
THE U.S. NAVAL OBSERVATORY



STAR



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The Captain's Corner

***CAPT Ben Jaramillo,
Superintendent***

I am sure all of you are still saddened by the events of September 11, 2001. Whether you are military, DoD civilian, or contractor it is hard not to somehow take those actions personally. As you look around you, you can see that life has certainly changed. I know I look at many things differently today. I am proud in the way you have coped with these changes especially the changes in security. The changes may not always make sense but they are implemented to ensure our safety and well being. If you keep that in mind the changes will be easier to live with. As I said in our last All Hands meeting, we, as the USNO community, will overcome this dramatic time in history. Please ask questions, talk to each other and reach out to those that are having a difficult time with today's events.

On a different note, it is the beginning of a new fiscal year. I want to thank all of you for a highly successful FY01 and I look forward to the challenges of FY02. I would like to pass along a special thanks to the Resource Management Department for doing an outstanding job in closing out FY01.

As the crisp, chilly air of fall is upon us and with winter not too far off, we have many events that I hope you consider for participation. The Combined Federal Campaign was a great success, ending with the annual Chili Cook-off, and the OS department is busy planning the annual Christmas party. Before we know it, the holidays will be here and, hopefully, a joyous time for us all to spend with family and friends. Be careful and have fun and I will see you as I walk around the grand grounds of the USNO.

USNO Releases STELLA 2.0 Software for Windows

***Nancy Oliveresen,
Astronomical Applications Department***

STELLA (System To Estimate Latitude and Longitude Astronomically) is a celestial navigation software system developed by the staff of the USNO Astronomical Applications Department for DoD use. The original version of STELLA (STELLA 1.0) was first distributed to Navy users in September 1995 and was developed for PCs using the Microsoft DOS operating system. An updated version of STELLA (STELLA 2.0) was completed and released to the fleet in January 2001. To-date 390 STELLA CD-ROMs have been distributed to Navy vessels and commands and 1100 copies were provided to the U.S. Naval Academy.

STELLA 2.0 has been specifically designed for PCs running the Microsoft 32-bit Windows operating systems (e.g. Windows 95, 98, 2000, NT). In general, STELLA 2.0 retains all of the basic functionality that was present in STELLA 1.x. In addition, STELLA 2.0 incorporates an updated Windows-based interface, features better integration of the navigation tasks, has an expanded help facility, and extends the date coverage from 1970 through 2010. A web site has been established for providing the latest STELLA information and updates:

<http://aa.usno.navy.mil/DoD/software/stella/>

STELLA was designed to simplify the process of celestial navigation by substantially reducing the

In This Issue:

Transit Circle Installed in B1.....	2
In The News.....	3
Security Notes.....	3
Announcements.....	4
Abstracts.....	4
USNO Happenings.....	6

amount of calculations that have to be performed by hand, and by reducing the need to rely upon printed almanacs and publications. In addition, STELLA is based on several new mathematical approaches to celestial navigation, originally developed by George Kaplan of the USNO staff. These include new developments of the sailing formulas, a rigorous method of computing a celestial body's position in the sky, a new algorithm for rise and set predictions for a moving platform, and new flexible ways of combining observations to form a fix. STELLA's computations are performed to one- arcsecond precision - about 30 meters on the surface of the Earth - far exceeding the accuracy attainable by hand-held sextants. This high precision was built into STELLA because its computational modules were designed for use with possible future automated instrumentation systems. Even with hand-held sextants, the improved precision of STELLA's calculations and the options it provides the navigator are likely to result in better fixes.

STELLA Use by the U.S. Coast Guard



Lt. Hollingshead points out stars to a cadet with a STELLA sky chart in the foreground (photo credit: Hartford Courant.)

In addition to its widespread use in the Navy, STELLA has been enthusiastically adopted for use by the U.S. Coast Guard. Every summer Coast Guard cadets are trained in seamanship and celestial navigation aboard the USCG Barque *Eagle*. William Tangren and Wendy Hultquist, two members of the STELLA team, were invited to sail on one of the *Eagle's* training cruises. They boarded the *Eagle* on July 29, 2001, for a 5 day trip from Norfolk, VA to New Bedford, MA. During the voyage they gave a short presentation on STELLA to the cadets and crew of the *Eagle* and assisted with the recording of sights. The *Eagle's* Capt. Luke stated that STELLA has helped to revitalize celestial navigation

training by the U.S. Coast Guard Academy. It has allowed the cadets to focus on learning celestial navigation and improving their sextant skills rather than spending large amounts of time correcting minor arithmetic errors. During the voyage, the USNO guests had many fruitful discussions with the *Eagle* crew concerning ways to improve STELLA in future releases.



USNO's Bill Tangren aboard the USCG Barque Eagle.

Historic 6-inch Transit Circle Displayed in Building 1

If you haven't ventured up to Building 1 over the past several weeks, you haven't seen one of USNO's most important instruments in its new home. Thanks to the efforts of Ted Rafferty, John Pohlman, and members of the AD Instrument Shop, the centenarian telescope now has a permanent and prominent place of honor for all USNO staff and visitors to see.

The 6-inch Transit Circle at USNO was built in 1897 by Warner & Swasey, and was used continuously from then until 1995. It is a highly specialized instrument, rigidly mounted so that it can only look along a line passing from north to south through the zenith (the point directly overhead). A star's position is measured as it crosses, or "transits", a set of crosshairs mounted at the telescope's focal plane. The time of the star's transit, measured against a celestial reference frame, gives its Right Ascension or celestial longitude. The star's altitude is measured

directly at the telescope, where two circles, each divided into 7200 sectors, are read by the observer. This reading can then be converted directly into the star's Declination, or celestial latitude. Transit circles could determine stellar positions to accuracies approaching 0.05 arcseconds. Although these measurements are no longer carried out today, their legacy forms the basis of many of our star catalogs.

The telescope celebrated the centennial of its first observation on 14 February, 1998. Ted Rafferty made the final observation with the instrument on the following day. During its long career nearly one million individual star position measurements were made.

The 5-inch Alvan Clark refractor, made for the 1874 transit of Venus, that used to grace the lobby of Building 1 has been moved down to the lobby of Building 52. Two other telescopes made for this expedition are also on display at USNO. One is in the Pier Room of Building 1, while the other greets visitors in Building 56.



The Transit Circle under assembly in Building 1

USNO In The News

The terrorist attacks on September 11 have forced a temporary closing of the USNO for public tours, but we are nevertheless still very much in the public eye.

A bright fireball, which occurred on the morning of September 6th, generated dozens of inquiries. As it turned out, the fireball was produced by a decaying rocket booster that was launched by the former Soviet Union in 1975.

High solar activity has resulted in several impressive displays of the Northern Lights across most of the country. The most recent, on November 5th, caused quite a stir in the Washington area.

Anticipation is running high for a good display of the Leonid meteor shower this year. Over the past few years, this event has generated tremendous interest in the media. We anticipate a similar amount of interest this year.

Security Notes

USNO POLICE EMERGENCY NUMBERS:

34th Street (24/7): 762-1468

South Gate (24/7): 762-1491

MEDICAL/FIRE EMERGENCIES: 99-911

(When calling the local emergency number please notify the NDW/USNO police in order to escort the emergency personnel and vehicles to the scene).

Naval District Washington (NDW) Force Protection Condition (FPCON) is currently at Bravo +, with FPCON Charlie Measures in effect 33, 35, 36, 38. Force Protection Measures are available for review in NDWINST 5530.14A, Appendix 2.

South Gate hours: 24/7, Sunday - Saturday.

All other gates are closed until further notice.

USNO Vehicle Registration, Building #59, Monday - Friday, 0800 - 1400 hours.

Identification Badges can be obtained at Nebraska Avenue, Building #43. Telephone # 764-0507.

Visitor Security Requirements:

All visitors must have a picture identification and will be issued a visitor's badge at the South Gate upon arrival, which shall be worn at all times and returned to the NDW Police on departure. Visitors should add additional time prior to arriving at their destination for issuance of a visitor's badge and vehicle inspection. ***All non-U.S. citizens are required to be sponsored by two USNO sponsors.*** Visitors without sponsorship will not be authorized to enter the U.S. Naval Observatory grounds.

ANNOUNCEMENTS

Command "Pass-down" Photo Album

Over the course of the next few weeks Lisa Turner and Geoff Chester will be compiling a "Virtual Staff Directory" for the benefit of our new CO and XO as they rotate in. We'd like to make this as painless as possible, so Lisa will be contacting your Department Heads to arrange a suitable time and place for individual and group photos. We will put the directory on line over the USNO Intranet, as well as compile a "hardcover" photo album for our new officers.

MWR Sales

Due to the suspension of the public tours, MWR has not been able to sell much in the way of USNO merchandise. Watch for upcoming MWR sales, and bear in mind that the holidays are just around the corner. Surely someone you know would love to have a USNO T-shirt or sweatshirt!

Annual Holiday Party

The annual USNO holiday party is scheduled for Tuesday, 13 December, from 1200 - 1530. It will be held in Building 1 and feature food provided by The Stargazer Cafe, music from an ensemble of the Navy Band, door prizes, and an appearance by Santa Claus. Tickets will be free for Navy Federal staff and their immediate families, \$10.00 for retirees, contractors, and guests.

Combined Federal Campaign

This year's Combined Federal Campaign was a resounding success. Command Chief Barry Wass reports: "We have concluded a very successful Combined Federal Campaign. Our goal this year was \$16,000 and USNO raised \$17,786. This is particularly noteworthy in view of the slump in the current economy and the fact that many people have already made contributions to the various relief funds associated with the September 11th funds.

"We achieved 111% of our goal which is a significant increase from last year's total (\$15,800). This gives us an average contribution of \$174.37 per person (overall). Our actual percentage of contributors was 51% so I think we did extremely well."



N096 RADM Richard West and Superintendent CAPT Ben Jaramillo Judge entries in the annual CFC Chili Cook-off

ABSTRACTS OF RECENT PAPERS:

SPECKLE INTERFEROMETRY OF NEW AND PROBLEM HIPPARCOS BINARIES. II. OBSERVATIONS OBTAINED IN 1998-1999 FROM McDONALD OBSERVATORY

Brian D. Mason, William I. Hartkopf, Ellis R. Holdenried, and Theodore J. Rafferty

The Hipparcos satellite made measurements of over 9,734 known double stars, 3,406 new double stars, and 11,687 unresolved, but possible double stars. The

high angular resolution afforded by speckle interferometry makes it an efficient means to confirm these systems from the ground, which were first discovered from space. Due to its coverage of a different region of angular separation - magnitude difference (p-dm) space, speckle interferometry also holds promise to ascertain the duplicity of the unresolved Hipparcos "problem" stars. Presented are observations of 116 new Hipparcos double stars, 469 Hipparcos "problem stars," as well as 238 measures of other double stars, and 246 other high quality non-detections. Included in these are observations of double stars listed in the Tycho-2 Catalogue and possible grid stars for the SIM mission.

SEARCH FOR FAINT COMPANIONS TO NEARBY SOLAR-LIKE STARS USING THE ADAPTIVE OPTICS SYSTEM AT MOUNT WILSON OBSERVATORY

Nils H. Turner, Theo A. ten Brummelaar, Harold A. McAlister, Brian D. Mason, William I. Hartkopf, and Lewis C. Roberts, Jr.

We present results of a search for faint companions to nearby ($d < 25$ pc) solar-like (F and G spectral type) stars using the natural guide star adaptive optics system on the Mount Wilson 100 inch (2.5 m) telescope during the period 1996 June to 1999 August. The observing list, based on the third edition (1991) of the Catalogue of Nearby Stars by Gliese and Jahreiss, at present has 416 entries. To date, about 20% of the objects have been observed under varied seeing conditions. We have detected faint visible companions to five of these stars: HD 144287, Mu Her A, HR 7123, 16 Cyg A, and HD 190067. The companions of three of these --- Mu Her A, HR 7123, and HD 190067 --- are new discoveries.

THE USNO CCD ASTROGRAPH CATALOG (UCAC) PROJECT AND BEYOND

Norbert Zacharias

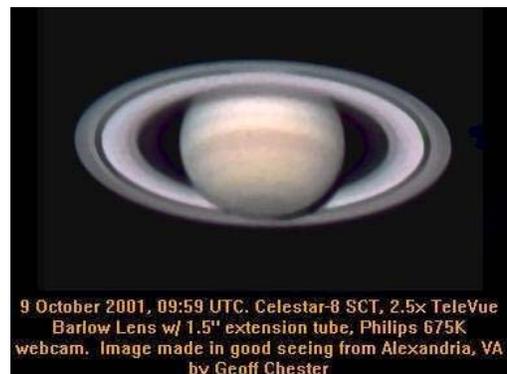
The goal of this project is to map the entire sky to provide high accuracy positions and proper motions for stars in the magnitude range of 8 to 16. For 10 to 14 mag stars a standard error of 20 mas and 1-2 mas/year, respectively, is expected. The 20 cm aperture U.S. Naval Observatory (USNO) astrograph

with a 4k CCD is being used at CTIO, Chile (1998 to 2001) and later at Flagstaff, Arizona. This extension of the Hipparcos system is tied directly to the extragalactic reference frame with additional observations performed at 1-meter class telescopes. By 2004 the final catalog of about 60 million stars is expected. The preliminary UCAC data already had an impact on minor planet observing and projects like the Sloan Digital Sky Survey (SDSS) and the 2-Micron All Sky Survey (2MASS). An outlook is given for similar, even more ambitious, future projects, utilizing the wide field of view which is available with such astrographs.

A DEDICATED 1-METER TELESCOPE FOR HIGH PRECISION ASTROMETRIC SKY MAPPING OF FAINT STARS

Christian de Veigt, Uwe Laux, and Norbert Zacharias

Requirements for future, ground-based, global, astrometric surveys are discussed. A new generation of catadioptric telescopes for high-precision astrometric catalog work is described. Results of design studies for modified Richter-Slevogt optical systems with apertures of 0.5 to 1.0 m and aperture ratios of about f/4 are presented. It is shown that these systems can be made nearly diffraction-limited with a field size up to 3 degree diameter and very small third-order distortion (less than 1.0 arcsec/deg**3). Because of their compact design (tube length less than 0.5 f) these telescope systems are optimal for automatic and remote operation. An example 0.9 m instrument could map a hemisphere with 4-fold overlap to 21st magnitude in one year, providing 10 mas positional accuracy for stars in the 15 to 19 mag range. The proposed design is applicable for dedicated photometric telescopes as well.



USNO
H*A*P*P*E*N*I*N*G*S
SECNAV Visits USNO



Secretary of the Navy Gordon England paid a visit to USNO on November 8. Following a luncheon with N096 RADM Richard West, he toured the grounds with Superintendent CAPT Ben Jaramillo and Scientific Director Ken Johnston.

USNO Visits Camden Yards



The Superintendent and Mrs. Jaramillo enjoy a beautiful day at the ballpark on August 18 along with many other USNO staff members.

USNO H*A*P*P*E*N*I*N*G*S



The Time Service Department has taken delivery of a new Two-way Satellite Time-Transfer mobile earth station, replacing the old van that's been in use since 1987.

Currently under test and calibration, it will make its first road trip to Maine in the coming weeks.

The U.S. Naval Observatory *Star*

U.S. Naval Observatory, Washington, D.C.

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