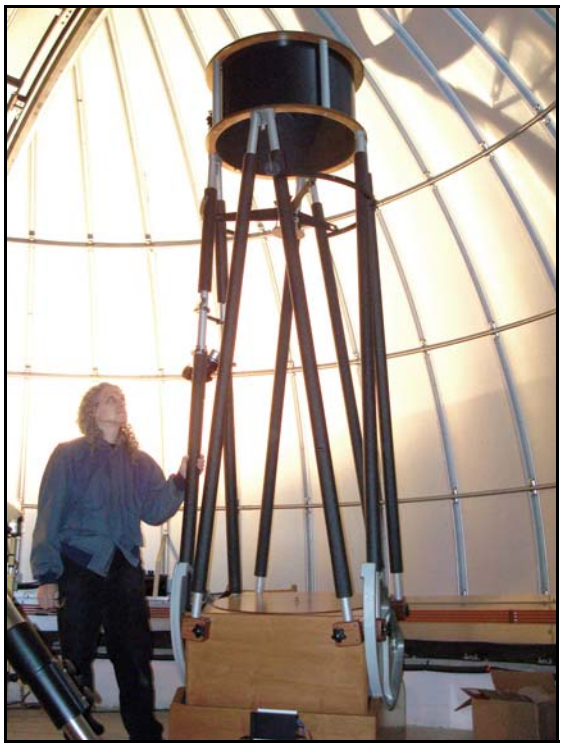
The Custer Comment

★ *For The Curious* ★

Spring 2009 Volume XXXIX Issue 2

Custer's New Obsession



Dr. Jeff Katz (left) and Obsession (right)
Photo courtesy of Cliff Chiesa

Last autumn, Suffolk County Community College (SCCC) placed on loan at Custer its 25" f/5 (125" 3175mm focal length) Obsession, a Newtonian-style reflecting telescope with a Dobsonian mount. Custer Research Committee Member, Ted Koukounas, who is also Chair of Science and Mathematics at SCCC, initiated the arrangements. Since that time, many people have been working hard to ready the scope for use. Volunteers from Custer and from the Astronomical Society of Long Island (ASLI President, Mal Speer, and ASLI Board Member, John Vogt) "retrofitted" the scope with a ServoCAT (partly donated by the manufacturer, Gary Meyers, of StellarCAT) and Argo Navis (on loan from Custerite David Cohn), which provide automated tracking, go-to capability, and allow for computerized operation. Custer Member, Steve Bellavia, a physicist from Brookhaven National Laboratory, designed and installed a system of counter-weights for the scope. And Observatory-Research Director, Dr. Jeffrey Owen Katz, and Senior Observatory Staff Member, Justine Haupt, designed revolutionary new optics: ordinarily the eyepiece height at the top of this telescope is 10' but, because of the new optics design, observers can look through the eyepiece by just standing on the ground or, at worst, on the first or second step of an ordinary step ladder; Katz and Haupt call their new optical design the "Terra-Vue™" and are in the process of obtaining a patent. Custer Member and ASLI Board Member, Tony Pirera (president of Spectrum Thin Films), donated the high-grade secondary mirror needed for the new optics. In late April, the telescope was mounted in its new home in Custer's 22' domed observatory. Dr. Katz said "We are privileged to have been given the opportunity to have a telescope of this size and quality for use by our Institute. Not only will our members, students and researchers benefit by its presence, but we are pleased that we can share it with the general public who will be able to see in unprecedented detail amazing sites in the universe around us. It is truly inspiring." To introduce the largest telescope in a public observatory on Long Island to the membership and community, two first-light parties were held: on Saturday, May 16th and on

inside...

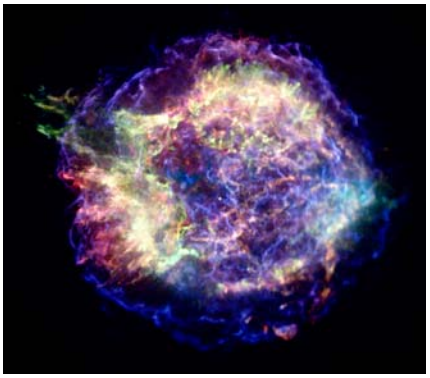
Tuesday, May 19th (more about that in the next issue). In addition to those mentioned above, appreciation goes to the following Senior Observatory Staff Members for their help with this exciting project: Bill Crispino, Donna L. McCormick, and David Van Popering. The basic telescope retails for around $13,500 and the retrofit is estimated to have cost an additional $3,000 in materials; add to that the revolutionary new optics and the value of the scope: priceless in terms of our educational goals.★

The Celan String Quartet, with Custer's Music Project Director, Anne Verticchio (left), will perform at Custer on June 13 and July 18.

COUNTY AWARDS GRANT TO MUSIC PROJECT

On March 9, 2009, Custer's Music Director, Anne Verticchio, received a letter from Suffolk County Executive Steve Levy: "I am pleased to inform you that I have recommended funding in the amount of $1,200 through the Suffolk County Community Arts Regrant Program...Thank you for your continued cultural and artistic contributions to the communities in Suffolk County." This is the second grant received by The Music Project since December, when $1,182 was awarded by the NYS Council on the Arts. Last summer, the Custer Institute began formally offering musical performances to the public through a program called "The Music Project" (TMP).

At inception, the Project was supported by donations from Custer Members (Barbara Lebkuecher, Anna and Rico Verticchio) and by the musicians themselves who discounted their fees. Music Director, Anne Verticchio, said: "Because of the interest that was shown in this Project by Custer Members and the community, I wanted to continue the program and to provide performances year-round so additional funding was sought." Thanks to the grants it has received, the Project is not only able to schedule performances all year, but is able to bring a more divers range of music to the East End than is ordinarily available. TMP 2009 offers an extraordinarily eclectic array of music including Traditional Irish Folk, Classical, Sephardic and Ladino, Neo-Pop/Soul, Jazz, Blues, and Spanish Traditional. "These performances give the audience an opportunity to not only experience the music, but to learn about the cultures surrounding the music." TMP also showcases new talent through its Open Mic Nights (hosted by Liza Coppola) on the first Friday of every month. "We are deeply grateful to all those who support the Project through their contributions and/or by attending TMP performances." If you are interested in becoming a sponsor and helping The Music Project continue to bring great music to the community, please send your tax-deductible contributions to: TMP, Custer Institute, P.O. Box 1204, Southold, NY 11971. Donations of $50 or more will receive two complimentary tickets to a TMP performance. ★



Chandra image of Cassiopeia A, the youngest known supernova remnant in the Milky Way. Photo courtesy of NASA.

CUSTER AWARDS OUTSTANDING STUDENTS

In February 2009, Custer presented two Scholastic Achievement Awards. The students had been selected by members of the Custer Research Committee (Justine Haupt and Dr. Jeffrey Owen Katz) on the basis of projects they presented at the 2009 Long Island Science and Engineering Fair (LISEF). Coincidentally, both awards were for projects on "cosmic rays" (particles that are produced in such cosmological events as supernovae).

Samuel Bryant, an 11th grader from Bay Shore High School, did a study on "The Correlation Between Barometric Pressure and the Average Velocity of Cosmic Rays," an experiment designed to understand how the velocity of cosmic rays varies and what factors affect it. Sam examined the correlation between the velocity and barometric pressure and, although variation in velocity was more than expected, no immediate correlation was found. The velocity was determined by the change in time differential between two gun case scintillators between two distant setups. The time differentials were compiled into six-hour averages, which were matched with six-hour pressure averages. The velocity hovered between 2.8E+8 and 2.99E+8. Due to scintillator pulses that indicated negative speeds, the velocity was calculated as the distance divided by the difference between the average time differential of the zero distance setup and the far distance setup. Despite this, three of the velocity plots broke light speed, with all three lying within acceptable margin of error. His results lead to the puzzling realization that there is some factor affecting the energy of cosmic rays significantly enough to cause velocity changes greater than the margin of error that is not barometric pressure.

Akshay Gupta is an 11th grade student from Sachem High School in Holtsville. His study involved "The Role of Ultra-High Energy Cosmic Rays in Low Level Cloud Nucleation." Cosmic rays have been suggested as one mechanism that aids cloud formation. The process of cloud formation starts with the nucleation of water molecules in vapor phase. The purpose of this project was to study the relationship between cosmic rays and cloud formation. To what degree do high-energy cosmic rays

induce ionization and is this rate of ionization enough to help cloud nucleation? The experimental design was created to establish the correlation between ultra-high energy cosmic rays (UHECRs) and the changes of low level clouds (LLCs) through analysis of data from cosmic ray ground array scintillators and a cloud charge monitor. The proposed question was not fully resolved because the degree of UHECR impact on the LLC ionization process was not evaluated. Nonetheless, the results warrant further investigation. The study may help our understanding of high-energy cosmic rays' role in weather patterns and could lead to better weather models.

Each student received a $100 award, a one year family membership in the Custer Institute, and the opportunity to participate as interns in Custer's "Education Through Research Project." Awards were drawn from the Vail Scholarship Fund and a grant from N.J. Grella & Associates, CPAs. Contributions to replenish and expand the Scholastic Achievement Awards and the Education Through Research Project are needed; please send your tax-deductible donations to SAA-ETRP, Custer Institute, P.O. Box 1204, Southold, NY 11971. Donations of $50 or more will received a framed deep space photo taken by Custer Member, David Barnett.★

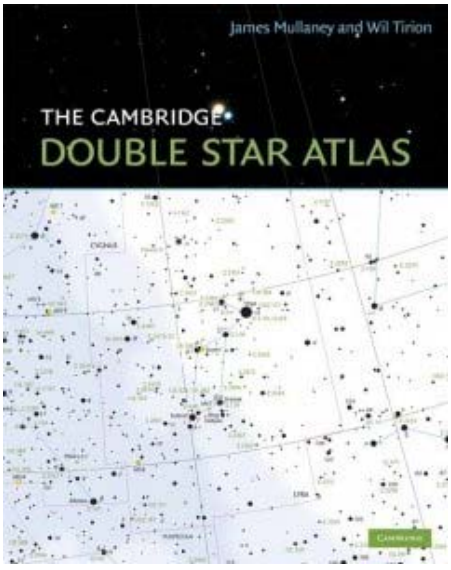
CUSTER'S NEW LIBRARIAN

In February 2009, Lauren R. Bernat joined Custer's volunteer staff as the new librarian. Lauren graduated St. John's University with a Masters in Library and Information Science in December 2008. She is a resident of Aquebogue and currently works part-time as a librarian at the Port Jefferson Free Library, the Middle County Public Library, and the Smithtown Library in Nesconset. Lauren is a much-welcomed addition to the staff. She is continuing work on the library database started by Custer Senior Staff Member, Jim Eagan, and has been sorting through and organizing the collection in preparation for reshelving when Custer's new library facilities are ready. During her work, many old and rare books were found, some of which came from the collections of Custer's founders. It is interesting to note that, in addition to works on astronomy and other sciences, the founding fathers of the Institute were reading about the politics and cultures of countries on the forefront of the news during their day. And, in a book about China (*My Country and My People* by Lin Yutang, copyright 1935), there are two pages of handwritten notes by Custer founder, Charles Elmer, who reflected on the extent to which the China of his era resembled China in the past and how it would compare to China in the future. It make one wonder what future generations of Custerites will learn about us as they browse through the books we add to the collection during our time! ★

NEW LIBRARY ACQUISITIONS

The Cambridge Double Star Atlas.
By James Mullaney and Wil Tirion. Cambridge University Press: 2009. ISBN 978-0-521-49343-7. $35.00 (paperback). 148 pp. Written by experienced observer James Mullaney and beautifully illustrated by renowned celestial cartographer Wil Tirion, this atlas provides an easy-to-use celestial roadmap to locate and identify double and multiple stars. Other deep sky objects such as star clusters, nebulae, and galaxies are also included and are color-coded for easy recognition and identification, making this an all-purpose observing reference. It is the first modern star atlas devoted to double and multiple stars. Nearly 2400 selected pairs plotted and labeled with discoverer, catalog, and/or observatory designations. Spiral bound and printed in red-light friendly colors, ideal for use in the field.

The Geometry of Light: Galileo's Telescope, Kepler's Optics
By Gerald Rottman, M.D. Published by Gerald Rottman, Baltimore, MD (www.TheGeometryOfLight.com): 2008. ISBN 978-0-0819416-0-8. $10.95 (paperback). 118 pp. This book presents Johannes Kepler's pioneering ideas about light, vision and the telescope. Kepler is principally known as a founder of modern astronomy, but he was also active in optics. When Galileo announced his revolutionary discoveries made by telescope, Kepler worked out a theory of lenses to understand the function of Galileo's telescope. Kepler's geometric approach conveys an intuitive grasp of optics that is hard to obtain using modern methods. This volume details how Kepler understood human vision and simple optical instruments, and demonstrates the power of elementary geometry. Dr. Rottman earned a Master's degree in physics at the University of Colorado before studying medicine. ★



CUSTER'S ANNUAL ELECTIONS

The 2009 Nominating Committee has finalized their slate of recommended candidates for positions on Custer's Board of Directors:

President	Donna L. McCormick
Vice President	David Van Popering
Treasurer	Barbara Lebkuecher
Secretary	Peter Guastella
Finance Chair	John Mastromarino, CPA
Director-at-Large	Jeffrey Owen Katz, Ph.D.
Director-at-Large	Alarico "Rico" Verticchio

The two remaining positions of Director-at-Large are currently filled by Brian Andrews, Esq., and Chiaki Yanagisawa, Ph.D., whose terms expire in 2010. The elections will be held at the Annual Meeting on Saturday, June 13, 2009 at 5:00 P.M. at the Custer Institute. Members who are unable to attend are encouraged to mail in their proxies. Proxy forms and instructions, as well as other information about the elections and meeting, were mailed to Members on May 10, 2009; if you did not receive a copy of these materials, please contact Donna L. McCormick (CusterDonna@yahoo.com or call 631-765-2626). After the meeting, there will be a barbeque: free to Members and $15 for non-Members; all are encouraged to bring a little something to add to the table. During dinner, the Celan String Quartet will perform a Baroque repertoire and, after dark, there will be a star party (feel free to bring your scopes).

A "SPECIAL EVENT"

In celebration of the 2009 International Year of Astronomy, the Great South Bay Amateur Radio Club (GSBARC) has kindly chosen the Custer Institute as a "Special Event" station from which club members will broadcast from 8:00 AM, Saturday, July 18 until 8:00 AM July 19. The GSBARC, which is based in West Babylon, was founded in 1974 and is dedicated to public service, providing communications for everything from the Long Island Marathon, to the TWA Flight 800 crash emergency, to the 1999 Empire State Games. They also provide free classes to help folks prepare for getting a ham radio license. The "Special Events" which the club holds at different locations are intended both to help promote other worthwhile organizations, as well as to enhance public knowledge of amateur radio. For further information, visit their website: www.GSBARC.org or write to them at P.O. Box 1356, West Babylon, NY 11704.

SPRING ISSUE OF "IN THE EYEPIECE"

The Spring issue is now available. You may pick it up at the observatory or click on this link to get the pdf file from Custer's website: www.CusterObservatory.org. *In the Eyepiece* is published quarterly by Custer Observatory Programs Coordinator, David Van Popering. It provides a seasonal guide to what is in the heavens above.

A CLASSIC DONATION

The observatory would like to thank Custer Member, Tom Burton, for the donation of a Tasco 7TE-5 60x1000 mm achromatic refractor. This 1960s-vintage Japanese import is considered quite excellent and is sought after by collectors. The telescope saw its first light at Custer on March 14, 2009. Everyone who looked through it was treated to a sharp image of Saturn and its rings at 50x. The telescope will be back out on the lawn for public observing sessions in the near future. --Bill Crispino, Senior Observatory Staff

FINANCIAL ADVISER WANTED

If you are a financial advisor and would like to volunteer your services to assist the Custer Institute with the development of planned giving programs, please contact Donna L. McCormick (CusterDonna@yahoo.com) or call 631-765-2626.

A S T R O N O M I C A L LEAGUE CONVENTION

The annual convention of the Astronomical League is being held this year at Hofstra University from Friday, August 7 through Saturday, August 8. Long Island was chosen as the 2009 ALCON site thanks to the hard work of members of the Amateur Observers' Society (AOS), who are also coordinating the event. The list of speakers is long and impressive; it includes David Levy, Phil Harrington, Al Nagler, and Tony Pirera to name just a few. On Friday night, the traditional convention "Star-be-que" (a gourmet meal with local wine tasting, a Galileo impersonator, brief talks and, of course, an observing session) will be held at Custer. For details or reservations, call Co-Chair, Rich Huber (631-598-4613), or visit www.ALCON2009.org

400 YEARS OF THE TELESCOPE[1]

by Edward Furey, Telescope Historian

Before Galileo made his telescope, people used tubes to help them observe without distraction and lenses were almost 300 years old. Along the way someone thought to set lenses a foot or so apart in a tube and look through it; that caught on. In 1609, German-Dutch lensmaker, Hans Lipperhey, tried to patent such a device but was turned down because the "technology" was already widespread. The concept made its way to Padua where Galileo made his own instrument, then used it to make unprecedented observations and discoveries. Galileo used mathematics to improve design and found a systematic way to develop telescopes. By Nov. 1609, he had one that magnified 20 times and saw the details of the moon. In Jan. 1610, he observed Jupiter and saw it was accompanied by three small "stars," studied them and eventually realized they were moons!

The first telescopes were refractors but, as they became larger, two problems emerged. In "chromatic aberration," the lenses produce their own spectra and "false" colors appear. In "spherical aberration," the lenses don't focus all the rays of light into a single place; some miss the focal point and produce fuzzy images. A partial solution is to extend the focal length of the telescope, which led to scopes scores of feet long, too long to be enclosed in tubes; the champ was Polish astronomer, Johannes Hevelius', 150-foot long telescope.

Hevelius' contemporary, Huygens, developed the "aerial telescope," which featured an objective lens and an eyepiece connected by long poles, mounted on long masts, and operated by pulleys and ropes. Aerial telescopes were problematic: they were hard to aim, the slightest wind caused the apparatus to sway, and humidity changed the texture and length of the ropes. The lesson: it wasn't enough to increase the power of the telescope, there had to be a practical way to mount the optics and maneuver them through the night.

Frustrating as aerial telescopes were to use, they delivered results. In 1655, Huygens used a 12-foot, 50 power telescope to discover Titan, the first moon of Saturn. With his 23-foot long, 100 power scope, he solved the riddle of Saturn's strange appearance: "It is surrounded by a thin, flat ring, nowhere touching," he wrote. An Italian astronomer, Giovanni Domenico Cassini, identified markings on Jupiter, Mars and Venus, and determined from them that all those planets rotate. When Cassini joined the Paris Observatory, its old water tower served as a vertical support for his telescopes, which progressed from 17- to 34- to 100- and finally to 136-feet. He discovered another four of Saturn's moons and that the planet has two rings separated by a small gap we still call "Cassini's Division."

The telescope took another step forward when William Gascoigne noticed that a measuring device inside the instrument could be lit up at the focal point and easily be made visible, that a spider thread came into focus as well as did celestial objects; this meant it was relatively simple to precisely measure the distance between two objects in the field. As a result, for the next couple of centuries astronomers made ever more precise measurements of the stars.

While early telescopes were useful, they had drawbacks. In England, Robert Hooke and Isaac Newton realized the simplest solution to the chromatic and spherical aberration problems was to use a mirror instead of a lens to gather the light and bring it to a focal point. Newton made the first "reflector," which focused the light from the stars onto a secondary mirror which, in turn, directed light into an eyepiece near the opening of the telescope. The most commonly used reflecting telescope today is a variant of the one developed in 1672 by a Catholic priest from Chartres, Laurent Cassegrain: light strikes a mirror, is reflected back to another mirror and then is reflected back through a hole in the primary mirror to an eyepiece behind it.

Refractors were still preferred for maintenance reasons: the glass lenses require little attention and, since light passes through the glass with little absorption, the images are bright. Early reflecting telescopes, on the other hand, mostly used speculum (copper and tin alloy) for their mirrors, causing other problems: since metals are not chemically stable, the mirrors tarnished when exposed to air; they had to adjust to climate conditions before being focused since metals shrink and contract with ambient temperature; and extreme cold could make the mirrors crack, which happened to William Herschel, a musician and the premier observer and telescope maker of the 18th century.

Herschel discovered Uranus in 1781; he wasn't the first observer to notice Uranus, but he was the first to see it wasn't a star (he initially thought it was comet). He cataloged "planetary nebula" and observed objects he thought were distant galaxies (he was right but it took another century to confirm that). Herschel's great accomplishment was a one-ton telescope with a 48-inch mirror, the largest at the time. He was assisted by his sister, Caroline, who discovered nine comets and was the first professional female astronomer.

In the late 1700s, metallurgy and machining progress led to the first equatorial mounts, which align with the celestial equator so the telescope sits at an angle that varies by the latitude of the observatory. The critical advantage of such mounts is that the telescope will track the stars with a single motion. Equatorials became the standard until the late 1900s. The last huge telescope to use the old-fashioned mounts was Lord Rosse's 72-inch "Leviathan of Parsonstown," the largest telescope in the world in 1845; it would not be surpassed for 75 years. Precise tracking proved be vital when the mid-19th century brought another critical development: photography.

The climax of the metal telescope mirror occurred around 1869 when the Great Melbourne Reflector with its 48-inch mirror saw first light in Australia. This scope was one of the biggest fiascoes in astronomy history: the mounting was defective and there was no one in Australia who knew how to polish the mirror when it tarnished, which it did quickly. It was the last great scope to use a metal mirror.

1 This is an edited version of Furey's March 28, 2009 lecture at the Custer Institute: "The History of the Telescope." To receive the full transcript by email, contact CusterDonna@yahoo.com.

In 1853 German chemist, Justus von Liebig, developed "silvering," a way to coat a clean glass surface with a very thin layer of metallic silver. Jean Foucault, was among the first to make a reflecting telescope from silver-coated glass; it was for the Paris Observatory. The silvering technique moved the future of astronomy to the reflector.

Despite the popularity of reflectors, Alvan Clark & Sons of Cambridge, MA produced refractors with the best optics in the world. Clark produced a 26-inch for the Naval Observatory in Washington (it's still there), a 30-inch lens for the Pulkovo Observatory in Russia, and a 36-inch refractor for the Lick Observatory in California. The company's greatest achievement was the 40-inch lens for the Yerkes Observatory in Williams Bay, WI, which brings us to the 20th century and the most important telescope developer since Galileo: George Ellery Hale of Chicago.

Shortly after joining the Univ. of Chicago, Hale met Alvan Clark, who spoke of two optically perfect 42-inch disks he made for a proposed observatory for USC on Mt. Wilson: USC had defaulted on its payment and Clark wanted someone to take the disks off his hands. Hale wanted them.

Hale then met streetcar magnate, Charles T. Yerkes, who had no known interest in astronomy, but Hale said he would be able to get Yerkes's name on a telescope even bigger that that of the Lick Observatory. Delighted to be able to "Lick the Lick" as he put it, Yerkes provided a million dollars to build the observatory. USC's Yerkes Observatory in Williams Bay, WI is a marvel to this day: the 40-inch telescope is 60-feet long, weighs 20 tons (mostly because of the lens), and is mounted on a pier over 40-feet high with a floor that moves up and down to accommodate observers. But Hale wanted bigger.

Hale's father funded a 60-inch mirror blank, which was made by the St. Gobain in France; it was the largest glass blank they could make in a single pour. Hale had the Yerkes optics shop grind it, even though he had no observatory for it. Then, in 1902, the Carnegie Inst. was founded and part of its $10 million endowment went to search for good observatory sites; Palomar was found between LA and San Diego. First light came in Dec. 1908. The 60-inch telescope was a success: four hour exposures yielded photos of stars down to the 20th magnitude, a quantum leap over the performance of all previous scopes. But Hale wanted bigger.

John D. Hooker was a hardware entrepreneur Hale convinced to fund the biggest telescope in the world. St. Gobain produced a 101-inch, 4.5 ton disk, but Hale and George Ritchey, his optical expert, were appalled when it arrived: it was full of bubbles. St. Gobain absorbed the cost and cast another, but the second disk broke during annealing; St. Gobain threw in the towel. Hale and Ritchey made the first disk work. The huge mounting was fabricated in a Quincy, MA shipyard and the assembled instrument weighed 100 tons. In a return to the days of Cassini and Huygens, the telescope was an aerial. From now on all the great telescopes were aerials. First light came in Dec. 1917. It was with this 100-inch Hooker telescope that Edwin Hubble made observations that confirmed Herschel's distant galaxies and others indicating that the universe is expanding.

The big astronomy project of the Great Depression was the 200-inch Hale telescope at Palomar. Corning cast the mirror made of Pyrex low expansion glass, which was poured over a honeycomb pattern, making the blank partly hollow, thus lighter. The first try was a disaster (it's on display at the Corning Glass Museum), but the second was a success. First light was planned for Jan. 1942, but most of the work was suspended until after W.W.II. Palomar opened in 1948. Hale never got to see it as he had died ten years earlier.

After the 200", other great telescopes were developed but only one was larger: a 236-inch Soviet built telescope on an alt-azimuth mounting. The next round of telescope building on the big (but less than Palomar) scale went on through late 1970s, with new 4-meter (approx. 13.2 feet) instruments on Kitt Peak in Arizona and Cerro Tololo in Chile. The Anglo-Australian 4-meter became the centerpiece of the great Australian complex at Siding Springs. The European Southern Observatory began operation of its 3.6-meter telescope in Chile. The decade closed with the dedication on Mauna Kea of two 4-meter infrared telescopes by NASA and Britain, along with the nearby 3.6-meter Canada-France-Hawaii telescope.

Modern astronomy began in Chile in 1849. An American scientific expedition led by James Gilliss brought the largest telescope ever made in the U.S. to set up an observatory; when Gilliss left, the observatory was given to Chile and it became the first national observatory in South America. In the late 20th century, Chile was to South America what California had been to North: the preferred site for great telescopes. Today, seven major telescopes, five of 8-meters and two of 6.5-meters, are operational in Chile. Three more great telescopes, one of 8.4-meters, are under construction.

In the 1980s, plans for even bigger telescopes were underway. The climax of the single great mirror came with the four telescopes of the Very Large Telescope complex of the European Southern Observatory in Chile. Each telescope required an 8.2-meter, 23-ton mirror, which pushed the size limits of the single mirror design. The biggest telescopes (the two 10-meter Kecks on Mauna Kea in Hawaii) were made from thirty-six 1.9-meter hexagonal shaped mirror segments, computer controlled to act as one. Each scope weighs 1,100 pounds, is 85-mm thick, and occupies a dome that takes up 700,000 cubic feet. The GTC in the Canary Islands, is also 10-meters and made up of 36 hexagons. Other great telescopes include: the Large Binocular Telescope on Mount Graham in TX, with two 8.4-meter mirrors forming the world's largest binoculars; the 9.5 meter South African Large Telescope; the 8.2-meter Subaru of the National Astronomical Observatory of Japan, part of the Mauna Kea complex; and there's even a 6-meter Large Zenith Telescope in Vancouver. All of these "Bigger Than Palomar" instruments have gone into service in only the last 20 years.

Many telescopes have gone into space. Everyone knows of Hubble, from which we've obtained amazing images and data. Another of note is the Chandra X-Ray Observatory, named for the great Indian-American astronomer, Subrahmanyan Chandrasekhar.

In the future, we can expect to see telescopes the size of stadiums: the proposed OWL (OverWhelmingly Large) telescope features a mirror 100-meters across. The immediate future is a bit more modest, but still impressive: the Moore Fdtn. donated $100 million for a 30-meter telescope, three times the size of the largest telescope of today; and the European Southern Observatory is developing a 42-meter telescope. Both of these projects hope to see first light by the end of the next decade. So when the time comes for celebrating the 500th anniversary of the telescope, there will be plenty more to say! ★

UPCOMING EVENTS

Fri., June 5, 7:00 - 10:00 PM OPEN MIC NIGHT: FIRST FRIDAY OF EVERY MONTH!
Interested in becoming a performer? This is a great opportunity for all you musicians, comics, poets, magicians and storytellers to let loose and get experience in front of a live audience. Everyone else: come and see the stars of tomorrow! Hosted by talented singer and songwriter, Liza Coppola. Suggested Donation: FREE (although any donation to help support our programs would be appreciated).

Sat., June 13, 5:00 PM ANNUAL MEETING, BBQ, CONCERT AND STAR PARTY!
Custer Members will be holding their annual meeting and election of Directors beginning at 5:00 PM. The meeting will be followed by an outdoor BBQ (free for Members; $15 Non-Members); all are welcome to bring their favorite dish, dessert or beverage. While we dine against the backdrop of the Southold Arboretum, the Celan String Quartet will play a selection of Baroque favorites. After dark, join us for a star party that will include the Members (and their telescopes) of Long Island's astronomy clubs...we might even see some Lyrid meteors! Suggested Donation for star party: General Admission of $5 Adults, $3 Children, free for Members and those attending BBQ.

Sat., June 20, 8:00 PM CLASSICAL CONCERT: THE EAST END BRASS ENSEMBLE
This popular North Fork ensemble--made up of the slide trombone, French horn, trumpet, and tuba--will perform a selection of unique pieces from their classical repertoire. Suggested Donation: $13 Members, $15 Non-Members, $8 Students.

Fri., June 26, 7:00 PM MEMBERS' NIGHT: LAST FRIDAY OF EVERY MONTH!
A Members-Only (and their guests) evening for mingling, observing, enjoying the observatory and its resources, discussing Custer's present and planning its future together. If it's clear, there will be observing. If it's cloudy, we'll watch a movie, work on projects, have lively discussions & more! Coordinator: David Van Popering. Admission: FREE.

MARK YOUR CALENDAR FOR THESE OTHER UPCOMING EVENTS

Sat., July 18, 7PM	Concert: Celan String Quartet: selections from Beethoven, Schostakowitsch, Arvo Part, and more..
July 18-19, 8AM-8AM	The Great South Bay Amateur Radio Club Event at Custer! A 24-hour marathon!
Fri., Aug. 7	Astronomical League 2009 Conference BBQ at Custer (in collaboration with AOS)
Sat., Aug 22, 7PM	Concert: Becca Hasselbrook and guest artist
Sat., Aug. 29	Messier Marathon
Sat., Sept. 26	Custer's 31st Annual Astronomy Jamboree
Sat., Oct 3, 8PM	Concert: String Trio with Wendy Fogel
Sat., Oct 17, 5-7PM	Concert and Storytelling by Johnny Cuomo
Sat., Nov. 21, 8PM	Sol y Sombra: "La Guitarra," traditional Spanish guitar, singer & costumed dancers
Sat., Dec. 5	Holiday Party and Concert
Thurs., Dec. 31	New Year's Eve Under the Stars
First Fridays	Open Mic Night with Liza Coppola
Last Fridays	Members' Night

ON-GOING: Every Sat. evening, from dusk until midnight, Custer is open to the general public. Staff provide guided tours of the sky (weather permitting) via laser pointers and powerful telescopes, and are more than happy to answer questions. Group visits by classes, scouts, and others are welcome (contact CusterDonna@yahoo.com to arrange). The facilities are also available for private functions.

**Sol Y Sombra at Custer in 2007.
They will return on
Sat., Nov. 21 at 8PM…
a MUST SEE performance!
Tickets are $15.
Seating is limited so send in your check to reserve now.**

TELESCOPE FOR SALE
The Custer Institute is selling off its 16" Meade LX200, which had been in service as the observatory's main scope, housed in the dome for two years (now replaced by the 25" Obsession). After being decommissioned, the telescope was returned to and refurbished by Meade. Those interested should contact Jeff Norwood at Camera Concepts in Patchogue (631-475-1118).

CUSTER PIANO FOR SALE
Asian console piano with bench. Specs: HSINGHAI model #751357; oldest brand of piano made in China, believed to have been manufactured in the 1980s but in like-new condition; recently tuned; high polish ebony finish; sleek modern leg-less design. Yours for a donation of $800 (or more ;). Contact CusterDonna@yahoo.com or call 631-765-2626. Nominal moving charge additional (for moving info, contact Douglas Gregg, Classic Piano Doc, 765-3996).

BENEFITS OF MEMBERSHIP
The Custer Institute is a 501(c)(3) N.Y. State educational nonprofit that operates exclusively on public support (proceeds from events, dues, and small donations); it has no endowment. It is staffed by volunteers dedicated to advancing Custer's educational and research goals, and its service to the community. In addition to the reward of supporting a unique organization such as Custer, Members also enjoy the following: email subscription to our newsletter, library privileges; discounts on classes, lectures, and other events; invitations to members-only events; voting privileges; access to the facilities; special training programs; opportunity to become an Observatory Staff Member. Annual Dues: $45 Individual; $60 Family; $25 Senior (65+), $25 Full-Time Student; $100 Sponsor; $250 Benefactor; $500 Patron; $1000 Corp. Sponsor.

SUBMISSIONS
The Custer Comment is published quarterly. Contributions are welcome. If you would like to submit material, please provide a brief description. All proposals are subject to review for compatibility with the publication's guidelines. Contact Donna L. McCormick (CusterDonna@yahoo.com).

The Custer Comment

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