ASTRAL PROJECTIONS

JANUARY 2005

ASTRA MEETING SCHEDULE 2005

Fri. Jan 14th - Mars Video
Sat. Jan 15th - Telescope workshop 7PM
Fri. Feb 11th - Rich Gamba Astro Nova / Solar Filter Review
Fri. Mar 11th - Phil Zollner
Sat. April 2nd - Star Party with O.C. Parks @ Wells Mills 6PM Setup 7PM public.
Fri. April 8th - Equipment Review (planning meeting?)
Sat April 16th - Astronomy Day (Spring Star Watch 8PM)

Fri. May 13th - Richard Fink
Fri. Jun 10th - John Endreson - Digital Photography
Fri. July 8th - Bob Salvatore - "Famous Astronomers Past and Present"
Fri. July 15th - Summer Star Watch 9PM
Sat Aug 13th - Perseid Picnic 2PM
Fri. Sept 9th - Sky Atlas Review / Bob Salvatore - Asterisms
Thurs. Sept 22 International Year of Physics
Einstein in the 21st Century
Special guest lecturer: Dr. Mike Shara
Curator-in-Charge, American Museum of Natural History-- Department of Astrophysics
Fri. Oct 7th – Fall Star Watch 8PM
Fri. Oct 14th – Planning Meeting for Committees and 2006 Schedule
Fri. Nov 11th - Rich Brady - Eyepieces
Fri. Dec 9th - Awards, Elections- Video

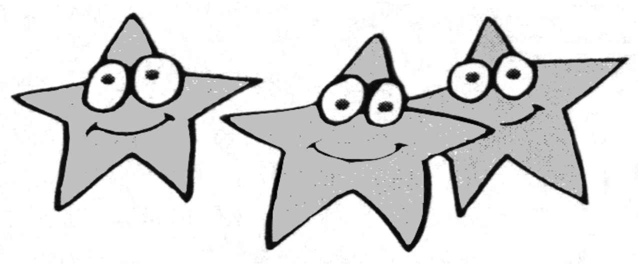
JANUARY MEETING: The January meeting will be Friday, January 14, at 8:00 PM in the Planetarium classroom. There will be a Mars Video and planning for the telescope workshop on Sat Jan 15th.

A telescope workshop for the general public will be held on Saturday Jan 15th 7:00 PM. Anyone (even club members) who bought or received a new telescope during the Holidays will receive help from A.S.T.R.A. members in setting up their telescope. Additional information on telescopes and astronomy will be available. Please come out and support the club. ***A word of caution***: please do not criticize the telescopes that may be brought to the meeting. Our aim is to help people with what they have and not make them feel bad. All of us were new to the hobby at one time and didn't know details on purchasing an adequate telescope. We need all of the support from the members we can get. We usually have over 100 people attend. Please support this event.

DUE$ ARE DUE: If your address label shows anything other than M2005 or PERM we'll be happy to receive your dues at the next meeting. Dues are payable January 1 each year, and past due as of the end of the March business meeting. Whether you mail your payment or bring it in person, ***please include the form that was previously provided.*** It's the only way we can keep track of your payment.

January Celestial Events:
supplied by J. Randolph Walton (Randy)

Day	Date	Time (EST)	Event
Sat	1	00:35	Jupiter Rises
		04:37	Mars Rises
		05:42	Mercury Rises
		05:50	Venus Rises
		07:22	Sunrise
		16:46	Sunset
		17:45	Saturn Rises
		22:36	Moon Rise
Mon.	3	07:00	Quadrantid meteors peak
		11:43	Moon Set
		12:46	Last Quarter Moon
Mon.	10	05:00	Moon closest until 2008
		07:03	New Moon
		07:21	Sunrise
		07:54	Moon Rise
		17:03	Saturn Rises
Wed	12	00:01	Jupiter Rises
Thu.	13	06:08	Venus Rises
		06:11	Mercury Rises
		07:00	Mercury 0.4 deg. S of Venus
		07:20	Sunrise
		18:00	Saturn at opposition
Mon.	17	00:25	Moon Set
		01:57	First Quarter Moon
Wed	19	06:15	Venus Rises
		06:25	Mercury Rises
		07:05	Saturn Sets
		12:23	Moon Rise
		17:00	Moon 1.4 deg. S of Pleiades (M45)
		17:04	Sunset
		23:35	Jupiter Rises
Tue.	25	04:24	Mars Rises
		05:32	Full Moon
		06:24	Venus Rises
		06:37	Mercury Rises
		06:40	Saturn Sets
		07:14	Sunrise
Mon.	31	05:00	Jupiter 1.5 deg. N of Moon
		10:08	Moon Set



Astronomy Courses: Planetarium staff offers a number of mini-courses on astronomy. Call the OCC Department of Continuing and Professional Education, 732/255-0404, for information or to register.

Newsletter Deadline: Material for *ASTRAL Projections* must be received 21 days before the next meeting. E-mail to Newsletter@astra-nj.org or mail to: John Endreson at: 722 Maple Road Lanoka Harbor, NJ 08734

Planetarium office: 732/255-0343 weekdays 9 AM - 4 PM. Hot line: 732/255-0342. Touch 5 for ASTRA.

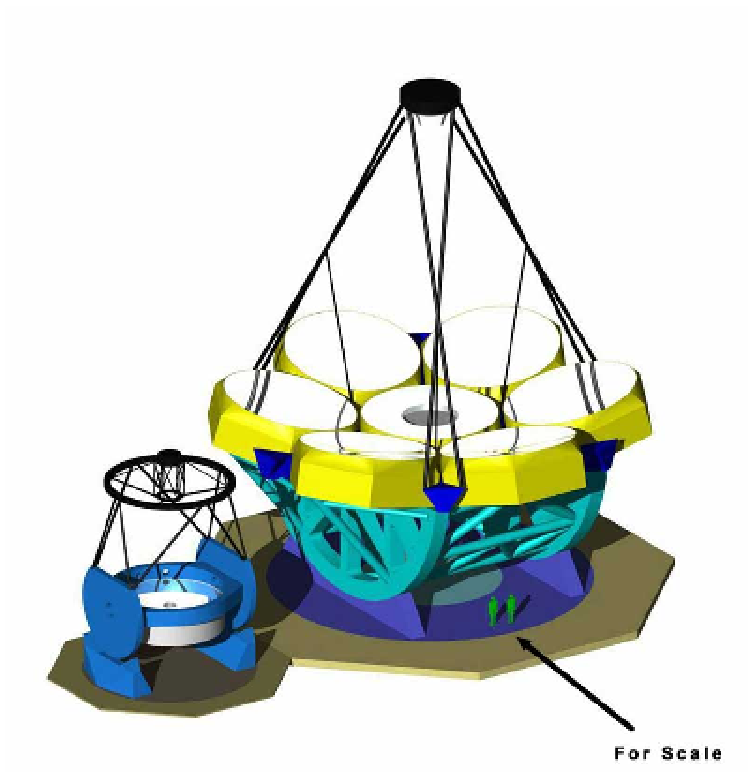
Visit our Web page at **http://astra-nj.org** Visit the Planetarium page at **http://ocean.edu/planet.htm**

Work Begins on Magellan Giant Telescope

Summary - (**Dec 13, 2004**) When it's complete, the Giant Magellan Telescope (GMT) will be the world's largest observatory, with a primary mirror 25.4 metros (83 feet) across - 4.5 times the collecting power of any telescope on Earth. The GMT is scheduled to be completed in 2016, in a remote location in Northern Chile, which has some of the best viewing conditions in the world. The observatory will be built using 7 primary mirrors arranged in a flower pattern, and reuse the manufacturing equipment that helped build the Large Binocular Telescope mirrors now being installed on Mt. Graham.

The Carnegie Observatories of the Carnegie Institution, and the University of Arizona, Steward Observatory Mirror Lab, have signed an agreement to produce the first mirror for the Giant Magellan Telescope (GMT)—the first telescope of the next-generation of extremely large ground-based telescopes (ELT) to begin mirror production. The telescope primary mirror will have a diameter of 83 feet (25.4 meters) with more than 4.5 times the collecting area of any current optical telescope.

"This agreement is historic for the future of astronomy," stated Dr. Richard Meserve, president of the Carnegie Institution. "It is the first of many milestones that we and our partners look forward to—both in constructing an enormous ground-based telescope and in the scientific discoveries that will result. Everyone in the eight-member GMT consortium is extremely excited by this step," he added. The consortium includes the Carnegie Observatories, Harvard University, Smithsonian Astrophysical Observatory, University of Arizona, University of Michigan, Massachusetts Institute of Technology, University of Texas at Austin, and Texas A&M University.



The GMT is slated for completion in 2016 at a site in Northern Chile. Viewing conditions in Chile, such as at Carnegie's Las Campanas Observatory, are some of the best in the world. The GMT will have ten times the resolution of the Hubble Space Telescope. With its powerful resolution and enormous collecting area, the GMT will be able to probe the secrets of planets that have formed around other stars in the Milky Way, peer back in time toward the Big Bang with unprecedented clarity, delve into the nature of dark matter and dark energy, and explore the formation of black holes—the most important questions in astronomy today.

"The Giant Magellan Telescope will allow an unprecedented view of extrasolar planets as well as a window out to the largest scales and back to the earliest moments of the universe. We plan to complete the GMT so that it will work in tandem with the future generation of planned ground- and space-based telescopes," stated Dr. Wendy Freedman, director of the Carnegie Observatories. "The real distinction of the GMT, however, is that it is building on a heritage of successful technology developed for the twin 6.5-meter Magellan telescopes at Las Campanas. Their performance has far exceeded our expectations. The Magellan telescopes have proven to be the best natural imaging telescopes on the ground, due in large part to the genius of its Project Scientist, Carnegie Observatories' Stephen Shectman, and Roger Angel and his team at the Steward Mirror Lab," she continued.

The mirrors for the GMT will be made using the existing infrastructure at Steward that made the 6.5-meter Magellan mirrors and the 8.4-meter Large Binocular Telescope mirrors on Mt. Graham. The new telescope will be composed of seven, 8.4-meter primary mirrors, arranged in a floral pattern. One spare off-axis mirror will also be made. Seven of the eight mirrors will be off-axis and require new techniques in casting and polishing. The first off-axis mirror will be cast this coming summer (2005) to address the new challenges. "The upcoming decade promises to be a very exciting one for astronomy. The National Academy of Sciences Astronomy and Astrophysics Survey Committee Report (2001) ranked the science for extremely large telescopes as the highest priority for ground-based optical astronomy," said Jeremy Mould, Director of the National Optical Astronomy Observatory. Site testing at the Las Campanas Observatory is also underway along with many other aspects of the project. Detailed information about the design of the GMT and the science that it will perform is located at http://www.gmto.org/.

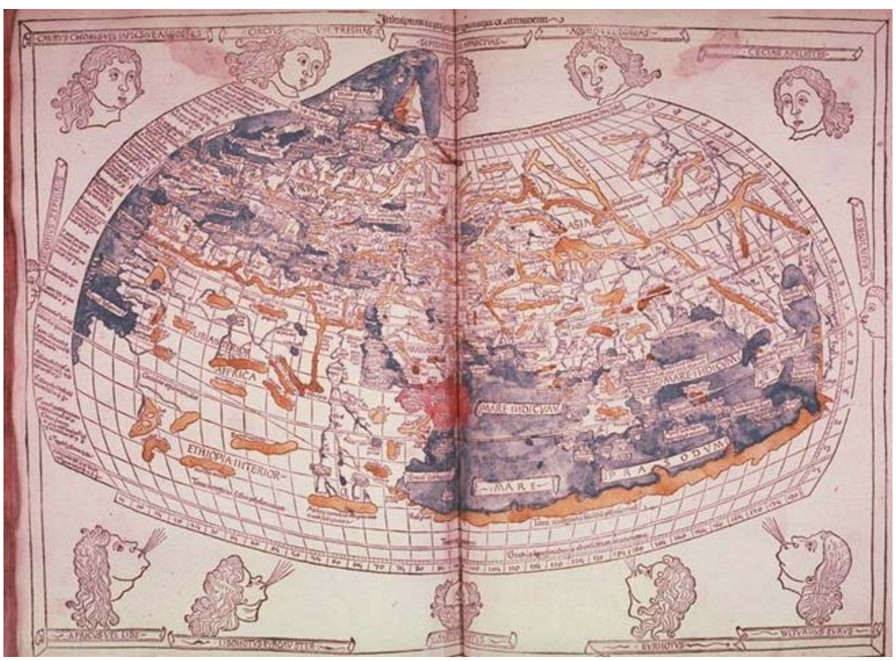
Mis-education, the Moons of Jupiter, and the Cost of Land in Southern France

Mike Montana

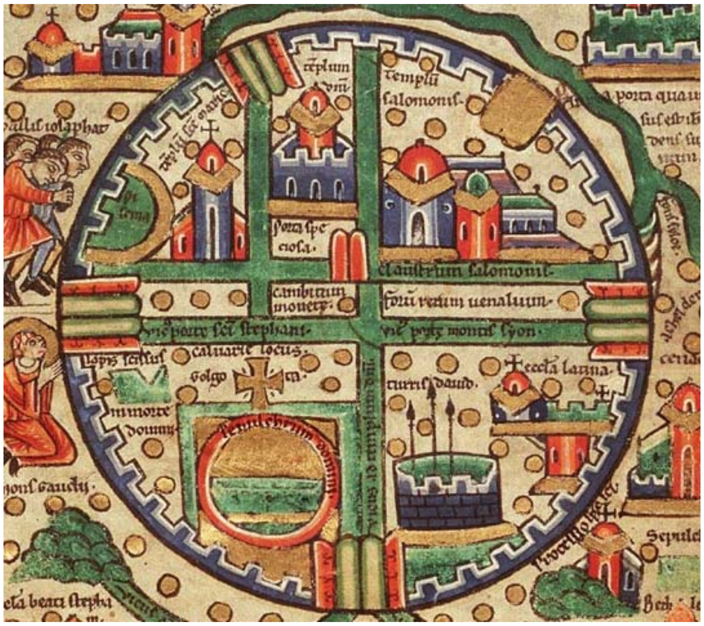
December 2004

Seemingly unrelated topics. Throw in the idea that this article should be on "Astronomy" and you should be wondering just how disjointed the newsletter has become. But, rest assured these topics are all very interrelated, very contemporary, and of interest to astronomy fans. This October I was helping my ten year old with her history homework and the usual statement came up, "Christopher Columbus proved the world was round, not flat as everyone thought". I recalled learning that same fact in grade-school. I explained to my daughter that when I learned this fact, I originally thought, "this guy Columbus must've been a real idiot to borrow someone's boats, sail to the edge of the world, risk falling off, just to come back and say 'I told you so!'" She laughed, adding "yeah, they were pretty stupid back then to think the earth was flat – like duh-helllllo!?" We had a good laugh. Then I leaned over, and with an air of secrecy I whispered to her, "ya know, that flat earth stuff is a lie. They really didn't think the earth was flat back then – they were pretty smart".

She gave me the skeptical look – she's grown accustomed to my fantastic stories. Then I began to explain it to her which I had only recently learned myself. Way back in ancient history, Ptolemy the writer and traveler had realized the earth was round. He didn't arrive at that conclusion on his own; he pieced together bits of knowledge from various sources that suggested the earth was round. Including a reasonably good approximation of the earth's circumference figured out by measurement of the shadow of the great pyramid in Egypt. Ptolemy put these ideas together, and published a map of the world. You've probably seen the old T-O style maps from the medieval period. "T" as in a very simplistic view of the world with Jerusalem as the center of a map with three land masses forming a "t" shape – Europe, Africa and Asia (the "O" comes from the shape of this styled map – it was always a circle). When you look at at the "T-O" map, you get the impression that the world was understood to be quite flat. Ptolemy's map was about 1,000 years older, and it showed the world as a sphere. Yes, a sphere – with latitude/longitude lines.



This is a 1482 reproduction made of Ptolemy's map from 150AD (no originals remain).



“T-O” style map of the from 1200AD

Clearly, someone thought the world was spherical for the last 2,000+ years. The people who traveled long distances knew the world to be spherical. It was a simple matter to determine this – take measurements to the North Star as you were walking. The farther north you traveled, the higher the star would appear. With a little persistence, you could arrive at the same conclusion by tracing the mid-day shadows for a year. Move somewhere else, and perform the same measurements laying the new traces on top of the previous set. If you did this in the northern hemisphere for a year, then the southern hemisphere, you’d have distinctively different shadow traces. You’d come to the conclusion that you were standing on a sphere that slowly changed position. People, who cared, mariners knew the earth was spherical, but couldn’t do much about it.

You should be challenging me with “Then why do all the navigation maps show a flat earth with dragons to devour ships at the Four Corners?” The simple fact is that it was impossible to sail more than a few days’ distance from a shoreline. Mostly because the open ocean, with 40 or 80 foot waves would easily destroy an 80 foot boat, made of wood. If an ocean storm didn’t kill you, the lack of supplies surely would. Eating cabbage and smoked fish, with drinking wine for weeks on end would sustain you, but, surely get sick of it. Even with the nasty offerings, amassing enough supplies for a full crew for weeks at a time was as risky as ocean storms. So, in all practical senses, the mariners of the day didn’t have the means to sail out across the spherical oceans. But they *knew* it to be round. Consider this, in the 1300s the “Spice Islands” was known to European traders and mariners. But the “Spice Islands” is what we now call the Philippines/Indonesia. At a minimum, there was a couple days travel across open seas to get from the mainland of China to the islands of the Philippines. For Europeans to trade in the middle of the Pacific, and do so successfully, it required the knowledge of spherical marine navigation. Simple ‘flat earth’ wouldn’t have been possible, as latitude (determined by angle to the Sun or North Star) would show the navigator to be somewhere near Ethiopia.

Columbus wasn’t setting out to prove anything about a ‘round earth’. He was an accomplished mariner, and knew full well that the earth was round. He was just bold enough to suggest that sailing west, through the uncharted waters, would bring him to the Spice Islands, or more directly, India. The payoff would be fantastic. We think of the ‘spice trade’ as simply getting pepper onto our dinner plates. Seems rather dull – to cart silk and pepper around. But, that’s not the realistic view of the spice trade. Envision the countries of Europe like corporations. Each competing with the other to make more money on selling exclusive items that everyone wanted, or more exactly, believed they *needed*. Spices weren’t food flavorings, they were medicines. The spice traders were the pharmaceutical corporations of Europe of the day – consider Viagra, Oxycotin as pepper, and cumin. There were big bucks in making pharmaceutical breakthroughs in production or new discoveries. Getting spices from Indonesia back to Spain in under a year was akin to opening an entire new medicines factory in Mexico. Columbus was able to convince the board of investors in one of Europe’s largest pharmaceutical corporations that an investment in his production vision would bring big rewards – consequently, in 1490 the Royal Family of Spain granted him the capital to sail on his voyage to find a shorter route to the source of these spices. As we know, the business venture was partly a failure. Columbus never made it to India. In fact he didn’t get to America, although he did make landfall in the Caribbean.

But the cat was out of the bag. The various European competitors caught on to the idea that a westward-passage was possible with one technological improvement – the determination of longitude. Without knowing the longitude, a mariner could not determine how far east or west he had sailed. The problem wasn't their ignorance of the world being a sphere, they fully realized that, but they needed a means to determine the longitude accurately. The problem was two-fold, for one; there was the immediate problem of needing to know how to avoid running aground. Many of the European countries suffered huge losses of life and finance because ships could not accurately determine east/west position and were lost to the rocks. The second impact of the problem was the ability to successfully sail open seas – and so find a shorter route to the Spice Islands. The European countries were in a mad-rush to solve this problem – huge sums of money were offered up to the inventor/discoverer of how to beat this problem.

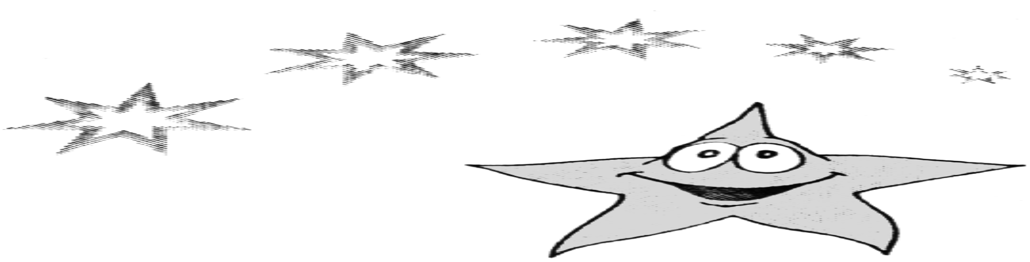
There were two basic approaches to the solution. One broad category of approach was simply "gimmicks" such as telekinetically inflicting pain on a chain of dogs strung out across the ocean (yes, I'm serious) so that mariners could accurately determine time, and thus, with celestial observations, determine position. The other was a broad category of celestial observations. It was noted that if a person was able to accurately measure the angle to several known stars, and knowing his time, he could consult an almanac to look up the angles for the given time and date, and so, in a reverse manner, determine his position. Many astronomers at the time cut their teeth on cracking this exact problem. Huygens and Cassini spent many months making accurate catalogs of star positions so that a mariner could back-track through a catalog. The key problem for the mariner was knowing his time. Clocks simply weren't accurate enough (need to be within a couple seconds accuracy per day). So, the race was on to find a set of celestial observations that would give the exact time. For example, a solar eclipse can be easily calculated down to the second – so, observing a solar eclipse would give the exact time. But, they were rare, and not universally visible. The moon was the next logical choice – the phase, and position of the moon became a frantic cataloging effort. If a mariner could observe the exact phase, angle to the moon, he could determine his position. The problem was the change of phase is too slow, and the orbit of the moon has enough wiggle to make the almanac a very complicated tool.

Enter Gallileo. He had already been known for using a telescope to observe the moons of Jupiter. But his claim to fame was charting the orbits of these moons; he realized that the regular and repetible sequence of Jupiter's moon could be a perfect time keeper. By observing the position of the 4 moons for a few minutes, one could determine the exact time by comparing their positions against a chart. Simple enough, and reasonably accurate enough. The only problem was in the practical use of such a device. Trying to observe the tiny dots of light through a 2" hand-made telescope is difficult enough, but trying to do so while standing still on the deck of a ship was impossible. Gallileo had a solution – he manufactured a helmet that had a telescope protruding out of one eye socket (looking like a creature from Terminator). He proposed that a navigator put on this helmet and note the positions of Jupiter's moons. The idea simply didn't work out.

Eventually, William Harrison, a very persistent clock maker from England, was able to build a clock accurate enough to be used to determine longitude. The clock was used by Magellan on his voyages, which once and for-all, proved the practicality of mechanical time over celestial observations. Once it became universally accepted for navigation, its use was adopted for land surveying. The ability to accurately determine latitude and longitude raised the level of surveying accuracy ten-fold, which turned out to be problematic for the King of France who was forced, by the evidence from his cartographers, to concede hundreds of miles of land to neighboring kingdoms.

In a sweep of two hundred years we see the pivitol role astronomy played in world finances, world politics, world discovery, and absolutely saving lives. Today, my ten year-old learns about astronomy in school with rediculously abstract statements like "millions of miles away… millions of years ago…." No wonder kids lose interest by the time they are teens, astronomy taught like this is not tangible, and it's not real. Back stabbing, lives on the line, fabulous fortunes, intrigue – the real tale of astronomy. Thinking back to my grade-school days of the ignorant "flat earth days", I cant help but think how flat the earth must appear to our school kids.

If you enjoyed my summary, then I recommend the book "The Illustrated Longitude" by Dava Sobel it's a great read, in a very light, and enjoyable style of writing.



Comet Machholz Shines!

By Alan M. MacRobert

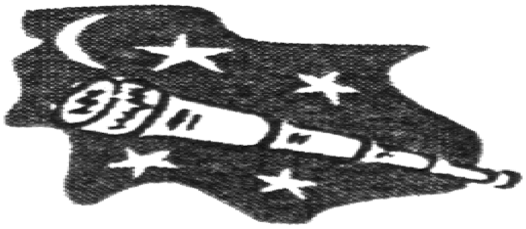
December 22, 2004 | If you haven't gone out yet to look for Comet Machholz west of Orion, you're missing the big sky event of this holiday season. The comet is a fine sight in binoculars, glowing at 4th magnitude pale greenish gray — a large fuzz cloud with a brighter core set against a background of pinpoint stars. This week it's about 13° west of Orion's Shield, high up in good view in the southeast after about 8 p.m. See our article and finder chart in the January *Sky & Telescope*, page 84, or online.

Unfortunately a bright Moon lights the sky until about Wednesday, December 29th. In a dark sky the comet has been easily visible to the naked eye; through moonlight or light pollution it's visible to the naked eye with greater difficulty if at all. Basically, if you can see the Andromeda Galaxy, you can definitely see Machholz.

Being near the celestial equator, the comet is currently visible during evening from all the inhabited parts of the globe. Mariano Ribas in Argentina writes that on December 19th, "for the first time I could see Comet Machholz with my unaided eyes in the light-polluted sky of Buenos Aires (the naked-eye limit is usually 4.5), despite the quarter Moon's interference."

In fact, there's really no rush. The comet will continue to be an easy binocular target during the evening all January and probably all February. It has been running a little brighter than originally predicted, suggesting that it will peak at about magnitude 3.6 during January's first week — when the sky will be free of moonlight. Enjoy!

In photographs, Comet Machholz (C/2004 Q2) has been showing a blue gas tail and the edge of an orange-yellowish dust tail emerging at very different angles from the coma. Johannes Schedler in Austria took this picture on December 12, 2004, using a Canon EF 200mm f/2.8 lens on an SBIG STL-11000M CCD camera. Courtesy Johannes Schedler.

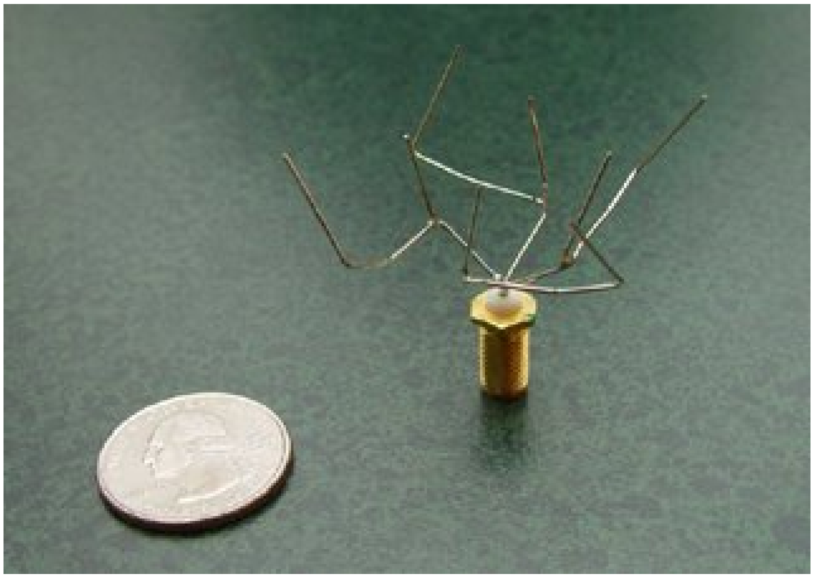


Antennas, Designed by Darwin

by Patrick L. Barry

Who in their right mind would design this bizarre-looking antenna? Actually, nobody did. It *evolved*.

Taking a cue from nature, NASA engineers used a kind of "artificial evolution" to find this design. The result may look odd, but it works very well.



"The evolutionary process improves the design of antennas, just as evolution in nature leads to fitter plants and animals," says Jason Lohn, leader of the Evolvable Systems Group at NASA's Ames Research Center.

The improvement comes from Darwin's idea of natural selection: only the fittest members of a generation survive to produce offspring. Over many generations, traits that hinder survival are weeded out, while beneficial traits become more common. "In the end," he says, "you have the design equivalent of a shark, honed over countless generations to be well adapted to its environment and tasks."

Evolutionary computation, as it's called, applies this principle to hardware design. It's particularly useful for tackling problems that are difficult to solve by hand--like the design of new antennas.

Designing a new antenna for NASA's Space Technology 5 (ST-5) mission was the challenge facing Lohn's group. ST-5 will explore how TV-sized "nano-satellites" can perform the tasks of much larger, conventional satellites at a cheaper cost. Antennas on these satellites must be smaller than usual, yet capable of doing everything that a bigger antenna can do.

The evolution of this bizarre-looking antenna happened inside a computer. Many random designs were tested in a computer simulation. The computer judged their performance against certain goals for the design: efficiency, a narrow or wide broadcast angle, frequency range, and so on.

As in nature, only the best performers were kept, and these served as parents of a new generation. To make the new generation, the traits of the best designs were randomly mixed by the computer to produce fresh, new designs—just as a father and mother's genes are mixed to make unique children. This new generation was again tested in the computer simulation, and the best designs became the parents of yet another generation.

This process was repeated thousands, millions of times, until it settled onto an optimal, shark-like design that wouldn't improve any further. With today's fast computers, millions of generations can be simulated in only a day or so.

The result: an excellent antenna with an odd shape no human would, or could, design.

For more about artificial evolution, see ic.arc.nasa.gov/story.php?sid=86&sec. For more about Space Technology 5, see nmp.nasa.gov/st5. For an animation that helps explain to kids how ST5's antenna sends pictures through space, go to spaceplace.nasa.gov/en/kids/st5xband/st5xband.shtml.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Note to Editor:
The image file can be found at http://spaceplace.nasa.gov/astro_clubs/antenna.jpg .

Dues are Due. . . .

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To renew your membership, all you need to do is fill out the form below and send it with your dues to:

Robert J. Novins Planetarium
ATTN: ASTRA
Ocean County College
Toms River NJ 08754-2001

PLEASE MAKE CHECKS PAYABLE TO ASTRA. You can also pay at the next meeting. If you do, please bring this form with you. Hope we'll see you there!

Annual dues, per family:	$15.00
Refreshments fee — $1.00 for each *additional* family member who is active in ASTRA:	__________
Telescope fund assessment (only if you wish - Optional for continuing members):	5.00
TOTAL (minimum $15.00):	__________

Privileges of membership include 12 issues per year of *Astral Projections*, use of Club telescopes (after suitable training), student discount on admission to Planetarium shows, membership in the Astronomical League, and a subscription to the Astronomical League's quarterly newsletter, *Reflector*. Dues are payable January 1 each year, and past due as of the end of the March business meeting.

(Detach and return with your dues payment)

NAME_______________________________________ **PHONE** (   )_________________

ADDRESS____

CITY____ **STATE**________ **ZIP**___________

NAMES OF OTHER FAMILY MEMBERS JOINING ASTRA (Add $1.00 for Each):
(Please indicate if member is over 18 - for voting purposes)

_________________ ☐ 18+ _______________ _ ☐ 18+ _____________ ______ ☐ 18+ __________ ☐ 18+

E-MAIL ADDRESS (if applicable) ____

TOTAL AMOUNT PAID (minimum $15.00)__________

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☐ **phone number** ☐ **e-mail address** ☐ **put me on the star party phone list**

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