

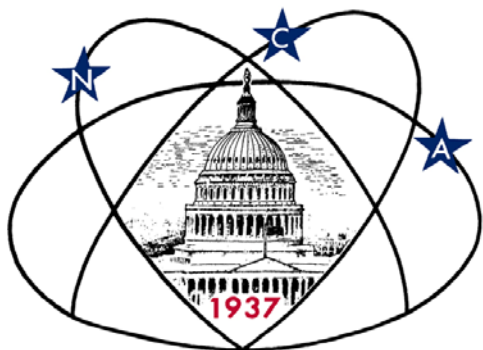
Star Dust

National Capital Astronomers, Inc.

February 2012

Volume 70, Issue 6

<http://capitlastronomers.org>



Next Meeting

When: Sat. Feb. 11, 2012
Time: 7:30 pm
Where: UM Observatory
Speaker: Jacqueline Fischer, NRL

Table of Contents

Preview of Feb. 2011 Talk.....	1
“Grab and Fly” Telescope.....	2
<i>The City Dark</i> Feb. 25.....	4
ESO 50 th Anniversary.....	5
Occultations.....	5
Agamemnon Occultation.....	6
Calendar.....	7

Directions to Dinner/Meeting

Members and guests are invited to join us for dinner at the Garden Restaurant located in the UMUC Inn & Conference Center, 3501 University Blvd E. The meeting is held at the UM Astronomy Observatory on Metzert Rd about halfway between Adelphi Rd and University Blvd.

Need a Ride?

Please contact Jay Miller, 240-401-8693, if you need a ride from the metro to dinner or to the meeting at the observatory. Please try to let him know in advance by e-mail at rigel1@starpower.net.

Observing after the Meeting

Following the meeting, members and guests are welcome to tour through the Observatory. Weather-permitting, several of the telescopes will also be set up for viewing.

February 2012: Jacqueline Fischer
Naval Research Laboratory

Herschel Space Observatory Spectroscopic Observations of Gas-Rich Mergers of Galaxies: Far-Infrared Line Deficits and Molecular Outflows

Abstract: The Herschel Space Observatory is an ESA-led space observatory with NASA contributions, launched to the Earth-Sun second Lagrange point in May 2009. It is the first observatory to cover the full far-infrared to submillimeter spectral range and hosts a 3.5-meter diameter telescope with the largest single primary mirror ever launched to space. I will discuss new Herschel Space Observatory observations of local ultraluminous infrared galaxies (ULIRGs) - galaxies with infrared luminosities as large as the optical luminosities of quasars. These galaxies trace a spectacular stage in the morphological transformation of mergers of gas-rich galaxies into gas-poor ellipticals. Our Herschel spectroscopic observations have revealed that this stage is often characterized by massive molecular outflows with velocities ~ 1000 km/sec and with order of magnitude deficits in far-infrared fine-structure line emission from atomic and ionized gas. AGN appear to be the dominant power sources in the ULIRGs with the highest outflow velocities, while the outflow velocity in the ULIRG with the highest line deficit in our sample is only ~ 100 km/sec and barely discernable in our data. I discuss the evidence, still inconclusive, that in many ULIRGs the central active galactic nucleus/nuclei or super-starbursts are fully or partially covered with far-IR thick media and that AGN power both the IR luminosities and the outflows.



Star Dust is published ten times yearly September through June, by the National Capital Astronomers, Inc. (NCA).

ISSN: 0898-7548

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Thank you!

Reminder

After the meeting, everyone is invited to join us at Plato's Diner in College Park. Plato's is located at 7150 Baltimore Ave. (US Rt. 1 at Calvert Rd.), just south of the university's campus. What if it's clear and you want to stick around and observe? No problem -- just come over when you're through. This is very informal, and we fully expect people to wander in and out.

Continued from Page 1

Biography: Jackie Fischer is an astrophysicist in the Radio/Infrared/Optical Sensors Branch of the Remote Sensing Division and is head of the Infrared – Submillimeter Astrophysics & Techniques Section. She was appointed as the Herschel Optical System Scientist and joined the Herschel Science Team in 2001. Her research interests are in the areas of the infrared instrumentation, evolution of galaxies, spectroscopic diagnostics of IR-bright galaxies, and in particular, in the role that galaxy mergers play in the morphological transformation of galaxies. She received a B.Sc. degree in Physics from the Hebrew University of Jerusalem in 1974 and a Ph.D. in astronomy from the State University of New York in Stony Brook in 1981. She first worked at NRL as a National Research Council postdoctoral associate and joined the Laboratory in 1988.

A Convenient “Grab and Fly” Telescope Setup

February, 2012

Tom Koonce

Lancaster, CA

Have you ever headed out on a long trip and wished that you could do a little stargazing once you arrived at your destination? But perhaps you have thought about the logistics of traveling with a telescope like the inconvenience of getting your telescope equipment through airport security, potential damage to the telescope, or maybe been daunted about what eyepieces and accessories to take? This article could help you to stop worrying... and start packing.

I had a unique opportunity to travel “down under” to observe from the dark skies of south central Australia, east of Melbourne, and then from the large island of Tasmania located off the southern tip of Australia. I knew I had to take a telescope with me or I'd certainly regret it. Major airlines fly into Melbourne, but only small “regional” airlines fly into Tasmania, so the amount of baggage I could take on the three week trip was strictly limited to a total weight of 23 kg (50.7 lbs). My astronomy setup would have to fit into an already limited volume that included work attire, a bulky jacket, shoes, shaving kit, notebooks of work materials, and a laptop. While the observing portion of this trip was secondary to the business portion of this trip, it was still very important to me personally and deserved careful planning ahead of time.

Some of my initial questions to be answered were concerning the climate of the location. Would it be hot or cold this time of year? Cloudy or clear? Dark skies or urban light pollution? My excitement grew as each of these answers were favorable to potential great southern sky views of the Clouds of Magellan, Southern Cross, Alpha Centauri, Canopus, the Coal Sack, the Tarantula Nebula, and on and on. Wow.

Now what telescope should be taken? It had to be portable, deliver wide-field views when paired with one or two eyepieces, but be of sufficient quality that I could “crank up the power” if I wanted to. It needed to be rugged enough to survive the jostling of going through security (I foresaw a major hassle regarding this) and the vibration shock of the flight and maybe a rough landing. It also needed to be light enough to be supported by a photo tripod since such a tripod was the only possible support within my weight and luggage volume limitations. I chose the Tele Vue Pronto ED doublet refractor telescope with a 480 mm focal length, f/6.8 and an objective diameter of 70 mm.

Continued on Page 3

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Continued from Page 2

I had purchased a Pronto in mint used condition from a friend for \$500 several years ago and loved it. When this short refractor is paired with both a Tele Vue 13mm Ethos and an 8mm Ethos, it can provide stunning views. The scope was also fitted with a 90 degree prism, two inch eyepiece focuser, a glass solar filter and a simple red dot sight.

I made a new foam insert for the stock Tele Vue Pronto padded carry bag to fit the telescope, both Ethos eyepieces, the right angle prism and accessories. I chose a closed cell foam with sufficient density to provide cushioning for all of the items, but rigid enough to hold each item securely. The solar filter, small red flashlight, my small southern sky atlas, dust blower and an O-III filter had to be carried in a 1 gallon ziplock in my suitcase, but still I was pleased that I managed to get my observing essentials down to such a small package.

The tripod I chose was the Manfrotto "Bogen" Carbon Fiber Tripod (BOG190CXPRO4) with a standard ball head. The entire tripod was no longer than the Pronto's carry case and I attached to the case with Velcro straps. The tripod was very light, but surprisingly stable with the 6 lb Pronto, diagonal, and with a 2 lb Ethos eyepiece mounted on it. Its maximum load was stated to be 11 lbs. The lack of a celestial drive was not an issue for my visual observations made with this setup. Also the time to setup and take down was less than 5 minutes. There was the expected difficulty looking at any object at zenith with this setup. To be honest, a big reason why I chose this tripod was because a friend offered to let me borrow one for the trip, and it's hard to argue with "free". It is an expensive tripod, but a perfect "Grab and Fly" match for this telescope setup.

Before the trip I had a concern regarding what this telescope/eyepiece/tripod package would look like to the airport security folks on their scanners since they probably hadn't seen too many telescopes come through as carry-on baggage? Primarily because of this, an extra hour was planned for security questions prior to the flight. I could have relaxed. I had no fluids (of course) in the bag, and nothing looked like a weapon on the X-ray. The TSA was very reasonable and had no problems whatsoever with the telescope. They did ask me what it was, to which I told them it was a "telescope lens", and then they sent me on my way. I was to my gate with an extra hour to spare. Once on the plane, this entire setup conveniently fit into an overhead aircraft bin, even on the regional-type aircraft from Melbourne south to Tasmania.

The trip allowed me ample time to observe the southern sky. The telescope setup worked like a champ. While I only used the solar filter once, I had the telescope out every night for at least two hours and all night long on the weekends. The weather in Tasmania had me chasing openings in the clouds for a couple of nights, but it cleared up and provided the darkest observing skies I have ever seen in my life. Regrettably the 70mm Tele Vue Pronto isn't made anymore, but it has been replaced by its close (more expensive) cousin, the Tele Vue 76 APO Doublet Refractor.

While this article has been about the selection of a convenient "Grab and Fly" telescope that could be taken anywhere one may be headed, I haven't said much about the deep sky views I had on my trip, of the hours I spent smiling, ear-to-ear, as I leisurely cruised from the Tarantula Nebula over to the Clouds of Magellan, or mention the friendliness of the Australian amateur astronomers I met. Those experiences were the real story made possible by having a "Grab and Fly" telescope.

NORTHERN VIRGINIA PREMIERE SCREENING

to benefit Arlington's David M. Brown Planetarium

A NEW **FEATURE DOCUMENTARY** FROM THE CO-CREATOR OF KING CORN



THE CITY **DARK**

a search for night on a planet that never sleeps

"Gorgeous."
- Indiewire

PRESENTED BY: Friends of Arlington's David M. Brown Planetarium, National Capital Astronomers, International Dark Sky Association, and Northern Virginia Astronomy Club

DATE: Saturday, February 25, 2012

TIME: 6:30 - 8:30 p.m., then telescope viewing (weather permitting)

LOCATION:	Founders Hall Auditorium	DONATION: Members \$8
	GMU - Arlington Campus	Non-members \$10
	3351 Fairfax Drive, Arlington, VA	Students \$5

Thank you Nancy Grace Roman
for finding this news release.

ESO 50th Anniversary

Complete news release at:
<http://www.eso.org/public/news/eso1202/>

The year 2012 marks the 50th anniversary of the European Southern Observatory (ESO), the foremost intergovernmental astronomy organisation in the world. On 5 October 1962, representatives from five European countries — Belgium, France, Germany, the Netherlands and Sweden signed the ESO Convention in Paris. Their signatures represented a formal commitment to establish the European Organisation for Astronomical Research in the Southern Hemisphere, today commonly referred to as the European Southern Observatory. ESO has come a long way since 1962.

ESO's first observatory was built on La Silla, a 2400 metre-high mountain, 600 kilometres north of Santiago de Chile. The La Silla Observatory is equipped with several optical telescopes with mirror diameters of up to 3.6 metres. The ESO 3.6-metre telescope is now home to the world's foremost exoplanet hunter, HARPS.

The second site established by ESO was the Paranal Observatory, home of the Very Large Telescope (VLT). Scientific operations began in 1999 and today the VLT is the flagship facility of European astronomy and with the VLT Interferometer (VLTI) the only regularly operated large interferometric telescope in the world. Also on Paranal, the VISTA telescope works in the infrared and is the world's largest survey telescope, while the VLT Survey Telescope is the largest telescope designed to survey the skies exclusively in visible light.

Continued on Page 7

Mid-Atlantic Occultations and Expeditions

David Dunham

Asteroidal Occultations

Date	Day	EST	Star	Mag.	Asteroid	Mag.	dur.	Ap.	Location
Feb 9	Thu	3:00	TYC54810542	11.9	Gonnessia	2.5	7	7	DE, MD, DC, nVA, WV
Feb 14	Tue	18:29	TYC48183009	11.3	Leonteus	4.5	7	7	NJ, PA; MD? Sun -9
Feb 15	Wed	1:07	2UC37896120	11.6C	Ursula	0.7	13	8	DE, MD, DC, nVA, OH
Feb 15	Wed	21:21	2UC44282531	11.6	Astarte	4.5	6	7	wPA, WV, VA, NC; MD?
Feb 22	Wed	20:53	TYC08170139	10.4	Lavrov	5.7	1	5	MD, nVA, WV, OH; DC?
Feb 24	Fri	4:15	TYC66580244	11.6	Hansa	1.3	7	7	NJ, DE, MD, VA; DC?
Feb 29	Wed	19:43	TYC18311670	11.3	2005 VA123	11.5	40	7	TNO; S.Am.; eN.Am?
Mar 8	Thu	18:31	SAO 92936	8.7	JUPITER		2157	3	D before sunset
Mar 10	Sat	23:20	SAO 112952	9.7	Mnemosyne	2.8	7	4	WV, nVA, DC, sMD, DE

Lunar Grazing Occultations (*, Dunham plans no expedition)

Date	Day	EST	Star	Mag.	% alt	CA	Location
Feb 14	Tue	3:08	SAO 183232	7.2	54-	21 5S	*MtJacksn, Mitchells, Poplar, VA
Feb 17	Fri	5:26	SAO 186529	8.2	21-	15 0N	Luray & Fredericksburg, VA
Feb 19	Sun	5:45	X 47620	9.4	7-	5 5N	*Burke&MtVernon, VA; Matawmn, MD
Feb 23	Thu	19:16	SAO 128350	9.6	4+	7 12N	*Damascus, Columbia&Dundalk, MD
Feb 26	Sun	22:03	ZC 313	7.1	23+	8 12N	Moosic, PA; Sparta&Wayne, NJ; NYC
Mar 2	Fri	20:00	SAO 78263	8.9	69+	72 10N	*Burke, VA & Brandywine, MD
Mar 2	Fri	20:03	ZC 969	7.3	69+	73 10N	*Culpeper, Stafd&Dahlgren, VA
Mar 5	Mon	17:16	Acubens	4.3	92+	20 -7S	*CrmlCh, VA; PtLookout, MD; Sun+9

Under Location, if two numbers are given, the first is the distance of the northern (for cusp angles, or CA, with N) or southern (for CA with S) limit (the graze line) from Greenbelt, MD and the second number is the bearing (azimuth) of that distance in deg.

Total Lunar Occultations

DATE	Day	EST	Ph	Star	Mag.	% alt	CA	Sp.	Notes
Feb 11	Sat	23:51	R	ZC 1885	7.3	77-	15 49N	K2	Az. 119
Feb 12	Sun	5:33	R	ZC 1906	7.8	75-	33 73S	K0	mg2 10.6, 48", PA 102
Feb 13	Mon	0:18	R	ZC 2018	6.6	66-	7 87N	A1	Az. 118
Feb 14	Tue	3:20	R	SAO 183232	7.2	54-	22 23S	F6	
Feb 15	Wed	3:36	R	SAO 184181	7.7	42-	15 68S	A3	Az. 137
Feb 15	Wed	3:36	R	ZC 2319	7.1	42-	15 52N	A0	Az. 136
Feb 15	Wed	6:11	R	ZC 2333	7.4	41-	28 51N	B9	Sun alt. -10 deg.
Feb 16	Thu	4:33	R	ZC 2471	7.9	31-	15 66N	A5	Az. 137
Feb 18	Sat	5:19	R	SAO 187789	7.7	13-	7 66S	B7	Az. 123
Feb 18	Sat	6:01	R	SAO 187837	7.8	13-	13 30S	F3	Sun -11, Az. 130
Feb 26	Sun	21:50	D	ZC 313	7.1	23+	10 42N	K0	Az. 282, maybe double?
Feb 27	Mon	21:13	D	RZ Arietis	5.8	31+	27 61S	M6	ZC 432
Feb 29	Wed	20:38	D	SAO 76668	7.6	50+	53 65S	G5	close double
Mar 1	Thu	19:42	D	114 Tauri	4.9	59+	70 61N	B2	ZC 817, close double?
Mar 2	Fri	0:24	D	SAO 77293	7.6	61+	20 67S	O7	
Mar 2	Fri	1:36	D	zeta Tauri	3.0	61+	7 16S	B4	Az. 291, ZC 847, sp.binary
Mar 2	Fri	18:00	D	SAO 78208	7.8	68+	62 33N	K0	Sun alt. -1 deg.
Mar 2	Fri	19:07	D	SAO 78252	7.7	69+	71 49N	K0	
Mar 2	Fri	23:44	D	16 Gem	6.2	70+	37 89S	A2	ZC 991
Mar 3	Sat	0:25	D	SAO 78420	8.0	70+	29 47S	A0	close double?
Mar 3	Sat	0:29	D	nu Gem	4.1	70+	28 41S	B6	ZC 995, mg2 6, ".2, PA139
Mar 3	Sat	1:11	D	SAO 78453	8.1	70+	20 64N	A0	
Mar 4	Sun	0:22	D	ZC 1114	6.8	79+	38 81N	F2	
Mar 4	Sun	1:57	D	ZC 1124	6.9	80+	20 47N	G5	mg2 12, sep. 13", PA 55dg
Mar 5	Mon	17:06	D	Acubens	4.3	92+	18 12S	A5	Sun+10, ZC1341, closeDbl?
Mar 7	Wed	1:30	D	14 Sex	6.2	98+	45 75S	K1	ZC1482, maybe double?
Mar 8	Thu	3:06	D	62 Leonis	6.0	100+	33 55S	K3	Terminator dist. 3"
Mar 8	Thu	3:50	R	= ZC 1605	6.0	100+	26 45N	K3	AA 323, term. dist. 2"
Mar 10	Sat	1:26	R	ZC 1845	6.5	95-	41 48N	G8	AA 321, mg2 9, 30", PA300d
Mar 10	Sat	22:55	R	SAO 158128	7.5	89-	16 71S	K5	
Mar 10	Sat	23:17	R	SAO 158141	7.7	89-	19 87S	M1	

Explanations & more information is at <http://iota.jhuapl.edu/exped.htm>. David Dunham, dunham@starpower.net, phone 301-526-5590. Timing equipment and even telescopes can be loaned for most expeditions that we actually undertake; we are always shortest of observers who can fit these events into their schedules, so we hope that you might be able to.

Information on timing occultations is at: <http://iota.jhuapl.edu/timng920.htm>.

Steve Conard answered my "911" call and discovered a satellite of asteroid (911) Agamemnon

David Dunham

Agamemnon's jealous wife chopped off his head; Steve found it, now circling his body in (almost) eternity.

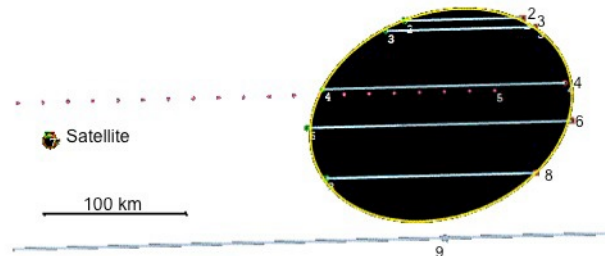
S. J. Conard, International Occultation Timing Association (IOTA), Gamber, MD; David Dunham, Greenbelt, MD; John Brooks, Winchester, VA; Tony George, Umatilla, OR; Dave Herald, Murrumbateman, Australia; Brad Timerson, Newark, NY; and Alin Tolea, Silver Spring, MD report that an occultation of the 8th magnitude star HIP 41337 (SAO 60804) by the Trojan asteroid (911) Agamemnon observed Thursday morning, Jan. 19 at 6:31 am EST, involved a secondary event that was consistent with a satellite. The observed occultation chord for the satellite had a length of 3 km, and was located 0.093 arcseconds from the asteroid at position angle 93 degrees - equivalent to a sky-plane separation of 278 km. Nearby observers did not record an occultation by the satellite, placing an absolute upper limit on the diameter of 36 km. However, comparison of the occultation light curves of the satellite with those of the main asteroid body indicate a diameter of 4 to 5 km.

The occultation observations involving the primary body are fit well by an ellipse with axes of 191 and 143 km. Photometric observations of this asteroid to determine the shape of the asteroid and to detect mutual eclipses and occultations are encouraged.

For more, see <http://www.asteroidoccultation.com/observations/Results/> which includes a video showing the clear occultation events that Steve recorded with a 14-in. SCT at Willow Oak Observatory in Gamber, northwest of Baltimore. The star's angular diameter, about 0.4 milli-arcseconds, was barely resolved by the observations, with its clear signature in the occultations by both the asteroid and the satellite. There was twilight, with the Sun altitude -10 deg. at the time, so any bird, airplane, or other flying object in the Earth's atmosphere would be faintly illuminated, and close examination of the video frames shows nothing like that, just a static background with some other field stars which remained visible with steady brightness during the recording (over two minutes long), including around the satellite event, which took place 10 seconds after the main event.

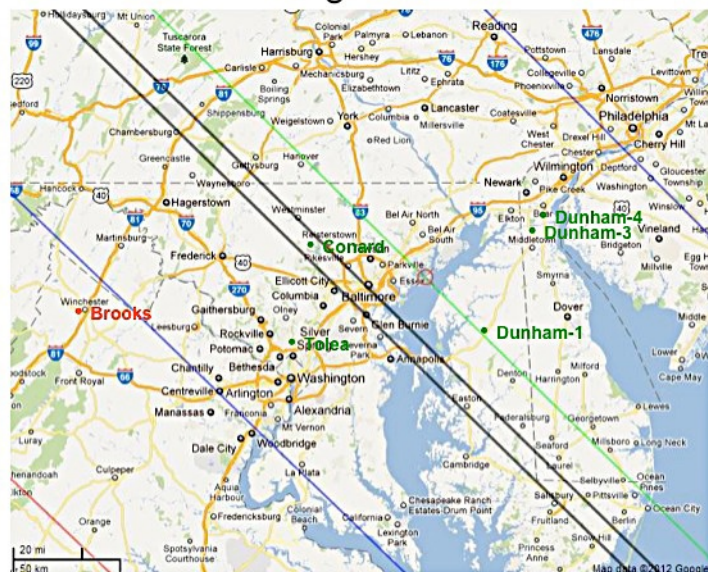
Besides Steve's observation, the occultation by the main asteroid was also recorded with "mighty mini" binocular-based video systems by Alin Tolea in Silver Spring, and by Dunham from three locations on the Delmarva Peninsula. Brooks' miss observation near Winchester, VA constrains the southern edge of the asteroid, while Timerson had a miss far to the north. The observations showed that the actual path shifted only about 25 km south of the predicted path, pretty good for a distant Trojan asteroid.

Sky-plane plot, 2012 Jan. 19th (911) Agamemnon occultation



Agamemnon: Axes 190.6 ± 0.9 by 143.8 ± 1.5 km, PA minor axis $-69.3^\circ \pm 1.3^\circ$, center $X 4661.6 \pm 0.4$ km, $Y 3113.7 \pm 0.6$ km; disappearances on right side Satellite plotted as 9-km circle (but it's more likely about 4 km across) $0.0931''$ (278 km in the plane) from Agamemnon's center in PA 93.8°

Map of 2012 Jan. 19th Agamemnon occ'n observers



Dunham ran a 2nd station between #1 and #3 but the video recorder at #2 failed.

Green dots mark positive observations, while red (Brooks) indicates a miss (negative, no occ'n). The green line is the predicted central line while the blue lines are the predicted path limits. The gray lines mark a 10-km zone bracketing Conard's location where the satellite occ'n occurred.

An occultation almost as good will occur at a more convenient time, at 11:20pm EST Saturday evening, March 10, when the large main-belt asteroid (57) Mnemosyne will occult a 9.7-mag. star in Orion; the northern limit of the east-west path is predicted to cross Washington, DC, but observers in the northern suburbs should also watch since the actual path could pass north of the predicted one. The Mnemosyne event will occur about 80 minutes after the National Capital Astronomers meeting, scheduled for that night, normally ends.

Continued from Page 5

On the Chajnantor plateau in Northern Chile, together with North American and East Asian partners, ESO is building a revolutionary astronomical telescope — ALMA, the Atacama Large Millimeter/submillimeter Array, the largest astronomical project in existence. ALMA will be a single telescope composed of 66 high-precision antennas that will study the building blocks of stars, planetary systems, galaxies and life itself. ALMA's construction will be completed in 2013, but early scientific observations with a partial array began in 2011 (Note: the US is also playing a major role in ALMA.)

ESO is currently planning a 40-metre-class optical/near-infrared telescope, the European Extremely Large Telescope or E-ELT which will become "the world's biggest eye on the sky". With the start of operations planned for early in the next decade, the E-ELT will tackle the biggest scientific challenges of our time.

Calendar of Events

NCA Mirror- and Telescope-making Classes: Tuesdays Feb. 7, 14, 21, 28 and Fridays, Jan. 3, 10, 27, 24, 6:30 to 9:30 pm at the Chevy Chase Community Center, at the northeast corner of the intersection of McKinley Street and Connecticut Avenue, N.W. Contact instructor Guy Brandenburg at 202-635-1860 or email him at gbrandenburg@yahoo.com. In case there is snow, call 202-282-2204 to see if the CCCC is open.

Open house talks and observing at the University of Maryland Observatory in College Park on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). There is telescope viewing afterward if the sky is clear.

Dinner: Saturday, Feb. 11 at 5:30 pm, preceding the meeting, at the [Garden Restaurant](#) in the University of Maryland University College Inn and Conference Center.

Howard B. Owens Science Center Planetarium: Friday, Jan. 10 at 7:30 pm. 9601 Greenbelt Road, Lanham, MD (301) 918-8750 howardb.owens@ggcps.org "Skywatchers of Africa"

Montgomery College Planetarium: Thursday, Feb. 18 at 7 pm and Saturday, February 20 at 1 pm. 7621 Fenton Street, Takoma Park, MD (240) 567-1463. "[African Skies](#)"

Mid Atlantic Senior Physicists Group talk on Wednesday, Feb. 22, at 1:00 pm at the American Center for Physics, 1 Physics Ellipse, College Park. Victor Yakovenko, Physics Department, University of Maryland. "The Statistical Mechanics of Money, Income and Wealth"

Upcoming NCA Meetings at the University of Maryland Observatory

- Feb 11, 2012 **Jacqueline Fischer** (NRL), *Gas-Rich Galaxy Mergers: Multi-Wavelength Views Become An Elliptical Galaxy*
- Mar 10, 2012 **Jennifer Wiseman** (GSFC), *Protostellar Disks and Jets*
- Apr 14, 2012: **Stella Kafka** (DTM), *Binaries in the Kuiper Belt*

National Capital Astronomers Membership Form

Name: _____ **Date:** ___/___/___

Address: _____ **ZIP Code:** _____

Home Phone: ___-___-___ **E-mail:** _____ **Age:** _____

Present or Former Occupation (Or, If Student, Field of Study): _____

Academic Degrees: _____ **Field(s) of Specialization:** _____

Employer or Educational Institution: _____

Student Membership: \$ 5

Standard Individual or Family Membership: \$10

Optional additional contribution to NCA: \$__

Total Payment (circle applicable membership category above): \$__

Members receive Stardust, the monthly newsletter announcing NCA activities, by e-mail. If you would like to receive a paper copy of Stardust via regular mail, please check here: _____

Please mail this form with check payable to National Capital Astronomers to:
Michael L. Brabanski, NCA Treasurer; 10610 Bucknell Drive; Silver Spring, MD 20902

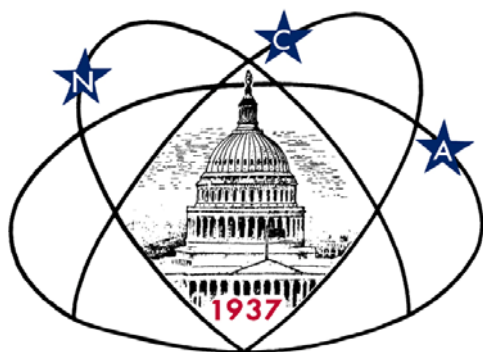
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If undeliverable, return to

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First Class

Dated Material



Next NCA Mtg:

Feb. 11

7:30 pm

@ UM Obs

**Dr. Jacqueline
Fischer**

Inside This Issue

Preview of Feb. 2012 Talk.....	1
“Grab and Fly” Telescope.....	2
<i>The City Dark</i> Feb. 25.....	4
ESO 50 th Anniversary.....	5
Occultations.....	5
Agamemnon Occultation.....	6
Calendar.....	7