arcsecond. Its measurements will not be of actual separations and position angles, as is customary with Earth-based telescopes. Rather, as the satellite scans the sky, it will record projected separations of the double stars' components. Only when these are combined from many sweeps (80 on average) will unambiguous position angles and separations emerge. Even so, for this technique to work it is necessary that the stars do not exhibit orbital motion during Hipparcos' anticipated 2.5-year lifetime. If they do, other data – such as observations by speckle interferometry or calculations of orbital ephemerides – will be necessary for interpreting Hipparcos' observations of binaries. If all goes according to plan, the first results on double stars should be made available about 12 months after data processing begins.

Hipparcos looks like the favorite satellite of second generation astrometrists Ann Charon Harrington and Amy Lucile Harrington, who have family ties to the U.S. Naval Observatory.

In his opening remarks Dommanget recalled a bit of little-known history concerning the origin of the Hipparcos project. As early as the 1960s an Earth-based instrument of this sort – one that could simultaneously make astrometric observations of two widely separated parts of the sky – was conceived. The idea didn't work because of differential refraction effects and instrument flexure, conditions that won't prevail in space.

History Session has Space for Astronomers

by David H. DeVorkin, Special to IAU Today

Tomorrow at 09:00 in Room 108, Commission 41 (History of Astronomy) will present a paper session and roundtable with historians and astronomers who will examine contemporary issues in the history of space astronomy. Subjects to be addressed include the identification of social and political forces that have shaped contemporary astronomy; the response of the astronomical community to NASA, the military support for astronomy, and the Hubble Space Telescope as "big science." The primary motive behind this half-day session will be to improve communication between historians interested in contemporary issues in astronomy and astronomers who have been sympathetic to the need that the history of our times be properly preserved and interpreted.

The session will begin with historians presenting their views of the major historical issues that one must address to appreciate the history of space astronomy. Then three astronomers will respond to the issues identified by the historians and add their own commentary. An open discussion with the audience will complete the morning.

ASTRONOMERS TO GO NONLINEAR IN FLORIDA

"Models of Galaxies," the fourth annual Florida workshop on nonlinear dynamics will be held in Gainesville in early February next year and will extend over about three days. The meeting is under the direction of Prof. George Contopoulos.

Scientists interested in attending should leave a message in the mailbox of Dr. Stephen T. Gottesman (U.S.) or write to him at the Department of Astronomy, University of Florida, Gainesville, FL 32611.

AFRAM Festival

Today begins another in the series of Baltimore cultural festivals celebrating the ethnic heritage of the city. This weekend the Afro-American Exposition (AFRAM) begins at 12:00 in Festival Hall adjacent to the Convention Center.

There will be a rich assortment of food, entertainment, and crafts available for your enjoyment. The program runs daily from 12:00 to 22:00. The events will be held in Festival Hall and in the parking lot just south of the hall. There will be live entertainment frequently during the day and into each evening. On Sunday there is a 10 K footrace beginning at 07:30 from Festival Hall to Fort McHenry and back. Each day, there is a nominal admission charge.

Dormitory Bus Schedule

	Every 20 minutes	On the Hour	Every 30 min.
Aug. 5	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 6	07:30 - 09:30	10:00 - 20:00	----------
Aug. 7	08:00 - 12:00	13:00 - 20:00	----------
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street and Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Program changes, commission business announcements, etc. for possible publication in IAU TODAY must be submitted to the General Secretary's Office.

Travel

Commuter Trains to Washington, D.C., from Camden Station: Camden Station is one block from the Convention Center. The MARC commuter trains depart from Baltimore, Monday through Friday, at 05:40, 06:35, and 07:42. The trip takes 55 minutes.

In the evening, they leave Washington, D.C.'s Union Station at 17:00, 17:35, and 18:25. Prices are $9.00 round trip; $32.50 weekly rate (Monday through Friday). If you cannot return to Baltimore at those scheduled hours, you may ride the Amtrak line, using the original round trip ticket plus an extra $1.00. But you will be stopping at Pennsylvania station, 1500 N. Charles Street, rather than Camden station, where you boarded in the morning. No seat reservation is necessary. Telephone: 1-800-325-7245, 1-800-872-7245 or 237-3402 (Camden station) or 291-4246 (Penn station)

Message from Omega World Travel: Omega will be on hand to assist you with your travel needs at our Travel Booth in the Pratt Street Lobby. If you should need to change your air flight arrangements, these changes may result in an air fare increase. In addition, many tickets may have been issued in other countries and Omega is not able to reissue or exchange these tickets. A ticket issued for travel in the U.S. by Omega, may be exchanged for a new ticket, subject to cancellation penalties. Tickets issued by other companies must be re-issued by the airline and are subject to the airline cancellation penalty. However, we will be happy to assist you with the optional tour program and any travel-related questions.

Convention Notices

Poster Boards: All material posted is under the supervision of the Commission Presidents and the General Secretary. Boards for scientific poster sessions are supervised by the General Secretary. Before posting anything, contact the IAU Administrative Office, Room 321.

Smoking: Please do not smoke in any meeting room.

Leftover Items: All papers not removed from the meeting rooms will be collected and thrown away at the end of each day. All personal items left in the meeting rooms will be taken immediately to the Lost and Found area, in the corridor beyond Hall A.

Brown Bag Breakfasts: The concession stand in Hall D will open daily at 08:00.

Tour Itineraries

A tour of Scenic and Historic Baltimore today will visit the Walters Art Gallery, the Peabody Library, and the Maryland Historical Society/Baltimore Museum of Art with lunch at Haussner's Restaurant.

On Sunday, August 7, the **Observatory Tour of Washington, D.C.** will visit the U.S. Naval Observatory, NASA-Goddard Space Flight Center, and the Mall adjacent to the Smithsonian. Lunch will be served at the Mall.

Longwood Gardens is the site of a tour, with lunch, on Monday, August 8. On Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania,** with lunch at Divine's Carousel.

Daily Washington, D.C., Tour

A daily trip to Washington, D.C., is offered as an alternative to the scheduled tours listed above. In order to go on the tour, you must sign up at the tour desk by 14:00 on the day before you want to go. There is a minimum number of 30 participants required for each daily tour to Washington; if fewer people have signed up, the tour will be cancelled for that day.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. SATURDAY, AUGUST 6, 1988

6

Discrepancy in Cluster Ages May be Resolved

by Richard Tresch Fienberg

How old are the Pleiades? Recent determinations made by comparing the observed main-sequence turnoff with classical stellar-evolution models suggest an age near 6-7 x 10^7 years. On the other hand, estimates made by comparing the lower main sequence with models of star formation and pre-main-sequence evolution indicate a value closer to 2 x 10^8 years. To some, this discrepancy implies that low-mass Pleiads formed first, more massive ones later (a process termed "sequential star formation"). But a study reported yesterday casts doubt on this interpretation.

In a paper at Commission 37's poster sessions on star clusters and associations, Dr. Paola Mazzei (Trieste) and Dr. Luisa Pigatto (Padova) described a new age estimate for the Pleiades. They matched the observed main-sequence turnoff not to the usual stellar evolution models, but to new ones that account for convective overshoot in the core of each star. Overshoot enlarges the hydrogen-burning volume and thereby increases the fuel supply. Thus, stars linger on the main sequence with enhanced luminosity, making the age corresponding to the cluster's main-sequence turnoff older than that corresponding to a classical model at the same luminosity.

Assuming a chemical composition for the cluster members of Y = 0.28 and Z = 0.02, and putting the main-sequence turnoff at 3.6 solar masses, Mazzei and Pigatto find an age of 2 x 10^8 years with 50 percent uncertainty. They obtain a similar value from extensive Monte Carlo simulations of synthetic clusters having the same global physical properties as the real Pleiades.

The new age estimate matches so well the prediction from pre-main-sequence evolution that the disagreement reported earlier for the two approaches vanishes. "A strong argument in favor of the sequential star formation hypothesis thus fails," write the Italian scientists. They consider their new result "further confirmation of the goodness of the overshooting evolution models."

In another poster at the Commission 37 sessions, Drs. Jesús Cabrera-Caño and Emilio J. Alfaro (Granada) presented a non-parametric approach to distinguishing between open-cluster members and field stars. The traditional parametric method involving only proper-motion measurements has proven unequal to the task in some clusters, especially those where background and foreground stars outnumber physical cluster members by a wide margin.

The new technique described yesterday combines position and proper-motion data (and photometric data, too, if available) and assumes only that the cluster members are more densely distributed in measurement space than the field stars. A companion poster illustrates its use in separating the cluster members and field stars in the vicinity of NGC 752, a particularly difficult case. General Assembly participants eager to learn more about these and related topics can view the Commission 37 posters through 12:30 today.

SHARP VIEWPOINT. Julian Christou described speckle interferometry yesterday in JCM 3, High Angular Resolution Imaging from the Ground.

ANNOUNCEMENT FROM THE GENERAL SECRETARY

New Meeting: Commission 34, Working Group on Nomenclature of the Interstellar Medium (H. Dickel), August 6, Session 1, Room 309.

New Catalog Offers Precise Star Positions

by Laurence A. Marschall

Two thousand years after Hipparchus compiled the first list of the positions of the brightest stars, astronomers are still laboring to define an absolute reference frame. On August 5, more than sixty scientists gathered under the auspices of Commission 8 (Positional Astronomy) to hear reports on fundamental catalogs of stellar coordinates and proper motions.

Heiner Schwan (Astronomisches Rechen Institut) presented a preview of the forthcoming FK5 catalog. The core of the catalog contains 1535 stars, not many more than Hipparchus' original 850. But the precision has improved immensely. Pre-telescopic measurements were limited to the resolving power of the human eye, about 1 arcminute. The new FK5 positions have typical precisions better than 0.1 arcsecond. Schwan also reported an extension of the FK5 to include an additional 2158 stars down to magnitude 9.5.

Despite a wealth of accumulated data from several centuries of telescopic observing and the recent development of high precision automated transit instruments, there still remain gaps in the observational data set. Leif Helmer (Copenhagen University Observatory) described plans to extend the fundamental reference frame to fainter magnitudes, observing a sample of several thousand stars in the visual magnitude range 11.5 to 12.0. And several astronomers commented on the need for better and more complete measurements of stars south of declination –30 degrees. "Southern Hemisphere transit observers had better get busy and start observing," said Richard Branham (Centro Regional de Investigationes Cientificas y Tecnologicas, Argentina).

Computer technology has taken its place along with classical posititional techniques in the reduction of systematic errors among the catalogs, and also in the dissemination of results. The FK5, along with other catalogs, will soon be available for distribution in machine-readable form. Roland Wielen (Astronomisches Rechen Insitutut), described an ambitious project to compile a comprehensive compilation of all astrometric measurements in a database called ARIGFH, (from an acronym meaning "the ARI History of the Fixed Stars of the Heavens"). That effort is in its early stages, with twenty students typing the data from astrometric catalogs into a computer database. The ARIGFH database currently contains position measurements of over half a million stars.

With the upcoming Hipparchos launch, astrometry will enter a new age, but there remains much work to be done down here on earth both to support and complement satellite work. Yves Requieme (Observatoire de Bordeaux) summed up the mood of the meeting: "Ground based astrometry is necessary even in the space era."

Tour Visits Goddard Space Flight Center Tomorrow

by Stephen P. Maran

Tomorrow's Observatories Tour offers a wonderful opportunity to visit one of the world's leading organizations in the exploration of space. The NASA-Goddard Space Flight Center in Greenbelt, Maryland, is the place where Orbiting Solar Observatories, Orbiting Geophysical Observatories, and Orbiting Astronomical Observatories were developed and operated during the early decades of space research. More recently, the Center is distinguished as the home of both the Solar Maximum Mission and the International Ultraviolet Explorer, NASA's two principal currently operating astrophysical observatory satellites, and as home base for Hubble Space Telescope operations and instruments. Goddard is also the installation where the Cosmic Background Explorer was built and is now being readied for launch next year.

Participants in the tour will be especially interested in the Space Telescope Operations Control Center. Once the HST is orbited, dozens of engineers, analysts and controllers will operate it from Goddard's STOCC. They'll integrate science scheduling requests from the Space Telescope Science Institute with the operational requirements submitted by subsystem controllers, communications routers, and other supporting staff. All this, so that the telescope can point with a precision of 7 milliarcseconds as it whips around the world in low-Earth orbit, where the Sun rises and sets 16 times a day.

Although launch is not scheduled until next summer, already the STOCC has controlled the spacecraft, now in a clean room in Sunnyvale, California, in order to accomplish important ground tests and simulations.

On the COBE front, Goddard engineers have reconfigured the spacecraft since the space shuttle Challenger accident. The reworked COBE will be launched on an unmanned Delta rocket. A special COBE data center is being readied at the Center to accommodate researchers on the background radiation, primordial galaxies, and other crucial scientific targets of the mission.

IAU Today **is published with the help of a generous contribution from Computer Sciences Corporation.**

The Convention Center will close today at 13:00. It will reopen Monday at 08:00.

IAU NEWS

IAU Travelling Telescope Almost Ready to Go

by John R. Percy, Special to IAU Today

The IAU's new travelling telescope should be ready for its first assignment later this year. About four years ago, Derek McNally and Richard West developed the idea for this fully-instrumented reflector that can be shipped around the world as needed. The realization of this project is on display in the Exhibit Hall, Booth 401, at various times during the General Assembly.

The purpose of the travelling telescope is to provide astronomers and students in countries where astronomy is still in the developing phase with practical training in observational astronomy. A grant from the Canadian Commission for UNESCO and the Canadian International Development Agency has enabled us to purchase an 8-inch Celestron telescope, OPTEC solid-state photometer, Optomechanics slit spectrograph, camera, power supply, and other accessories. An objective grating and a set of shipping containers are being completed. Other instrumentation such as a microcomputer and a Reticon or CCD detector can be added.

We are preparing instruction manuals for the telescope and instruments and writing outlines for teaching and research projects for which it is suitable. We expect the telescope to be used heavily in conjunction with such IAU activities as the Visiting Lecturers Program and the International Schools for Young Astronomers.

Suggestions on instrumentation, documentation, and transportation of the travelling telescope would be gladly received, as well as advice on suitable observational projects. They should be addressed to the author at Department of Astronomy, University of Toronto, Toronto, Ontario, Canada M5S 1A1. The many organizations, comnpanies and individuals who have contributed to this project are gratefully acknowledged.

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New Working Group for the Promotion and Development of Astronomy Established

At its meeting on Monday, the IAU Executive Committee established a Working Group for the promotion and development of astronomy. The group held its first meeting on August 4 and started considering its plan of action for the immediate future.

The objectives of the Working Group are:

a) to identify and advise the Executive Committee as to the best way to help develop astronomy in Associate member countries;

b) to examine projects that are important for regional developments of astronomy and advise the Executive Committee in regard to the possible steps, e.g., sponsorship, that could be adopted;

c) to promote the participation of astronomers of astronomically less-developed countries in projects that involve or could involve international cooperation, such as VLBI projects, observations with large telescopes and from space vehicles, etc.; the Working Group should review the means to encourage ease of access to astronomical databases, data analysis systems, and promote technology transfer on a wide geographical basis;

d) to engage, as appropriate, in the fund raising process for the materializing of specific projects under a), b), and c).

The membership of the Working Group includes A.H. Batten as Convenor, R. Kippenhahn, Y. Kozai, P. Lena, J. Sahade, and Y. Uchida.

Astronomical Photography is Live and Well

by Jacqueline Mitton

Astronomical photographers are about to enjoy a new era of cooperation with the manufacturer of virtually all the plates used in astronomy. This was the confident prediction of David Malin (Anglo-Australian Observatory), commenting after a meeting of Commission 9 yesterday. "There had been a communication problem," Malin said, "but this meeting has broken new ground. Eastman Kodak really is enthusiastic about astronomy".

Gordon Brown, marketing planner for Kodak's scientific products, explained that astronomers only constitute five percent of the science market – but their requirements are some of the most demanding. Despite the need for profitability, Kodak recognize a "moral" obligation to the astronomical community. They are justly proud of the fact that Kodak plates have been used for so many major astronomical discoveries. But there has to be some compromise and that involves working out what limited range of products will best meet the needs of astronomers. Efforts would be made, he said, to satisfy special requirements on request but, ideally, observatories should try to club together to consolidate special orders.

Brown's remarks followed a slide presentation by John Burdsall, who is in charge of plate manufacturing at Eastman Kodak. He illustrated the stages in plate manufacture, with considerable emphasis on the high level of quality control. He also explained the efforts he is making to avoid batch-to-batch variations in the sensitivity of 3aJ and 3aF emulsions, in response to correspondence with Malin. Finally, Burdsall invited interested astronomers to talk to him at the Kodak exhibition stand today or on Monday.

Malin gave a dramatic demonstration that photography is still alive and well alongside electronic imaging techniques. He illustrated the effectiveness of a method for adding together the images from a sequence of plates of the same area of sky for a remarkable improvement in signal-to-noise ratio. He takes intermediate images on a commercially available Agfa Gevaert film (RA-71p), selected because it has a built-in developer and for its rapid, uniform processing qualities. Only a simple frame is needed for this potent method of picking out low surface brightness information and, at one minute per exposure, the process is not time-consuming.

Seven Nations to Join the IAU

by Richard Tresch Fienberg

At the closing General Assembly on August 11, the IAU family of nations will grow by seven. Algeria, Iceland, Morocco, and Saudi Arabia become the newest full members. Malaysia, Peru, and Sri Lanka join as associate members. Altogether, this raises the number of adhering member organizations from 51 at the beginning of the Baltimore meeting to 58 at the end.

The new category of associate member was created at the Extraordinary General Assembly on August 2. According to General Secretary Jean-Pierre Swings, it is "for countries with little astronomical infrastructure but with a few professional researchers who want to promote astronomy." Associate member nations are expected to upgrade to full membership within nine years.

Dr. Samir Kadiri, director of the Laboratory of Astrophysics and Geophysics in Rabat, heads the Moroccan delegation to the 20th General Assembly. In an interview, he described how his country came to apply for membership in the IAU. "This year my laboratory joined the IRIS helioseismology network, which includes France, the United States, and the U.S.S.R. In September, we open our solar observing station at Oukaimeden, near Marrakesh. When you have an international program, it makes sense to join the international community."

Kadiri says that membership in the IAU will give Moroccan astronomers access to something they sorely need: information. Importing foreign journals is very difficult because of currency restrictions. "So, it is very important to us to open up communication with astronomers around the world," said Kadiri.

Dr. Maria Luisa Aguilar, Peru's first full-time professional astronomer, chairs her country's Local Commission at the University of San Marcos in Lima. Over the past decade, in part with help from the IAU's Visiting Lecturer Program, she has built a strong astronomy curriculum there. She proudly calls it "the source of future astronomers" for her country.

Peru is about to establish a national observatory, thanks to the donation of a research astrograph by the Vatican Observatory. Thus, IAU membership comes at an auspicious time for this Latin American nation. "My best hope," Aguilar said, "is that the international scientific community will work with us to help Peru make a significant contribution to world astronomy."

Nomenclature "No No" No. 6: Radio Source Lists Cause Confusion

by H. R. Dickel, Special to IAU Today

Don't omit the coding for epoch when you name and catalog celestial objects according to position. Consider this: two lists of 5-Ghz radio sources were published recently. In the first list, an object is called MG 0003 + 119. The second list includes two sources given as MG 0003 + 1210 and MG 0006 + 1214, respectively. Can you tell which of those two corresponds to the object from the first list? Had the epoch-coding been included ("B" for "Besselian 1950" or "J" for "Julian 2000"), it would have been clear that MG B0003 + 119 and MG J0006 + 1214 are probably one and the same.

ERRATA

IAU Today, August 5 issue –

p.2: The photograph by Loek Zuyderduin should be captioned: Model for a piece of a fluffy comet, an aggregate of interstellar grains with silicate cores that have two outer layers. Tiny particles in the outer mantles produce far-UV extinction.

p.6: In the article, "The Anglo-Australian Observatory at Siding Spring," the final sentence should read, "All of the observatory's facilities are freely available to visiting astronomers, whether they come for a few nights' observing or spend a sabbatical year at the AAO."

IAU PEOPLE

REMINISCENCES

The 9th General Assembly in Dublin, 1955

by Hermann and Mary Brück, Special to IAU Today

The 9th General Assembly of the IAU in Dublin was by general consent a very successful one. This was all the more noteworthy as the choice of Dublin at the previous Rome Assembly was originally a compromise between proposals for other venues which had been put forward in an atmosphere of some political dissension.

The IAU was fortunate in having at the Dublin Assembly a confirmed internationalist as President, Otto Struve, who in his Presidential Address stressed the global character of astronomy "before which ideological and political differences fade away in the common goal of the exploration of the universe." His wishes were fulfilled at this General Assembly which attracted 600 participants — a very large number by the standards of that time — from 41 countries, the largest contingent from the U.S. (112) followed by France (71). The Soviet Union was represented by twenty delegates and the People's Republic of China by three of their senior astronomers.

At a reception by the Irish Government at the magnificent St. Patrick's Hall of Dublin Castle and at a Garden Party by the President of Ireland at his official residence in the Phoenix Park, delegates experienced the legendary hospitality of the Irish and had a chance to meet the Taoiseach (Prime Minister) John A. Costello, and the former Taoiseach, later President, Eamon de Valera, Ireland's "Grand Old Man," himself a keen student of mathematics and astronomy, who in the 1940s had been responsible for the reopening of the old Dunsink Observatory within the Dublin Institute for Advanced Studies.

After 33 years, it is still possible to relive the excitement of the Dublin Assembly. The most eagerly attended event was the Symposium on "The comparison of the large-scale structure of the galactic system with that of stellar systems." W. Baade, who had announced his major revision of the distance scale of the universe at the Rome meeting in 1952, discussed the place of our Galaxy in the general classification of spiral nebulae and described his results on the distance of the Andromeda nebula and on the distribution within it of stars of "Population I and II." J. Oort extended the notion of two populations to a comparison of our Galaxy with other spirals. The success of radio astronomers in Australia and the Netherlands in tracing the distribution and motions of neutral hydrogen in the Galaxy by 21-cm line observations, described by H.C. van de Hulst, made a great impression. So too did the achievement of the Pretoria astronomers, through radical velocity observations, of finding the period of rotation of the Large Magellanic Cloud. The general picture of our own and other galaxies, now long familiar to students was brought together for the first time at this symposium.

In a symposium on "Non-stable Stars" the most exciting topic, and one which captured the imagination of the local newspapers ("Stars are Born!"), was G. Herbig's idea that T Tauri stars observed among gas and dust clouds, were recently formed, or still forming within the nebulae. We now know what a fruitful line of inquiry this turned out to be.

The President of Ireland's Garden Party. Left to right: Bart J. Bok, H. Brück, A. Massevich , M. Brück.

Radio astronomy was a field yet in its infancy, and there was considerable interest in the observations of 2,000 faint radio sources unidentifiable with optical objects but surmised to be the most distant objects in the universe, which were reported by Martin Ryle and his Cambridge group. Solar physics also played a prominent role. At the discussion on Solar Flares we remember the beautiful movies of solar spectroheliograms taken at R. McMath's Observatory, the high resolution spectra revealing turbulence in the Sun's photosphere, J.P. Wild's monitoring by radio of particles actually moving through the solar corona following a flare, and an account of the first ultraviolet solar spectra obtained from rocket-borne instruments. High expectations were expressed regarding the planned International Geophysical Year of 1957-58 for the field of solar-terrestrial relations.

On the instrumental side, the new techniques of electronic image converters were introduced for the very first time. The pioneers in the field "were in general agreement on the importance of giving image tubes a permanent place in the organizational structure of the IAU," a place which the modern young astronomer takes for granted. A highlight of the Assembly week was the practical demonstration organized at Dunsink Observatory by P.B. Fellgett of Cambridge in collaboration with the electronic firms of Pye when visitors could admire on a television screen in the laboratory an image of the Moon recorded in a telescope in a dome outside.

The happy and harmonious gathering of astronomers in 1955 included most of the giants of the day, many now sadly no longer with us; and young aspirants who were to become in turn the leading figures of a new generation. One of the founders of the Union in 1919, (F.J.M. Stratton) was present and also two others (G. Abetti and H. Shapley) who had never missed an Assembly since it first met in Rome in 1922. The oldest delegate, remembered with affection, was Madame Gabrielle Flammarion, widow of the French astronomer and writer Camille Flammarion (1842-1925). One of our many treasured mementos is the first copy of a revision of Flammarion's famous "Astronomie Populaire" by Madame Flammarion and André Danjon, the successor of Struve as President of the IAU, and inscribed by the two authors.

H. A. Brück (now Emeritus Professor at the University of Edinburgh), then Director of Dunsink Observatory, was host to the Dublin General Assembly and Chairman of the Local Organizing Committee.

CALL TO ACTION

Space Debris: What You Can Do

by David L. Crawford, Special to IAU Today

Several attendees have asked me what they can do to make a statement, individual or collective, protesting space debris, in general, or a specific proposal, such as the Celestis project mentioned by President Sahade in his talk at the opening ceremony. Here are some suggestions:

1) Write directly (or talk to) the proposers.

2) Write to me, in my role as Commission 50 president (or Chairman of the American Astronomical Society Committee on these issues). I will forward your letter to those involved or concerned. Such input by many should help make the astronomy community's views known.

3) If feasible, communicate to your own national organizations, who can also implement items 1 and 2 above.

4) Join the International Dark-Sky Organization, a new non-profit organization with the goal of spreading awareness of the issues and pushing for solutions. See me for details.

International Cooperation: Telescope Transfer Anticipated

by Leif J. Robinson

If all goes well, a year from now the Vatican double astrograph will be working atop Arequipa, Peru. This mountain was the site of Harvard Observatory's southern station where much pioneering research was carried out early in this century.

Final details for the transfer of the telescope, which has apertures of 60 and 40 cm, were worked out on August 4 in the office of the IAU's General Secretary. The principal participants were Maria Luisa Aguillar (Peru), Richard Boyle (The Vatican), and George Roberts (Fundación INCA, U.S.). A formal document effecting the transfer should be signed within 30 days by the Peruvian ambassador to the Holy See and by George Coyne, director of the Vatican Observatory. The telescope is being presented as an outright gift to the Peruvian National Research Council. It will be operated as a national facility by the University of San Marcos, where Aguillar has established a flourishing department of astronomy (see article on new member nations, page 2).

Why did the Vatican donate its astrograph? According to Boyle, "to foster astronomy in a country where the science is growing. Also, because of light pollution at Castel Gandolfo, the fine telescope has been out of use." Roberts describes this transfer as "a model for nations developing in astronomy — a diadem showing how the job can be done right." As soon as the rector of the University of San Marcos approves the transfer, a Perüvian engineer will be sent to the Vatican to participate in disassembling and shipping the telescope.

The roots of contemporary astronomy in Peru can be traced directly to IAU President Jorge Sahade, who earlier in this decade taught there. This was followed, in Robert's words, "by Aguillar's heroic efforts to single-handedly create astronomy in Peru." The future of Peruvian astronomy will be assisted by an international committee headed by David L. Crawford of Kitt Peak National Observatory.

ON TOUR

Hubble Telescope: Here We Come

by Patrick Moore, Special to IAU Today

How will we all feel when the Hubble Space Telescope is finally launched? Fairly ecstatic, I imagine. Meanwhile, we can at least preview some of the preliminaries.

I joined one of the popular IAU tours to the Space Telescope Science Institute. I am not sure that I knew quite what to expect. An introductory ten-minute film was useful, but only when we entered our first port of call, the Guide Star Selection department, did I really appreciate the complexity of the mission.

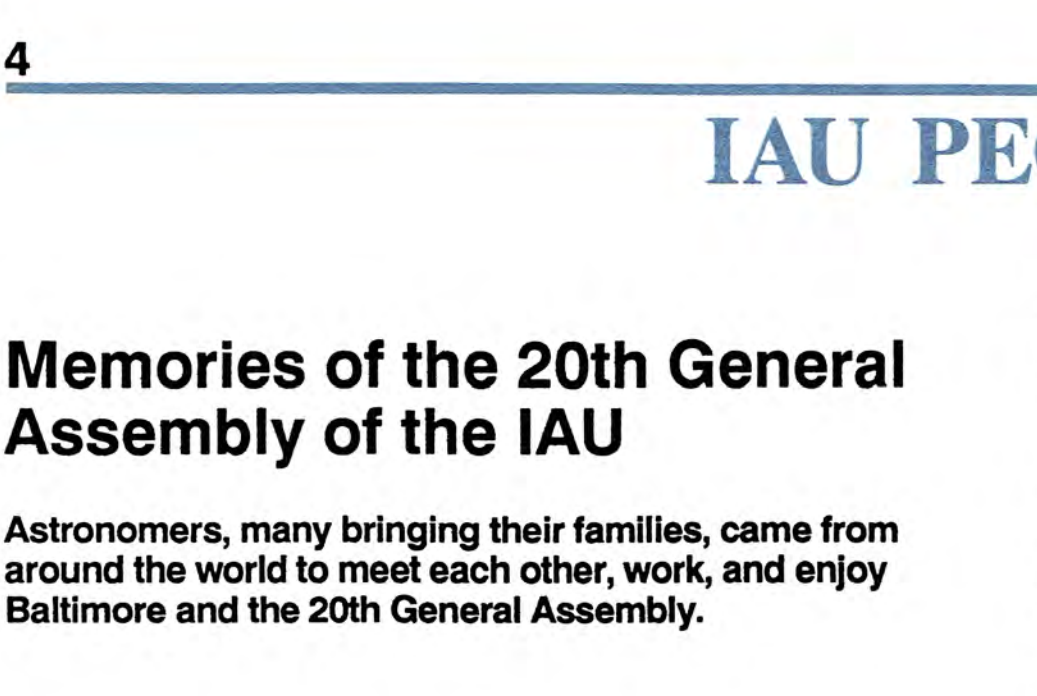
It is sobering to recall that no existing star catalogues were accurate enough to satisfy the needs of the HST; even so, we were assured that 20,000,000 objects down to magnitude 16 was only the beginning. Next stop was the Space Telescope Science Data Analysis System. There I was slightly alarmed by the mention of the SAP (Survival Auxiliary Package) until I realized that it referred to data only! We also visited the Astronomy Visual Laboratory and the Observation Support System, whose functions speak for themselves.

Overall impressions? Admiration, and appreciation of the willingness of the STScI staff to interrupt their busy schedules to show us around. If you have not yet joined a tour, I urge you to do so. You will have vivid memories of it at the 21st General Assembly when, if all goes well, the HST itself will be happily orbiting the Earth far above our heads.

IAU PEOPLE

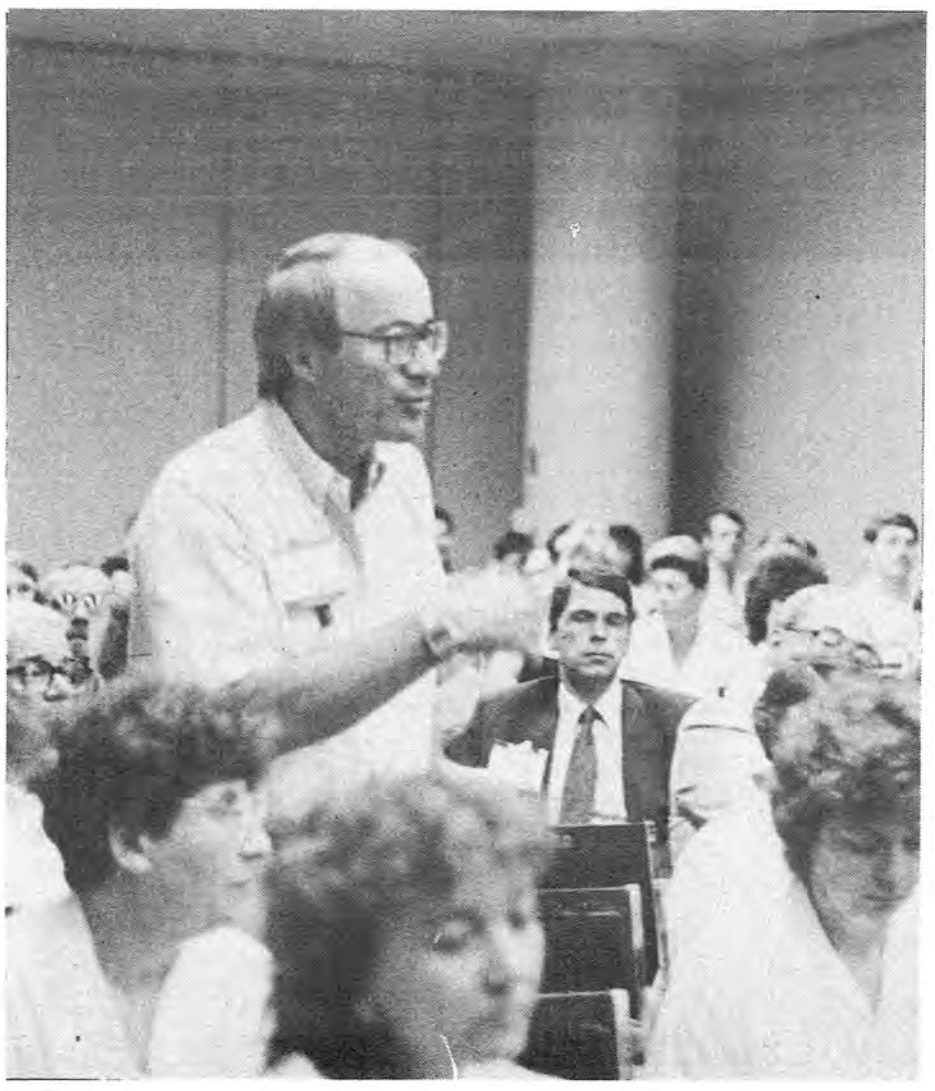
Memories of the 20th General Assembly of the IAU

Astronomers, many bringing their families, came from around the world to meet each other, work, and enjoy Baltimore and the 20th General Assembly.



John Irwin (Tucson), Martin McCarthy (Vatican City State) discussed old times.

Pictorial posters proliferate, posing problems for postman.

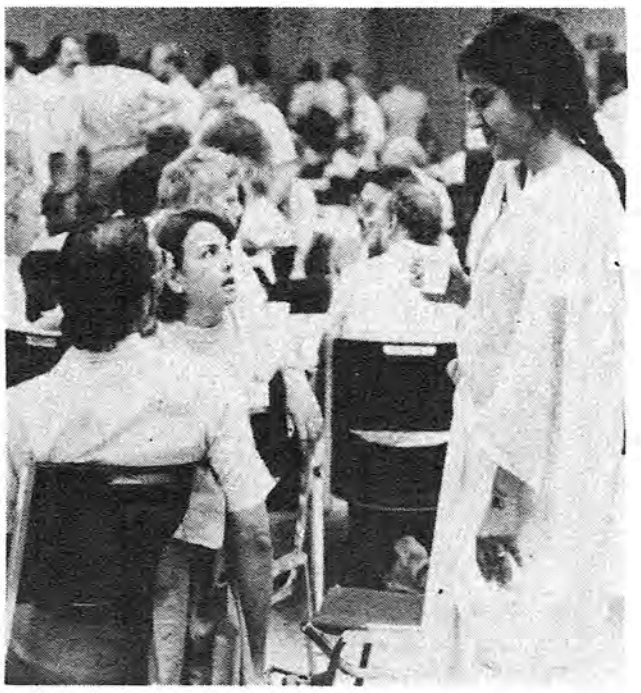


Peter Wehinger (Arizona State Univ.) made a point in JD I.

V.E. Zharov is a young astronomer from the U.S.S.R.

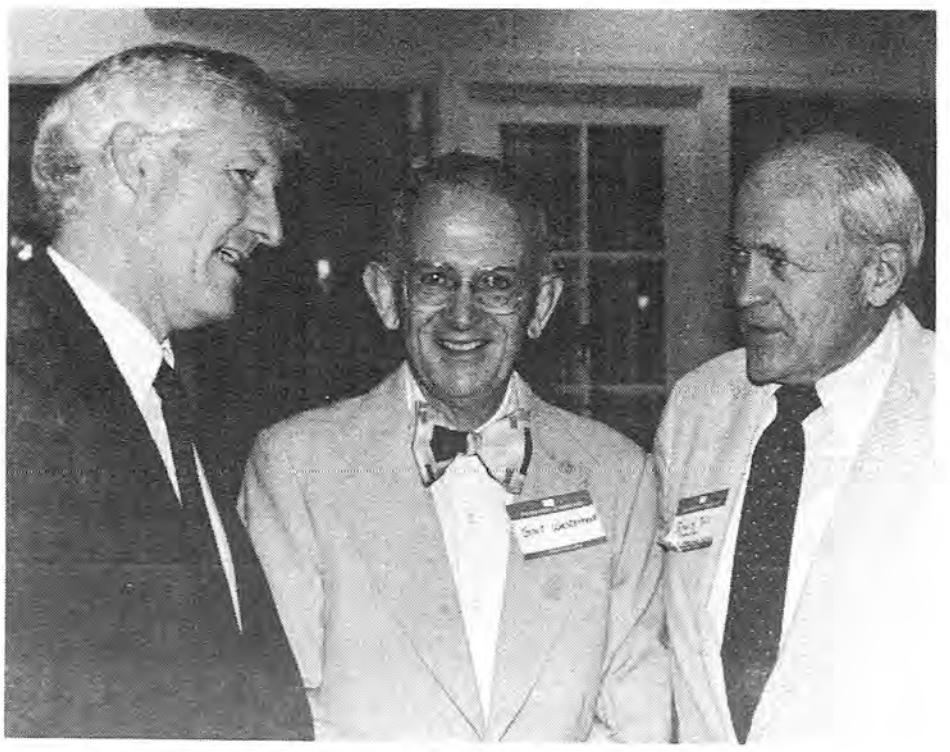
IAU PEOPLE

Keith Butler and Sylvia Becker came to their first G. A. from the Federal Republic of Germany.

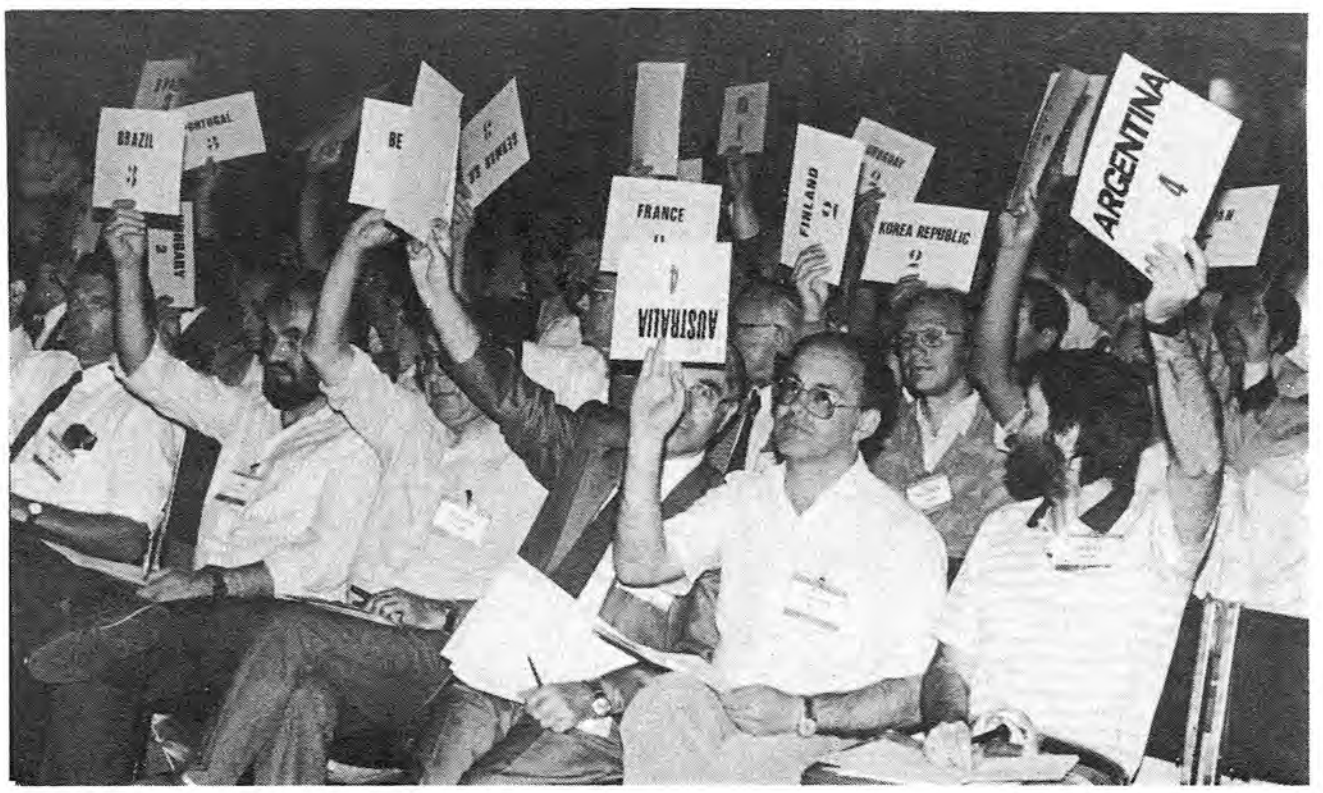


"Coffee Break" was one of the most popular sessions.

Wil van der Veen (The Netherlands) was at no loss for words about mass loss and planetary nebulae.



W. "Jack" Welch (Berkeley) consulted with Gart Westerhout (U.S. Naval Observatory) and John S. Toll (Chancellor, University of Maryland).



Australia votes "Down Under" style. National representatives shown here (front row, left to right) are Fernando Noel (Chile), Christopher R. Purton (Canadaa), Jacques R. Lepine (Brazil), L. Houziaux (Belgium), Hermann F. Haupt (Austria), Kenneth C. Freeman (Australia), and Roberto H. Mendez (Argentina).

Olga B. Dluzhnevskaya represents the Astronomical Council of the U.S.S.R. Academy of Sciences.

IAU WORLD

The Forthcoming Bicentennial of Armagh Observatory: 1990

Mart de Groot, Special to IAU Today

In 1990 the Armagh Observatory in Northern Ireland will be celebrating its 200th anniversary. It is the second oldest observatory in the British Commonwealth and, within this group, the oldest still in its original location. A wide-ranging program of events to celebrate this bicentenary is being planned.

The city of Armagh owes its origin to the proximity of the ancient site of Navan (Emania in its Latin form), the ancient capital of the Kings of Ulster. Following the destruction of Navan the center of influence moved to the present site of Armagh, probably in the fifth century AD. Also in this century, St. Patrick founded his first church in Armagh. For the next four centuries Armagh was regarded as the "Metropolis of Ireland" and was renowned throughout Europe as an ecclesiastical center. The religious colleges which thrived in Armagh and other parts of Ireland at the time were responsible for carrying the torch of western civilization through the early Middle Ages. Among their duties was the recording of historical events, which included astronomical observations such as the appearance of comets. Many of the observations made at Armagh during this period are compiled in the medieval "Book of Ulster."

In later centuries, following the Viking and Norman invasions, the center of power in Ireland moved elsewhere and by the sixteenth century Armagh was a collection of ruins and thatched cabins. During this period, Armagh and its surroundings were a battlefield for the continuing strife between the forces of the Earl of Tyrone and Queen Elizabeth I.

In the latter half of the eighteenth century, during more peaceful and prosperous times, the Archbishop of Armagh, Primate Richard Robinson, decided to move his ecclesiastical capital back to Armagh and he proceeded to construct a city with fine buildings in the manner of the day. Conscious of the former importance of Armagh as an educational center, he proposed to establish a National University there, which would, had it come about, been the first in Ulster. When Robinson died in 1794 he left a considerable sum to be used towards establishing the University. However, the money was not used as intended within the time prescribed and the University never became a reality. However, the Observatory and the Public Library, which probably were to be incorporated in the University, were already in existence and remain to this day.

The construction of the Observatory began in 1789 upon plans drawn up by Francis Johnston, a native of Armagh who became known as the "Wren of Ireland." The first director, the Rev. James Archibald Hamilton, was appointed at a meeting of the Governors and Guardians held on 24 August, 1790. The Primate also gave certain townlands as an endowment for the astronomer. Within a few months, the whole procedure was sanctioned and approved and an Act of Parliament was signed by King George III.

Archbishop Robinson's death in 1794, before the finances of the new observatory were secure, produced a few problems due to the lack of interest in astronomy of his successor and the uncooperative attitude of his heirs. Nevertheless, the latter ones could not prevent the delivery, in 1795, of the main piece of equipment the Observatory was to possess for many years – an equatorial telescope of 2.5 inches aperture and 3 foot focal length by the celebrated instrument-maker Troughton. This instrument is being restored and will soon be on permanent display in its original dome.

The Observatory clocks, too, were outstanding. Two of these were made by Thomas Earnshaw of London and the first of these (which, incidentally, is the first Earnshaw ever made) was of excellent quality. These clocks, too, are to be restored for display at the Observatory.

During the two hundred years of its life, the contributions to science by Armagh Observatory have been quite out of proportion to its size and the funds spent on its maintenance. This has largely been due to the energetic and productive directors and staff it has had. In the nineteenth century, Dr. Thomas Romney Robinson, the third director, was a well-known astronomer and meteorologist. He held office for 59 years – a world record for an observatory director! He was closely associated with many technical improvements in telescope design which were implemented by the Earl of Rosse and by Grubb, Dublin telescope makers.

Armagh Observatory

A transit instrument and mural circle by Thomas Jones of London were installed (the latter still in excellent condition and on permanent display) as well as a Grubb reflector. With these instruments Robinson and his assistants compiled "Places of 5,345 stars observed from 1828 to 1854 at the Armagh Observatory," the "Armagh Catalogue," and a later list of still more accurate positions, "On the places of 1000 stars observed at the Armagh Observatory." Robinson made many other important innovations, including the famous Robinson Cup Anemometer. This invention transformed the way wind speed and direction were measured and recorded. It has stood model for many generations of cup anemometers since. An early example still graces the roof of the Observatory today.

Robinson died in 1882 and was succeeded by his Danish assistant John Louis Emil Dreyer. One of Dreyer's first tasks was the acquisition of a larger telescope. This 10-inch Robinson Memorial refractor by Grubb was installed in 1885 and remains until today entirely in its original state and dome. Whilst at Armagh, Dreyer produced, at the invitation of the Royal Observatory, his "New General Catalogue of Nebulae and Clusters of Stars" still in regular use today. His later years were devoted to the history of astronomy. His works on the great 16th-century Danish astronomer Tycho Brahe are still the standard texts.

Robinson held office for 59 years – a world record for an observatory director.

Due to the Church of Ireland's disestablishment in 1869, the Observatory went through a financially difficult period, especially between the two World Wars. Armagh Observatory's modern development began immediately after the Second World War. Dr. Eric Mervyn Lindsay had become the seventh director in 1937. In that year Parliament passed a law that changed the constitution of the Observatory's Board of Governors, thus freeing the way for direct financial support from the Government through the Department of Education in Northern Ireland.

Dr. Lindsay was a keen promotor of closer relations between the Observatory at Armagh and its neighbors in the Republic of Ireland at Dunsink near Dublin. First he played an important role in the reopening, by the Taoiseach, Eamon de Valera, of Dunsink Observatory in 1947 after that institution had been closed since 1937. Then he was the chief promotor of a tri-partite agreement between Armagh, Dunsink and the Harvard College Observatory, which secured its signatories access to a number of facilities at the Boyden Observatory near Bloemfontein, South Africa. One of the main instruments was the so-called ADH Telescope, the largest Schmidt telescope in the Southern Hemisphere from 1950 to the early 1970s. It was said that this was the only formal agreement in which the governments of Northern Ireland and the Republic of Ireland were both signatories.

Even more important, this international venture was soon extended to include members from three further European nations to set an example of international collaboration in astronomy south of the equator which has since been copied several times and has given U.K. astronomers shares in the South African Astronomical Observatory (a share now suspended), in the Anglo-Australian Observatory with the largest optical telescope in the Southern Hemisphere, and recently, in the Observatorio del Roque de los Muchachos on the Canary Island of La Palma. Armagh astronomers today are involved in observing at these facilities and in the development of further instruments for La Palma Observatory.

Astronomical research at Armagh today concentrates on the study of cool stars which have very active atmospheres where complicated magnetohydrodynamical processes release enormous amounts of energy in very short times. Their study, with the aid of ground-based optical, infrared, and radio telescopes, and with spaceborne ultraviolet and X-ray instruments, and in collaboration with a number of colleagues around the world, is leading to a better understanding of these processes. Hot supergiants and a number of peculiar stars complete the spectrum of astrophysical research at an institute which is surprisingly young for its 200 years.

Today, research at the Observatory is supported by an annual grant-in-aid from the Northern Ireland Department of Education and by occasional grants from the UK Science and Engineering Research Council. It collaborates with colleagues at many universities and observatories in the UK and abroad. To highlight these contacts, the Royal Astronomical Society will hold its 1990 annual out-of-town meeting in Armagh on 11-12 April, 1989 there will be an international colloquium on "Surface Inhomogeneities in Late-Type Stars" in August.

There will also be many events for the general public: popular lectures, open days, the opening of the newly landscaped gardens and of new offices, exhibitions featuring the Observatory's achievements, and the publication of a book about the Observatory's first two centuries.

IAU WORLD

Bosscha Observatory, Lembang, Java, Indonesia

by B. Hidayat, Special to IAU Today

While we are conferring here at Baltimore, some of my colleagues back home (in the time-zone which is exactly +12 hours) are carrying out some of our programmed observations. One part of the programme is a long-range, systematic undertaking, dictated by the climatic regularity which, most of the time, offers good weather in August. The other part arises from particular circumstances provided by the geographic location, a planetary configuration or unpredicted phenomena.

The type of observation that falls in the first category, includes:

- Observations with the Schmidt telescope (51-71-127 cm): Giant and supergiant M stars on either side of the Galactic plane, near the direction of the Galactic center; Compact HII regions, with interference filters, and surveys of selected areas for H-alpha emission-line stars. These can be termed "Galactic structure studies."
- Observations with the Zeiss double-refractor (60 cm; f/17): Mainly for visual double stars and globular clusters, but especially in August this year, the telescope will be used almost solely for Mars observations.
- Observations with the 37-cm Bamberg Refractor: In view of the limited structural stability of the telescope and weather conditions, this telescope is utilized for observations of eclipsing binaries. We have chosen to collect data on the binaries whose periods are around 24 hours. Differential photometry, rather than absolute photometry, has better prospects here. (See recent contribution by Malasan *et al.*, on delta Cap, submitted to *A.J.*).

The second type of program this month is the observation of Mars, which will attain its favourable opposition in September. Not only will the planet be very close to the Earth, but it will also be very high up in Lembang's sky due to the Observatory's geographic latitude, 7 S. On August 15, for example, at 3:00, the planet attains an altitude of 80°.

The morning sky at Lembang is usually very steady. Seventeen years ago when S. Larson of Arizona observed Mars' opposition (see *Sky & Telescope*, vol. 42, 1, 1971) he noted that "the seeing is often very good, allowing near-theoretical resolutions of the telescope". I can only confirm his impression. We hope that observations of Mars this year will reveal more detailed information on inter-annual variations of the regression of the Martian polar cap.

During the opposition of Mars in 1986 we secured hundreds of pictures of Mars. These have been analyzed by Iwasaki, Panjaitan and others for their study of the regression of the Martian South Polar Cap (*Vistas in Astronomy*, in press). The accompanying picture of Mars, taken in orange color, shows typical results from 1986.

Returning to the seeing conditions, I can add here that we double-star observers, on occasions, manage to photograph very close visual binaries (separation 1" 1.2").

Besides the advantage of having good seeing conditions, our Galactic astronomy workers also enjoy our geographic location. From June through September, which correspond to our main "dry season", the Milky Way stretches across the sky, north-south, with the Sagittarius Cloud practically overhead when it reaches its highest altitude.

It is not fair, though, not to mention the other side of the story. We have only two seasons: namely dry and wet. In the wet season, from November to April, the tropical rains pour down almost daily, but usually it stops before midnight. After such a heavy rainfall, the dust in the sky has been washed away, the sky usually becomes very transparent. It is the ideal time for observations. Unfortunately, the occurrence is rather unpredictable, so we are hesitant to observe the "winter Milky Way."

I think it is also fitting to mention here that the diurnal temperature variation is only a few degrees. At dawn in August the temperature could be as low as 13°C (most of the time only 17°C), and in the evening, at the start of the observing run the temperature could be as high as 20°C. When the humidity gets down to 50-60 percent it can be very cold. Yearly temperature variation is also very little.

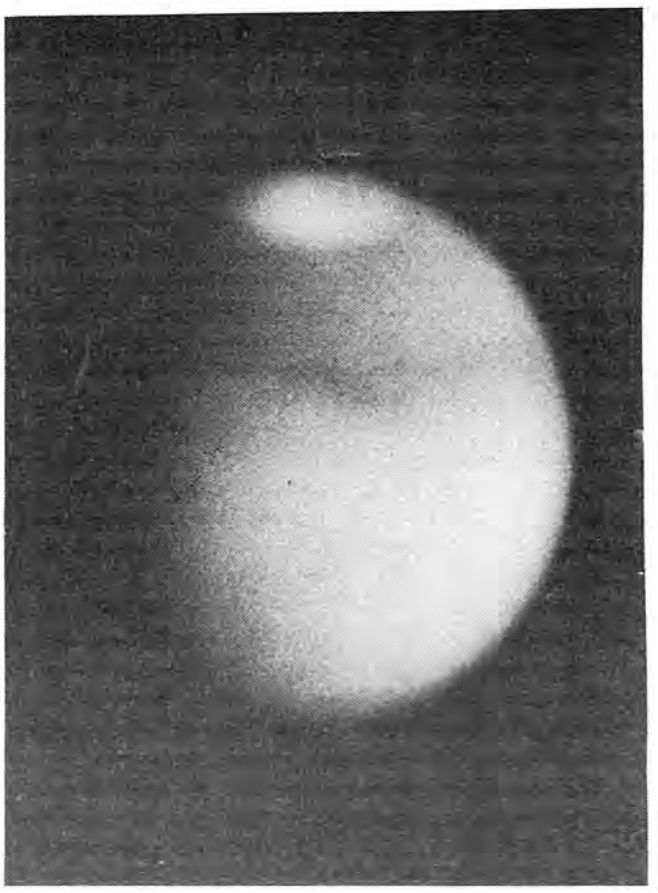
The Observatory is part of the Institute of Technology of Bandung. Here, at the Institute, astronomy courses are offered by the staff of the Department of Astronomy of the Faculty of Mathematics and Natural Science.

Thanks to the help from our colleagues in Holland, in Cleveland, and from other institutions, the Observatory can maintain a fairly complete research library.

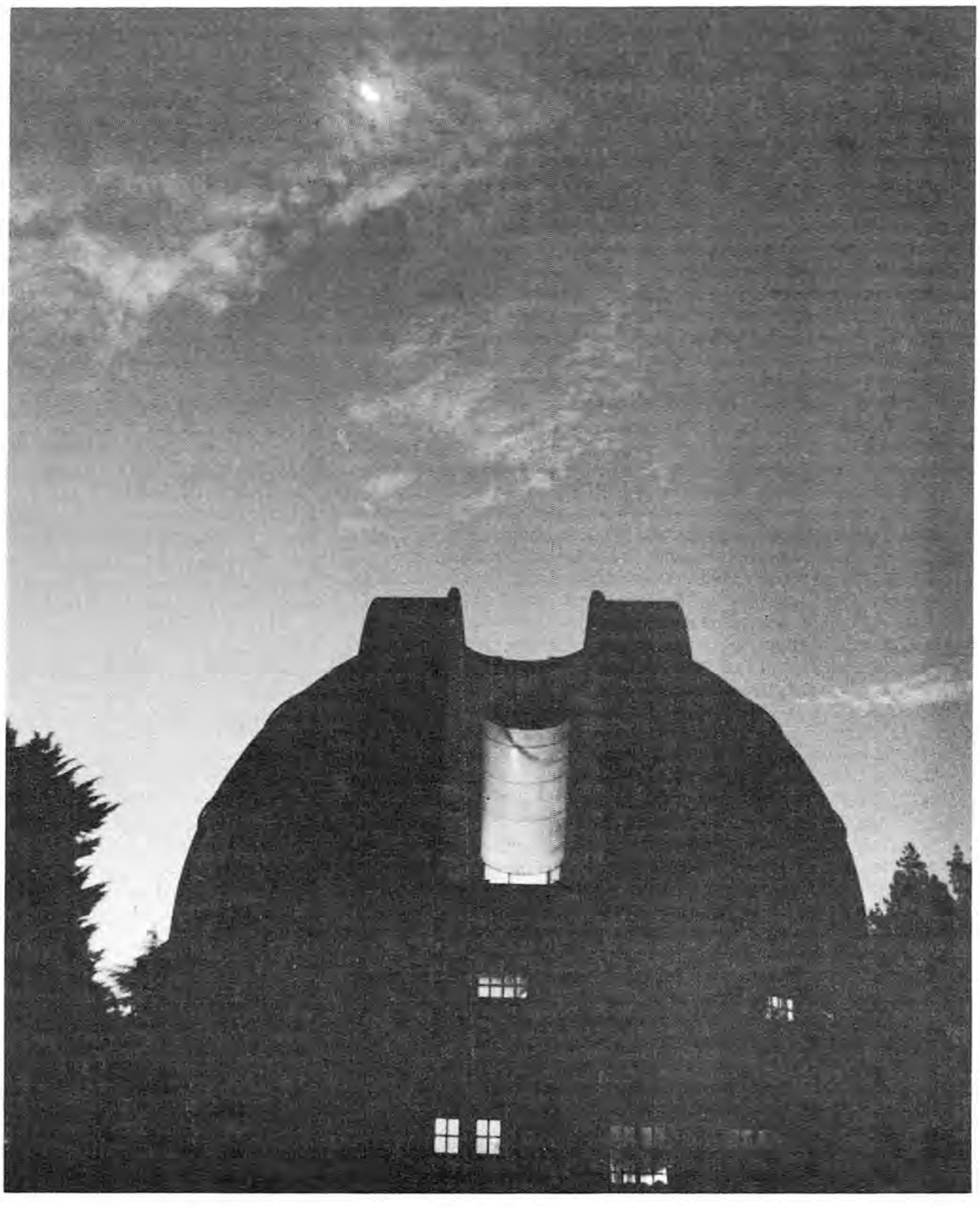
Auxiliary instruments – microdensitometer, photometer, wedge sensitometer, interference filters (centered on important lines), and forming gas sensitizer – are also available at hand.

The Observatory complex is situated at an elevation of 1300 meters, on the southern slope of an extinct volcano. I can assure you that you should not be afraid of it. The latest activity on record was in 1969. It was just smoke and a little bit of dust.

We feel obliged to share our love of astronomy with others. On scheduled public nights (two nights, in the months of April through August, from 17:00 - 19:00) many students and other visitors were given popular lectures by staff and assistants. It is our hope that astronomy may find its place in our society.



Mars (right) was photographed on July 18 at Bosscha by Edward Panjaitan and K. Iwasaki.



The large telescope barrel seen below actually contains two reflectors, the Bosscha double 24-inch telescope. Photo by E. Panjaitan.

IAU ACTIVITIES

THE YOUNGEST REGISTRANT. At just four months old, Marilis Cardinal of Canada is the youngest registered guest at the General Assembly. "She is too small to wear her badge," according to her mother Suzanne Cardinal, who pinned it prominently on the stroller.

Champagne Cruise

Champagne Brunch will be served on the much-anticipated Annapolis cruise tomorrow. Some tickets are still available in the Pratt Street Lobby. Cruise participants will meet at the Inner Harbor, on the quay alongside the Light Street Pavilion, between 08:30 and 08:45. The vessel will depart at exactly 09:00.

Baltimore Hospitality Needed

The call is out to all local astronomers! We have visitors from abroad who are urgently in need of temporary housing after the General Assembly is over, due to travel connection schedules. If you are interested in hosting a visitor in your home for a day or two, please post your name and home number on the LOC Bulletin Board.

Visitors who need housing, please read this Bulletin Board daily and contact people as indicated.

Banquet Day Incorrect on Tickets

Please note that the Banquet is WEDNESDAY, August 10. Tickets indicate that the banquet is on "Thursday, August 10."

AFRAM Festival

You can experience a Baltimore cultural festival. Today and tomorrow, the Afro-American Exposition (AFRAM) will take place in Festival Hall adjacent to the Convention Center.

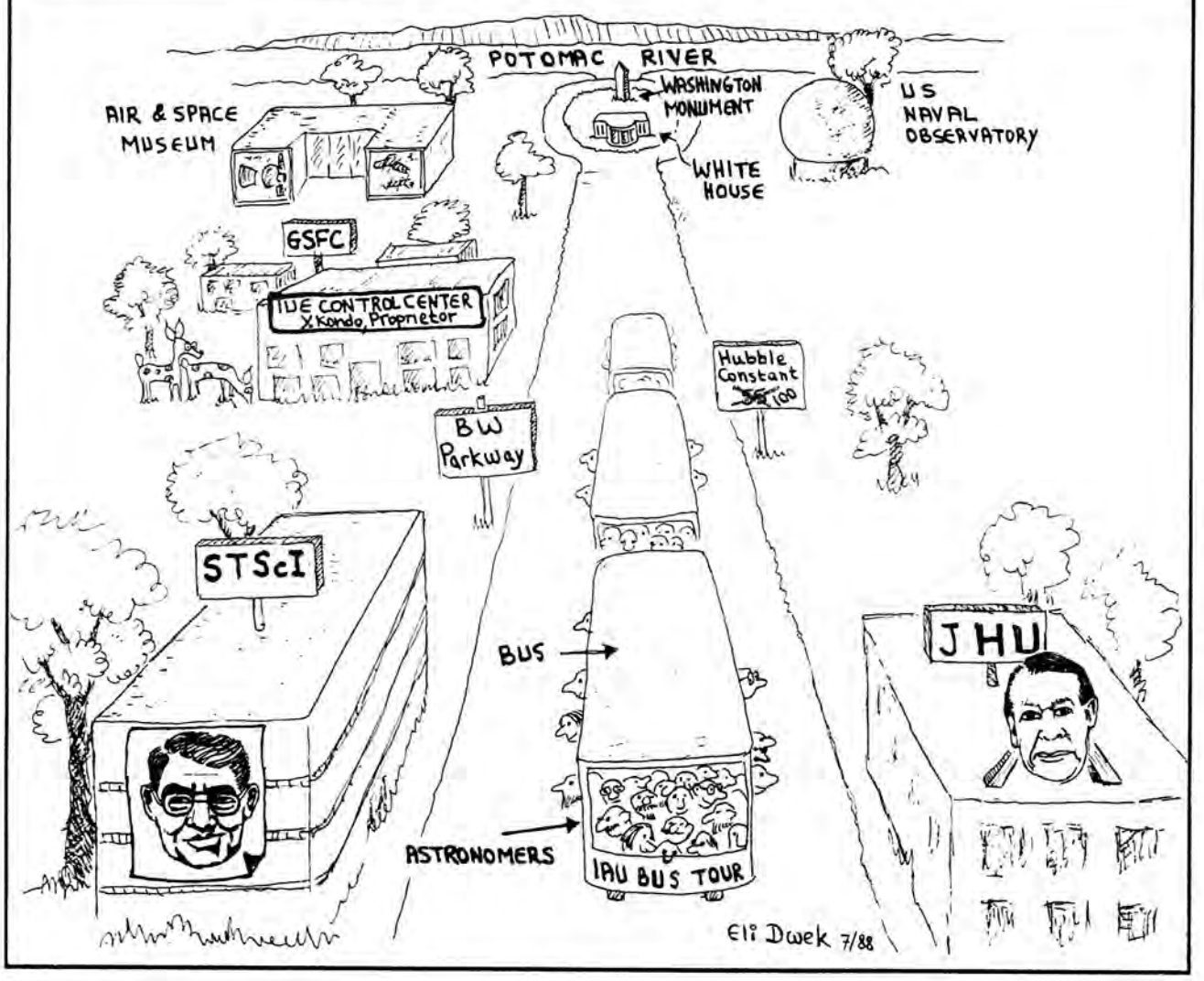
There will be a rich assortment of food, entertainment, and crafts available for your enjoyment. The program will run to 22:00 each day. The events will be held in Festival Hall and in the parking lot just south of the hall. There will be live entertainment frequently during the day and into each evening. On Sunday there is a 10 K footrace beginning at 07:30 from Festival Hall to Fort McHenry and back. Each day, there is a nominal admission charge.

Travel

Commuter Trains to Washington, D.C., from Camden Station: Camden Station is one block from the Convention Center. The MARC commuter trains depart from Baltimore, Monday through Friday, at 05:40, 06:35, and 07:42. The trip takes 55 minutes. Telephone: 1-800-325-7245, 1-800-872-7245 or 237-3402 (Camden station) or 291-4246 (Penn station)

Program changes, commission business announcements, etc. for possible publication in IAU TODAY must be submitted to the General Secretary's Office.

IAU TOURS WILL EXPLORE THE AREA TOMORROW



Dormitory Bus Schedule

	Dorms to Convention Center		C.C. to Dorms
	Every 20 minutes	On the Hour	Every 30 min.
Aug. 6	07:30 - 09:30	10:00 - 20:00	----------
Aug. 7	08:00 - 12:00	13:00 - 20:00	----------
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street and Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Tour Itineraries

On Sunday, August 7, the Observatory Tour of Washington, D.C. will visit the U.S. Naval Observatory, NASA-Goddard Space Flight Center, and the Mall adjacent to the Smithsonian. Lunch will be served at the Mall. **Longwood Gardens** is the site of a tour, with lunch, on Monday, August 8. On Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania,** with lunch at Divine's Carousel.

Daily Washington, D.C., Tour

A daily trip to Washington, D.C., is offered as an alternative to the scheduled tours listed above. In order to go on the tour, you must sign up at the tour desk by 14:00 on the day before you want to go. There is a minimum number of 30 participants required for each daily tour to Washington; if fewer people have signed up, the tour will be cancelled for that day.

THE GALLOPING GASTRONOMER

RESTAURANT RATING

Average Star ★
Double Star ★★
Supernova ★★★
Starburst Galaxy ★★★★

The Orchid
419 N. Charles Street, 837-0080
Rating: ★½

by Laurence W. Fredrick, special to IAU Today

The Orchid is within easy walking distance of all the Inner Harbor hotels. Casual attire, little or no waiting.

A menu posted outside the restaurant brought back memories of a Charlottesville restaurant, the "Eastern Standard," so we opted to try it. Inside we were met by a charming maitre d' who seated us in an intimate, nicely appointed dining room. There we inspected the menu again and found it an interesting blend of French and Chinese cuisines.

The offerings do not overwhelm you. There are, perhaps, five entries in each major category: salad, fish, chicken, etc. We tried the bibb lettuce salad and two seafood entrees. Of course, in the European tradition we followed the entrees with the caramel custard dessert.

The salmon was excellent, with a sauce containing three modest-sized shrimp. The accompanying vegetables were stir fried, and they were crisp and tasty. The batter-fried shrimp, our other entree, were large and done in a tangy sweet-and-sour sauce that did not overpower the shrimp. This dish was served with a bed of rice that was more French than Chinese.

With a pre-dinner drink and a bottle of excellent California wine to complement the meal, dinner at The Orchid will cost about $30 per person, including tip.

To be honest with the readers, I should say that we had intended to eat at Tio Pepe but were turned away. Reservations are required there; the alternative may be a wait of up to two hours. What we saw was sufficient to make us want to return on a later day with a reservation and the required attire (coat and tie for men, no jeans or slacks for women.) Tio Pepe is located between Charles and St. Luke on Franklin, a relatively brief walk from our hotels.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. **MONDAY, AUGUST 8, 1988** **7**

B. Gustafsson, H.R. Johnson, M. Querci, and V. Straizys were among the giants at Colloquium 106.

ANNOUNCEMENTS FROM THE GENERAL SECRETARY

New Meeting:

- Commission 20, ad hoc committee to discuss conversion from B1950.0 to J2000.0, August 8, Session 2, Room 203.

Schedule Change:

- Commission 7, August 8, Sessions 2 and 3, moved to Room 309.
- Commission 30: 30/3, business and scientific, now scheduled for August 9, Session 4, Room 203.
- Commission 48/4, August 10, Session 3 is cancelled.

COLLOQUIUM 106

Tracing the History of Red Giant Stars

by Hollis R. Johnson, Special to IAU Today

Nestled among wooden hills and secure in a long tradition of research on red giants, Indiana University in Bloomington was a fitting host for IAU Colloquium 106. The colloquium on July 27-29, was titled "Evolution of Peculiar Red Stars."

Arising from a suggestion of the Working Group on Peculiar Red Giant Stars of IAU Commission 29, the conference was endorsed by IAU commissions 27, 29, 35, 36, and 45 and received financial support from IAU and Indiana University. The Scientific Organizing Committee consisted of Feast, Gustafsson, Jaschek, Johnson (Chairman), Kaler, McClure, Renzini, Straizys, Sweigert, Tsuji, Wood, and Zuckerman. A strong international flavor was evident among the 120 attendees. The Local Organizing Committee, which all agreed did an excellent job, was headed by Honeycutt. Our goal was to trace and explain the evolutionary status and history of the many groups of peculiar red-giant stars (PRG's) – M, MS, S, SC, C, Ba, R, CH, CH-like, and other stars. In particular, we were interested in determining the properties – luminosity, temperature, and composition – of each group of stars and then relating these to initial mass and composition.

IRAS color-color diagrams were used by several investigators to obtain the space density of both M and C stars. Several controversial interpretations of the results as well as more straightforward explanations were offered. Together with mass-loss rates derived from circumstellar molecular emission, IRAS data was used to estimate that rates of mass return to the interstellar medium from C and M stars on the AGB are approximately equal, and the total is in rough agreement with observations.

Opacities and model atmospheres for the molecule-dominated PRG stars are slowly approaching reality. Advances noted at the conference were dynamic envelopes for pulsating red giant stars, atmospheric models for M miras with spherical symmetry, and an opacity sampled treatment of water vapor. The introduction of periodic shocks in an envelope/atmosphere greatly distends the atmosphere.

Chemical composition and isotopic abundances tend to support the view that the main evolutionary path is M-MS-S-SC-C stars. Specifically, there is a good correlation between the $^{13}C/^{12}C$ ratio and the carbon enhancement (C/O) in all types of AGB stars, as would be expected from the third dredge-up, and the oxygen isotope ratios further support this picture. The s-process isotope ratios observed in S stars are in solar ratios, although the absolute abundances are, of course, enhanced. The presence of Tc seems to be an excellent tracer of the commencement of dredge-up and is not found in "spectroscopic" PRG stars.

Radial-velocity observations over a decade have yielded binary companions for 18 of 20 Barium stars, 11 of 12 CH stars, and only 4 of 15 R stars. All but the last of these groups are therefore "spectroscopic" or "accidental" PRG stars which apparently owe their chemical peculiarities to mass transfer from the present white-dwarf companion when that companion was itself an AGB star. Orbital information confirms that the masses of the companions are 0.6 M, as expected for white dwarfs.

Despite much effort on the part of theoreticians, half the famous carbon star mystery (the lack of bright carbon stars in the LMC) is still with us. None of the various possibilities – they are hidden by massive dust shells, they have been converted back to M stars by hot bottom burning, or they have ejected their envelopes as planetary nebulae – can be ruled out. Several theoreticians have been able to produce carbon stars at the low luminosities observed in the LMC (Mbol = –4.2), but the codes differ in opacity, mixing length, and mass loss. Theories for carbon star formation were discussed at length, with several radically new ideas presented. Whether carbon stars can form with $M > 3M$ was argued enthusiastically but was not resolved.

Variable stars were reviewed and the relation of variability to evolution was explored but not settled. Separating multiperiodicity and randomness (chaos) among the irregular variables will be very difficult and can only be answered by long time series of photometric observations.

see RED GIANTS, page 8

IAU Today **is published with the help of a generous contribution from Computer Sciences Corporation.**

Women in Astronomy Meeting Tonight

"Women Worldwide in Astronomy," tonight at 19:30, Room 309; open to all General Assembly participants. E.M. Burbidge will moderate with speakers from Shanghai, India, Mexico, South Africa, France, and the U.S.S.R.

INVITED DISCOURSE 3

The Formation of Martin Rees

by Virginia Trimble

Tonight's invited discourse will make the point that 90 percent of the matter in galaxies is dark and so not easily studied. Much the same could be said of the speaker, Prof. Martin J. Rees of Cambridge University. Well-illuminated – and illuminating – though many of his accomplishments are, a large number, especially in encouraging the work of younger colleagues, have remained relatively unknown. To find out more about dark matter in galaxies, especially how it is involved in the very difficult problem of understanding galaxy formation, come to the talk.

Dr. Rees was born 23 June 1942, the son of a Welsh schoolmaster, and as a child he had the run of the large building and garden which housed the school. He claims

see REES, page 7

Martin J. Rees

IAU NEWS

JOINT DISCUSSION V
Astrochemistry: Data Needed

by Peter L. Smith, Special to IAU Today

Joint Discussion V on Atomic and Molecular Data for Astrochemistry, will be held today from 09:00 in Room 317. It was organized by Drs. Claude Arpigny, David Flower, and the author.

Research in astrochemistry comprises observations of distant molecules and atoms and the determination of the physical nature of their environment as well as the consequences of its chemical composition and the variations it may undergo. By these studies we hope to recognize how particular astronomical entities came to be, to predict how they will change with time, and to place them with other objects in evolutionary sequences.

Astrophysical molecules and atoms are studied through their spectra – both absorption and emission – at wavelengths ranging from radio to the extreme ultraviolet. Molecules have been detected in a great diversity of astrophysical systems, providing evidence on the birth and death of stars, the interactions of ionization and dissociation fronts, stellar winds, and supernovae explosions with the interstellar gas, and on the collisions of interstellar clouds and galaxies. Molecular observations often provide data that is otherwise unobtainable. They also reveal new phenomena not accessible by other techniques. As diagnostic probes, molecules have enormous value as measures of density, temperature, and mass distribution in our own and nearby external galaxies.

The processes by which astrophysical molecules and atoms absorb and emit light and how they are created and destroyed in particle- and photon-initiated gas-phase and surface reactions are of fundamental importance. The interpretation of the observations and the modelling of the physical and chemical processes are critically dependent upon accurate knowledge of the fundamental parameters of molecules and atoms. Precise line positions are needed to identify species, including isotopic variants. Rate constants and photoionization and photodissociation cross sections are needed to understand the creation and destruction processes and, ultimately, abundances.

Interpretation of the observations for comparison with models of astronomical objects is no more accurate than the atomic and molecular data employed. In fact, shortcomings in the fundamental data are frequently more limiting to scientific progress than is lack of observational information.

JD V will consider the chemistry of diffuse and dense interstellar clouds and the influence of radiation and shock waves that propagate through them. Speakers will discuss molecules on interstellar grains, in circumstellar shells, in the solar and stellar atmospheres, in the comae of comets, and in the atmospheres of planets and their satellites. The status of fundamental atomic and molecular data will be reviewed, and data that are needed for improved models will be identified.

Radio Astronomers Pool Knowledge on M51

by Ronald A. Schorn

Studies of interstellar molecules in other galaxies have advanced to the point where many of the opportunities and problems previously faced by astronomers studying our own Milky Way are now encountered on a larger field. Moreover, detailed comparisons between the properties of different systems are now appearing in substantial numbers. These are the overall impressions gathered on August 5 from Joint Commission Meeting 4 on Molecules in External Galaxies.

Among the many interesting topics presented during Friday's first session, Stuart Vogel (Rensselaer Polytechnic Institute) presented radio observations of the carbon monoxide distribution in M51, the whirlpool galaxy. He suggested that these and other data indicate that giant molecular clouds between the spiral arms of this system are collected into larger aggregates called giant molecular associations as they pass through the spiral arms, and then disperse when they leave. The larger formations live for about 30 million years. Apparently the era of peak O-star formation occurs after the larger groups break apart, but density waves do seem to be the triggers for this activity.

Vogel noted that the hydrogen in M51, at least, does not seem to follow the "classical" process in which atomic hydrogen between the arms is compressed to the molecular form by density waves as it passes through the arms. Most of the hydrogen in M51 lies between the arms and most is molecular. What atomic hydrogen does exist may be the dissociative byproduct of star formation.

Ake Hjalmarson (Onsala Space Observatory) presented other radio studies of the extensively studied M51, which detected carbon monoxide everywhere in this galaxy – between the arms as well as in them. There are discrete clouds in the interarm regions as well as continuous lines of clouds in the arms, with a lot of gas in the system's central region. Hjalmarson concluded that molecular arms do exist in this galaxy but that the interarm clouds may contain a large portion of the molecular gas. He also suggested that spiral density waves may play a role in organizing clouds into larger groupings in the arms, but probably do not form the clouds themselves.

Going beyond M51, Francoise Combes (Observatoire de Paris) discussed the role of tidal stripping in the Virgo cluster. Her radio observations of carbon monoxide in NGC 4438 show that the gas is displaced with respect to the galaxy. The intracluster medium cannot be responsible as it falls short of doing the job by a factor of about 100. Tidal interactions are an obvious alternative and numerical simulations show that this explanation is promising; among other things it reproduces the visible-light appearance of NGC 4438, as well as the X-ray and radio continuum observations. We may be witnessing tidal stripping in action in this galaxy. Combes concluded by noting that some 30 to 50 percent of the galaxies in the central regions of the Virgo cluster may have experienced such a hydrogen-stripping encounter.

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The Short, Significant Life of Quasars

by Virginia Trimble

A quasar is not forever, according to Prof. Maarten Schmidt (California Institute of Technology), who delivered the second Invited Discourse on Friday evening. Not only do the individual objects have lifetimes less than 1 percent of the 10-20 billion year age of our universe but, in addition, the era during which most of them brightened, flourished, and faded away was also short, perhaps 10 percent of the age of the universe. This brief period, he suggests, must have been a significant epoch in cosmic history.

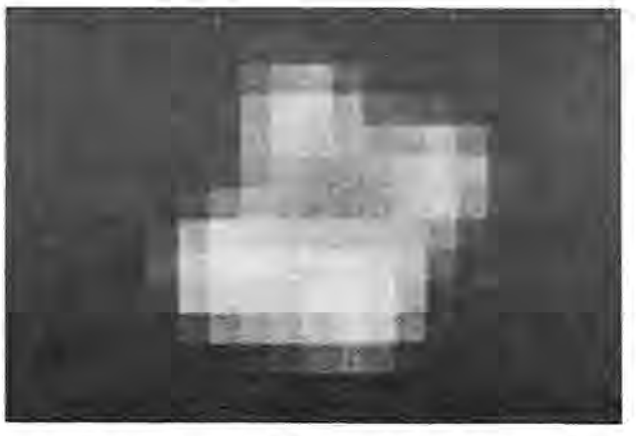
Schmidt began with the discovery of quasars between 1960 and 1963. Serendipity clearly played a role, though not, we suspect, so large a one as he modestly suggested. Perhaps more important (and more important for us as a model) was the close collaboration with radio astronomers Cyril Hazard and Thomas Matthews and spectroscopists Jesse Greenstein and J. Beverley Oke. This made possible the efficient identification of strong radio sources and the elimination of many possible interpretations of their emission lines that led up to Schmidt's attempt to construct an energy level diagram for a hypothetical atom and so to his recognition of the redshifted hydrogen lines in the spectrum of 3C 273.

The speaker repeatedly emphasized the large numbers of people who have contributed to our present understanding of quasars. But most of the defining properties were already evident in his initial work – star-like images (hence the name quasi-stellar and its various permutations), rapid variability (implying small size), and broad emission lines with large redshifts.

Schmidt and his collaborators quickly decided that these were best interpreted as cosmological redshifts, placing the quasars at large distances and their heyday in the remote past. Most astronomers agree, and the speaker suggested that the issue might never have become controversial if quasars had been discovered after rather than before we recognized the rapid variability of Seyfert nuclei. In any case, the only alternative to placing the quasi-stellar objects at cosmological distances (so that they probe an early phase of cosmic evolution) is to accept that we live in a very special place, near the center of a hole in the quasar population.

Perhaps the most striking of many elegant slides was a plot of the number of quasars as a function of age of the universe (or cosmic time), in linear rather than logarithmic coordinates. The steep spike at 3 billion years (for H = 70 km/sec/Mpc and small q_o) represents a density 130 times the present one. The decline in quasar numbers at earlier times is also significant both in the data collected by Schneider, Gunn, and Schmidt at Palomar and in that from Paul Hewitt's group in Cambridge (U.K.).

The sharp maximum must signify an extraordinary event in the early universe. Astronomers have been looking for such an epoch – that of galaxy formation – for a generation. Schmidt left us with the idea that these two special epochs may be intimately associated, and with the confession that he is "awaiting with some trepidation Prof. Rees's judgement" on this point in his Invited Discourse today. So are we.



Lucky Quasar? Good seeing on March 8 and a high-resolution CCD camera on the ESO/MPI 2.2-m telescope let astronomers under P. Magain detect a "cloverleaf" pattern in H 1413+117. Spectroscopic data suggest the quadruple structure is due to gravitational lensing. Photo copyright European Southern Observatory.

IAU NEWS

Comet Halley Tells Tale on Dust

by Jay M. Pasachoff

The composition of Halley's Comet is very similar to interstellar dust particles, listeners learned at Joint Discussion IV on cosmic dust on August 5. Donald E. Brownlee, II (University of Washington) told the large audience that the dust content of Halley's Comet, analyzed by the Soviet Puma 1 experiment on the Vega mission, is basically high-temperature assemblages that show no sign of a hydrated phase.

Dust in Halley's Comet is also especially similar to carbonaceous chondrites, Brownlee reported. The Halley dust contains some silicates, some carbonaceous grains, and some "tarballs." These "tarballs," which he showed in electron-microscope slides, are a few thousand angstroms across. They contain ultrafine grains made of mineral grains or organic matter. All the "tarballs" have the same composition: they are the same as the solar abundances to within a factor of 2, except for carbon.

J. Mayo Greenberg (University of Leiden), explained that the major impetus for the joint discussion about cosmic dust came from the discovery in Halley's Comet of many phenomena that appear to derive from interstellar dust properties. Recent work, he said, "has shown that the structure of interstellar dust is complex, involving layers of organic material as well as layers of various simple and complex ices. Such material had been postulated to be the main components of a comet because it had been assumed that comets are the most primitive bodies of the solar system, and might be connected with the molecular cloud of gas and dust out of which the solar system was born."

Greenberg displayed sketches of dust particles. His model particles resembled kernels of candy, with crunchy centers and chocolate outsides. In the interstellar case of diffuse dust grains, however, the crunchy centers are made of silicates and are surrounded by a coating of organic refractory materials. The precometary grains were said to have an additional external coating of ices.

Brownlee discussed the CHON particles – particles rich in the basic elements carbon, hydrogen, oxygen, and nitrogen – that were found in analysis of Comet Halley's dust. He discussed how CHON, mixed, and silicate particles all exist in the interstellar medium. The CHON abundance, however, is higher in Halley. The grain size in the Halley dust is about the same size as the grain size of interstellar dust particles, but is smaller than the size of particles in most chondrites.

What is the connection between planetary and interstellar dust? Interplanetary dust, Greenberg explained, is trapped in the Earth's atmosphere and is presumed to be of cometary origin. One of the major controversies that is yet to be resolved is how directly is interplanetary dust related to the original composition of a comet? There may be evidence in the interplanetary dust that a comet is not made exclusively from interstellar dust. One difference is in the type of silicate or rocky materials that was observed in the Comet Halley emission at around 10 micrometers and the kind of silicates that are measured by laboratory techniques on recovered interplanetary particles. The latter appear to be essentially crystalline in nature whereas the former appear to be predominantly amorphous and therefore similar to the silicates seen in interstellar space and in circumstellar media.

Nomenclature "No No" No. 7: Designation Despite Directions

by H. R. Dickel, Special to IAU Today

Don't cause confusion among conscientious colleagues when you catalog celestial objects. To avoid problems, refer to "Designation and nomenclature for astronomical sources of radiation," in *Astron. Astrophys. Suppl.* Ser. 68, 75, 1987. If this source doesn't resolve the situation, consult with the President of IAU Commission 5 for information on who to contact among the members of the Clearinghouse on astronomical designations established by the Commission at the 19th General Assembly. And watch the journals: once per year many of them will print IAU-approved information on proper designations.

Abundance Data Puzzle Researchers

by Laurence A. Marschall

What causes the abundance variations we find in globular clusters? Since the globulars contain some of the oldest known stars, the answer may shed light on the primordial composition of the Galaxy. Alternatively, since globulars contain large numbers of stars in later evolutionary states, the study of abundances in clusters may reveal the effects of nucleosynthesis on evolving stars. Yet judging by the August 6 session of Commission 37 on the abundance spread within globular clusters, the growing observational evidence remains tantalizingly inconclusive.

Nicholas Suntzeff (Cerro Tololo Inter-American Observatory) presented data on metal-poor clusters and noted that many of the gross elemental patterns support the notion that abundance variations are due to nuclear processing. The carbon abundance, for instance, drops as stars evolve from the main-sequence to the tip of the giant branch, and the C^{12}/C^{13} ratio follows suit. Both these trends are expected if significant amounts of CNO-processed material are mixed into the stellar atmosphere from the hydrogen-burning layers at greater depths.

But data on individual stars seem to contradict the overall picture. There are huge variations in heavy element line strength in stars that are side-by side on the HR diagram, and those patterns of element overabundance and depletion cannot be explained by any simple nucleosynthetic model. In addition, there seems to be a puzzling bimodality in the CN abundance among cluster giants: one group has systematically stronger lines than the other.

Catherine A. Pilachowski (National Optical Astronomy Observatories), whose high-resolution spectroscopy of selected cluster and field stars highlighted the same problems, called for additional observations as well as continued work on model atmospheres to investigate possible systematic problems in the interpretation of data. She hinted that the ultimate resolution of the globular abundance problem might involve both the primordial and the nucleosynthetic models: "It's a complicated picture," said Pilachowski,"not a straightforward interpretation by any means."

REGIONAL ASTRONOMY

Malaysia

by Mohammad Ilyas, Special to IAU Today

An "Astronomical Centre" is now under construction at the equatorial location of Penang in Malaysia. The ground breaking ceremony held in early June this year was officiated by the Penang State Governor during a Regional Calendrical Astronomy Seminar. Attended by 100 participants from 25 countries, this was the first astronomical meeting in Malaysia. The planning for the Centre has been going on for the last three years. The first phase will consist of an observatory, a data and computer centre, and a guest room for visiting scientists and astronomers.

The Centre will be part of the Malaysian Science University in Penang (5.2°N, 100°E) and the construction of the first phase is expected to be completed by mid-1990. Penang island is a well-known tourist attraction (Pearl of the Orient). It is served by an international airport, has modern facilities, and has the world's third largest bridge linking it to the mainland.

Astronomical work at the Science University (locally known as Universiti Sains Malaysia) has been conducted in the Physics Faculty for more than a decade, but in recent years the interest group has been steadily increasing. There are at present about one dozen scientists interested in the subject with about half that number having a more serious involvement. The Astronomical Centre under construction is located on the western side of the nearly N-S running Penang Hill, about 15 miles from the University's main campus (the University has three campuses). Most of the western side of the hill is unpopulated and makes a better location. Although there are troublesome rainy days during the monsoon seasons, Penang does get a significant number of clear nights for observational work.

Model of the future Astronomical Centre at Penang.

Initial facilities will include a small telescope, photoelectric instruments, and a computer. In the second phase a more elaborate arrangement is envisioned. There will be an astronomy unit set up at the university campus which will undertake educational activities and the running of the observatory and organization of activities for outside users. Visiting scientists will be most welcome for short and long visits and for cooperative research and astronomy development programmes. Those interested should contact the author at the Astronomical Centre Project, School of Physics, Universiti Sains Malaysia, 1180 USM, Penang, Malaysia.

Saudi Arabia

by Abdulrahman Al-khashlan, Special to IAU Today

There are two universities with full-fledged departments of astronomy in Saudia Arabia. One is King Saud University in Riyadh and the other is King Abdulaziz University in Jeddah. The astronomy department in King Saud University has three telescopes on campus for teaching and training of undergraduate students. King Abdulaziz University has a 15-cm Coudé refractor for undergraduate students. King Fahad University in the eastern province of the Kingdom offers an optional course in astronomy in the physics department. The University of Ummul-Qura in the holy city of Makkah provides a similar facility in astronomy.

The prime function of the government scientific organization known as the King Abdulaziz City for Science and Technology (KACST) in Riyadh is to promote applied research in this country. It has a role similar to research councils or science foundations. This organization has also been given the responsibility to construct a number of lunar observatories to sight the young crescent Moon for Arabic months and to develop a large-scale national observatory for the Kingdom of Saudi Arabia through an undertaking known as the National Observatory Projects (NOP).

In cooperation with the National Research Council of Canada, NOP has carried out a program of site testing at five locations along the mountain ranges on the west coast and on a southern plateau. The net result of this program is that the seeing is good enough to support large telescopes.

Other activities of NOP include the establishment of a laser and lunar-ranging telescope, and a 10-m dish antenna for VLBI. Preliminary arrangements have been completed to start a Saudi Astronomical Society. With such active astronomical progress, Saudi Arabia hopes to become a member of the IAU at this General Assembly.

IAU PEOPLE

REMINISCENCES

Moscow: The 10th G.A. and the 1973 Extraordinary Assembly

by Prof. Wilhelmina Iwanowska, Special to IAU Today

Prof. Iwanowska has participated in ten General Assemblies over the past 50 years, including all those from Hamburg (1964) to Delhi (1985), many of them as leader of the Polish National Committee.

At the time I joined the Union, at the Stockholm 6th GA in 1938, the U.S.S.R. did not participate in IAU activities. Thus, when they joined after the War, Soviet astronomers were eager for a General Assembly in their country. A decision was taken at the GA in Dublin that the next one would be held in Moscow. The acting IAU President was Prof. André Danjon from France, the General Secretary Dr. P. Th. Oosterhoff from Holland; Prof. Ambartsumian was the LOC Chairman and Prof. Kulikovsky, the Vice-Chairman.

The arrangements for this Moscow meeting were splendid and generous: all members of the IAU Commissions were guests of the USSR Academy of Sciences. The meetings were held at the new buildings of the Moscow University and at the Sternberg Institute. Accommodation and meals were in the monumental hotel Ukraina. Profs. P. P. Parenago and B.V. Kukarkin, living nearby, invited large groups of foreign guests to supper at their homes. On Sunday, special buses took those wanting to attend Sunday service to some active churches. A brilliant reception was given at the Kremlin Palace, and free excursions to Poulkovo and Leningrad were offered.

In the scientific program, 38 Commissions held sessions. The four Joint Discussions were concentrated on 1. Solar Flares and Corpuscular Streams, 2. Astronomical Observations by Means of Artificial Satellites, Rockets, and Balloons (the first Sputnik was launched on 4 October 1957), 3. Luminosity of Cepheids, and 4. Nucleosynthesis in stars (a famous publication on this topic by Burbidge, Burbidge, Fowler, and Hoyle appeared in 1957).

Some official and unofficial Symposia were held, including one on the Hertzsprung-Russell diagram and another on Rotation of the Earth and Atomic Time Standards.

The 10th GA was attended by 820 participants from 34 countries. At the end of this Assembly, the total number of IAU members surpassed 1000 and the newly elected President, Prof. Oort, expressed his concern about the growth of the Union, saying "the real dangers that loom before us are not storms and typhoons, but rather that the ship will break under its own weight."

An important service which a country can bring to the IAU is to be a host of its meetings. In this respect, we in Poland were glad to have in our country the Extraordinary General Assembly in 1973, commemorating the 600th anniversary of the birth of Nicolaus Copernicus, born in Torun in 1473. It was composed of six Symposia (three in Warsaw, two in Torun, and one in Cracow) on topics connected with the work of Copernicus, who "stopped the Sun, moved the Earth, and rejected the stars to great distances." An important Copernican gift was given to the Torun Observatory from the National Research Council of Canada, represented by Drs. J.L. Locke and K. O. Wright, with help from the Polish-Candadian community. It was a fine spectrograph built at the Observatory in Victoria British Columbia, under the care of Dr. E. H. Richardson for our 60/90-cm telescope.

The site of the 10th General Assembly in Moscow, 1958: Stemberg Astronomical Institute with the Moscow University in the background.

REMINISCENCES

One Year After Sputnik: The 10th General Assembly

by Alla Massevich, Special to IAU Today

At the Opening Ceremony chaired by Prof. A. Mikhailov, IAU President André Danjon, U.S.S.R. Premier A.N. Kosygin, Vice President of the U.S.S.R. Academy of Sciences A.V. Topchiev, and LOC Chairman V. A. Ambartsumian spoke. The intention of the government to start building a 6-meter telescope was first announced at this ceremony.

The scientific program included two large symposia, seven joint discussions, and commission meetings. Most of the participants attended the symposium on the "The H-R Diagram" – observational results and theoretical interpretations for nearby stars, clusters and the Magellanic Clouds. One of the fathers of this diagram, Prof. E. Hertzsprung was in the audience. The hypothesis that mass loss from luminous stars plays an important role in their evolution (first proposed in 1949 by V. G. Fessenkov and A. G. Massevitch) was discussed in lively fashion. It is interesting to note that at that time the idea was rather coolly received (as a matter of fact, almost rejected) and actually was reanimated only in about 1970 when observations from outer space confirmed the significance of mass loss from luminous stars.

At the Joint Discussion on "origin of chemical elements" the highlight was the B^2FH hypothesis presented by F. Hoyle, W. Fowler and the Burbidges. This was the first time it was discussed in detail by the international astronomical community. It is only fair to mention that at this discussion Y. B. Zeldovich predicted the existence of a "hidden" or "dead" mass in the Galaxy.

The dance at the closing dinner of the 10th General Assembly of the IAU in Moscow.

First results of solar observations with balloons in France and the U.S. were presented at another Joint Discussion. It was a surprise to see the convinced theorist Martin Schwarzschild enthusiastically presenting his observational results. The Assembly took place less than one year after the launch of the first *Sputnik*; only very few results of extraterrestrial observations of solar ultraviolet radiation, cosmic rays and micrometeorites were available at that time, but expectations for the future were already great.

The second symposium was devoted to irregularities in the rotation of the Earth and also to the program of the International Geophysical Year. The idea of using precise satellite observations for polar motion measurements had not yet been born at that time.

The other joint discussions dealt with solar-terrestrial relations, Cepheids, origin of the solar system, comets, and meteors.

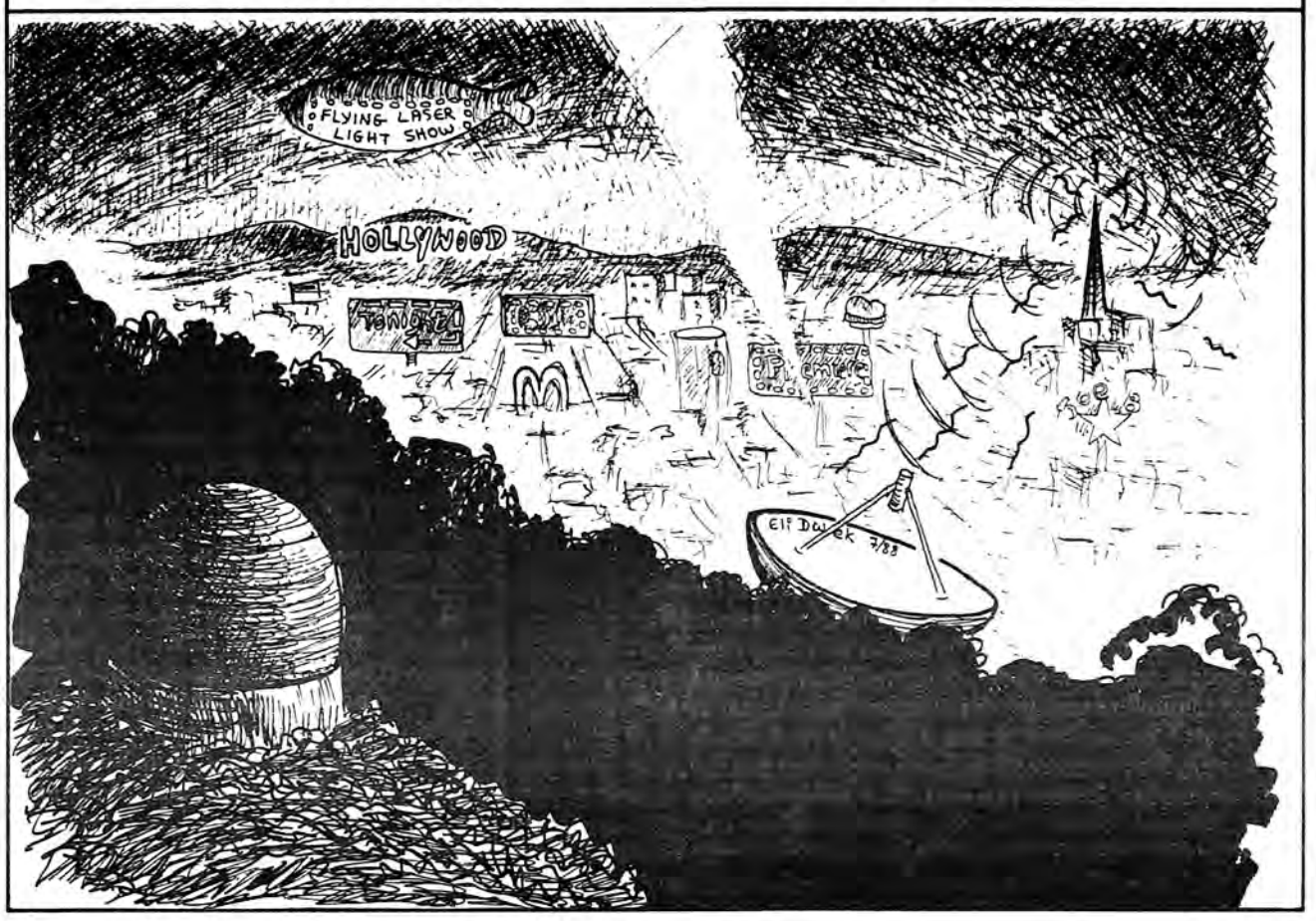
Prof. J. Oort was elected the new President of the IAU at the Plenary Session.

The tradition of issuing an IAU newspaper was reestablished at this Assembly. The newspaper *Cosmos* was published in three languages (English, French, and Russian) and was very popular with the participants.

Social highlights of the gathering were a grand reception at the Kremlin Palace with a dance in its splendid St. George Hall, a concert given by the participants (Donald Menzel, Leo Goldberg, Pjotr Kulikovsky, Mitrofan Zverev and others) at the Sternberg Astronomical Institute, and a very cozy reception for the ladies at the Moscow Club for Scientists.

IAU ACTIVITIES

CIVILIZATION INTERFERES WITH ASTRONOMY



THE GALLOPING GASTRONOMER

RESTAURANT RATING

Average Star ★
Double Star ★★
Supernova ★★★
Starburst Galaxy ★★★★

Ikaros
4805 Eastern Ave., 633-3750
Closed Tuesdays, major credit cards accepted, reservations required for groups of 6 or more
Rating: ★★★

by Laurence W. Fredrick

This restaurant with an astronomically familiar name is as far afield as this Galloping Gastronomer has gone from the Inner Harbor. It is a $5 taxi ride which can be split with as many as four riders. I suggest not driving your own car as the parking is on "the street," which means that space is hard to find.

Ikaros is an unassuming place from the outside. When you first step inside you might think you came to the wrong place were it not for the unmistakable aroma that penetrates to your very soul. You're glad to see that other patrons are chatting in Greek and calling the waiters by their first names. (In fact, at one point I almost reached for my passport.) There is plenty of space in the three generous rooms reached from the crowded entry.

For an appetizer try the Tyropitas or the octopus. The entrees are accompanied by vegetables. The beef stew (Vothino Cuvetsaki) was more than enough for one person and the lamb (Hasapa Arni Psito Sto Fourno) was very tasty. A side order of endive is recommended for those unfamiliar with this green, leafy food. The small Greek salad is well worth trying – with olives and tomatoes that are thoroughly ripe and smothered in olive oil. (I haven't seen so much olive oil since the doctors suggested people over 30 should lay off the stuff.) Those garden-fresh tomatoes were so ripe that they would not have held for another day.

You can top the meal off with Kataifi-Kata, a concoction of shredded wheat stuffed with walnuts swimming in honey. All this plus a cocktail and wine came to $20 per person, which is quite reasonable by local standards. A group of four might order just three entrees and split them four ways; there will be plenty for each and you will reduce the price accordingly.

Normally I like my vegetables crisp, but the Greek chefs do theirs various ways. (College food services should study this.) The green beans were cooked until they looked like they were left over from a Fourth of July celebration (Ikaros was visited on July 31) but were fresh and tasty despite the near-mush consistency. The cooking reminded me of the restaurants in downtown Patras or the personal restaurants on the slopes of Mt. Lycabetos in Athena.

Yet something seemed amiss. After a while we realized what was wrong: the Ikaros uses menus. In the restaurants in Greece mentioned above, the "menu" was a trip to the kitchen with the waiter who remembered everything you pointed at and brought it to your table in the proper order and at the right time. Nevertheless, our evening at Ikaros was very pleasant.

ON TOUR

Guests Enjoy Baltimore

by Jacqueline Mitton

While IAU participants ponder weighty astronomical problems in the Convention Center, their families and guests, and some colleagues too, have been out having fun. A full program of tours, offering something for everyone, is ensuring that no-one need be bored.

When I joined the "Baltimore by Land and Sea" tour on August 3, a fair sprinkling of blue and green badges could be spotted among the yellow ones, identifying the scientists who had been tempted into taking a relaxing day off.

The first call after a short bus-ride through the Baltimore streets via Federal Hill was Fort McHenry. This historic site is famous as the scene of the battle in the War of 1812 that inspired the writing of "The Star-Spangled Banner." Lunch followed at the bustling Lexington Market, where everyone could choose their favorite delicacies from the huge range on sale. Then it was down to the harbor to embark on the *Baltimore Patriot II* for a 90-minute cruise with a commentary on the many interesting and historical landmarks along the route.

Our professional guides were provided by "About Town." Betsy, who took charge of the bus I was on, bubbled over with her enthusiasm for the city of Baltimore. She takes pride in her knowledge of the history and geography of the area and it appeared that there were no questions we could think of that she could not answer.

An equally good day followed on Thursday, when the highlight of the tour to Annapolis was a visit to the U.S. Naval Academy. "A brilliant day," reported one 13-year-old guest, who was specially impressed by the chapel with its huge dome.

IAU SOCIAL EVENING

Fiddles, Banjos, Ragtime, and Jazz Tuesday on Pier 6

A wonderful evening of American music and dance will be presented for General Assembly participants under the tent on the Pier 6 Concert Pavilion at 20:00 tomorrow. Admission is free but G.A. badges are required for admission. Pier 6 is located in the Inner Harbor. Although it is in walking distance of the Convention Center, a shuttle bus service will be provided.

Supper on the Pier. Food, beer, and soft drinks will be sold when a concession stand on Pier 6 opens at 19:15, so come early and enjoy a picnic supper. A bluegrass band will entertain diners from 19:30, prior to the 20:00 concert.

Ragtime Concert. The internationally recognized Peabody Ragtime Ensemble, recently returned from performing in the U.S.S.R., will entertain at the 20:00 concert. The Ensemble performs historic American music dating as far back as 1880 and as recently as the 1940s, with emphasis on compositions by the great Scott Joplin and his contemporaries. Also, they'll feature Dixieland music and Big Band tunes.

Folk Culture of the Appalachian Mountains. Also appearing on Pier 6, West Virginia's mighty Critton Hollow String Band will perform traditional music of the Appalachian mountains, from old-time songs and fiddle tunes to sensitive ballads. Finally, look for that southern Appalachian specialty, clog dancing! The Fiddle Puppets, folk dance company will perform along with international dance artist and Master Hoofer LaVaughn Robinson, who went from dancing on the street corners of Philadelphia to performing with all-time jazz greats Cab Calloway, Charlie Parker, Billie Holiday, and Ella Fitzgerald.

Peabody Ragtime Ensemble

Critton Hollow String Band

IAU WORLD

REGIONAL ASTRONOMY

Astronomy in Israel: Collaborative Efforts in a Young Field

by Hagai Netzer, Special to IAU Today

From the beginning, when the first institutions of higher learning were opened in Israel some sixty years ago, the Exact Sciences, and Physics in particular, attracted some of the best Israeli scientists. Six of the seven universities in the country support large, strong physics departments.

The youngest discipline in most of these departments is astronomy and astrophysics, which came into being in Israel only about 20 years ago. Nevertheless, four small, but active astronomical groups are now working, with about 40 full-time members and a similar number of graduate students. There is a lot of collaborative inter-university work, as well as a monthly national seminar, bringing together members from all institutions.

1. The Technion (Haifa)

Five faculty and several students are working on a variety of theoretical problems such as: stellar structure and evolution, cataclysmic variables, chaos in astrophysical systems, cosmology, neutrino astrophysics and extragalactic hydrodynamics. The astronomy group is part of the Physics Faculty. Introductory astronomy courses are offered for all Physics major students and there is a full graduate program, leading to the degrees of M.Sc. and Ph.D. in astronomy.

2. The Weizmann Institute of Science. (Rehovot)

This institute has many research groups in different areas of the natural and exact sciences, and conducts a full graduate program in most of these disciplines. A small theoretical group in astronomy (two senior members and several students) work in the Department of Physics on problems such as: gravitational theory, binary stars, quasars and gravitational lenses and the early universe.

3. Ben Gurion University (Be'er Sheva)

This is one of the newest universities in Israel. The theoretical astronomy group, in the Physics Department, includes four faculty and several graduate students. Areas of research are: the theory of black holes, gravitational fields and entropy, clusters of galaxies, early universe, stellar dynamics, neutron stars, solar physics and dark matter in the universe. In addition, several members of the Physics and Mathematics Departments are working on general relativity. Graduate, as well as undergraduate courses in astronomy are given.

4. The Hebrew University (Jerusalem)

The astronomy group is part of the Racah Institute of Physics. Twelve senior members, one or two long-term visitors and several graduate students are working on theoretical and phenomenological problems including: cosmology, dynamics of gravitating systems, large-scale structure in the universe, relativistic astrophysics, general relativity (classical and numerical), compact objects, stellar structure and evolution, novae and supernovae. An international winter workshop, on the formation of galaxies, is organized by the group every other year. Introductory astronomy courses and a full graduate program in astronomy are available.

5. Tel Aviv University

The Astronomy Department, in the School of Physics and Astronomy of the Raymond and Beverly Sackler Faculty of Exact Sciences, offers introductory astronomy courses for physics and general BA students. The University operates the Wise Observatory, the only one in Israel. There are fourteen faculty and staff and several graduate students. Several members of the Department of Geophysics are working on planetary sciences and the solar system. Topics of theoretical research include the microwave and X-ray backgrounds, high energy astrophysics, clusters of galaxies, stellar structure and evolution, quasars and active galaxies, general relativity and cosmology. Observational projects of current interest are: variability of peculiar stars and Seyfert galaxies, quasar spectroscopy, symbiotic stars, novae, x-ray sources, structure and evolution of galaxies, comets and planets.

6. The Florence & George Wise Observatory (Mitzpe Ramon)

Located on a high plateau in the central part of the Negev Desert, some 220 km south of Tel Aviv, the observatory enjoys good weather conditions (170 nights of zero cloudiness and about 240 useful nights). Sky background is moderately dark and the average seeing is about 2-3 arcseconds.

The observatory was dedicated in 1971. It contains a 1-m Boller and Chivens telescope that may be used at either f/7 or f/13.5. At f/7, a corrector plate provides a field of up to three degrees in diameter. This focus is used for imaging and spectroscopy while the f/13.5 focus is for on-axis photometry.

The instrumentation includes (1988):

a. A Boller and Chivens spectrograph with an option of two cameras, f/1.4 and f/2.2. The first of these can be used in conjunction with an EVC Digicon and the second with a CCD detector from Photometrics Ltd. The CCD is a thinned RCA 512 x 320 chip, with good blue sensitivity and readout noise of about 50 electrons.

b. Direct Camera. Used to take large (up to 14 x 14 inch) photographic plates through a variety of filters.

c. CCD Camera. Uses the Photometrics CCD chip, at the f/7 focus, for imaging through a variety of filters. The field scale is 30"/mm and the field of view is about 7 x 5 arcminutes.

d. Two-Star Photometer. Built by E. Nather, this instrument can be used for standard UBVRI as well as fast photometry.

New instruments planned for the near future are a fast spectrograph and an infrared photometer.

Data reduction. An 11/750 VAX is operated in a data reduction center at Tel Aviv University. There are several standard packages (VISTA, AIPS) and an advanced color display for image processing, and several graphic terminals.

Visitors' Programs. Since its early days the Wise Observatory has enjoyed a large influx of visitors. The observatory encourages foreign observers to apply for time to use the local facilities or to bring their own instruments. Special warm relations developed with the Royal Greenwich Observatory (which helped to build several of the instruments and left them on long term loan for the use of local and visiting observers), the McDonald Observatory ("responsible" for the Digicon and the photometer) and the astronomy group at Durham University. (Using their own polarimeter, Durham holds the record for the largest number of papers published per instrument.) Information and application forms can be obtained from the Wise Observatory office, Tel Aviv University.

Florence and George Wise Observatory at Mitzpe Ramon.

IAU PEOPLE

LETTERS TO THE EDITOR

A Good Example

The present General Assembly gives me a happy opportunity to express my deep gratitude to the International Astronomical Union and to my numerous friends and colleagues all over the world. It is their tremendous efforts which, in combination with my own long struggle, made eventually possible my emigration to the United States, and the resumption of an active scientific career. I am especially grateful to the staff of the Harvard-Smithsonian Center for Astrophysics that made so many efforts on my behalf and toward a happy start of my life in this country.

I believe that my case is a good example of how much could be done by an international scientific community for the defense of the human rights of its members. – *Leonid Ozernoy*

Telescope Needed

In Uruguay, an underdeveloped country, we are trying to install an observatory devoted to training university students and also for stellar and solar system photometry, polarimetry, spectroscopy, and photography. We are building our own installations, but we need a telescope, preferably a reflector of 14 to 20 inches in diameter. Perhaps in another country there is one that can be lent to us. If a reader can help with this request, please write to me at Comite Nacional de Astronomia, Ministerio de Educacion y Cultura, Calle Reconquista 537P7, Montevideo, Uruguay. – *Gonzalo Vicino*

Perfect Setting

Baltimore and astronomy have a lot in common. There is a sense of history and the excitement of the future coupled together elegantly in sleek new lines. A perfect setting for a look at the many exciting innovations and to listen to the latest news. Sprinkled along the byways and channels of the Inner Harbor we can casually spot other members of this large and gracious astronomical family. There are signs of greeting in all languages and opportunities for interaction on many levels. The Convention Center and its spacious comforts even allow looking for colleagues as we glide up and down escalators above the main floor. There is a sense of ease and good fun as people travel the walkways and corridors of various sessions and things are running smoothly. – *Susan Field*

That's Not Us

Our thanks for good intentions should, I suppose, go to the singer in the Jacqueline bar of the Omni Hotel who on Friday evening dedicated her first song to members of the "International Astrological Society." She was disappointed that no one present would admit to being a member of that organization. – *W.B. Somerville*

Astronomer, Wife, Mother, Administrator: Elisabeth Hevelius Had It All

by Cecylia Iwaniszewska, Special to IAU Today

Since a special session on women in astronomy is planned for tonight, it seems appropriate to recall seventeenth-century Polish astronomer Elisabeth Hevelius (1647-1693), second wife of Johannes Hevelius (1611-1687). This is of added interest since only last year we celebrated the tercentenary of the death of Johannes Hevelius.

After his first wife, Catharine, died, Johannes married Elisabeth Koopman in 1663. Johannes was a rich bourgeois of Gdansk, a merchant city on the Baltic Sea. Elisabeth was 36 years his junior. Already interested in astronomy, she is known to have said that "nothing is sweeter than to know everything, and enthusiasm for all good arts brings, some time or other, excellent reward." Her new husband was a famous astronomical observer, the owner of an observatory on the roofs of his three adjoining houses. He is widely known today as author of *Selenographia*, the first modern lunar atlas, published in 1647.

During twenty-four years of marriage, Elisabeth Hevelius proved to be not only a good wife and the mother of four children but also an able administrator of houses and breweries belonging to the family. Above all, however, she was a faithful assistant in Johannes' astronomical work. In his *Machina Coelestis*, she is shown with Johannes at the 6-foot brass sextant that he built himself. She worked with this richly ornamented instrument on the observations for his famous star catalog.

It is only owing to Elisabeth's patience and perseverance that after Johannes' death the publication of the work he valued most highly was accomplished. Thanks to Elisabeth Hevelius, we can look at the beautiful drawings of the constellations in the atlas, which were published with the star catalog in 1690. Among the twelve new constellations shown in the Hevelius atlas was the Shield of Sobieski, named for a famous Polish king. It remains on modern star maps as Scutum the Shield.

Johannes Hevelius had worked in his observatory for nearly half a century. Although Elisabeth continued the work after his death, the observatory came to an end when she passed away in 1693.

REES / from page 1

not to have been particularly scientifically precocious; his first loves were large dogs and small boats, not stars and galaxies.

A 1960 graduate of Shrewsbury School, Rees received his B.A. in mathematics from Cambridge University in 1963 and his Ph.D. in 1967, working with Dennis Sciama on testing cosmological models and on properties of quasars. He has been associated with Cambridge almost continuously since then, apart from a year (1972-73) as a professor at Sussex and visiting appointments at Harvard, Princeton, and Caltech. He was one of the founding staff members of the Institute of Theoretical Astronomy, then directed by Fred Hoyle, from 1967-72, and returned in 1974 to the restructured and renamed Institute of Astronomy as Hoyle's successor in the Plumian Chair of Astronomy and Experimental Philosophy. Rees has served as director of the Institute from 1977 to 1982 and 1987 onward, in alternation with Donald Lynden-Bell.

Among Dr. Rees' best-known and most widely cited scientific contributions are the prediction of superluminal motion in extragalactic radio sources (*Nature* 211, 468, 1966) and the idea of powering extended radio sources via beams of low-frequency electromagnetic radiation (*Nature* 229, 312, 1971). This latter spawned a model for pulsar-driven supernova remnants (*MNRAS* 167, 1, 1974, with J.E. Gunn) and gave rise to the now generally accepted "twin exhaust," jet, or beam models for active galactic nuclei (MNRAS 169, 395, 1974, with R.D. Blandford) and to the ion-supported-torus mechanism for channeling jets (*Nature* 295, 17, 1982 with M.C. Begelman, R.D. Blandford, and E.S. Phinney). In recent years, in company with students and postdocs, he has focused on problems of galaxy formation, particularly, though not exclusively, in the framework of biased cold dark matter.

No such brief list can do justice to the scope and breadth of Rees' publications. His name appears on more than 290 "real" papers (excluding conference abstracts, book reviews, popularizations, etc.) since 1965, on topics from accreting plasmas to anthropic principles.

These accomplishments have been recognized by memberships in the Royal Society, the U.S. National Academy of Sciences, and the American Academy of Arts and Sciences, as well as more than thirty prizes and honorary lectureships, including the first Bappu Memorial Award of the Indian Academy of Sciences, the Robertson Memorial Lectureship (U.S. National Academy), and the Bakerian Lectureship (Royal Society).

Less widely known are Rees' contributions as mentor and encourager. Twenty-one students have completed Ph.D.s under his direction, including Blandford, James E. Pringle, Begelman, Craig Hogan, and Phinney. Many of these scientific offspring now have "doctor children" of their own, and there will soon be a significant number of Rees great-grandchildren exploring the universe. In a less formal way, Rees turns up in enormous numbers of acknowledgement paragraphs and lists of referees and references for younger colleagues.

Virtually everyone who talks with Martin Rees, even casually at a conference, comes away feeling that he has made a new scientific friend and ally. Not long ago, in conversation over a coffee break, there arose the topic of which of their contributions various scientists were proudest (it is not always the one for which the world remembers them). When asked of which of his works he was proudest, Martin said, "Well, I hope I haven't written it yet." We think he may be right, but the mind boggles.

SUNDAY RUSH HOUR. You can never find a taxi when you need one. Fortunately, the LOC has arranged ample and frequent bus service. Here, participants in the 20th General Assembly and family members assembled yesterday morning to board buses for Washington, D.C. and the observatories tour.

ERRATA

IAU Today, August 5 issue – Page 2, caption: "1978A" should be "1987A."

IAU Today, August 6 issue – Page 3, third column, "Aguillar" should be "Aguilar." Page 7, caption for observatory photo: "two reflectors" should be "two refractors."

IAU NEWS

IAU BULLETINS

Baltimore Hospitality Needed

The call is out to all local astronomers! We have visitors from abroad who are urgently in need of temporary housing after the General Assembly is over, due to travel connection schedules. If you are interested in hosting a visitor in your home for a day or two, please post your name and home number on the LOC Bulletin Board.

Visitors who need housing, please read this Bulletin Board daily and contact people as indicated.

Banquet Day Incorrect on Tickets

Please note that the Closing Banquet is WEDNESDAY, August 10. Tickets indicate that the banquet is on "Thursday, August 10."

Travel

Commuter Trains to Washington, D.C., from Camden Station: Camden Station is one block from the Convention Center. The MARC commuter trains depart from Baltimore, Monday through Friday, at 05:40, 06:35, and 07:42. The trip takes 55 minutes. Telephone: 1-800-325-7245, 1-800-872-7245 or 237-3402 (Camden Station) or 291-4246 (Penn Station).

Tour Itineraries

Longwood Gardens is the site of a tour, with lunch, on Monday, August 8. On Tuesday, August 9, a tour will visit an Amish farm and house in **Lancaster, Pennsylvania**, with lunch at Divine's Carousel.

Daily Washington, D.C., Tour

A daily trip to Washington, D.C., is offered as an alternative to the scheduled tours listed above. In order to go on the tour, you must sign up at the tour desk by 14:00 on the day before you want to go. There is a minimum number of 30 participants required for each daily tour to Washington; if fewer people have signed up, the tour will be cancelled for that day.

Dormitory Bus Schedule

	Dorms to Convention Center Every 20 minutes	On the Hour	C.C. to Dorms Every 30 min.
Aug. 8	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Service will depart from the dorm on the hour and from downtown on the half hour.

The dorm pick up point is the northwest corner of Charles Street and Cold Spring Lane.

The Comfort Inn boarding point is at the front entrance of the Inn.

Note: There will not be a 13:00 departure from the dorm or 13:30 departure from the Convention Center.

Commission business announcements, resolutions, program changes, etc., for possible publication in IAU TODAY must be submitted to the General Secretary's Office.

COLLOQUIUM 115

High Resolution X-ray Spectroscopy of Cosmic Plasmas, August 22-25

by Virginia Trimble

High resolution spectroscopy will be an important aspect of no less than five missions now at various planning stages. There are ESA's XMM, NASA's AXAF, Japan's SXO, West Germany's SPEKTROSAT, and the Soviet Union's SPECTRA-X. Collectively these represent a large fraction of the efforts devoted to astronomy from space for the remainder of the century.

IAU Colloquium 115 has three primary scientific goals. The first of these is the presentation and discussion of existing data, largely at low and medium resolution, from Einstein, Exosat, and Tenma. The second is to review the present state of our theoretical understanding of X-ray emission by plasmas in astrophysical contexts, with input from relevant laboratory plasma experiments and from pure theory of radiation mechanisms. The third goal is to discuss the future observatories and to clarify their scientific objectives and choice of instrumentation.

Colloquium 115 is scheduled for August 22-25, in Cambridge, Massachusetts and is co-sponsored by Commissions 44 (Astronomy from Space) and 48 (High Energy Astrophysics). Its organizing committee, chaired by Paul Gorenstein, has members from Denmark, Germany, Italy, Japan, Netherlands, U.K. and the U.S.S.R., as well as the U.S. The proceedings will be published under the editorship of Martin Zombeck and Paul Gorenstein and will include invited review, oral, and poster papers.

Given the physics of X-ray emission, all topics discussed at this colloquium will be hot. One of the hottest is given the unlikely designation cooling flows. If current interpretations of low resolution (in both space and wavelength) data are correct, many rich clusters and individual massive galaxies have X-ray gas flowing toward their cores at a rate that would add up, over a Hubble time, to a large fraction of the total mass. Evidence that this is currently going into stars or any place else is exceedingly sparse. Among the physical effects that may not yet have been properly taken into account are thermal conduction in the gas and the influence of magnetic fields. These may enable data to be explained with smaller mass flow rates (one solar mass per year per galaxy or less, rather than ten or more). But the most urgent need is for detailed temperature measurements as a function of position across the sources.

Supernova remnants are another strong source of X-rays. It would seem obvious that one ought to be able to use X-ray fluxes and spectra to determine their masses and compositions. This has, of course, been attempted many times, but the results are not entirely satisfactory, especially for the supposed Type I remnants Tycho, Kepler, and 1006. Such events are thought to result from the deflagration of about one solar mass of carbon and oxygen to Ni^{56}, which becomes Fe^{56}. But the X-ray fluxes seem to imply uncomfortably large masses, and there is no evidence of the expected 6-7 keV iron line. Inclusion in the models of non-equilibrium ionization and of non-solar abundances in a self-consistent way improve the agreement of expectations and observations, but, again, there is a great need for better spectral data.

Other X-ray emitters featured prominently on the program of the colloquium are compact binary stars, stellar coronae and flares, active galactic nuclei, and the interstellar medium. For all of these, high resolution spectroscopy will tell us things we have been wanting to know for a long time.

IUE Hands-on Archive Demonstration Today

by Willem Wamsteker, Special to IAU Today

A special demonstration of a new interactive ultraviolet spectroscopy archive, which is already available in ten countries, will be held at the Space Telescope Science Institute today and tomorrow (13:30-14:30). It will be conducted there at the STSDAS and IRAF displays. To attend, register at the STScI stand and use the bus that departs the Convention Center at 13:10.

The facility to be demonstrated is the Uniform Low Dispersion Archive, developed by the International Ultraviolet Explorer project in new compacted form. It currently consists of 25,000 absolutely-calibrated spectra and is supported by the software package USSP to allow data selection and to perform data transfer over most of the existing networks used by astronomers. With this system, the data can be delivered to your institute's computer in a format the local user can select. FITS and most other currently used astronomical data analysis system formats are supported.

Since international computer communications are fairly expensive, USSP was designed so that it can be installed in national host institutes in order to support the astronomical community in any nation. The system may be available later this year for installation in other interested nations. A users' manual (IUE Newsletter No. 30) can be consulted at the ESA exhibition stand for further information. Inquiries can be sent to the author at ESA-Vilspa (Spain).

Workshop Begins Thursday at Space Telescope Science Institute

The Workshop on Organized, Patterned, Time-Dependent Stellar Mass-Outflow welcomes all interested colleagues when it opens at 14:30 August 11 at the Space Telescope Science Institute. The workshop, which continues through August 13, will include summary talks by D. Baade, V. Doazan, H. Henrichs, J.M. Marlborough, K. Leitherer, and S. Owacki.

COMMISSIONS 40, 44

High Resolution Radio Astronomy from Space

Experts from the European Space Agency, Japan, the United States, and the U.S.S.R. will describe space experiments designed to attain high spatial resolution at radio frequencies in the joint meeting of Commissions 40 and 44 on August 10 at 09:00 (Room 307). Unlike ground-based interferometry, the space experiments are not limited in baseline by the size of the Earth.

The United States will report on a successful experiment in using the TDRS relay satellite as a radio telescope in a Very Long Baseline Interferometry observation that included radio telescopes in Australia and Japan. The observation revealed that brightness temperatures above $3X10^{12}$ K exist in quasars. The current Soviet mission, RADIOASTRON, will also be described, along with status reports on a Japanese project and ESA's QUASAT. The session will end with a look at prospects in the more distant future.

RED GIANTS / from page 1

Essentially all PRG stars have chromospheres, as evidenced by the appearance of bright Mg II lines in the ultraviolet spectra, but the strength of these lines differ greatly from one type of star to another. The decline in Mg II emission in the cooler stars may partly be due to absorption. Acoustic energy deposition seemed favored over magnetic excitation, with the effects of shocks uncertain.

Mass loss is one of the characteristic features of PRG stars, and some evidence indicates that rates have been underestimated in the past. Increasing numbers of observations of microwave lines now allow the first general conclusions to be drawn. This is especially true when used in conjunction with IRAS data and the growing number of visual identifications of the underlying stars. Considerable work has been done using IRAS and molecular observations to trace the time dependence of mass loss and central-star evolution from AGB to planetary nebulae.

After twenty invited papers and fifty poster papers, the meeting closed with a lively panel discussion. The proceedings will be published by Cambridge University Press.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. **TUESDAY, AUGUST 9, 1988** **8**

30-Year-Old Prediction Makes News

by Richard Tresch Fienberg

Theodore P. Stecher (NASA-Goddard Space Flight Center) and colleagues announced yesterday the serendipitous discovery of a molecular process predicted three decades ago but never before seen in space. An International Ultraviolet Explorer spectrum obtained last month shows the unmistakable signature of molecular hydrogen fluorescence in IC 63, a reflection nebula in Cassiopeia. Stecher reported his results in an unscheduled five-minute presentation to Joint Discussion V.

The Stecher group were using IUE's short-wavelength spectrometer to study the scattering properties of dust grains. They observed IC 63 mainly because of its relatively simple geometry. The system consists of a small interstellar cloud roughly 2 parsecs to one side of 2.5-magnitude γ Cas, a Be star. At wavelengths between about 1600 and 1800 Å, the familiar spectrum of a reflection nebula is evident. But shortward of 1600 Å, the spectrum displays a variety of weak and strong emission and absorption lines. They immediately suspected that the curious spectral features originate from molecular hydrogen.

In the 1960s, following earlier work by Donald Osterbrock (Lick Observatory), Stecher had investigated mechanisms for destroying hydrogen molecules in interstellar space and convinced himself that incoherent resonant scattering should play an important role. In this process, hydrogen molecules are excited by stellar ultraviolet photons, whereupon they return to any of several available vibrational levels or the vibrational continuum. As this cycle repeats, it generates a multitude of ultraviolet emission and absorption lines.

John H. Black offered a preview of JD V at a press conference yesterday. Photo by Richard Tresch Fienberg.

When they compared a laboratory spectrum of this gas process with their results on IC 63, the IUE observers found a very good match. They now plan further analysis of the system, focusing on the possible contribution to the excitation by particles in γ Cas' wind and by an X-ray source in the vicinity. And now that they know what to look for and have one success under their belts, they will search for the same effect in other reflection nebulae.

Cosmologists Pull Strings into Their Discussion

by Laurence A. Marschall

There's a poster showing the distribution of galaxies in the Shane-Wirtaanen catalog that has become a classic on the walls of astronomy classrooms – yet cosmologists remain unsure of what it shows. James Peebles (Princeton University), speaking on the large-scale distribution of galaxies at a session sponsored by Commission 47 (Cosmology) yesterday, cautioned that first appearances can be deceiving.

The overall impression from galaxy surveys is that the universe is isotropic on the largest scales, but there are groupings on smaller scales, "strings" or "filaments" tens of megaparsecs long. Yet visual perception is not a passive process: we tend to see patterns even in random data. Peebles described his continuing work on the two-point correlation function, an impersonal mathematical technique that measures the tendency for galaxies to cluster together over various distances. Recent critiques of this work by Margaret Geller (Harvard-Smithsonian Center for Astrophysics) and collaborators have led Peebles and his associates to reexamine the Shane-Wirtaanen data. The results, they found, are quite robust, and in good agreement with his past analysis.

On scales smaller than 10 megaparsecs, noted Peebles, the correlation function is a power law, indicating that the clumping of galaxies resembles a fractal, i.e., each level in the heirarchy of clustering is similar to the other levels. On scales larger than 10 megaparsecs, however, the correlation function drops steeply. This sharp break, however, need not mean that the largest coherent structures are no larger than 10 megaparsecs. The two-point correlation function may simply be inadequate to characterize the distribution. New statistical approaches are called for as well as more complete redshift surveys to determine the arrangement of galaxies in three dimensions.

One such new approach to existing data was presented by Suketu Bahvsar (University of Kentucky), who has applied a mathematical technique borrowed from graph theory to analyze the scale of clustering in the CfA redshift survey. "The eye evolved to enhance our chances for survival, not to pick out large-scale structures in images of the sky," he cautioned. "We must be wary of using it to decide whether a pattern is real or not."

Bahvsar's method involves mathematically connecting the galaxies in the redshift survey into strands, called "minimal spanning trees," and measuring the distribution of the strands. By seeing how these length distributions change as the data are subjected to various randomizing processes, the investigator can determine whether a given "structure" is real or simply an artifact of our perception. The CfA survey appears to contain real structures as large as 30 megaparsecs, confirming the strong impression that the universe is spongy on the largest scales surveyed so far.

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JOINT DISCUSSION VI

Jets and Disks on Various Scales in the Universe

by John Dyson, Special to IAU Today

As everyone knows, the gravitational collapse of bodies with angular momentum naturally leads to the formation of disk-like structures. Such structures are ubiquitous in the universe on scales ranging from the stellar to the galactic – hardly a surprise. What is at first glance much more surprising is the equally ubiquitous occurrence of jet-like phenomena. Young stellar objects as well as active galaxies have jets. Jets are also associated with objects as diverse as comets, the galactic center, symbiotic stars and that most bizarre evolved object, SS 433. The physics and phenomena involved will be explored today in JD VI on Jets and Disks on Various Scales in the Universe (Room 317, from 09:00).

One does not need to be Sherlock Holmes to infer from the title of JD VI that there are – or at least are suspected to be – connections between disks and jets. Take as an example the strange case of pre-main sequence stars embedded in cool, dense molecular clouds. Only recently, to the consternation and excitement of astronomers, these young stellar objects were found to have optically-emitting jets traceable to a few thousand astronomical units from the stellar surfaces. These same objects have dense disks and high-speed, expanding bipolar flows of molecular gas. What is far from clear, however, is where and how the jets are collimated. Also, do the jets drive the bipolar flows or does something else, e.g. a disk wind, do the driving?

At the other extreme, active galactic nuclei are often the source of spectacular jets of plasma observed at radio wavelengths. Unlike stellar jets, these frequently have velocities ranging up to the relativistic domain and show remarkable collimation over length scales ranging from the interstellar to the intergalactic. But active galactic nuclei also show evidence for associated disks, for example the now celebrated "blue bump" in their ultraviolet spectra. So we have again the possibility of a connection between disks and jets.

Perhaps we should not be too surprised that jets and disks often seem to be closely related. Just as disk formation may be the natural effect of angular momentum on gravitational collapse, jets may somehow be related to the effects of energy and mass conservation and transfer in collapse. JD VI addresses now the highly topical question of the interrelationships between jets and disks over a wide range of astronomical physical phenomena and effects associated with them.

U.S. SETI at the Crossroads

by Leif J. Robinson

The good news heard at Commission 51 (Bioastronomy) during its all-day sessions yesterday is that the most ambitious effort to search for extraterrestrial life – NASA's SETI program – is now essentially ready to be built and put on the air. The bad news is that it may not get funded by the U.S. Congress for fiscal year 1989. "One has to be pessimistic," said Frank Drake (University of California, Santa Cruz). Yet this situation is not new to SETI advocates: "SETI projects throughout the world," reflected Michael Papagiannis (Boston University), "have suffered from the lack of funding."

At both the first session and at a subsequent press conference, Drake made an eloquent case for NASA's

see SETI, page 8

IAU NEWS

Deterioration of the Skies Alarms Astronomers

by Stephen P. Maran

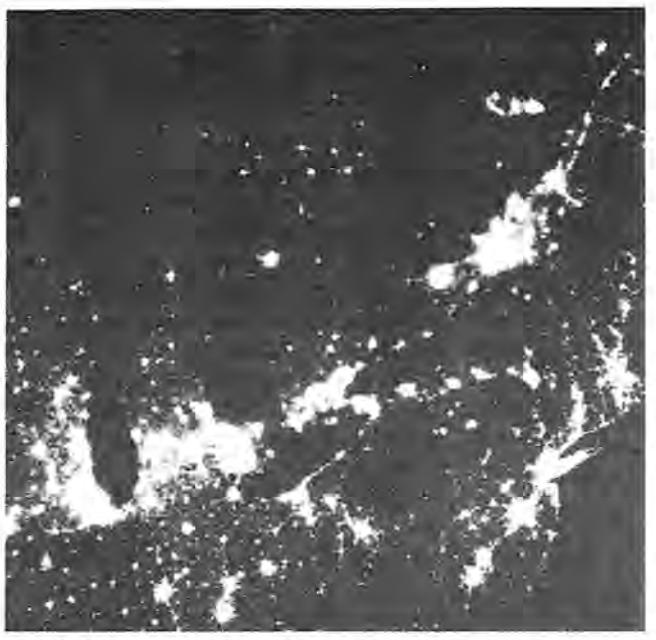
About 125 astronomers and other specialists will attend IAU Colloquium 112, on Light Pollution, Radio Interference, and Space Debris, at the Omni Shoreham Hotel in Washington, D.C., August 13-16. They will present over 75 reports, confront the mounting evidence of interference with astronomical observations, and hold two press conferences.

The Colloquium is sponsored by IAU Commission 50 (The Identification and Protection of Existing and Potential Observatory Sites), with cosponsorship by Commissions 21 (Light of the Night Sky) and 40 (Radio Astronomy). David Crawford of the National Optical Astronomy Observatories in Tucson, Arizona, is chairman of the Scientific Organizing Committee.

Light pollution refers to the illumination of the atmosphere by stray light from buildings, street lamps, billboards, and other manmade sources. Light pollution has had serious effects on several observatories in California and on observatories in other locations. In addition, the common experience of the inspiring beauty of the heavens is at risk for all citizens, not just astronomers, as light pollution destroys our view of the stars.

Reports to Colloquium 112 will outline the problem as it exists at the current time in various regions of North America, Europe, and Asia, and will include a paper on "Light Trespass Countermeasures" by D. A. Schreuder of the Institute for Road Safety Research in The Netherlands. There will be a report from Venezuela on "Pollution and Pollution Control in the Third World," and from Philadelphia on "Outdoor Lighting Effects on Insects." These talks will be given on Saturday, August 13.

Space debris, also called orbital debris or space junk, refers to material of artificial orgin that is orbiting the earth as a result of the deterioration, abandonment or breakup of satellites, rockets, and other equipment. According to one estimate, there are 48,000 objects of 1-cm size or larger orbiting the Earth, and the great majority of them are debris. The magnitude of the problem is revealed when we realize that there must be far more even smaller debris particles in orbit, many of them capable of damaging or interfering with operating spacecraft.



Satellite photo of the eastern United States shows the light pollution of Baltimore and Washington, D.C. metropolitan areas at lower right.

Reports on space debris, mostly planned for Sunday, August 14 at Colloquium 112, will include an overview of the problem by a NASA specialist, Donald J. Kessler of the Johnson Space Center, and discussions of the relevant legal issues and liability implications by an expert from the Office of the Judge Advocate General in Washington, D.C. In what may be a lively session, speakers from the Royal Greenwich Observatory and the Space Science Laboratory at Berkeley, California, will discuss the pros and cons of "space art," proposed structures or displays in space that are intended for artistic purposes. Investigators from Australia, the Soviet Union, and the U.S. Naval Space Surveillance Center will discuss the detection, tracking and even "traffic control" of space junk.

Radio frequency interference, which refers in this context to artificial signals that interfere with observations by radio telescopes, will be dicussed by astronomers from many nations. Topics range from the protection of radio bands in Asia and the detection of radio interference with space instruments to the serious problems in protecting radio bands in which astronomers search for evidence of extraterrestrial intelligence. Will unintelligent management of radio broadcasting on earth prevent us from hearing transmissions from more intelligent beings elsewhere in the Galaxy? These topics will be discussed mostly on Monday, August 15.

The final sessions of Colloquium 112, on Tuesday, August 16, will review regulatory issues in radio astronomy in the U.S. and the U.S.S.R., feature a report from France on "Pollution of Geophysical Sites," and include a discussion of so-called "thermal pollution." Thermal pollution, in the form of heat rising from buildings, already may affect precision measurements of stars made at the U.S. Naval Observatory, and could threaten other observatories as urban and suburban development brings larger and larger buildings to the once-isolated sites of astronomical facilities.

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Palomar Survey Prices May Rise

by Robert Brucato, Special to IAU Today

The California Institute of Technology has not yet received the minimum number of orders for film and glass copies of the Second Palomar Observatory Sky Survey. Under these circumstances, the price per copy, which is solely the cost of production, will exceed published estimates. There will be no financial gain or loss to Caltech.

Institutions intending to purchase copies must place their orders before 1 October 1988. If the number of orders received by that date is insufficient, the Caltech administration may be forced to cancel the project.

Infrared Astronomy: A Bevy of Satellites in the Offing

by Richard Tresch Fienberg

For scientists interested in the small bodies of the solar system, the interaction of newly formed stars and surrounding interstellar matter, or the early thermal history of the universe, there is very good news: The next great era of infrared space astronomy is about to begin.

Next spring a U. S. Delta rocket will thunder aloft with the Cosmic Background Explorer, designed to produce the first complete spectrum of the 2.7 K background radiation from 100 microns to 1 centimeter. During the next five years, as many as four more infrared and submillimeter space experiments from Western Europe, Japan, and the Soviet Union also will ascend to orbit.

These and other satellites were described to Commission 44 Saturday morning at two sessions on infrared astronomy from space. All the presentations shared a common theme: the revolution in our view of the cool sky brought about by the Infrared Astronomical Satellite (IRAS) was only a prelude to the enormous gains future projects will bring.

IRAS made many exciting discoveries in widely diverse areas of astronomy. But, as Gerry Neugebauer (California Institute of Technology) noted in a review of the 1983 mission, it was constrained by low spatial resolution and limited spectroscopic capabilities. The European Space Agency's Infrared Space Observatory (ISO), now under construction and slated for launch in 1993, will feature longer integration times, advanced-technology detectors, and a more thorough complement of focal-plane instruments to improve vastly on IRAS. Mission Scientist Martin Harwit (U. S. National Air and Space Museum) said ISO will be at least 1,000 times more sensitive than its predecessor. It will also cover a broader range of infrared wavelengths and will obtain images and spectra of many sources that were found by IRAS.

NASA hopes to orbit a still more sophisticated satellite later in the 1990s. Giovanni Fazio (Harvard-Smithsonian Center for Astrophysics) described the Space Infrared Telescope Facility (SIRTF), an observatory-class instrument that will be larger and have a longer lifetime than ISO. Its three instruments – an array camera, spectrometer, and multiband imaging photometer – are under development, but the project is still several years shy of a formal "new start" needed to fund the construction of the satellite.

While ISO and SIRTF will focus primarily on individual sources, the Japanese Infrared Telescope in Space (IRTS) and Soviet Relict-2 and Aelita satellites will study diffuse emission. Haruyaki Okuda (Institute for Space and Astrophysical Sciences, Japan) said that IRTS could fly as early as 1993 on an H-2 rocket. Nikolai Kardashev (U.S.S.R. Academy of Sciences) indicated that Relict-2 is approved for launch in the summer of 1992 and that Aelita is now under development for possible launch in 1994.

At the longest infrared and submillimeter wavelengths, the only way to achieve high spatial resolution is to build truly giant telescopes. Dennis Downes (Grenoble) told how ESA plans to construct and launch an 8-meter reflector – the Far Infrared and Submillimeter Telescope (FIRST) – around the year 2000. It would resolve objects as small as 3 arcseconds at 100 micrometers. Ned Wright (University of California, Los Angeles) described the NASA Large Deployable Reflector (LDR), a 20-meter telescope originally planned for the 1980s, but now more likely to reach orbit around 2010. Both FIRST and LDR will operate at ambient temperature, for there is no practical way to cool such enormous spacecraft cryogenically.

In closing remarks, Malcolm Longair (Royal Observatory, Edinburgh) argued that the best way to sell these ambitious and expensive space missions to funding agencies is to emphasize their broad utility. "These experiments are not for small communities," he said. "They're for everybody."

As IRAS demonstrated, infrared observations from space are crucial if we are to unlock the secrets of the cosmos. Said Longair, "We're talking about the origins of planets, the origins of stars, the origin and evolution of galaxies, and – if you're being ambitious – the origin and evolution of the universe itself."

IAU NEWS

Space Astronomy is not Expendable

by Jay M. Pasachoff

Riccardo Giacconi (Space Telescope Science Institute) discussed some aspects of U.S. space research at the joint meeting of Commissions 44 and 9 yesterday. Giacconi discussed the pros and cons of using the space shuttle vs. expendable launch vehicles. "Since we do not have an expendable heavy-lift vehicle, essentially the success of all the Great Observatories program is dependent on the shuttle. The shuttle is necessary both for launch of these heavy missions and for refurbishment and maintenance. Because of the uncertainties of servicing, future missions such as AXAF will be designed differently, perhaps to be serviced more infrequently."

Giacconi is now convinced that, given the great cost of systems, "it would be just as inexpensive or expensive to launch observatories at regular intervals and take the chance if something should happen that you cannot repair them. That would make it reasonable to have more satellites in geostationary orbits, like IUE, which has been very successful."

Servicing the Hubble Space Telescope has been a serious concern because some experts feared that frequent shuttle missions would be required to re-boost the HST as atmospheric drag brings it down. However, Giacconi reports that to limit the effect on the Space Telescope of the expansion of the Earth's atmosphere because of the solar maximum, "there is a very good plan: NASA plans to launch the HST in an elliptical orbit with extent between 310 and 330 nautical miles. Within that, we should have an altitude that puts us conservatively above drag problems, with reentry 10 years after injection, which gives us ample time to push it up a little more."

Save the Data!

by Carol A. Grady, Special to IAU Today

Carlos Jaschek's (Strasbourg) plea for observatories to return to systematically cataloging and archiving all observations, which was read to the Commission 5 Working Group on Astronomical Data on August 4 by Gart Westerhout (U.S. Naval Observatory), triggered a lively discussion on the history and present state of astronomical archives.

Donald Wells (National Radio Astronomy Observatory), noted that observatories have long archived photographic plates, since these were regarded as a permanent record of the observation and as belonging to the observatory, but digital data have not been treated this way. Westerhout noted that the early radio observations, including detections of some sources that were later identified as pulsars, have been discarded. Only recently, and mostly as a result of comparatively well-funded space missions, has systematic documentation and archiving of all observations regained favor. In the case of the International Ultraviolet Explorer, the demand for archived data now exceeds the rate at which new data are being acquired by observers.

The new systems being developed for archiving the digital observational data from La Palma, the European Southern Observatory, and the Hubble Space Telescope were described during Joint Discussion 1. Chris Benn (Royal Greenwich Observatory) pointed out that the La Palma archive is maintained by a manager and two part-time assistants at a cost that is only a very small fraction of the cost of acquiring the data.

Gravitational Force is the Law in Western Connecticut

An informal workshop on The Galactic Gravitational Force Law and the Galactic Velocity Distribution will be held on 19-20 May 1989 at Western Connecticut State University in Danbury, Connecticut. The University is the site of an active galactic research program and will soon inaugurate a new observatory with a CCD-equipped 20-inch reflector. For information, contact Dr. Phillip K. Lu, Dept. of Physics and Astronomy, WCSU, 181 White St., Danbury, CT 06810.

REPORT OF THE FINANCE COMMITTEE – 6 August 1988

by Peter B. Boyce, Chairman

The task of the Finance Committee is to inspect the accounts of the Union for the past three years in sufficient detail to assure that the accounts are in order and to report the Committee's findings to the General Assembly. We compared the actual expenditures with the amounts budgeted and ascertained the cause of any major discrepancies. The Committee is also expected to look over the budget for the coming triennium, as proposed by the Executive Committee, and comment upon the fiscal implications of the projections. Much of the detailed work of the Committee was relegated to a Finance Subcommittee which was appointed on 2 August, 1988. This report was modified and approved at the final meeting of the Finance Committee on 6 August, 1988.

The Finance Committee has inspected the accounts of the IAU for the period 1985-1987 and finds everything to be in order. It also examined the accounting summaries for the first half of 1988 and found no indication of any problems in the accounts for the current year. Certified external auditors have performed yearly audits of the IAU accounts. The auditors have found no irregularities and have certified that the accounts are an accurate representation of the state of the IAU finances. The Finance Committee, in making its examination of the accounts, has relied upon the auditors' reports for its information. Our examination leads us to confirm that the General Secretary has managed the finances in a prudent and fiscally responsible manner. In view of the complete change of personnel in the Secretariat during 1987 the General Secretary is to be congratulated for keeping the affairs of the Union running smoothly.

Operations of the Secretariat

The operations of the IAU Secretariat have benefitted greatly from the continuation of the modernization that had already started under the previous General Secretary. The membership files are up to date, and the ease of communicating with the Secretariat by means of telex has been of significant help in making the meeting arrangements for this General Assembly. The IAU Secretariat soon will be moved from the gate house of the Paris Observatory into the building of the Institut d' Astrophysique. Access to better photocopy equipment, a Fax machine and a tie-in to the electronic mail networks will help to improve further the daily operations of the Secretariat. The Finance Committee applauds this move.

In order to keep the operating costs low, our Union depends heavily upon volunteers to take on the jobs of General Secretary and Assistant General Secretary. We are grateful not only to our busy colleagues who agree to provide their time and energy but also to the institutions and governments who make such arrangements possible. In particular, the last two General Secretaries have enjoyed a high level of support that has contributed to keeping the operational costs of the Union at a very low level.

Comments on Individual Items

In looking over the accounts, the Finance Committee wishes to comment upon a few specific items. We are concerned that some of the member countries are behind in the payment of their contributions and urge all countries to make their payments promptly. We note that, owing to the financial problems within UNESCO, the level of support from ICSU has been cut in half during the past three years. We understand that the support is not expected to decrease in the future. The proposed budget for the next triennium assumes the recent level of support from ICSU.

Since a six year contract with D. Reidel was concluded in 1985, the favorable level of income from IAU publications has been maintained and is expected to continue for the next three years. The Committee wishes to call attention to the decline in the market for the traditional astronomical publications in recent years. All publishers are feeling financial pressure that is expected to increase in the future and that may put this source of income at risk after the contract expires in 1991.

We feel it is appropriate to remind the General Assembly and the members of the Union that most of the funds that the IAU provides to the General Assembly are used to support the attendance of young astronomers. Some of the contributions from member countries are also used to support young astronomers.

The Finance Committee notes that only about one-half the funds budgeted for the exchange of astronomers in the present triennium have been used. The Finance Committee believes this indicates either that there is not sufficient awareness of this program around the world or that there is now less need for a program which can only provide travel support. We urge the Executive Committee to examine this program to see how it might better fulfill the goal of promoting the long-term visits of astronomers to institutions in other countries.

Operating Surplus and Account Balances

The Committee notes that certain temporary circumstances have caused a positive net income for the past two years. These include a reduced salary expenditure in the Secretariat during 1987 and a fortuitous reduction in Executive Committee expenditures. This has resulted in an operating surplus. While this is not the deliberate operating policy of the Executive Committee, it is, nevertheless, accepted as prudent.

The accumulated balance in the IAU accounts acts as a reserve fund which now stands at somewhat more than one year of operations. The Finance Committee feels this is adequate, and, in view of the somewhat uncertain economic situation in the world, is very appropriate.

Proposed Budget

The Committee has examined the proposed budget for the triennium 1989-1991. The income estimates are appropriately conservative. However, the expenses will grow by 12.6 percent, or slightly more than four percent per year. The members of the Executive Committee are more widely scattered, the General Assembly travel costs will be higher, and the increased IAU membership means increased costs. In view of the average inflation around the world, we find the proposed increases to be reasonable. In forming our opinion about the costs to be expended for the support of the General Secretary and Assistant General Secretary we noted that the IAU is only covering a small fraction of the actual costs which the job entails. We note that the support of travel to IAU Symposia and Colloquia is proposed by the Executive Committee to be kept at the same level.

To cover the operating expenses of the Union, the Executive Committee has proposed an increase in the unit of contribution of slightly over three percent per year. We understand the burden that these contributions impose on some countries with large inflation rates. Nevertheless, the Union's expenses must be paid and the Committee strongly supports the proposed unit of contribution.

Fiscal Management

The budget of the IAU is of sufficient size and complexity that we urge the Executive Committee to consider possible methods to provide appropriate assistance and advice to the General Secretary. We believe it may be possible to draw upon the expertise which exists within the membership of the IAU to accomplish this without raising costs.

Cost of the General Assembly

The cost of holding a General Assembly was the subject of discussion within the Finance Committee. The current meeting has cost approximately $1,500,000, about 1.5 times the entire last three years of the IAU operations. The Committee notes that more than 90 percent of the cost is borne by the local hosts, including an amount for the support of young astronomers that slightly exceeds the IAU contribution.

The finance subcommittee is concerned that the cost of holding a General Assembly may make it impossible for many countries to act as host. We feel this would be an unfortunate situation. We are also concerned about the smaller-than-expected attendance at the last three General Assemblies. In fact, the fraction of IAU members attending the General Assembly has declined since 1970. Since the attendance severely impacts the finances of a meeting, we find this trend to be particularly disturbing. We recommend that the Executive Committee reconsider the functions of the General Assembly, analyze the costs and the factors that drive them, and consider ways in which the functions can be accomplished more effectively and cheaply.

IAU PEOPLE

A Quarter Century of Stellar Evolution

by Daiichiro Sugimoto, Special to IAU Today

The fortunate circumstance that six past and present Presidents of IAU Commission 35 (Stellar Constitution) are attending the General Assembly naturally inspires thoughts of how this field of research has progressed over the years of their collective tenure. Martin Schwarzschild (U.S.) headed the commission a quarter-century ago, from 1961-1964, when the theory of stellar evolution was experiencing a revolution. The introduction of computers as regular tools for research in stellar constitution was a major event during his presidency of Commission 35. Pierre Demarque (U.S.), the next Vice President of the Commission, is noted for his realization of the Henyey method to calculate isochrones in the HR diagram. Arthur Cox (U.S.), who was President during 1982-1985), calculated the much-used "Cox opacity tables" which were extensively applied in subsequent stellar models. Bohdan Paczyński, President of the Commission during 1976-1979 (and then working in Poland), the author (from Japan, and current President, 1985-1988), and the next President, Andre Maeder (Switzerland, 1988-1991) belong to a younger generation, who began their study by reading the famous textbook by Martin Schwarzschild, *Structure and Evolution of Stars*. They extended the computer algorithms used in calculating interior models and evolution and applied them extensively to realistic cases. Recently, even a single computer code is able to handle the whole life of a massive star, convering the quasi-static stages of nuclear burning through the dynamical stage of final explosion.

One of the goals for the members of Commission 35 has been to calculate stellar models from the birth of a star up to the supernova explosion. It can be said that this has now been successfully accomplished. Supernova 1987A was a prize that nature gave us: scenarios of stellar evolution were proved sound not only qualitatively but also quantitatively as discussed during Joint Discussion III at this General Assembly.

PRESIDENTIAL CONVENTION. Past, present and future officers of Commission 35 shown here are (left to right), M. Schwarzschild, B. Paczyński, D. Sugimoto, A. Cox, A. Maeder, and P. Demarque. Photo copyright 1988 by John Blondin.

During the past quarter century, the scope covered by Commission 35 expanded greatly. Observations through different wavelength bands, with the X-ray spectrum of particular note, brought new kinds of celestial objects into the concern of the commission. They include protostars, close binary systems, neutron stars, and more. In addition, the theoretical understanding of self-gravitating systems is finding even more fields of application. For example, it is the author's "hobby" to discuss the dynamical evolution of globular clusters in terms of stellar evolution theory. From this perspective, a globular cluster consists of a large number of stars, while a star consists of a large number of gas particles. Thus, the interaction of Commission 35 with others, such as Commissions 29, 36, 37, 40, 42, 44, and 48, in particular, is growing every day.

The 20th General Assembly provides us with a good chance for interactive communications, especially in the recent circumstances where symposia and colloquia cover usually well-defined topics and are attended primarily by specialists. It becomes more difficult to summarize research activities in a single article appearing in the IAU Transactions volumes on Reports on Astronomy. Since 1973, therefore, the commission has chosen to concentrate on a few topics for its report each term. This time, they are convective overshooting, mass loss, novae, presupernova stars and SN 1987A, X-ray bursters, and astroseismology.

REMINISCENCES

Remembering the IAU at Berkeley

by George Herbig, Special to IAU Today

The 11th General Assembly of the IAU was held in Berkeley, California from August 15-16, 1961. It was opened by the President of the Union, J.H. Oort, before several thousand participants sitting in brilliant sunshine in Dwinelle Plaza on the University of California Campus. The organizers had hoped to have President John F. Kennedy attend the ceremony, but it was Adlai Stevenson, U.S. Ambassador to the United Nations, who came to welcome the Union on behalf of the host country. There was an undercurrent of international political concern: the events at the Bay of Pigs had happened just four months before, the Berlin Wall was going up, and Stevenson's speech, in addition to the usual homilies, reflected some of the issues of the Cold War.

The Space Age was already under way: the far side of the Moon had been photographed by a Soviet spacecraft, Gagarin had flown in April, Shepherd in May, and Titov had circled the Earth 17 times less than two weeks before the IAU convened. Van Allen presented an Invited Discourse on the exciting new topic of the radiation belts about the Earth. There was much talk of astronomical observations from space, but also concern about the potential effects of Project Westford, a U.S. proposal to place a belt of copper needles in Earth orbit. The Westford launch took place two months later, but no undesirable astronomical effects were reported. The Union passed a resolution stressing the need to safeguard astronomical interests in such experiments; whether it has had any impact on subsequent proposals is hard to say.

Another administrative uproar arose over the withdrawal of the People's Republic of China, a member since 1935, from the Union over the admission of Taiwan and the subsequent refusal of the I.A.U. (by vote of the adhering countries) to expel Taiwan.

It is not easy to reconstruct the state of the astronomical community at that time. Certainly, there was much energy at the General Assembly and in the Commissions devoted to forgotten issues, or ones that in retrospect seem inconsequential. Yet one sees in those activities some problems that still remain: for example, the conflict between the age of the oldest globular clusters, then thought to be about 25×10^9 years, and the age of the universe inferred from the Hubble constant. In hindsight, one can detect the emergence of new concepts that were destined later to have a major impact. Harold Johnson described a new 9-color photometer to measure UBVRIJKLM magnitudes. Kraft opined that all U Geminorum-type variables are short-period binaries. Hayashi had just demonstrated the importance of a surface convection zone during the contraction of young stars. Schwarzschild's Invited Discourse described a new phenomenon of post-main sequence evolution, the helium flash.

That time seems so far away when one considers what has happened since: the largest known redshift was $z = 0.44$; Oort spoke of the important problems of radio astronomy that could be approached if only a resolution of 1 arcminute could be achieved; there were only two telescopes in the world with apertures greater than 100 inches.

The social side of the General Assembly featured excursions to attractions in the San Francisco Bay area: to the Napa Valley with an extravagant vineyard luncheon catered by a well-known San Francisco restaurateur, to the Lick Observatory, and a memorable closing dinner at the Claremont Hotel, in the Berkeley hills, which was highlighted by musical entertainment by some very talented astronomers.

Amateurs' Assistance Aids Hipparcos Input Catalog

by Jean Dommanget, Special to IAU Today

Amateur astronomers are making important contributions to the preparation of the Hipparcos Input Catalog. Their special role is in the identification of close pairs (separations less than 3 arcseconds). The catalog requires the collection of astrometric and photometric data for many stars, especially double and multiple systems. To fulfill this need, a catalog of the Components of Double and Multiple Stars (CCDM) was compiled at the Royal Observatory, Belgium, and a Double Star Working Group was established which initiated astrometric and photometric observations.

The role of amateur astronomers in identifying close double stars is organized by the Commission des Etoiles Doubles of the Société Astronomique de France, under the leadership of P. Bacchus of the Université de Lille on one side and by a group of German amateurs under the leadership of U. Bastian (Astronomisches-Rechen Institut, Heidelberg) on the other. Their observations are made with professional refractors at the Pic-du-Midi, Haute Provence, and Nice Observatories.

Amateur astronomers are also contributing in classical astrometry. Three Belgian amateurs have conducted three one-month missions at the European Southern Observatory (Chile). More than 1,500 plates have been obtained and some of them have already been reduced at ESO (Garching), Brussels, and La Plata. Belgian amateurs are also participating in a CCD observation program using the 1-m Kapteyn Telescope at La Palma. This effort is conducted by a group of professional observers under the leadership of A. N. Argue (Cambridge University). More than 1,500 double stars have already been observed.

As coordinator of the Hipparcos Working Group on Double Stars, the author can attest that the contributions of amateur astronomers have been of major importance to the Hipparcos Input Catalog and will continue to be necessary in order to complete the CCDM to the benefit of double-star astronomy. Some of the above-mentioned observations have been published or are in press.

IAU ACTIVITIES

THE GALLOPING GASTRONOMER

RESTAURANT RATING

Average Star ★
Double Star ★★
Supernova ★★★
Starburst Galaxy ★★★★

Burke's
36 Light Street, 752-4189
Rating: ★½

by Laurence W. Fredrick

This eating establishment pretends to be a pub but really isn't. Burke's is within easy walking distance of the Convention Center. The Galloping Gastronomer decided to sample this well-known downtown Baltimore restaurant on the theory that non-North American astronomers may prefer an "American restaurant" rather than the ethnic restaurants. Well, it is almost as American as apple pie, corn on the cob, and all that neat stuff.

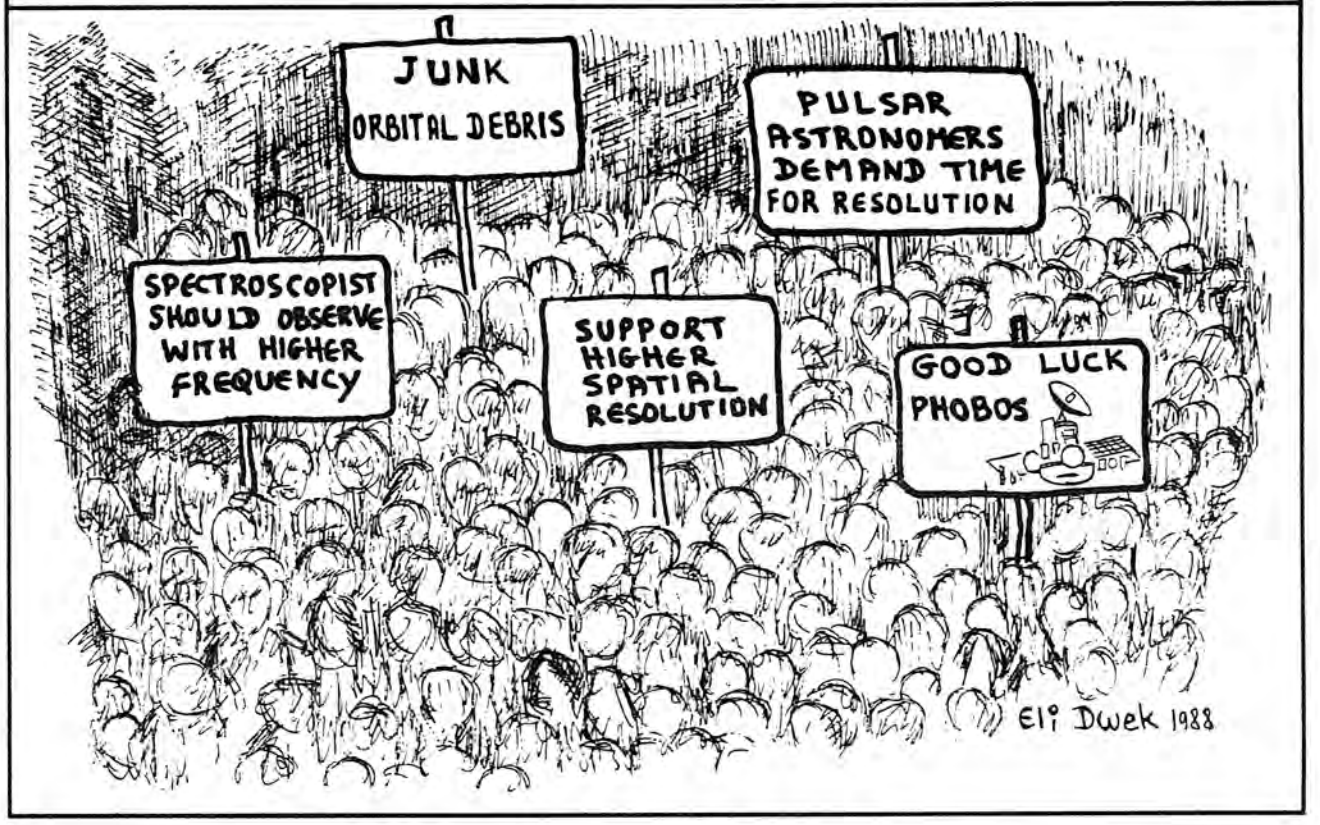
Lunch has a wide selection of innovative sandwiches and salads. The tuna melt using cheddar cheese should be tried. Cheddar, while credited to the English, has been perfected by the dairymen of Wisconsin and is much preferred to compliment fish, apple dishes, and any other dish where you don't want a long aftertaste.

If you want to eat light food try the pasta salad. They give you the impression that it is Italian, but who ever had a pasta salad smothered with half a head of shredded lettuce? This is an American restaurant. The hamburgers are done to your specification and are much less fatty than those of the infamous fast food chains.

Dinner is almost the same menu except that the prices are slightly higher. In the evening they clearly want you to opt for the more substantial offerings such as their steaks or seafood. You can't go wrong with whatever your waitress suggests as the special of the day. Try an order of their "colossal onion rings." These are original, at least I have never seen them offered anywhere else.

A very impressive bar extends the length of the building. Beer is served in a frosted mug (if you will settle for a draft beer made in the U.S. or Canada) or you can have a daiquiri in various fruit flavors. Peach is okay, but if you have enjoyed a peach daiquiri in Atlanta, choose the strawberry. They claim that they make the best martini in town. There are a lot of places in Baltimore that would dispute that claim. The decor is quiet, with paneled walls, stuffed leather booths, and chairs. Be prepared to part with something like $30 per person as a minimum.

ASTRONOMERS RESOLVE TO DO BETTER



Johns Hopkins Hosts Closing Banquet August 10

The Johns Hopkins University is proud to host the Closing Banquet of the 20th General Assembly on Wednesday, August 10 at 19:00 on the university's Homewood campus. Meet your friends and colleagues and join in a final banquet filled with the sights, sounds, tastes, and spirit of America.The festivities will take place under a large tent set up in the center of the university's main quadrangle, allowing guests to mingle with their friends and colleagues in a relaxed atmosphere on this last evening in Baltimore.

Shuttle buses will provide transportation from downtown hotels and dormitories to and from the Homewood campus. The shuttle bus schedule is available at the General Assembly Information Booth.

Guests are invited to savor foods representing four regions of the U.S. Feast at a New York-style delicatessen counter, experience the unique seasoning of New Orleans' Cajun food, enjoy down-home Texas barbecue-style fare, and save room for the famous seafood of the Chesapeake Bay in Maryland and Virginia. An open bar is included and beer, wine, and soft drinks will be served as well.

While enjoying these regional feasts, guests will be treated to a variety of entertainment, ranging from the excitement of Broadway to the serenity of the Bay. Don't miss this exciting culmination of social events for the 20th General Assembly.

The Show Goes on in the Exhibition Hall

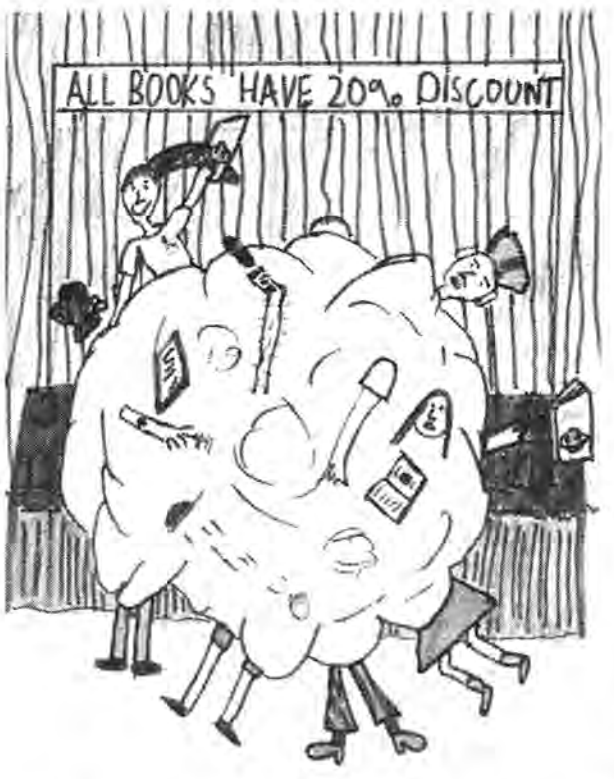
by Jacqueline Mitton

Books, videos, models, computer graphics, colorful posters, and much more combine to make the exhibition hall a kaleidoscope of light and sound. Judging by the number of visitors who throng there at almost any time during the day, the exhibits have proved a popular success. The exhibitors too seem well pleased with the splendid facilities and the high level of interest shown by participants and guests.

Displays range from lavish stands and life-size models set up by ESA, NASA, and aerospace firms down to tables simply laid out with books and leaflets, such as those of *Sky & Telescope* and the Astronomical Society of the Pacific.

But as impressive as the displays are, the most important part of an exhibit is the people standing beside the booth. Here is a unique opportunity to chat informally with technical manufacturers, publishers, and representatives from observatories and university departments. You can sample the SIMBAD astronomical database, test the machine-readable version of the *Astronomical Almanac*, and play with educational graphics, all on computers set up in the hall.

Free gifts of posters, postcards, and key rings have been predictably popular. Publishers offering a 20 percent discount on orders of the many hundreds of astronomy books on display report brisk business. Asked what his most popular line had been, Edward Tenner of Princeton University Press pointed to a collection of ornithology books. "I reckoned that observational types like astronomers would probably be keen on birds as well as stars," he commented. It seems he got it right.



Some IAU exhibits are overly popular, Veronica Mitton of the U.K. observes.

ASTRONOMERS AT BAY. IAU participants including Nigel Henbest (right) docked at Annapolis Sunday.

IAU WORLD

FACILITIES

The Royal Observatory at Edinburgh, Scotland

by William M. Napier, Special to IAU Today

The Royal Observatory at Edinburgh is situated about two miles south of the center of Edinburgh, on a hill which overlooks the city, the Castle (built on an old volcanic plug), and the estuary beyond known as the Firth of Forth. The Observatory acts on behalf of the U.K. Science and Engineering Research Council, and is responsible for the operation and support of two major telescopes in Hawaii and an accurate, high speed microdensitometer for analyzing photographic plates. It also houses a large collection of plates taken with the UK 1.2-m Schmidt telescope, and a unique library known as the Crawford Collection.

The Hawaiian telescopes are the James Clerk Maxwell telescope (JCMT), which is specifically designed for observations of the submillimeter waveband, and the UK Infrared Telescope (UKIRT), which is optimized for infrared observations. JCMT is operated in collaboration with the Netherlands Foundation for Radio Astronomy and the National Research Council of Canada; the University of Hawaii participates in both telescopes.

The JCMT is a 15-m telescope designed to take advantage of the exceptionally dry atmosphere on Mauna Kea; it received "first light" at the end of 1986. It is of Cassegrain design, with a chopping facility on the secondary mirror to allow rapid switching between a source and the background sky. The initial suite of receivers consists of three front ends and two back ends: a bolometer, which can operate in the 1100, 800, 450 and 350 micrometer wavelength atmospheric window, and heterodyne receivers which cover the wavebands approximately 220 to 270 and 320 to 370 GHz and which can be used with either a digital autocorrelation spectrometer or an acousto-optical spectrometer.

The 3.8-m UKIRT is equipped with photometers, a spectrometer and an infrared camera. The camera uses an array of 58 x 62 detector elements, sensitive to the 1-5 micrometer wavelength band. It has various bandpass filters and wire-grid polarizers, and can be used with a Fabry-Perot etalon as a line-mapping instrument. There are single-element photometers available covering 1-5 micrometers and the 10, 20 and 34 micrometer wavelength windows. Low resolution spectroscopy is possible with the shorter wavelength photometers. A cooled grating spectrometer provides a spectral resolution of about 500 over the 1 to 5 micrometer wavelength range.

The 15-m primary mirror of the Maxwell Telescope. There are 276 panels in seven rings. Panels are accurate to about 12 micrometers (r.m.s.). Copyright 1987, Royal Observatory, Edinburgh.

Photographic Plate Library at Royal Observatory, Edinburgh. Copyright 1982, Royal Observatory, Edinburgh.

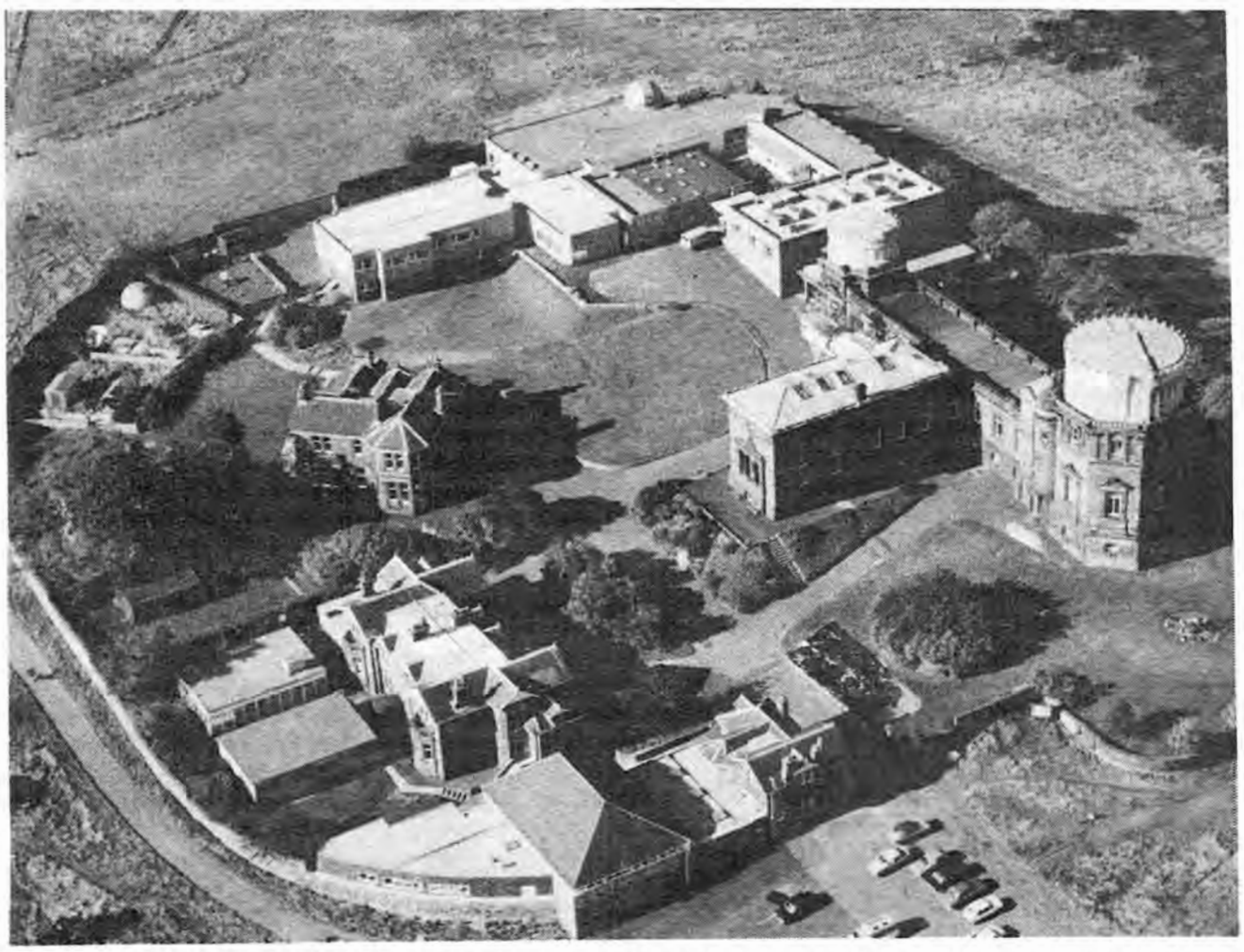
At the Royal Observatory Edinburgh we have over the last decade developed a system capable of extracting quantitative information from astronomical photographs, accurately and at high speed. The hardware of this system (the COSMOS machine) is a computer controlled scanning microdensitometer that can accept plates up to a maximum size of 356 x 356 mm. There is software for the analysis of both direct and objective prism plates and recently we incorporated an image deblending algorithm to handle the crowded field case. The output the user receives is the catalogue of objects detected (on magnetic tape), each object described by a set of parameters. These parameters contain information on the position, brightness and structure of the image and enable star/galaxy discrimination.

With a throughput of 800 plates per year it is possible to consider major projects surveying large areas of sky. Examples of such projects are studying the structure of the Galaxy from multi-color star counts and the distribution of galaxies and the structure of the universe from major galaxy surveys. In addition to the large scale surveys, there is the selection of objects of special interest, *e.g.*, quasar surveys from objective prism spectra, quasars from multi-color searches, discovery of variable objects from multi-color searches, and others.

The collection of plates taken with the UK 1.2-m Schmidt Telescope now exceeds 13,000 and is held in the Observatory's Plate Library. Each 14 x 14 inch plate covers a field of view ~6.5° square. Deep sky-limited plates can reach 22-23 mag. Most of the photographs are available for loan to astronomers either as original plates or as film or glass copies. Details of the plates taken with the telescope are contained in the UKST Plate Catalogue which can be accessed in the U.K. through Starlink or at a number of other locations throughout the world. The associated photographic laboratories make film and glass copies of the plates available for sale as sky atlases and for special research projects. They also make specially enhanced prints from the original plates. The plate library has extensive plate inspection facilities that are available for use by visiting astronomers. The use of these facilities is governed by a variety of factors of which scientific importance is paramount.

Inquiries about applications for time on the Hawaiian telescopes should be made to the Royal Observatory, Blackford Hill, Edinburgh EH9 3HJ, United Kingdom. In addition, there is a service observing facility on UKIRT through which astronomers can have small amounts of observing (less than three hours) done on their behalf by local staff. Service observing is particularly appropriate for monitoring variable sources, responding to "targets of opportunity" (*e.g.*, novae), making measurements for which a whole night would be too large an allocation and for feasibility studies. Further information can be obtained from the address above (telephone 31-667-3321) or from the Joint Astronomy Centre, Hilo, Hawaii (telephone 808-961-3756). Information on the COSMOS machine, which is run as a national facility, can be obtained by applying to the COSMOS Facility at the Observatory. The facilities of the plate library include borrowing original or copied plates, obtaining new plates from the telescope, acquiring special photographs or visiting the plate library. Interested astronomers should write to UKSTU at the Observatory.

All these facilities, and the work of the Royal Observatory, are described in detail in a Research and Facilities Handbook which can be obtained from the Research and Coordination Unit at the Observatory.



The Royal Observatory, Blackford Hill, Edinburgh, was moved to this site in 1896. Photograph copyright 1980, Royal Observatory, Edinburgh.

IAU WORLD

REGIONAL ASTRONOMY

Beijing Astronomical Observatory

The Beijing Astronomical Observatory is a comprehensive institute with, besides its headquarters in Beijing, five observing sites, including the modern Huairou Station for solar physics research and the Xinglong Station where a new telescope will begin work soon. The observatory was preceded by what is now called the Beijing Ancient Observatory, established in 1442.

Huairou Station is located on a small island in a reservoir, in order to obtain very stable atmospheric seeing. There, a dome is mounted atop a tall observing tower, which protects a solar magnetic field telescope that is used to measure both the vector magnetic field of the Sun and the solar radial velocity field. In this well-equipped installation, a VAX 11/750 minicomputer is used both for telescope and instrument control and for solar image processing.

The other observing sites of the Beijing Astronomical Observatory are the Xinglong, Miyun, Shahe, and Tianjin stations. Xinglong Station is well situated in an attractive wooded site at altitude 960 m, south of the main peak of the Yanshan Mountains and north of the famous Great Wall. Next year, if all goes well, a 2.16-m telescope will go into operation at Xinglong. It will join the existing 1.26-m infrared telescope at this optical observing site, which is also equipped with a 60/90-cm Schmidt camera and a 60-cm reflector. There is a Guest House at Xinglong and astronomers from other countries are welcome to apply for use of the telescopes at this station. There are more than 200 clear nights annually and the seeing and transparency are both good. Samples of recent Xinglong research include infrared maps of IRAS source regions, photoelectric photometry of dwarf Cepheids and other stars, and photography of cometary ion tails.

The Miyun Station is Beijing Observatory's principal radio astronomy facility. There is a meter-wave aperture synthesis telescope that consists of 28 paraboloid antennae, each 9 m in diameter. The Station is conducting a meter-wave sky survey as well as supporting research on variable radio sources and supernova remnants. Computer graphics are used to produce detailed two- and three-dimensional representations of the radio observations for analysis and study.

On an island in Huairou reservoir, Beijing Astronomical Observatory operates this modern solar observing tower.

The Shahe Station of Beijing Astronomical Observatory is conveniently located in a northern suburb of Beijing. The station is equipped with a modern solar chromospheric telescope, a time and frequency laboratory, radio telescopes for solar microwave observations (3.2 cm, 10 cm), and a 35-cm coelostat and solar eclipse spectrograph. Researchers have obtained detailed photographic records of the flash spectrum during eclipse. Within the Shahe time and frequency laboratory there are atomic clocks, a Doppler dual-frequency radio receiver, and other precision equipment. Shahe Station also operates a satellite laser ranging system, Mark II photoelectric astrolabe, and an optical tracking theodolite.

The Tianjin Latitude Station is located in a western suburb of that city. It is equipped with a vacuum photographic zenith tube and performs research programs in terrestrial latitude variations and polar wandering.

At Beijing Astronomical Observatory headquarters there is a sky survey laboratory, computing and image processing laboratory, facilities for instrument development that include an infrared laboratory, and an astronomical library. Besides scientific research, the observatory staff prepares and edits several publication series including the monthly *Solar-Geophysical Data*, *Publications of Beijing Observatory*, *Acta Astrophysica Sinica*, and books on historical astronomy. There is practical work as well, and an affiliated factory with machine shops. For example, the type KBT 5-m paraboloid receiving antenna, which was designed and built by the observatory, is currently manufactured for commercial sale and is used for receiving television programs via relay satellites.

The computing and imaging processing laboratory at Observatory headquarters is equipped with a VAX 11/780 minicomputer, a Sigma ARGS image subsystem, and other equipment. CCD data are processed and Starlink software is in use. A television scanner is used in the sky survey laboratory for such work as discovering optically violently variable quasars on Schmidt camera plates. A digital image system for analysis of astronomical plates is equipped with a two-dimensional Reticon array camera designed by the infrared laboratory. Equipment under development includes instrumentation for multi-object spectroscopy by use of optical fibers.

As Beijing Astronomical Observatory approaches the 450th anniversary of the establishment of the ancient observatory at Beijing, things are very advanced indeed.

REGIONAL ASTRONOMY

Greece: An Ancient Tradition

Everyone has heard about astronomy in ancient Greece. The names of Thales, Aristarchos, Ipparchos and Ptolemy have already been mentioned in the sessions of this Assembly. Having to compete with their ancestors, modern Greek astronomers (dating back, say, to after the installation of the first National Observatory about 150 years ago), have a hard time. Just pause and count how many ancient Greek astronomers you know? How does this compare with the number of modern Greek astronomers that you have heard of?

Maybe the comparison is unfair. After all, ancient astronomers had ample time (~ 2000 to 3000 years) to become famous. In Greece today, there are about 100 active astronomers. They are mainly distributed in eight institutions including the six oldest universities (Athens, Thessaloniki, Patras, Ioannina, Xanthi and Crete), the National Observatory, and the Research Center for Astronomy of the Academy of Athens.

Greece is a very mountainous country with many peaks exceeding 2500 m. There the night sky is ebony and the stars shine brightly. Unfortunately, there are no large telescopes on the Greek mountains. The largest, a 48-inch Grubb & Parsons Cassegrain-Coudé reflector is located at Kryonerion, on Mount Killin, near ancient Korinth in southern Greece at an altitude of 950 m. A 30-inch reflector is also situated at a similar altitude in nearby Stephanion. Research projects using these instruments are often connected with stellar optical or infrared photometry, planetary, and solar observations. Many projects involve international cooperation.

Astronomical research in Greece is carried out in many, diverse fields. Observational astronomers travel around the world using large instruments and theoreticians collaborate with colleagues from all continents. The tradition left behind by the ancient Greek astronomers is in good hands in modern Greece.

Towards a European Doctorate in Astrophysics

by Josef Hron and Pierre J. Lena, Special to IAU Today

European cooperative activities in astrophysics like ESO, ESA, and IRAM are well known and so are the advantages of these organizations for large projects like the VLT, Hipparcos, and ISO. However, university education in astrophysics is still quite different from one country to another in Europe. It is difficult for a Ph.D. student to do part or all of his research in another country.

In response to this situation, the European Astrophysics Doctorate Network was founded in 1986. It initially federates astronomy graduate departments – one per country. Currently, departments in these countries are participating: France, the Netherlands, United Kingdom, Federal Republic of Germany, Italy, Belgium, Switzerland, Greece, Spain, Austria, and Portugal. ESO and ESA are associated with EADN; Denmark and Sweden are considering joining.

The main goal of EADN is to improve the quality of research by increasing the mobility of Ph.D. students, the exchange of ideas, and the possibility for joint ventures decided early in their careers. Although Europe has a comparable number of Ph.D. students in astrophysics to the U.S., their mobility is much less.

Currently the two main activities of the EADN are: (1) to provide financial support for Ph.D. students who want to do part of their research in another EADN country; (2) to organize a summer school for graduate students at the beginning of their Ph.D.s in order to provide courses about "modern" astrophysical topics at an advanced level.

Stays of up to three months for about 20 students per year have been supported. A summer school (Galaxy Structure and Evolution and Astronomical Observations) with 60 students will be held in September in Les Houches, France. Another school is foreseen next year elsewhere and the program should continue afterwards.

Long-term goals for the network are to associate more universities, increase and ease the exchanges, plan for jointly supervised Ph.D.s, and progressively set a European standard for the Ph.D. in astrophysics. A booklet giving an overview of the opportunities and requirements for a doctorate in astronomy in the participating countries will soon be completed.

The money required for the activities of EADN is provided by the ERASMUS program of the European Community, the European Council, and through contributions from participating countries. Anyone interested in further details should write to Prof. J. Heyvaerts, Observatoire, 92195 Meudon Cedex, France.

DAO Opens New Center in Victoria

An extension to the Dominion Astrophysical Observatory in Victoria, B.C. was opened on July 22. Built for $2.1 million (Canadian), the extension will house the Canadian Astronomy Data Centre. The facility "will serve Canadian astronomers, users of the DAO and the Canada-France-Hawaii Telescopes, and scientists from around the world," according to Canada's National Research Council. It will also be used by Canadian scientists involved in analyzing and collecting data from the future Hubble Space Telescope.

New Observatory in Cuba

The Cuban Academy of Sciences is developing the National Astronomical Observatory "Valles de Picadura" at a site 70 km east of Havana. Work will emphasize solar physics (optical and radio), cosmic geodynamics, variable stars, and astrometry. Contributions of books, publications, and other material will be greatly appreciated and should be addressed to Biblioteca Observatorio Astronomico, Inst. Geofisica y Astronomica, Calle 212 No. 2906 e/29 y 31, Lisa, C. Habana, Cuba.

IAU NEWS

IAU BULLETINS

Airport Transportation

Baltimore-Washington International Airport

Service will be provided from the Convention Center to BWI Airport on Thursday, August 11 with departures at 13:00, 14:00 and 15:00. The charge for the one-way transfer is $5 per person.

If you wish to depart for the BWI Airport earlier you may use Gladney Transportation Service for van service from the downtown hotels or the Convention Center. This service operates from the hotels between 05:40 and 01:00 and will stop at the Convention Center from 09:30 to 15:30. The cost is $5 per person, one way. Call 850-0305 or 850-0306 to reserve a seat.

From Loyola Dormitories, service will be provided by Gladney Transportation at 05:10, 06:10, 07:10, 08:10, 09:10, 10:10 and 11:10. Call Gladney at the number above to reserve a seat.

Taxi service is available from, among others, Yellow Cab Company (call 685-1212). A one-way trip is approximately $15 from downtown.

Dulles International Airport

Direct service will be provided to Dulles International Airport on August 11 at 14:00 by reservation only. You must sign up for this service by 17:00 on August 10, at the transportation desk in the Convention Center Pratt Street Lobby. The charge for the one-way trip is $20 per person.

Alternate service to Dulles is via the BWI Airport. Take the bus or van to BWI as described above, then transfer at the ground transportation booth to the BWI/Dulles interconnect bus. The fare from BWI to Dulles on the interconnect bus is $20.

Limousine service is available to Dulles from Baltimore for a cost of $96 per car. The limosine will accommodate up to six passengers. Reservations are required. Please telephone Maryland Limousine Service at 850-4100.

Baggage Storage on August 11

For your convenience, a baggage check area will be available at the Convention Center in the Pratt Street Lobby for a charge of $.50 per item. This service will be available from 08:00 to 15:00.

Baltimore Hospitality Needed

The call is out to all local astronomers! We have visitors from abroad who are urgently in need of temporary housing after the General Assembly is over, due to travel connection schedules. If you are interested in hosting a visitor in your home for a day or two, please post your name and home number on the LOC Bulletin Board. Visitors who need housing, please read this Bulletin Board daily and contact people as indicated.

Daily Washington, D.C., Tour

A daily trip to Washington, D.C., is offered. In order to go on the tour, you must sign up at the tour desk by 14:00 on the day before you want to go. There is a minimum number of 30 participants required for each daily tour to Washington; if fewer people have signed up, the tour will be cancelled for that day.

Dormitory Bus Schedule

	Dorms to Convention Center		C.C. to Dorms
	Every 20 minutes	On the Hour	Every 30 min.
Aug. 9	07:30 - 09:30	10:00 - 17:00	17:00 - 22:00
Aug. 10	07:30 - 09:30	10:00 - 17:00	17:00 - 18:00
Aug. 11	07:30 - 03:00		

Astronomers Adapt to New Optics

by Ronald A. Schorn

Interested participants packed the August 6 tutorial on adaptive optics, sponsored by Commission 9 (Instruments and Techniques). The session was informal and featured numerous comments from the audience and a lively interplay between speakers and listeners. For many in attendance it was a first opportunity to meet investigators they had previously known only as names on papers. The subject is relatively new to astronomy, and no complete working system is yet available at an observatory. Much of the research done so far has been funded from defense monies.

Larry Goad (National Optical Astronomy Observatory) presented a survey of the field. The basic aim of using adaptive optics is to correct distortions in an incoming stellar wavefront that are produced by Earth's atmosphere. Most systems now in development perform the corrections with a mirror whose surface can be warped in a precisely controlled manner. Several types of reflectors have been considered: segmented, continuous thin plates, "monolithic" (one variety uses a ceramic originally developed for capacitors), and the membrane or pellicle kind, which uses electrostatic deformation. In addition, the wavefront must be sensed in order to determine just what warping must be done, and sensor development is a vital part of all programs, such as the NOAO one Goad described. Alan Wirth (Adaptive Optics Associates) covered developments by his company, including some surprisingly compact configurations.

Fritz Merkle (European Southern Observatory) pointed out that Europe has an ancient history of work in adaptive optics, stretching back to the practical systems of solar mirrors devised by Archimedes of Syracuse to combat the Roman fleet. However, modern efforts such as the continuous thin-plate system at ESO only began about five years ago, somewhat after similar efforts in the U.S. He reminded the audience that the field is so new that Horace W. Babcock (Mount Wilson and Las Campanas Observatories), who wrote the pioneering paper on the use of a deformable oil-film mirror, was seated in the room.

By popular demand, Fred Forbes (Kitt Peak National Observatory) gave a repeat performance of his talk on "bimorph" mirrors, which are made of piezoelectric lead titanate. One reflector under development at KPNO is segmented, with a diameter of 23 millimeters but a thickness of only 1 mm. A voice from the crowd informed the audience that many persons in the room could begin research on these mirrors immediately. If you have a digital alarm watch, just take it apart – there's a bimorph plate inside!

Renaud Foy (Meudon Observatory) brought listeners up to date on artificial "laser stars." A dye laser illuminates a carefully chosen small area of a scattering layer in the atmosphere. The resulting small spot of light can be observed at the same time and with the same telescope as a program object, in effect providing a nearby "companion" star whose light can be sampled to provide information on wavefront deformation.

Adaptive Optics at Work in Chengdu

Merkle concluded the session by telling the audience about the work of Liang Wenhan (Institute of Optics and Electronics, Chengdu). Wenhan's group has built a closed loop system that operates over a distance of several hundred meters in the laboratory. It uses a deformable mirror, piezoelectric actuators, and laser light, and works quite well. A video tape of a sample run shows a flood of light, produced by inhomogeneities in the air along the light path, turn dramatically into a small, steady spot when the compensating device is turned on.

The Dirty Side of Astronomy

by John Mathis, Special to IAU Today

Interstellar dust is generally regarded by astronomers as a painful nuisance, to be coped with as best one can, but some of us love it. In fact, 200 of us gathered at Santa Clara University near Palo Alto, California, on July 26-30 for IAU Symposium 135 on Interstellar Dust.

In the fifteen years since the last IAU symposium on interstellar dust there has been much controversy generated by new observations in the infrared and ultraviolet spectral regions, with various accompanying theoretical interpretations. Symposium 135 showed that there has been real progress in understanding this material, resulting in an uneasy consensus on the gross chemical composition of the dust. There is still a lack of understanding of some very fundamental properties of interstellar dust, however, such as the origin of the strongest spectral feature in its spectrum, the infamous 2175 Å "bump." This monstrous absorption feature has an equivalent width of 1000 Å for a star with E(B-V) of unity, as opposed to 50 Å for Lyman-alpha.

Among the most interesting topics at the symposium were the infrared emission bands, which range from 3.3 to 11.4 micrometers, with an associated continuum. There are several emission bands that show rather unambiguously that some sort of aromatic hydrocarbon is a major component of the dust. The leading candidates for producing these bands are the free-flying molecules called polycyclic aromatic hydrocarbons (PAHs), which consist of linked benzene rings of 20-60 carbon atoms (depending upon whom you believe) that have lost many of their edge hydrogen atoms.

The big problem with this interpretation, however, is in accounting for the ultraviolet extinction, which is so very smooth, although each individual molecular species has strong ultraviolet absorption bands. Two other possible sources of the infrared emission bands are (a) "hydrogenated amorphous carbon," or HAC, which is not really amorphous but merely much less well-ordered than graphite; or (b) the sort of material that condenses onto the walls of a test vessel after a discharge through gaseous hydrocarbons. There is also a wealth of information in the spectra of ices of various molecules found deep within cold, dark clouds. An interesting observation is that the grains there emit polarized thermal radiation, which implies that they are aligned. One would not expect them to be aligned in very dense regions because the gas density is so large that the grains and dust should be closely coupled in thermal equilibrium and the grains should tumble randomly.

Three general types of theories for dust were discussed in a panel session. Mayo Greenberg (Leiden) presented his silicate core/processed mantle grains; John Mathis, several bare-carbon/silicate theories by various authors; David Williams, his (with Walt Duley) grains with silicate cores and amorphous carbon sheaths. If these sound somewhat alike, you should know that to dust aficianados they differ appreciably. The models deviate from one another in such basic things as the nature of the bump and the particle size distributions. There are problems with and successes for each theory. It is encouraging that calculations of grain destruction no longer suggest that all grains should be destroyed by hard shocks from supernovae. Grain formation in the expanding atmospheres of cool stars now actually produces grains under reasonable conditions.

There was one point of general agreement: the local arrangements of the symposium were superb. The invited papers will be published by Reidel, and the contributed papers by NASA.

SETI / from page 1

program, which will conduct its search in two different ways. The first will be a very-high-sensitivity, targeted study of about 1,000 nearby solar-type stars. According to Drake, one of the fathers of modern SETI searches, "it will be a hundred thousand times more sensitive than were the early surveys." The second search technique, though less sensitive, will produce a 10-million-fold increase in sampled combinations of frequency and bandwidth. The key to both efforts is the development of the so-called MultiChannel Spectrum Analyzer; the prototype has been under test since 1985 and is now at Arecibo Observatory. Even though the final version will be able to process 10 million channels of data per second, the targeted survey is expected to take three to five years and the all-sky survey five to seven years.

IAU TODAY

20TH GENERAL ASSEMBLY OF THE INTERNATIONAL ASTRONOMICAL UNION

BALTIMORE, MARYLAND. U.S. A. **WEDNESDAY, AUGUST 10, 1988**

9

PRESS CONFERENCE YESTERDAY. The dual topics of astronomy in developing countries and the status of women worldwide in astronomy were discussed by (left to right) Vera Rubin (U.S.), Silvia Torres-Peimbert (Mexico), Cecylia Iwaniszewska (Poland), John Percy (Canada), and Mazlan Othman (Malaysia). Photo by Jay M. Pasachoff.

A Woman's Place Is in the Dome

by Richard Tresch Fienberg

Women make up half the world's population, but only a tiny fraction of the world's professional astronomers. Moreover, few of those women who do enter a career in astronomical research ever hold a senior faculty or administrative position. Possible explanations for these inequities were discussed on the evening of August 8 in a lively two-hour special session, "Women Worldwide in Astronomy," attended by over 200 people.

More than a dozen speakers described the status of women astronomers in their respective countries. Considering numbers alone, there is wide variation. Among nations with at least 50 astronomers, Japan has the lowest fraction of women, 2 percent, while France has the highest, about 30 percent.

Most participants agreed that overt discrimination is not what keeps more women from becoming astronomers or other kinds of scientists. Instead, societal attitudes are responsible. In most countries, people seem to feel that "a woman's place is in the home" and that "science is a man's job."

Such biases extend to the schools. Claire Flanagan, a graduate student from South Africa, described her survey of 100 schoolchildren there. "I asked if there was any problem for women doing science," she said. "They vehemently told me that there's no such thing as sex discrimination in science these days. So I asked them what jobs they intend doing after they finish school," she continued. "The boys want to become engineers and doctors, and a lot of the girls want to become nurses, schoolteachers, and social workers. It's a subtle discrimination that's not recognized."

Having received virtually unanimous encouragement from the audience of more than 200, meeting co-organizers Vera Rubin (Carnegie Institution of Wash-ington) and Deidre Hunter (Lowell Observatory) will seek to establish an IAU Working Group on Women in Astronomy. In the meantime, the Executive Committee will welcome two women to its ranks at the close of this General Assembly. Shu-Hua Ye (Shanghai Observatory) becomes Vice President and Jacqueline Bergeron (Institut d'Astrophysique) becomes Assistant General Secretary. Attendees at the session expressed hope that in taking this important step, the IAU will become a model for other scientific organizations around the world.

JOINT DISCUSSION VII

Hubble Space Telescope: Status and Prospectives

by Peter Stockman and Riccardo Giacconi, Special to IAU Today

This was to be the General Assembly where the first dramatic results from the Hubble Space Telescope would be presented, several years after its 1986 launch. We should have been treated to a beautiful optical picture of the M87 jet, showing the structure of individual knots. The details of the inner core of a globular cluster, a close-up of the narrow-line regions of some active galactic nuclei, perhaps some more examples of protoplanetary systems, and a faint resolved image delineating the morphology of a galaxy at a redshift 0.7 should all have competed for our wonder. There is also no doubt that by now the first HST observations should have resulted in several new and probably conflicting "back of the envelope" estimations of H_0 and q_0.

Alas, the Challenger disaster has altered the character of this General Assembly as radically as it delayed the progress of U.S. space science. Nevertheless, it is inevitable that attention be paid at Baltimore to the culprit responsible for luring most of us here. Actually, since there is a good chance that the HST will finally be launched during the latter part of 1989 and since the first round of General Observer proposals are due by 1 October 1988 this is a very opportune time to reacquaint ourselves with the goals and status of the HST. Many of us had science proposals almost ready to submit two years ago, and we, as well as new proposers, need some moral and intellectual encouragement to help us complete the task.

Joint Discussion VII has a dual purpose. First, it should bring the astronomical community up to date on

see SPACE TELESCOPE, page 8

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An Orbiting Super- Observatory Before the Year 2000?

by Aleksandr A. Boyarchuk, Nikolai S. Kardashev, Yaroslav S. Yatskiv, Special to IAU Today

Following the successful launch of the giant Soviet rocket "Energija", discussions have started in the U.S.S.R. about the establishment of a new astronomical facility in space. The goal is to construct and launch a super-observatory equipped with large instruments for the major wavebands, from radio to gamma rays. It might be operational by the year 2000.

Thanks to the new rocket, very heavy objects can be lifted into space. With a take-off weight of 2,400 tons, Energija can place 100 tons in near-Earth orbit. The first stage is fuelled by liquid oxygen and hydrocarbons and the second by oxygen and hydrogen. The payloads would first be delivered to a low-earth orbit (altitude 400 km) for check-out and assembly. From there, a special rocket would lift the observatory into a higher orbit, possibly a highly elliptical one with an orbital period of about nine days. It may also be possible to place the observatory near the Lagrangian point L_2. This would mean that the Earth, Moon, and Sun are always in one hemisphere, opening the other to an unimpeded view of the universe.

Which instruments would you like to place here? Well, obviously as big and sensitive ones as possible. The planning is just starting and the preliminary ideas center around three instruments. First, a radio telescope with an effective aperture of about 400 meters, sufficiently rigid and with a surface that allows it to work from the millimeter range to tens of meters. This dish could also be used for radio interferometry, together with other space or ground based antennas with resolutions in the microarcsecond range.

The second instrument could be a 10-m optical telescope. It would be able to detect individual objects of magnitude 30 during exposures lasting up to 24 hours. It would also allow very high spectral resolutions to be achieved (~ 0.005 Å) in the 0.1-1 micrometer range, as well as low-resolution spectra of very faint objects even in crowded fields.

A third instrument would be an X-ray and gamma-ray observatory with a collecting surface of about 100 square meters.

Needless to say, such a project can only be realized in the context of broad, international collaboration. We expect that the coming International Space Year will provide a useful frame around the consultations and we herewith invite all interested parties to contact us at their earliest convenience. We hope to give more details about this ambitious project as soon as possible at meetings, in the literature, by personal interventions.

Seeing improvement at Soviet 6-meter telescope; story on page 3.

ANNOUNCEMENT FROM THE GENERAL SECRETARY

New Meeting

- Discussion of monitoring maser activity in circumstellar shells of red giant stars, today, 09:00-12:30, Room 202.

IAU NEWS

No Nation Has a Monopoly on Interest in Astronomy

by Richard Tresch Fienberg

Why should developing countries want to become more involved in astronomical research when they have so many other problems to overcome? Dr. Mazlan Othman of the National University of Malaysia posed and then answered this question at a press briefing yesterday morning (see photo, page 1). "Mayor Schmoke said astronomy is 'the stuff of dreams and youthful fascination,'" said Dr. Othman. "This is true in the United States, and it is also clearly true for us in developing countries.

"Our youth are interested in astronomy and space just as much as young people in developed countries," she continued. "And when you do achieve your dreams, we hope not to be too far behind you."

Othman offered two more reasons why Third World nations will invest scarce resources to build up an astronomical research enterprise. One is to improve scientific literacy among the public. "For excitement in science, there's nothing better than astronomy," she said. Another rationale is to aid the transfer of technology – telescopes, computers, CCDs – into the country.

Unfortunately, even as more and more modern facilities spring up around the world, developing countries may be losing ground in the race to close the technological gap between themselves and more advanced nations. "My feeling," said Silvia Torres-Peimbert of the University of Mexico, "is that we are getting farther and farther from the frontiers of research."

One possible solution is to become more heavily involved in other countries' space-science missions. Another is to send students to train in advanced nations and then lure them back home with modern, well-equipped research institutions. In any case, international cooperation and the personal contacts established at meetings like the 20th General Assembly will be crucial.

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Long Jet Suspected in Milky Way

by Ronald A. Schorn

The possible detection of a 4-kiloparsec-long radio jet emanating from the nucleus of the Milky Way was reported yesterday to Joint Discussion VI, Disks and Jets on Various Scales in the Universe. According to Yoshiaki Sofue (Nobeyama Radio Observatory) this feature, which may be cylindrical in shape, is some 200 parsecs in diameter and extends roughly perpendicular to the galactic plane. The structure might be the remnant of a one-sided jet, or it might be a "magnetic tornado."

Many other interesting results were described at JD VI. Geoffrey Bicknell (Mount Stromlo) discussed the general properties of jets in different types of radio sources. In his talk he mentioned the two basic explanations for one-sided jets, intrinsic asymmetry and Doppler amplification and attenuation of relativistic jets, but gave no obvious hint of where his sympathies lie.

Mark Reid (Harvard-Smithsonian Center for Astrophysics) reported on proper-motion studies of M87, which show that this giant elliptical galaxy's one-sided jet is moving at a rate of about 1 milliarcsecond per year. This corresponds to a speed of only about one quarter that of light. He pointed out that in this case simple superluminal-jet models don't work. Perhaps, Reid suggested, the "pattern" speed is much slower than the speed at which material moves through the pattern, analogous to the behavior of lee-wave clouds in the Earth's atmosphere.

Rees Pieces Together How Galaxies Form

by Virginia Trimble

The cosmogonic problems are all so closely connected that we cannot expect to solve any one of them until the whole picture comes into focus.

This slightly depressing view of galaxy formation and the early universe was offered toward the end of the August 8 Invited Discourse 3 by the speaker, Prof. Martin J. Rees (Cambridge University). But do not despair; the remark came at the end of an hour of insightful exposition of just what those problems are and what branches of physics and astronomy are likely to be able to contribute to their solution.

Prof. Rees expressed many of the questions in two forms, once as a "why" and once as a "what" or a "how." The second form always made the problem sound less intractable. Why do galaxies exist at all, when, if they did not, no theorist would feel compelled to invent them? This seems almost unanswerable. But, rephrase it as: what physical processes have determined the masses and sizes of the galaxies we see and what spectrum of density perturbations must have come out of the early universe to permit these processes to occur, and you have much less exotic-sounding questions, but also much less daunting ones. The existence and properties of stars are set by a balance between the forces of gravity and electromagnetism. Similarly, at least upper limits to the mass and size of galaxies come from a balance between the time scales of gravitational collapse and cooling of gas spheres.

As for the perturbations, Rees made it clear that many different patterns could have evolved into the present structure. The chief difficulty is for them to do so without introducing more temperature variation than we see into the 3 K microwave, blackbody radiation, which last interacted with ordinary matter just as the perturbations were starting to grow.

Another of the major questions is the why and wherefore of dark matter. Ask it in the form, what kinds of mass energy could account for galaxy rotation curves, cluster velocity dispersions, and such without radiating much, and you are left with an embarrassment of answers. These range from small stars and large black holes to neutrinos, axions, and weakly interacting massive particles. Rees claims on this issue to be an agnostic, attaching roughly equal probability to each of the major candidates, but reserving 25 percent for something we haven't thought of yet. Laboratory experiments currently under way to look for WIMPs and axions could redistribute this probability quickly. In the mean time, properties of dark matter are most severely constrained by its having participated in the process of galaxy formation.

The third question concerned quasars – why do they exist, or, alternatively, what is happening at the centers of a few galaxies (or many galaxies, but briefly) to make them flare up? Our regular readers (both of you) will readily understand that we awaited with trepidation a judgement on what connection this process might have with the epoch of galaxy formation, alluded to at the end of Prof. Maarten Schmidt's ID 2. We are still waiting. The connection is apparently not simple, but the mere existence of quasars before a redshift of 4 pushes the epoch of galaxy formation back further than some models prefer.

Undoubtedly we do not yet have a complete picture of the formation and evolution of structure in the early universe, but some edges are beginning to emerge from the hypo, and we can already see Martin Rees in the front row, grinning.

Interest Flares in GHRS Workshop

One of the primary objectives of the Goddard High Resolution Spectrograph on the Hubble Space Telescope is the detection of coronal lines in the UV during stellar flares. This is an objective of the GHRS Science Team and will be discussed in the GHRS Flare Workshop at College Park, Maryland, on 26-28 October 1988.

Interested scientists, especially those who can make correlative observations of AU Mic, should contact M. R. Kundu, Astronomy Program, University of Maryland, College Park, MD 20742 U.S.A. by 15 September 1988.

Rare Galaxy at z = 3.8; Common One at z = 2.4

by Jay M. Pasachoff

A record galaxy distance was reported at the G.A. on August 8 by Ken Chambers (Johns Hopkins University) and George Miley (Space Telescope Science Institute). At a redshift of a z = 3.8, galaxy 4C41.17 is observed as it appeared only about one billion years after the Big Bang, when galaxies should not, for the most part, have formed, according to some cold dark matter cosmologies.

4C41.17, was one of fifty objects Chambers, Miley, and Wil van Breugel (Berkeley), have studied in a ten-year analysis of radio spectra. Recently, they took broad-band optical images and spectra at Kitt Peak. Seven objects have z > 2, with 4C41.17 taking the record from the z = 3.4 object reported by others a few months ago. The redshift of 4C41.17 is based on a strong Lyman alpha line plus a very faint line from triply ionized carbon.

Chambers explained that 4C41.17 casts doubt on our ability to use distant galaxies to set the distance scale of the universe, because it seems to be very different from closer galaxies. First, it must be rare and very bright, because a normal galaxy would not be detected at its distance. Second, the shape that it exhibits on a narrow-band hydrogen photograph closely matches the shape of the radio emission.

The cold dark matter theory can allow the existence of a few galaxies at this early time in the universe. If, however, many more such objects were to be discovered, then a disagreement with the theory might exist. 4C41.17 is sufficiently bright that similar objects would be detectable up to z = 7.

On August 9, the discovery of a very distant but "nearly normal" galaxy at redshift z = 2.39 was reported by Rogier Windhurst (Arizona State University). He told Commission 28 that Hercules 2.02, an elliptical system, is only a weak radio source.

IAU NEWS

OBITUARY

Guillermo Haro: 1913-1988

by Silvia Torres-Peimbert, Special to IAU Today

Guillermo Haro, who was to serve both as Vice President of the IAU (1961-67) and as Vice President of the American Astronomical Society (1960-62), was born in Mexico City. He was director of the Instituto de Astronomia of the University of Mexico from 1948 to 1968 and of the Observatorio Astrofísico de Tonantzintla (now the Instituto Nacional de Astrofísica, Optica, y Electrónica - INAOE) from 1950 to 1984. Haro started the site development at San Pedro Martir, Baja California, where the present Observatorio Astronomica Nacional is located, and at Cananea, Sonora, where the observatory of INAOE is being established.

Prof. Haro made many contributions to observational astronomy, especially with the Tonanzintla Schmidt telescope. Among them were the detection of a large number of flare stars in young stellar associations (with Enrique Chavira), the discovery of a large number of planetary nebulae in the direction of the galactic center, the discovery (also independently done by George Herbig) of the nonstellar condensations in high density clouds near regions of recent star formation, now called Herbig-Haro objects.

Other major research by Haro included the list of 8746 blue stars in the direction of the North Galactic Pole, published jointly with Willem J. Luyten in 1961, from a search using the three-color image technique developed at Tonanzintla. At least 50 of these objects turned out to be quasars (which were not yet discovered in 1961). Haro's list of 44 blue galaxies, compiled in 1956, was a precursor to the work of Markarian and others in searching for such galaxies. Haro also discovered a number of T Tau stars, a supernova, more than 10 novae, and Comet Haro-Chivara.

1992: THE INTERNATIONAL SPACE YEAR

by Richard West, Special to IAU Today

The ICSU Coordinating Committee for the Planning of the International Space Year (1992) has just delivered its report. It will be discussed by the ICSU General Assembly in Beijing early next month.

The Committee recommends that ICSU, and its adhering scientific unions, among these IAU, actively participate in the ISY. These are some of the main conclusions from the report:

The ISY represents an important opportunity for global cooperation within science and science education, in full agreement with ICSU's objectives. The proposed epoch, the calendar year 1992, with follow-up activities in the subsequent years, is timely and realistic, allowing sufficient time for preparations.

The ISY activities would concentrate around Space Science and Applications, as well as Public Education and Information.

In full accord with the International Geosphere-Biosphere Programme, recently launched by ICSU, particular emphasis should be given to the study of the Earth from space (Mission to Planet Earth). The ISY will coincide with several satellite missions of great importance to the IGBP and will provide an opportunity to call attention to the power of space based observations to provide a highly quantitative perspective for many properties of the geosphere and biosphere.

Other important areas include Solar-Terrestrial Sciences, Planetary Exploration, Astronomy, Qualifying Humans for Long Duration Flight, Microgravity Applications and Communication Satellites. These areas combine a broad spectrum of science and applications and will undoubtedly attract participation by many of ICSU's Scientific Unions, Committees and Associates.

It is unrealistic to expect that major new space missions can be put into operation before 1992. The ISY should first of all attempt to further the cooperation within existing programmes and also to provide a catalysing atmosphere for future collaborative projects. Above all, a special effort should be made to include scientists from nations which do not normally engage in space activities. ICSU's wide connections in these countries will be crucial in achieving this goal.

Public Education and Information, taken in the broadest sense, offer great possibilities in connection with an ISY. In particular, it is suggested to establish an ISY "Public Education and Information Programme", which would actively support national efforts by making printed and audio-visual material of the highest quality available on a world-wide basis. The ICSU Press may play an active role within this framework.

In order to ensure the efficient and economical coordination of the various ISY activities, it is recommended to establish a three-tiered management structure which will contribute to an effective information exchange among the numerous participating organizations and individuals, even though they will be of many professions and come from many geographical areas.

The central, coordinating role for the ISY should be assumed by a Steering Committee, representing organizations and agencies connected to space research, as well as public education and information. The Steering Committee must be recognized as the only body that has the mandate to coordinate and supervise all significant ISY activities. ICSU would appoint some of the members, including COSPAR representation. Others would be appointed by the recently established Space Agency Forum on ISY (SAFISY), and some would come from other space-oriented organizations like IAF and IAA, and also from appropriate UN bodies.

The Steering Committee will be supported by the ISY Conference which will meet annually (if possible already during the first half of 1989) with the widest possible participation of representatives from involved nations and organizations. The day-to-day business should be taken care of by a suitably staffed ISY Office.

The funding for the ISY would come from many different sources, including space agencies and industries, national and international organizations. Fund-raising efforts should be undertaken by the ISY Office staff. In view of the world-wide highly visible character of the ISY, funding is not seen as a major problem.

In conclusion, the ISY (1992) will provide a great opportunity to further collaboration among scientists, engineers and politicians on a world-wide basis, in full agreement with ICSU's charter. Moreover, related educational and public information efforts may make important contributions to a positive image of science and stimulate the overall interest, not only in space-related activities, but science and technology in general. With a minimum of financial involvement, ICSU and other participating, international bodies may achieve better visibility, for the benefit of their members and also for individual scientists. IAU Commissions 44 and 46 are close to the subject matter of the ISY, but I am also sure that all individual IAU members will be able to contribute in a significant way to the ISY, as soon as the program has been defined and the management structure has been established.

Look for news in the next issues of the *IAU Bulletin.*

Don't Pollute Interplanetary Space, Astronomers Ask

by Colin Keay, Special to IAU Today

At the August 3 business meeting of IAU Commission 22 (Meteors and Interplanetary Dust) it was noted that pollution of the near-Earth space environment had become serious and would be the subject of an IAU Colloquium 112 in Washington, D.C. (August 13-16, 1988). As interplanetary dust is the concern of Commission 22, the members considered steps to avoid similar problems arising in the future in planetary and interplanetary environments where contamination would be very damaging and could ruin scientific experiments. The opportunity still exists to adopt preventive measures rather than repeat the mistakes that have occurred in low-Earth orbit.

The use of propellants and explosives that yield products of high elemental abundance, such as water or nitrogen oxides, is benign compared to other fuel mixtures that leave residues of elements that have a low-abundance in the solar system. Such residues can seriously compromise future elemental abundance studies and isotope-ratio measurements, thereby masking evidence of the early history of planetary bodies. A collision or impact involving a spacecraft containing large amounts of the so-called "cosmic fingerprint" elements could be a major scientific disaster if it polluted one of the minor bodies in the solar system.

Members of Commission 22 strongly supported the establishment of a working group to frame recommendations on the composition and terms of reference of a high-level Panel on Interplanetary Pollution. In order to be fully effective, they felt the panel should involve COSPAR as well as the IAU. Iwan Williams of Queen Mary College, London, agreed to convene the working group. Initial members included P. B. Babadzhanov of the U.S.S.R. and Jerry Weinberg and Bob Soberman of the U.S. Members from other IAU Commissions and COSPAR are invited and it is hoped that all nations with launch-vehicle capability will be represented. Recommendations are to be developed for possible action at the COSPAR meeting due in 1990 and at the IAU General Assembly in 1991.

The Uneasy Marriage of Science and Politics

by Stephen Cole

Like it or not, astronomy in the latter half of the twentieth century is conducted in an environment of governmental and public influence in which the goals of the scientific community often are modified by those of other interest groups. Space astronomy in particular has been shaped by non-scientific interests, according to several speakers at the August 6 sessions of Commission 41 on issues in the history of space astronomy.

Robert Smith (Johns Hopkins University), in a talk on "Space Astronomy and Big Science in the United States," noted that the change from "little science" since World War II is characterized by the need to design projects with a coalition of government, industry, and scientists – the "adhocracy" that now makes the decisions on big science projects. Although forming such coalitions requires a lot of time on the part of scientists, such efforts are absolutely essential to the success of a project, as important as the engineering concept of a project.

Citing the example of the Space Telescope, Smith stated that a very active lobbying effort by the astronomy community was necessary to sell the concept to decision-makers. Part of the pitch included an awareness of the "market forces" at work: an estimate of how much money the government was likely to spend on the project.

Joe Tatarewicz (U.S. National Air and Space Museum) echoed the problem of bigness in modern science in his talk, "The Entangled Future of Ground-based and Space Astronomy, 1958-1972." After Sputnik, lots of federal money became available for space research and astronomers suddenly found themselves face-to-face with an amazingly wealthy patron who, unfortunately, sometimes asked for research that astronomers were not necessarily keen on. For example, NASA wanted planetary research done on the Martian atmosphere in anticipation of its space missions but could find no takers, despite having funding readily available for the work.

"Astronomers found that the price to pay to use federal money was loss of control," said Tatarewicz.

A panel discussion with three astronomers further developed these issues. Moderator Martin Harwit (NASM) raised the question of whether NASA missions were designed more for "engineering thrills" than for scientific objectives. A certain "scientific elitism" sometimes dominates new missions: scientists want new and better instruments, which often drives up the cost of a mission, and engineers want newer and bigger spacecraft in order to reap the glory from technological achievements.

IAU WORLD

15-m Swedish-ESO telescope at La Silla

The New Swedish Telescope

by Roy Booth, Special to IAU Today

The 15-m Swedish-ESO Submillimeter Telescope (SEST), the first large submillimeter telescope in the Southern Hemisphere, has operated successfully in the open air since early this year. It is located on the ESO site of La Silla in the Chilean Andes, and was opened for scheduled observations in April. It is currently provided with dual polarization receivers for the frequency ranges 80-117 GHz and 220-240 GHz. Both line and continuum observations are supported. The telescope's reflecting surface has been set to within 65 micrometers rms of the optimal paraboloid. Plans are under way to refine this setting further by holographic measurement using the LES-8 satellite as a beacon. The telescope is specified by its designers, Institut de Radio Astronomie Millimetrique, to maintain a surface accuracy of 50 micrometers. Telescope time is shared equally between ESO and Sweden. The next deadline for proposals is October 15. Further details may be obtained from the author at Onsala Space Observatory or from Peter Shaver at ESO.

The Buenos Aires Oath

by Roberto H. Mendez, Special to IAU Today

Earlier this year, an international conference about scientists, peace and disarmament, held in Buenos Aires, Argentina, produced a project to implement an oath somewhat similar to the "Hippocratic Oath" for medical scientists. This oath would be individual and voluntary. The idea is to ethically bind people upon graduation to use their scientific knowledge only for the benefit of mankind. This would help to establish an ethical frame of reference for the inspiration of scientists. The text of the "Buenos Aires Oath" is as follows:

"Aware that, in the absence of ethical control, science and its products can damage society and its future, I pledge that my own scientific capabilities will never be employed merely for remuneration or prestige or on instruction of employers or political leaders only, but solely on my personal belief and social responsibility - based on my own knowledge and on consideration of the circumstances and the possible consequences of my work -that the scientific or technical research I undertake is truly in the best interests of society and peace."

The Argentine delegation has submitted to the IAU Executive Committee a suggestion for a resolution inviting all universities in the world to implement a voluntary oath following the spirit of the Buenos Aires Oath.

FACILITIES

Status of the Soviet 6-meter Telescope BTA

by L.I. Snezhko, Special to IAU Today

Astrophysical observations with the 6-m BTA telescope began in January 1977. In the first 10 years of operation, BTA realized the astronomers' expectations in many respects, and especially in the field of high spectral resolution and in observations of faint objects.

The observational experience of the world's largest telescope has its own significance. BTA may serve as an operating model for the other large telescopes under design in the world. First of all, successful realization of the alt-azimuth mounting and solving the problem of its controlling was our greatest achievement of national telescope-building. The experience of designing and operating the monolithic 6-m mirror was also very important. However, some miscalculations and difficulties of the BTA project, mainly the problem of the astroclimate inside the dome, should be considered when planning optical telescopes.

The telescope effectiveness is determined by the quality of optical systems and adjustment, setting and guidance accuracy, the stability of these characteristics and the operational reliability of all systems. Substitution of the BTA main mirror and adjustment system in 1983-1985 improved the optical quality. In the image created by the main mirror 90 percent of the energy is contained in a circle of diameter 0.8 arcsecond. At the prime focus, with the field corrector, this blur circle diameter is 0.9 arcsecond, growing to 1.1 arcsecond at a distance of 4.5 arcminutes from the field center. These quantities correspond to the residual optical aberrations of the system. In 1980-1985 V. Ya. Vainberg investigated the telescope geometry and developed hardware and software for setting corrections. In the new BTA control system, setting accuracy of ± 3 arcseconds is achieved and the guidance accuracy is improved. For the last three years telescope down time due to technical troubles has been negligibly small.

Astroclimate

Meteorological and astroclimate characteristics of the BTA site, given in the technical specifications for the telescope, have been verified. During 10 years, the annual number of BTA observational hours ranged from 1200 to 1800 with an average of 1300. In this period, 30 percent of observations were carried out when the seeing was $\beta < 2$ arcseconds, and 70 percent of observations when the seeing was $\beta < 3.5$ arcseconds. The histogram of β distribution at the BTA is shifted relative to that measured outside the dome by ~1.5 arcseconds. This is explained by temperature inhomogeneities of the air inside the dome due to large temporal variations of the external temperature and the large volume and thermal inertia of the interior of the dome. The most powerful heat source is the oil-support system of the telescope. Now a special air ventilation system has been created for the dome to control the temperature regime.

During the past two decades it became clear that there are no places possessing better astroclimate characteristics for a large telescope in the European part of the U.S.S.R., including the Transcaucasus, than the BTA site.

Science Programs at the BTA

The programs at present are spectral observations with a TV-scanner for extragalactic research, high and moderate resolution spectroscopy for stellar problems, speckle-interferometry, photometry at very high time resolution and measurements of stellar magnetic fields. In 1985-1986 the role of photoelectric observation methods (TV-scanner, electrophotometry, speckle-interferometry) increased to 70 percent, while the time allotted to photographic methods decreased to 30 percent of the total observation time.

In 1988 a two-dimensional digital system for image storage and processing, the "Quant" system, was put into operation. The system is used in the "long slit" operation mode, with the echelle-spectrograph, in direct imaging and in multi-object spectroscopy.

Observational programs for the BTA are selected by the Time Allocating Committee, chaired by V. Yu. Terebizh. For scientific and technical tasks about 30 percent of the observating time is allotted to the Special Astrophysical Observatory, and 70 percent is for external programs, including 15 percent for foreign users. In 1983-1985 of 738 requests sent to the TAC, 486 were granted. Annually 50-70 observational programs are carried out at the BTA. To use the limited observational time more effectively, we avoid time distribution by the calendar and compile blocks of observational programs instead. Cooperative astrophysical programs are given priority for observing time.

FACILITIES

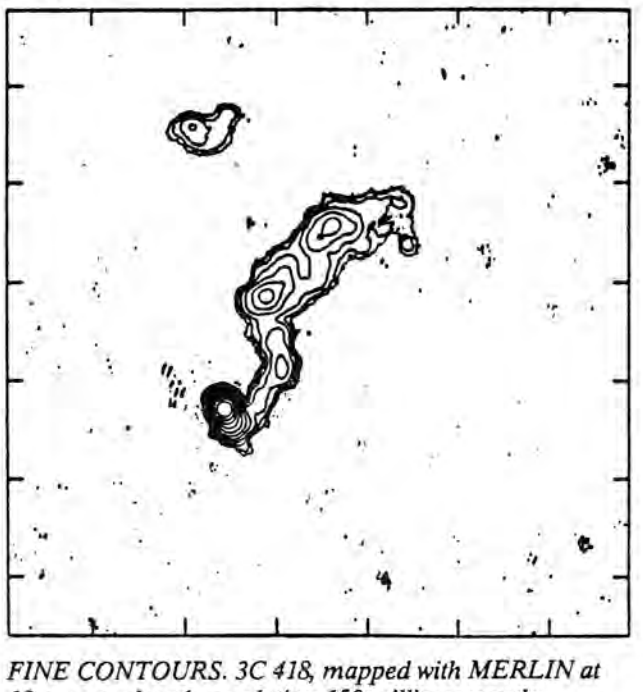
MERLIN Works Magic for Radio Astronomy

by Peter Thomasson and Dennis Walsh, Special to IAU Today

A major enhancement of the synthesis radio telescope, MERLIN, will be completed within two years. MERLIN is an open facility operated by the University of Manchester, Jodrell Bank, England, and applications for observing time are considered from qualified astronomers of any country. It is the largest existing connected array, seven times larger than and complementary to the VLA, with correspondingly higher resolution (e.g., 10 milliarcsec at the λ1.3 cm H_20 line). Technical details are given by Thomasson in the September 1986 issue of *QJRAS*. Write to the director for further information.

Recently, in collaboration with the Mullard Radio Astronomy Observatory, the maximum baseline was extended from 134 km to 230 km by the inclusion of a seventh antenna (18-m diameter) at Cambridge, the latter to be replaced in 1990 by a 32-m dish capable of operating to at least 43 GHz. Other technical improvements will yield greatly improved sensitivity, particularly at higher frequencies, opening new areas of astrophysical research. Thus at λ1.3 cm it will be possible to map continuum thermal emission from some stars with extended atmospheres, e.g. α Ori, and in the spectral line mode to measure three-dimensional motion of compact H_20 masers in star-forming regions.

Jodrell Bank is a member of the European VLBI Network (EVN). The new Cambridge dish, when added to the EVN, will provide a baseline common to MERLIN and the EVN. This will tie the two arrays together, providing a unique system with resolution corresponding to baselines from 6 to 2500 km with no significant gaps and with greater sensitivity than any other comparable array.



FINE CONTOURS. 3C 418, mapped with MERLIN at 18-cm wavelength, resolution 150 milliarcseconds.

IAU ACTIVITIES

REMINISCENCES

14th General Assembly: Brighton, 1970

by Laurence W. Fredrick

Every IAU General Assembly has its memorable moments, good and bad. Even the bummers eventually are remembered with humor, but the 14th General Assembly, at Brighton, U.K., stands out in my mind.

We were welcomed by none other than Margaret Thatcher, who was Minister of Education. We had to ride the train from downtown Brighton out to the university. One day I left my raincoat on the train. I discovered this before the train had left the station, but it was moving and I waved goodbye to my coat. In case it could be recovered, I went to the stationmaster who said he would remedy the problem and asked if I could wait 20 minutes. About 18 minutes later, a two-carriage train approached from the east and behold, the conductor reached out and handed the stationmaster my coat! By telephone they had alerted the outbound conductor, who handed the coat off to the inbound conductor one stop away.

Many other neat things like this occurred, but what really stood out was a free afternoon. Peter van de Kamp suggested that we ride to downtown Brighton and walk around. On one street we came upon a cinema featuring a Buster Keaton Festival, a non-stop showing of classic, silent films with the noted comedian. Each film was accompanied by a honky tonk pianist who tried to act interested. Dr. van de Kamp, who plays piano to accompany his private showings of Charlie Chaplin films, noted that the pianist was not really into his work. I suggested that Peter replace him and perhaps the music would improve. Happily, Peter agreed. It wasn't clear at the moment whether he thought the music would benefit or whether the pianist needed relief.

At the end of the next film we went down and talked with the pianist, who allowed that he could do with a "pint." This gave Peter an opening to offer to substitute during the coming reel. The pianist responded, "Aye, as much as I need the bloody pint, ya ken n' do it."

"Why not?" responded Peter.

"Mate, ya is nah a member of the union," replied the pianist.

To which Professor van de Kamp drew himself up to his full height and stated "But I *am* a member of the union."

"Aye mate, and what union be that?" came the question.

With strong emphasis Peter replied, "Why, the International Astronomical Union."

"That's good enough for me, mate," accepted the pianist as he headed for the door and the nearest pub.

Peter gave a marvelous performance, and when the pianist returned, he stood by and applauded vigorously and asked Peter to do the next film so he could catch a bite to eat as well. After the day was over, Peter said he enjoyed making a journeyman pianist's life a little easier.

TV GUIDE

Observatories of the World

by Jean-Pierre Swings, Special to IAU Today

With the financial help or sponsorship of a variety of French and international organizations, R. Pansard-Besson is producing an important series of television broadcasts, "Les Palais de la Découverte: de Stonehenge au Télescope Spatial." The result will premiere on a French channel, and then will become available around the world, including developing countries. The broadcasts will center on observatories, showing domes, instruments, data acquisition and reduction, research programs, discoveries and astronomers. Two well-known French astrophysicists, J.-C. Pecker and P. Léna, and the science historian M. Serres, are scientific advisors.

The IAU has agreed to be a link between the producer and the astronomical community, and to help with a few logistics. The General Secretary, therefore, took the liberty of writing to several observatory directors, requesting that they open the doors of their observatories, field stations, etc., as widely as possible, or provide information of relevance, in order to facilitate the work. The positive answers were very impressive, and Mr. Pansard-Besson has already been able to film in many observatories around the world; filming is still underway.

The pre-editing film that will be shown in Hall A on August 11 at 09:00 shows pictures of India where, in 1726, a Maharajah Jai Singh II was an architect as well as an astronomer. This excerpt from the final movie will last 40 minutes. Please understand that it is a working copy, with some black parts in it; special effects (celestial objects, astronomical tables) will be added later. In the words of R. Pansard-Besson: "The editing is not finished yet, but to show you some pictures, even without a comment, is a way to say thank you for the warm welcome received while being in institutes and observatories throughout the world."

Hubble Telescope on the Air

The Hubble Space Telescope will be featured in a series of 50-minute video documentaries to be made by BBC TV and distributed worldwide. The first, "The Promise of the Space Telescope," should be ready for transmission before the launch of the observatory and will be updated with much new material a year later. This program will be followed by two more films, one on the early planetary and stellar observations with HST and the other on the new work in extragalactic astronomy.

The writer and producer of the BBC documentaries is Alec Nisbett, who has prepared 140 major science documentaries, mostly for the BBC's prestigious Horizon science series. Some of these, from "The Crab Nebula" (1971) onward, were also shown on U.S. television as programs under the Nova series.

"Our emphasis will be on the science," says Nisbett. "Part of that will be what light HST can throw on the big questions in astronomy, but also I want to show an aspect of how science is done – the process and the joy of discovery."

THE GALLOPING GASTRONOMER

The House of Welsh
301 Guilford Avenue, 685-7158
Rating: ★★

by Laurence W. Fredrick

Located on the northeast corner of Guilford and Saratoga, this pleasant eatery stands out like a sore thumb: two-and-a-half stories of nineteenth-century limestone amid twentieth-century concrete and glass.

The House of Welsh is Baltimore's oldest tavern. Pictures and newsprint tell its story in the restaurant's foyer. It specializes in American cuisine, and offers the usual regional seafood. The cherry paneled rooms are hung with Tiffany-shaded lamps, a decor that encourages a feeling of comfort and that good food is assured.

The various steaks are their real specialty and they come hot (calorically speaking). My filet was large and literally melted in the mouth. One would be hard put to find a better steak, as even the famous McClusky's in Austin, Texas, couldn't match this one. Indeed, Rod's Steak House in Williams, Arizona, may find itself in second place.

My companion chose the crab cakes and they were tasty, with only a few flakes of shell. Dessert was a robust cherry cheese cake. Other dessert items are available, but since they are not made in house one should pick the one that will have the most character. The full-service bar can produce any concoction you request and has an ample wine list. Meals run about $30 per person with a cocktail and wine.

For a shot in the dark, this establishment was a pleasant surprise. Two stars and we gallop off to our last assignment.

GETTING SOMETHING FOR THE FOLKS AT HOME

IAU WORLD

REGIONAL ASTRONOMY

Brazil: New Initiatives Build on Historic Heritage

by Pierre Kaufmann, Special to IAU Today

Astronomy in Brazil has had remarkable growth since the 1960s. New initiatives have led to the formation of research groups, which have enhanced several areas of modern astronomy, radio astronomy and astrophysics, in the country. However, the early history is also of interest.

The historical origins of astronomy in Brazil were reviewed in a book by L. Muniz Barreto, celebrating the 160th anniversary of Rio de Janiero's National Observatory, in 1987. The first astronomical observations in Brazil were performed just one week after the country was discovered by the Portuguese navigator Cabral (22 April 1500). A first description of the Southern Cross constellation was given. Astrolabe solar observations led to latitude determination (one degree accuracy). The results were sent in a letter to the King of Portugal, from Master João Faras. Four hundred and seventy-five years later, the first VLBI experiments using the Itapetinga 13.7-m antenna improved the coordinate determinations at another site by six orders of magnitude.

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The first astronomical observatory in Brazil, which was also the first in the Americas and the Southern Hemisphere, was located on the northeast coast, then Dutch Brazil. George Marcgrave, from Leiden, built the Mauritius Observatory at Antonio Vaz island, near Olinda, in 1640, in honor of Prince Maurice of Nassau. This initiative vanished as the Dutch left Brazil. More than one century had elapsed, when astronomical activities were resumed at Rio de Janeiro, circa 1780. They led to the Imperial (late National) Observatory, dedicated in 1827 by D. Pedro I, the Emperor of Brazil, six years after the country became independent from Portugal.

Today the National Observatory (ON) is an important organization, with research and graduate courses in fundamental astronomy, astrophysics and geophysics. The headquarters are in Rio de Janeiro. The ON operates the National Laboratory for Astrophysics (LNA), in Brazópolis, State of Minas Gerais, which has Brazil's largest optical instrument: a 1.6-m telescope. It also operates an astrolabe in Rio, geomagnetic observatories at Vassouras and elsewhere, and supports the Time Service in Brazil. Through an agreement with the University of Santa Maria, there are plans for building a large metric wavelength interferometric array.

The largest astronomy group in Brazil today is at the Astronomical and Geophysics Institute of São Paulo State University (IAGUSP), in São Paulo City. With an history dating from the turn of this century, the São Paulo Observatory, as it is also known, once had an emphasis on fundamental astronomy. Today the staff performs research and offer graduate courses in fundamental astronomy and astrophysics. IAGUSP operates the Abrahão de Morais Observatory in Valinhos, near São Paulo, where there is complete astrometric instrumentation and a 60-cm reflector telescope for photometry, spectrography, polarimetry and infrared surveys. There is a new 2-m radio telescope to be used in future CO observations.

An important group originated in 1960 in São Paulo City. The Mackenzie University's Center for Radio-Astronomy and Astrophysics (CRAAM), introduced new areas of radio astronomy, solar physics (and solar-terrestrial relations), producing a large scientific output and offering graduate and undergraduate training. They built and operated the Umuarama Radio Observatory, Campos do Jordão, and the Itapetinga Radio Observatory, Atibaia, where the first large (13.7 m) mm-wave radio telescope in the Southern Hemisphere was sited. One MK-II VLBI facility was built and used successfully in several runs with international networks. The group still operates a 7 GHz solar polarimeter, very low frequency tracking receivers and conducts research with NASA's SMM satellite. A solar optical telescope loaned by Caltech's Big Bear Observatory may become operational soon. CRAAM has been maintained and operated by ON (1977-1980) and the Institute for Space Research (INPE) (since 1980), through an agreement with Mackenzie University. Since 1987, the group has had to suffer a drastic decline in activities.

The 13.7-m radome-enclosed telescope was built in 1971 at Itapetinga Radio Observatory (near São Paulo) and is used extensively for VLBI, solar physics, and other radio astronomy programs.

At INPE, São José dos Campos, São Paulo State, there is a group devoted to high energy astrophysics, carrying out experiments with balloons. Part of the group is devoted to optical astrophysics, using other facilities in the country, and offers graduate courses. There are plans for solar radio astronomy at the decimetric range.

The Institute of Physics of Rio Grande do Sul Federal University, Porto Alegre, in the south of Brazil, has a Department of Astronomy very active in optical astrophysics, research and graduate courses. It operates a 50-cm telescope, used mostly for photometry, near Porto Alegre, and use other facilities in the country. The Valonga Observatory, Rio de Janeiro Federal University, Rio de Janeiro, is devoted primarily to fundamental astronomy and astrometry, and offers graduate courses. It operates one Zeiss astrograph and a 50-cm reflector, located near Campinas, São Paulo State, at the Capricórnio Observatory.

The Minas Gerais Federal University, Department of Physics, operates a 60-cm reflector and a 15-cm Coudé refractor at Peidade Observatory, near Belo Horizonte. Research and graduate courses concentrate on stellar and galactic astrophysics, and planetary systems. At the Technological Institute of Aeronautics (ITA), São José dos Campos, São Paulo State, a traditional group now concentrates on fundamental astronomy and celestial mechanics. It operates a 50-cm telescope at its campus, offering also graduate training. In the city of Natal, Rio Grande do Norte State, the Federal University maintains a small group in the Department of Physics, concentrating on fundamental astronomy and astrophysics.

New groups are presently being organized in Brazil. At São Paulo State University, Polytechnic School, a Laboratory for Space Applications has been established to explore VLBI, with plans for the installation of a suitable terminal in the country. At Campinas State University, São Paulo State, a new group is working on the development of balloon-borne astrophysical and geophysical experiments.

About half a dozen other Brazilian universities, observatories, and institutes also carry out research and teaching in astronomical topics, including high energy astrophysics in São Paulo, astrometry in Rio de Janeiro, and planetary work at Piedade. Several new groups are being organized at present. Despite the difficulties at CRAAM, astronomical research is in a healthy state in our country.

IAU WORLD

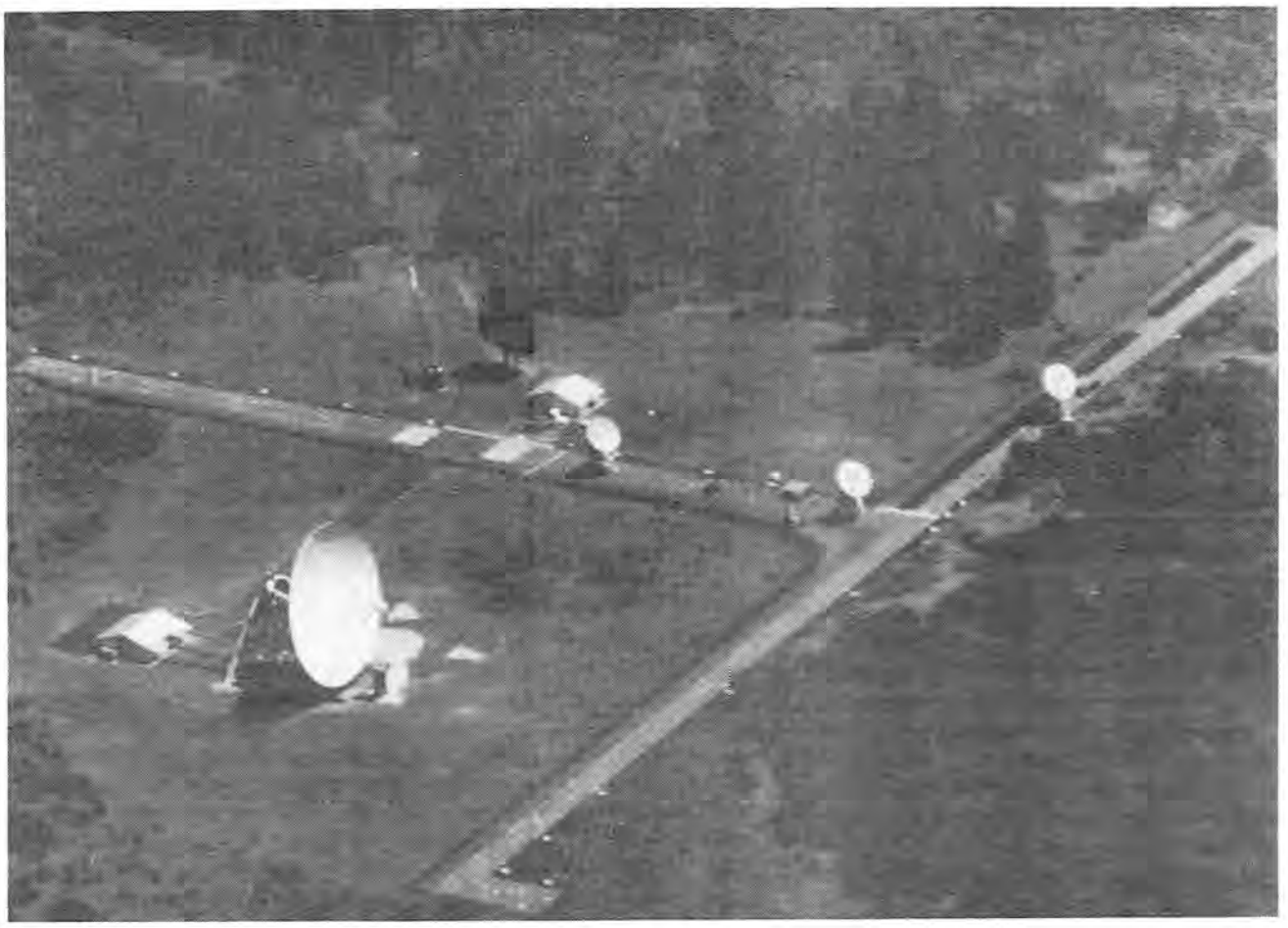
FACILITIES

BIMA: An Array of Millimeter-wave Telescopes at Hat Creek

by Leo Blitz, Special to IAU Today

The University of Maryland, the University of Illinois and the University of California, Berkeley, operate an array of millimeter-wave telescopes at Hat Creek in northern California. The array is formally known as BIMA and at the present time consists of three 6-meter dishes linked together to do aperture synthesis observations at frequencies from about 70 GHz to 120 GHz. We are currently expanding the array to six dishes, which will make the collection of data five times faster than with the current array and, when completed, the array will be the largest instrument of its type in the world. We are also planning to increase the frequency coverage to nearly 300 GHz, the practical limit for the low elevation site in California.

The telescope is especially well suited for doing molecular spectral line studies and the spectrometer can observe up to eight spectral lines simultaneously. For making extragalactic observations, the bandwidth of the spectrometer is wide enough to accommodate 800 km/s at the J = 1-0 transition of CO, and will be doubled so that the same spectral coverage will be available at the J = 2-1 transition of CO at 230 GHz. This velocity coverage is sufficient for all galactic and extragalactic sources detected to date. Observations of the solar system, galactic molecular clouds, star forming regions, evolved stars, extragalactic molecular clouds, and active galactic nuclei are routinely made with BIMA, at a resolution which is typically from 1" to 5" depending on the source. The field of view is about 2 arc minutes, although mosaicing of larger fields is also possible. The digital spectrometer divides the variable bandwidth into 512 equal parts, so that adequate frequency resolution is available to observe any known spectral line.



Berkeley-Illinois-Maryland Array at Hat Creek, California

At present 30 percent of the observing time is made available to outside users from whom we welcome proposals. First time users and those unfamiliar with radio interferometry are encouraged to collaborate with one of the BIMA scientists, but we have no set requirements for collaboration. Proposals consist of a scientific justification of no more than two typed pages, and a standard cover sheet detailing the technical parameters of the observations. Cover sheets are available from the project offices at each of the universities in the consortium. The proposals should be submitted to the author (University of Maryland), or to either Dr. Richard Crutcher (University of Illinois) or Dr. William J. Welch (University of California, Berkeley).

There is no necessity to go to the site. The observations can be controlled and monitored remotely from each of the three universities, and data can be reduced equally well at each location. The University of Maryland and the University of Illinois will maintain the data reduction and analysis facilities, but these will be fully available by remote links both at Berkeley and at Hat Creek. Special facilities will be available to facilitate data gathering, reduction and analysis by visitors at all three sites in the consortium.

FACILITIES

Boyden Observatory Near Bloemfontein

by Allan H. Jarrett, Special to IAU Today

Potential users are generally welcome to the observatory. However, their expeditions would normally have to be entirely self-supporting so far as personnel and funding are concerned.

Enquiries should be sent to the Director, Boyden Observatory, University of The Orange Free State, P.O. Box 339, Bloemfontein 9300, Republic of South Africa.

There is no accommodation available on site; visitors stay in Bloemfontein, 25 km distant, where the usual range of hotels is available.

The particularly dry, almost desert-type climate at Boyden makes it very suitable for infrared astronomy; this has been verified by several successful expeditions from the United Kingdom and North America.

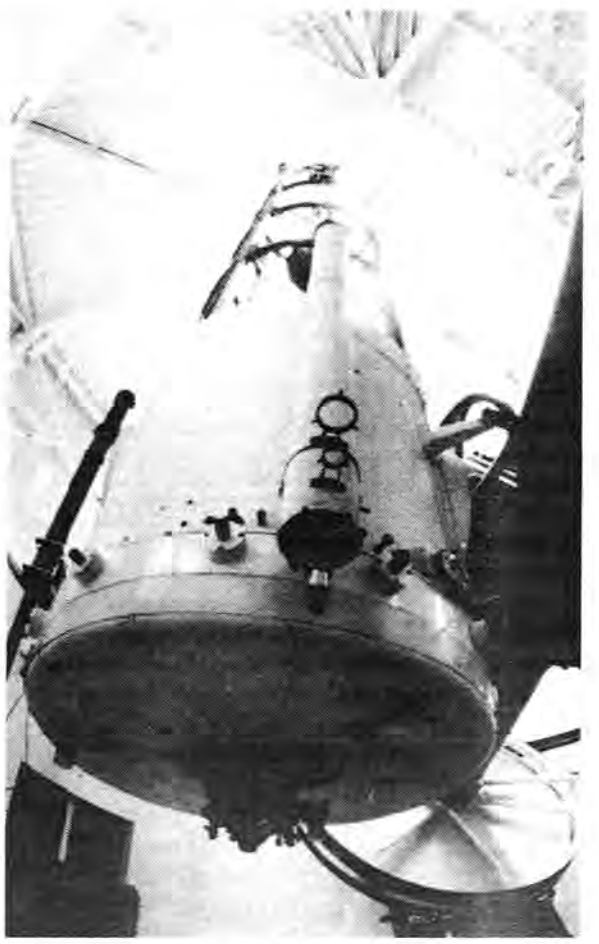
Throughout the years many overseas astronomers have made use of the facilities at Boyden, and have added to the prestige of the establishment. The activity at Boyden has largely evolved around observations of stars and starfields in the southern Milky Way, the Magellanic Clouds and Southern Hemisphere variable stars. At 29 degrees south of the equator, Boyden is very favorably sited for studies of the centre of our galactic system and the Magellanic Clouds.

Boyden Observatory (a part of the Department of Physics and Astronomy of The University of the Orange Free State) is located at Mazelspoort, 24 km East North East of Bloemfontein at a latitude of 29°02′20" South and a longitude of 26°24′20" East. The elevation above sea level is 1387 m.

The most convenient mode of travel to Boyden is by air via Jan Smuts International Airport at Johannesburg and thence to the airport at Bloemfontein, which is 12 km from the observatory. Bloemfontein is also the center of the South African Railway System.

The main instrument is the 1.52 m Cassegrain reflector. It is equipped with a UBVRI photometer, a grating spectrograph (dispersion 280 to 70 Å/mm), an image tube camera, and an intensifier video monitoring system. The telescope is controlled by an HP85 microcomputer. The special-purpose instruments include the 41-cm Nishimura reflector (UBVRI photometry), 33-cm Boyden reflector, 25-cm Metcalf triplet (objective prism spectroscopy and patrol cameras), and the 20-cm coelostat for solar work.

The measuring facilities on site include a Joyce Loebl Microdensitometer, an Askania iris diaphragm photometer, and a Pye two-dimensional measuring microscope. There is a normally-equipped darkroom and a small library with standard journals. The computing facilities include an HP125 computer and associated peripherals for stand-alone data analysis and graphics and a modem link to the mainframe Univac 1106 on the university campus. There is a machine shop on site and more extensive electronic and mechanical facilities on campus.



Boyden Observatory's 1.52-meter (60-inch) Cassegrain telescope

IAU NEWS

IAU BULLETINS

Airport Transportation

Baltimore-Washington International Airport

Service will be provided from the Convention Center to BWI Airport on Thursday, August 11 with departures at 13:00, 14:00 and 15:00. The charge for the one-way transfer is $5 per person.

If you wish to depart for the BWI Airport earlier you may use Gladney Transportation Service for van service from the downtown hotels or the Convention Center. This service operates from the hotels between 05:40 and 01:00 and will stop at the Convention Center from 09:30 to 15:30. The cost is $5 per person, one way. Call 850-0305 or 850-0306 to reserve a seat.

From Loyola Dormitories, service will be provided by Gladney Transportation at 05:10, 06:10, 07:10, 08:10, 09:10, 10:10 and 11:10. Call Gladney at the number above to reserve a seat.

Taxi service is available from, among others, Yellow Cab Company (call 685-1212). A one-way trip is approximately $15 from downtown.

Dulles International Airport

Direct service will be provided to Dulles International Airport on August 11 at 14:00 by reservation only. You must sign up for this service by 17:00 on August 10, at the transportation desk in the Convention Center Pratt Street Lobby. The charge for the one-way trip is $20 per person.

Alternate service to Dulles is via the BWI Airport. Take the bus or van to BWI as described above, then transfer at the ground transportation booth to the BWI/Dulles interconnect bus. The fare from BWI to Dulles on the interconnect bus is $20.

Limousine service is available to Dulles from Baltimore for a cost of $96 per car. The limosine will accommodate up to six passengers. Reservations are required. Please telephone Maryland Limousine Service at 850-4100.

Close-Out Plans

All **Poster Boards** will be removed TODAY (Wednesday) at 18:00. Any notices or posters left on the boards will be discarded at that time.

The **Exhibit Area** will close promptly at 18:00. Tear down will begin at that time.

The **Mailbox Area** will be open today until 18:30. This area will be open Thursday 08:00 to 13:30. Tear-down will begin promptly thereafter. The organizers will attempt to return all first class mail. All other materials will be discarded.

All areas of the Convention Center except the Pratt Street Lobby will close to participants one hour after the end of the Closing Assembly.

On Thursday, **Concessions** of coffee and pastries will be sold in the Pratt Street Lobby from 08:00 to 13:00.

Baggage check, Thursday, will be operated 08:00 to 15:00 in the upper Pratt Street Lobby. The cost is $.50 per item. It will close at exactly 15:00. At that time, all unclaimed items will be taken to the Convention Center Lost and Found. The local organizers are not responsible for unclaimed items.

Baltimore Hospitality Needed

We have visitors from abroad who are urgently in need of temporary housing after the General Assembly is over, due to travel connection schedules. If you are interested in hosting a visitor in your home for a day or two, please post your name and home number on the LOC Bulletin Board. Visitors who need housing, please read this Bulletin Board daily and contact people as indicated.

PUBLISHER'S CORNER

Technology Terrifies Typesetters

by Pamela Hawkins Blondin

What is this new technology that makes *IAU Today* possible? Desktop publishing allows universities to save countless dollars by publishing important reports themselves. Public relations offices around the world are cancelling contracts with typesetters and producing glamorous promotional materials in-house. In a relatively few hours, ten people produce a polished newspaper for a world assembly of astronomers. Desktop publishing, a major step beyond word processing, is revolutionizing the presentation of the written word.

Desktop publishing is a simple software concept that allows the user of a fairly-sophisticated microcomputer to become a graphic designer, publisher, and typesetter. It is a major commercial product of the new age of information technology.

IAU Today is published with a relatively simple and widely available desktop publishing system. Xerox Ventura Desktop Publisher operates on the equivalent of an IBM AT with a simple laser printer. There are many comparable hardware systems and software packages as well as many more complex systems that will handle the heavy demands of producing magazines, books, more elaborate newspapers, and other publications.

Desktop publishing allows the user to combine text files prepared with a word-processing program, graphic files, and even digitized photographs with "style-sheets" that define the underlying design of a publication. Sounds complicated? Consider how we produced this page, and perhaps you will change your mind.

1. The articles were written directly on a computer terminal with a common word-processing package (approximately 30 minutes).

2. The page was designed by using various simple functions in the desktop publishing package (15 minutes).

3. The article was retrieved from a disk file and inserted into the page format. Appropriate adjustments were made so that the columns would line up; each headline was designed with a few keystrokes (15 minutes).

4. The page was printed and proofread, corrections were made at the terminal, and a final page was printed and prepared for reproduction (20-30 minutes).

Of course, the larger and more complex a document becomes, the more time is involved in producing a finished product (please don't think that producing this newspaper is an effortless task). However, the software simplifies the tasks in producing a finished publication.


PUBLISHER'S CORNER¶

Technology Terrifies Typesetters¶

PROCESS OR PERISH? Photograph of the monitor screen on which the accompanying article was composed with a desktop publishing program.

There is a very strong interactive relationship between the word-processing and desktop publishing software which, for example, allows the user to designate headlines in the word-processor or to edit or compose text right on the screen of the desktop publisher. Another feature of most systems is the WYSIWYG ("What You See is What You Get") display that allows you to see the page on the screen as it is being designed.

Like any type of information technology, a complete system of hardware and software for desktop publishing can cost as much as you are willing to spend. However, simple, very effective systems such as the one on which this paper is produced can be purchased for less than $6,000, including software and hardware.

SPACE TELESCOPE / from page 1

the status of the instrumentation and on the project as a whole. During the delay, the instrument teams and the Space Telescope Science Institute have improved their understanding of the telescope and instrument capabilities and, in instances such as the Faint Object Spectograph, have corrected or improved their performance. Thus, the morning sessions will feature presentations of current information on the instruments' calibrations as well as information concerning anticipated user-support facilities and the General and Guaranteed Time Observer science programs. As a necessary byproduct of the high accuracy pointing and target acquisition required for HST, the STScI has digitized Northern and Southern Hemisphere photographic sky surveys to create a unique database of 19.5 million star identifications. A description of some astronomical applications of this Guide Star catalog will be the last invited topic of the morning.

Will the thrill be gone three or four years after launch? The afternoon sessions will consider current plans for keeping HST at the forefront of astronomy over its intended 15-year lifetime. Space shuttle visits every three to five years will bring new parts including state-of-the art scientific instruments. The selection of the second-generation instruments is already at a fairly advanced state; and the principal investigators of the instruments currently in the technical study phase will review the capabilities of their devices today. Of particular interest to the community is which of the two competing infrared camera/spectrographs will be chosen by NASA later this year. This topic might engender considerable discussion.

What about the next generation of astronomers? Design studies for the HST began more than twenty years ago and the lead times for projects in space astronomy aren't getting shorter. Thus the Baltimore G.A. is a good occasion to explore possible successors to the HST. These include larger, perhaps segmented, space telescopes and large baseline, orbiting optical interferometers. To end J.D. VII on an upbeat note, we have invited Professor G. Illingworth to discuss a possible 8-m telescope in space, and Professors N. Kardashev and M. Longair will give some personal perspectives on the next thirty years of space astronomy.

Undoubtedly there will be several Joint Discussions devoted to the results of the HST during the next General Assembly in Buenos Aires. We shall have to wait until then to see that beautiful slide of the galaxy at redshift 0.7; and the devotees of M87 must be content with the beautiful radio pictures made with the VLA. Please bear with us!

Back Issues of IAU TODAY

Back issues are available at the General Assembly Information Booth in the Pratt Street Lobby.