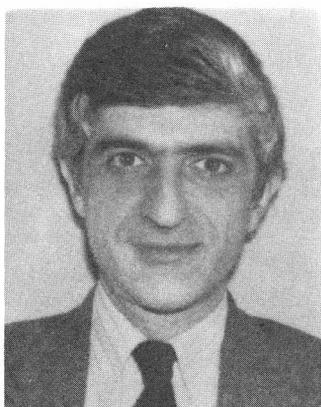




## Panagia Reports New 1987A Changes; Science Fair Awards in June



DR. PANAGIA

Dr. Nino Panagia, Space Telescope Science Institute, will address National Capital Astronomers on June 6. He will present data from the past three weeks to a few days on very important changes in the Magellanic-cloud supernova, SN 1988A.

New data are beginning to explain some of the peculiarities of the SN. The ultraviolet spectrum of the previously suspected progenitor, Sanduleak 69-202, has completely disappeared; the star no longer exists as the previous 12th-magnitude supergiant. The explosion was asymmetric; expansion velocities and masses differ. In the past three weeks radiation in the UV spectrum has begun to rise slightly again, perhaps because of thinning of the expanding envelope. It is apparently approaching the typical type-II curve asymptotically. Recently the optical magnitude has been very gradually decreasing (becoming brighter), and seems now to have peaked (at about magnitude 2.9. See IAU Excerpts, page 40. this issue. -- Ed.)

Dr. Panagia will elaborate on these and other new findings and present new interpretations.

Nino Panagia was born in Rome, Italy. He received his degree (equivalent to the Ph.D.) in physics from the University of Rome in 1966 with his thesis on stellar models. He subsequently studied diffuse interstellar matter and interpretation of UV spectral lines in the stellar winds of early-type stars. In 1972-3 at Cornell University he studied model theory of H-II regions around early stars. He is one of fifteen European Space Agency astronomers at the Space Telescope Science Institute in Baltimore.

### JUNE CALENDAR -- *The public is welcome.*

Tuesday June 2, 9, 16, 23, 30, 7:30 pm -- Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

Friday, June 5, 12, 19, 26, 7:30 pm -- Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

Friday, June 19, 26, 9:30 pm -- NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at 960-9126.

Saturday, June 6, 6:00 pm -- Dinner with the speaker at the Smithson Restaurant, 6th and C Streets, SW., inside the Holiday Inn. Reservations unnecessary. Use the 7th Street and Maryland Avenue exit of the L'Enfant Plaza Metrorail station.

Saturday, May 2, 8:15 pm -- NCA monthly lecture in the Einstein Planetarium of the National Air and Space Museum, Seventh Street and Independence Avenue, SW. (Enter Independence Avenue side. Dr. Panagia will speak.

Saturday, June 20, July 25, August 15, 9:00 pm -- *Exploring the Sky*, presented jointly by NCA and the National Park Service. Glover Road south of Military Road, NW, near Rock Creek Nature Center. Information: 320-3621.

For other organizations' events of interest see elsewhere in this issue.

## JUNE MEETING

Dr. George Sonneborn, Telescope Operations Manager for the International Ultraviolet Explorer satellite (IUE), delivered the May 2 National Capital Astronomers colloquium at the National Air and Space Museum. He presented recent ultraviolet data from the Magellanic-Cloud supernova, 1987A, and some interpretations.

He emphasized the importance of SN1987A as the first supernova for which identification of the progenitor star seems possible, and presented current evidence for such identification. It is the closest, about 170,000 light years, since 1605 (Kepler's star), and the brightest since 1885 in the Andromeda galaxy. The latter did not reach naked-eye brightness.

Because of its brightness, it was discovered quite early, which allowed the rising light curve to be monitored. The optical spectrum showed Balmer lines of hydrogen, which indicates a type II supernova; it is atypical, however, in several peculiarities. The rapidity of its rise in brightness, about six magnitudes in less than 3 hours (100 times), has never before been seen. Plates taken the day before discovery show that it could not have been brighter than magnitude 12.5. Although it is exceptionally bright because of its closeness, its absolute brightness is less than expected for such an object. The expansion velocity approximates 15,000 kilometers per second -- about .05 times the speed of light. About 5,000 km/s is more usual; few exceed 10,000 km/s.

A strong, early continuum faded by a factor of 1000 in four days; no UV emission lines, usually seen in type II spectra, were displayed. Comparison of IUE spectra from 120 to 190 nm, taken on 24 February at 20:55 UT and less than three hours later showed an unprecedented 20 percent decrease in UV radiation. The optical brightness was simultaneously increasing. By 26 February the far UV spectrum had essentially disappeared, except for an unknown 190 nm feature which persisted until about 1 March. Meanwhile, the 200 to 320 nm UV was rapidly declining, while the optical radiation was increasing. The ultraviolet behavior first suggested a type I supernova, while the optical spectrum showed Balmer lines of hydrogen, indicating a type II. The confusion has since been resolved as a type II, albeit with some peculiar behavior.

Never before has so bright an extragalactic source been available for spectroscopy. It has made possible the detailed, high-dispersion UV and optical absorption spectra of the interstellar gas in the outer parts of our own galaxy.

Australian radiotelescopes detected the SN early, but the radio emission was already fading as was the UV. Ordinarily, the radio emission would be expected to peak weeks or months later.

No gamma or X-ray emission has been detected to date. Attempts by the Solar Maximum Mission have so far been unsuccessful. This is not entirely unexpected; The expanding envelope must first thin out enough to become transparent to these wavelengths. Perhaps in a few weeks or months these emissions will be detected.

Neutrinos, predicted by the theory, had never before been detected from a supernova. From 1987A, a burst of 13 neutrinos was detected in Japan, and eight in Ohio. Neutrinos penetrate everything, including the Earth, and are extremely difficult to capture! About 99 percent of the energy of a supernova is emitted in the form of neutrinos. Of the remaining one percent, about 99 percent is the kinetic energy of the explosion dispersing the mass. The remaining one ten-thousandth of the total energy is the radiation we observe.

The optical brightness had risen to about 4.5, declined slightly, then increased again to about 3.5, where by April 27 it seemed to plateau, probably to have peaked in the optical, but is still slowly rising in the UV. This may indicate that the envelope is thinning, thus becoming more transparent.

Previous plates show a 12th-magnitude type B3 supergiant, Sanduleak -69 202, in the position of the supernova. This may have been the progenitor. There are some astrophysical reasons to doubt this, however; This is not the type of star that is expected to explode. (B-types are young, very hot, blue-white stars.) It seems, however, to be the best candidate, as indicated by the UV spectra of two stars taken by the IUE following the drop in UV from the SN. There were two fainter stars on opposite sides of S -69 202 on previous plates. The two recorded spectra seem to be separated too widely to be those of S -69 202 and one of the fainter stars, but seem to indicate the two fainter stars. S -69 202 seems to be missing!

Before 1987A fades from view, great advances in the understanding of the supernova processes, and of the galactic envelope, seem promised.

R.H. McCracken

## NCA ELECTS FISCAL 1988 OFFICERS

Elected at the May 1987 annual meeting of National Capital Astronomers were: President, Walter I. Nissen; Vice President, Jay H. Miller; Secretary, Patricia B. Trueblood; Treasurer, Ruth S. Freitag; Trustee, Stanley G. Cawelti; Sergeant at Arms, Frank Dischel.

### OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call (301) 495-9062 (silver Spring, MD).

Date	UT Time	Place	Vis Mag	Pent Sunlit	Cusp Angle	Min Aper
06-06-87	03:09	Herndon, VA	7.8	63	14N	10 cm
06-14-87	04:02	Pleasant Springs, MD	4.8	92	5N	10 cm
06-23-87	09:17	Ruther Glen, VA	6.1	7	17N	8 cm

### SCIENCE FAIR AWARDS IN JUNE

Three winners of the annual National Capital Astronomers High School Science Fair Awards will be presented one-year junior NCA memberships at the June lecture meeting: Jonathan Worsley, McDonough High School, Pomfret, Maryland, for his project on the use of photography in space distance measurement; Michael E. Souaya, St. Bernadette School, for his project on tracking Jupiter's satellites; Justin Metcalfe, Takoma Park Intermediate School, for his project on meteor showers.

We welcome these young people into membership, and thank NCA Science Fair Judges Robert Bolster, Jay Miller, and Walter Nissen for their contributions to tomorrow's scientific leadership.

### NCA WELCOMES NEW MEMBERS

Melvin J. Alexanderwicz Family  
2200 Decatur Place, NW  
Washington, DC 20008

George and Dorothy Elford Family  
7546 Coddle Harbor Lane  
Potomac, MD 20854

Daniel and Karen Elsea Family  
11023 Beavertree Lake Drive #409  
Reston, VA 22090

Warren A Erickson  
5623 Ridgeview Drive  
Alexandria, VA 22310

Eric O. Nystrom  
3317 Holly Berry Court  
Falls Church, VA 22042

Charles R. Sherwood  
8601 Lancia Court  
McLean, Va 22102

Mary R. Spriggs  
7401 Eastmoreland Road #404  
Annandale, VA 22003

### AIR AND SPACE MUSEUM OFFERS PROGRAMS, TELESCOPIC SKY VIEWING

The following free, public programs will be held in the Einstein Planetarium of the National Air and Space Museum.

Saturday, June 6, 9:30 am -- "The Great Equatorial." Jan K. Herman, Historian of the Old Naval Observatory, will relate the history surrounding the 26-inch equatorial refractor (now at the present Naval Observatory) when it was installed at the old Naval Observatory in 1873. Following the talk, weather permitting, NCA President and NASM Docent Stanley Cawelti will offer safe telescopic solar viewing on the east deck.

Wednesday, June 17, 7:30 pm -- "Star Formation and Stellar Demise." Harry L. Shipman, professor of physics, University of Delaware, will describe supernovas. Following the talk, weather permitting, Stanley Cawelti will provide telescopic sky viewing on the east deck.

The Air and Space Museum will be open from 10:00 am to 9:00 pm. until Memorial Day,

### ASTRONOMY AND PERSONAL COMPUTERS

This past month I attended a lecture on teaching celestial mechanics with the aid of a PC, by Professor J.M.A. Danby of North Carolina State University. He demonstrated programs in **Turbo Pascal** that he uses in his classes. One program plotted ellipses, another plotted the orbits of binary stars, others showed different spacecraft orbits resulting from changing launch conditions or from applying thrust during the orbit. Danby believes firmly in using PC's as a part of the educational process, and has written a textbook on differential equations that expects the student to solve problems by writing programs. He also has written a textbook, **Fundamentals of Celestial Mechanics**, which he says is being released this summer.

Danby's demonstrations were done with a Compaq portable PC and a Kodak Datashow, which is an LCD display device that sits on a viewgraph projector and shows what is on the screen. The Computer worked very well. The Datashow was very affected by the heat from the projector and was essentially useless.

Another lecture at the same conference was given by Professor W. Jefferys from the University of Texas, who has written a computer language for least squares problems, which he has named **Gauss**. (The least squares process is used for smoothing data curves.) This interesting language is still under development, but Jefferys has a version that executes on a Macintosh. The software is written in C, but can be converted for any computer with a C compiler.

These lectures were a part of a meeting of the Division on Dynamical Astronomy of the American Astronomical Society. The DDA will be meeting in Gaithersburg next summer, in conjunction with a symposium on celestial mechanics, and the International Astronomical Union meeting in August in Baltimore.

Joan B. Dunham

## EXCERPTS FROM THE IAU CIRCULARS

1. April 19 -- Ducati and Costa, Universidad du Sul, detected molecular bands of C<sub>3</sub>, H<sub>2</sub>O<sup>+</sup>, CO<sup>+</sup>, and C<sub>2</sub> in Comet Wilson with the 60-cm Lowell telescope at Cerro Tololo.
2. April 23 -- Carolyn and Eugene Shoemaker discovered a comet of 14th magnitude in Ophiuchus with the 46-cm Schmidt telescope at Palomar.
3. Supernova 1987A brightened 0.03 magnitude per day during April to a plateau of 2.9. The IAU data have shown increased UV brightness at 280 to 330 nm since mid April. Speckle interferometry with the Anglo-Australian telescope and the 4-m Cerro Tololo telescope now shows a feature 3 magnitudes fainter than the S/N at a position angle of 195 degrees and a distance of 0.06 second. Robert N. Bolster

## NASA GODDARD COLLOQUIA SCHEDULED

The NASA Goddard Space Flight Center scientific colloquia are held on Fridays at 3:30 pm in the Building 3 Auditorium. Coffee and tea are served from 3:00. Enter the main gate and obtain a visitors pass from the guard. Call Jaylee Mead, 286-8543, for further information

June 5 -- "Formation of the Terrestrial Planets," George Wetherill, Carnegie DTM.  
June 12 -- The John C. Lindsay Memorial Lecture.

## FOR SALE

Unfinished telescope started in NCA class. Parts include finished and aluminized 6-inch F/8 mirror, tube, wooden mirror cell with adjustments, equatorial pipe mount with cradle for tube. \$75.00. Rob Woodruff, 949-1656 (Aspen Hill - Silver Spring, MD) Call evenings.

## THANKS

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★ S T A R D U S T

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