DISTANT LIGHT

Rockland Astronomy Club Journal ~ October 2004

Cat's Eye Nebula NGC 6543

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DISTANT LIGHT
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International Dark Sky Association

Rockland Astronomy Club is proud to be the first astronomy club to become a lifetime member of the International Dark Sky Association, and is a longtime member of the Astronomical League.

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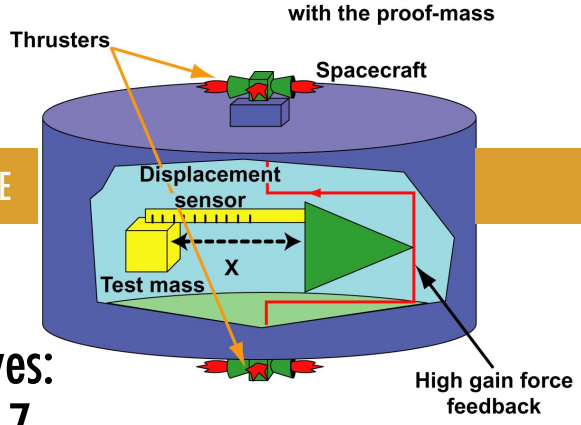
NASA SPACE PLACE

Hunting Gravitational Waves: Space Technology 7



Space Technology 7 will test a technology to be used in detecting gravitational waves in space.

by Patrick L. Barry
and Dr. Tony Phillips

Among the mind-blowing implications of Einstein's general theory of relativity, direct verification is still missing for at least one: gravitational waves. When massive objects like black holes move, they ought to create distortions in space-time, and these distortions should spread and propagate as waves--waves in the fabric of space-time itself. If these waves do exist, they would offer astronomers a penetrating view of events such as the birth of the Universe and the spiraling collisions of giant black holes. The trick is building a gravitational wave detector, and that's not easy. Ironically, the gravitational waves spawned by these exceedingly violent events are vanishingly feeble. Gravitational waves exert a varying tug on objects, but this tug is so weak that detecting it requires a device of extraordinary sensitivity and a way to shield that device from all other disturbances.

Enter Space Technology 7 (ST-7). This mission, a partnership between NASA's New Millennium Program and *(continued on next page)*

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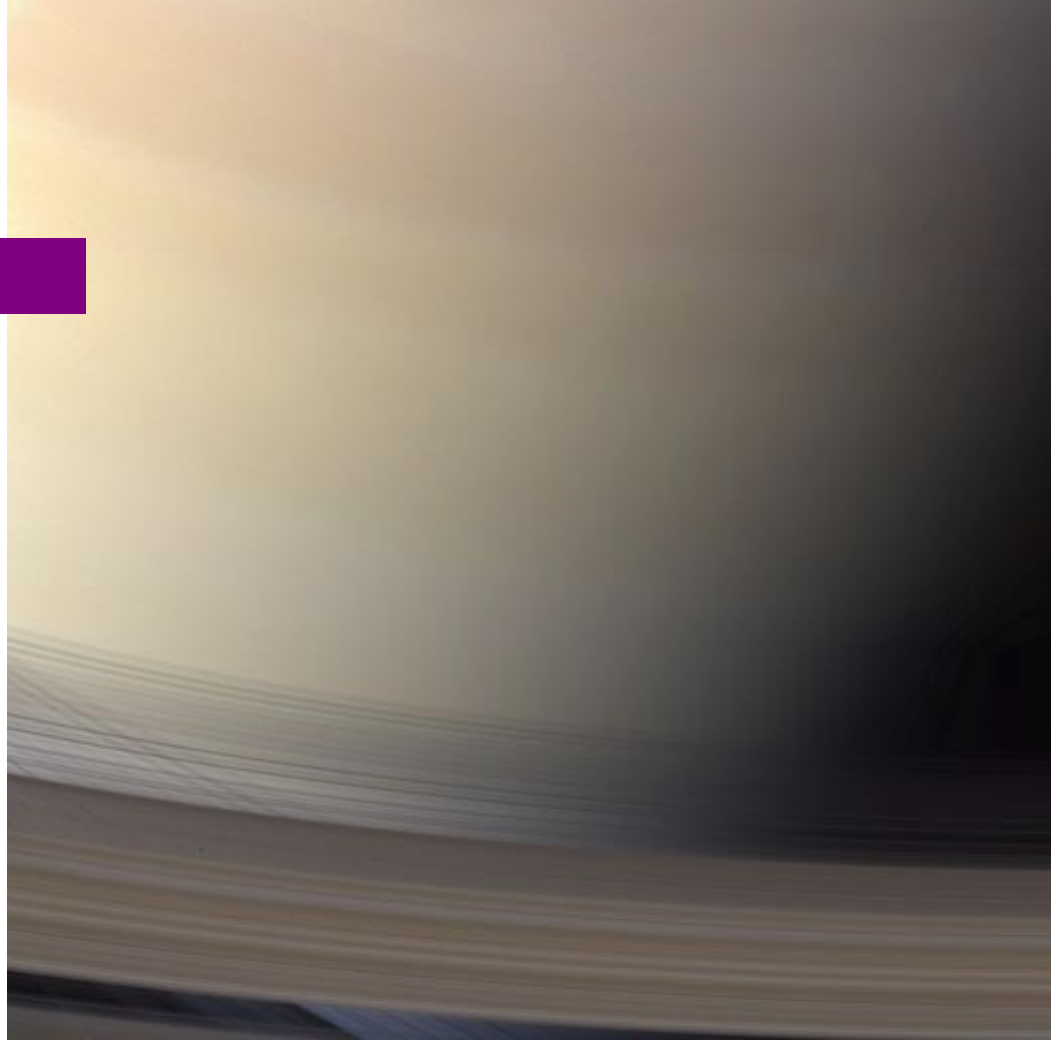
CASSINI PHOTO

Saturn's Ring Shadows



Saturn and its rings would nearly fill the space between Earth and the Moon. Yet, despite their great breadth, the rings are a few meters thick and, in some places, very translucent. This image shows a view through the C ring, which is closest to Saturn, and through the Cassini division, the 4,800-kilometer-wide gap (2,980-miles) that arcs across the bottom of the image and separates the optically thick B ring from the A ring. The part of the atmosphere seen through the gap appears darker and more bluish due to scattering at blue wavelengths by the cloud-free upper atmosphere.

The different colors in Saturn's atmosphere are due to particles whose composition is yet to be determined. This image was obtained with the Cassini spacecraft narrow angle camera on July 30, 2004, at a distance of 7.6 million kilometers (4.7 million miles) from Saturn.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute, Boulder, Colo. ✶

Image above right: Saturn's faintly banded atmosphere is delicately colored and its threadbare rings cross their own shadows in this marvelous natural color view from Cassini. Image credit: NASA/JPL/Space Science Institute.

For images and information about the Cassini-Huygens mission, visit http://saturn.jpl.nasa.gov and http://www.nasa.gov/cassini. Images are also available at the Cassini imaging team home page, http://ciclops.org.

NASA SPACE PLACE

(continued from previous page)

the European Space Agency (ESA), will place a satellite into a special orbit around the Sun where the pull of the Earth's and Sun's gravities balance. But even the minute outside forces that remain -- such as pressure from sunlight -- could interfere with a search for gravitational waves.

To make the satellite virtually disturbance-free, ST-7 will test an experimental technology that counteracts outside forces. This system, called the Disturbance Reduction System (DRS), is so exquisitely sensitive that it can maintain the satellite's path within about a nanometer (millionth of a millimeter) of an undisturbed elliptical orbit.

DRS works by letting two small (4 cm) cubes float freely in the belly of the satellite. The satellite itself shields the cubes from outside forces, so the cubes will naturally follow an undisturbed orbit. The satellite can then adjust its own flight path to match that of the cubes using high-precision ion thrusters. Making the masses cube-shaped lets DRS sense deviations in all 6 directions (3 linear, 3 angular).

ST-7 is scheduled to fly in 2008, but it's a test mission; it won't search for gravitational waves. That final goal will be achieved by the NASA/ESA LISA mission (Laser Interferometer Space Antenna), which is expected to launch in 2011. LISA will use the DRS technology tested by ST-7 to create the ultra-stable satellite platforms it needs to successfully detect gravitational waves.

If ST-7 and LISA succeed, they'll confirm Einstein (again) and delight astronomers with a new tool for exploring the Universe. ✶

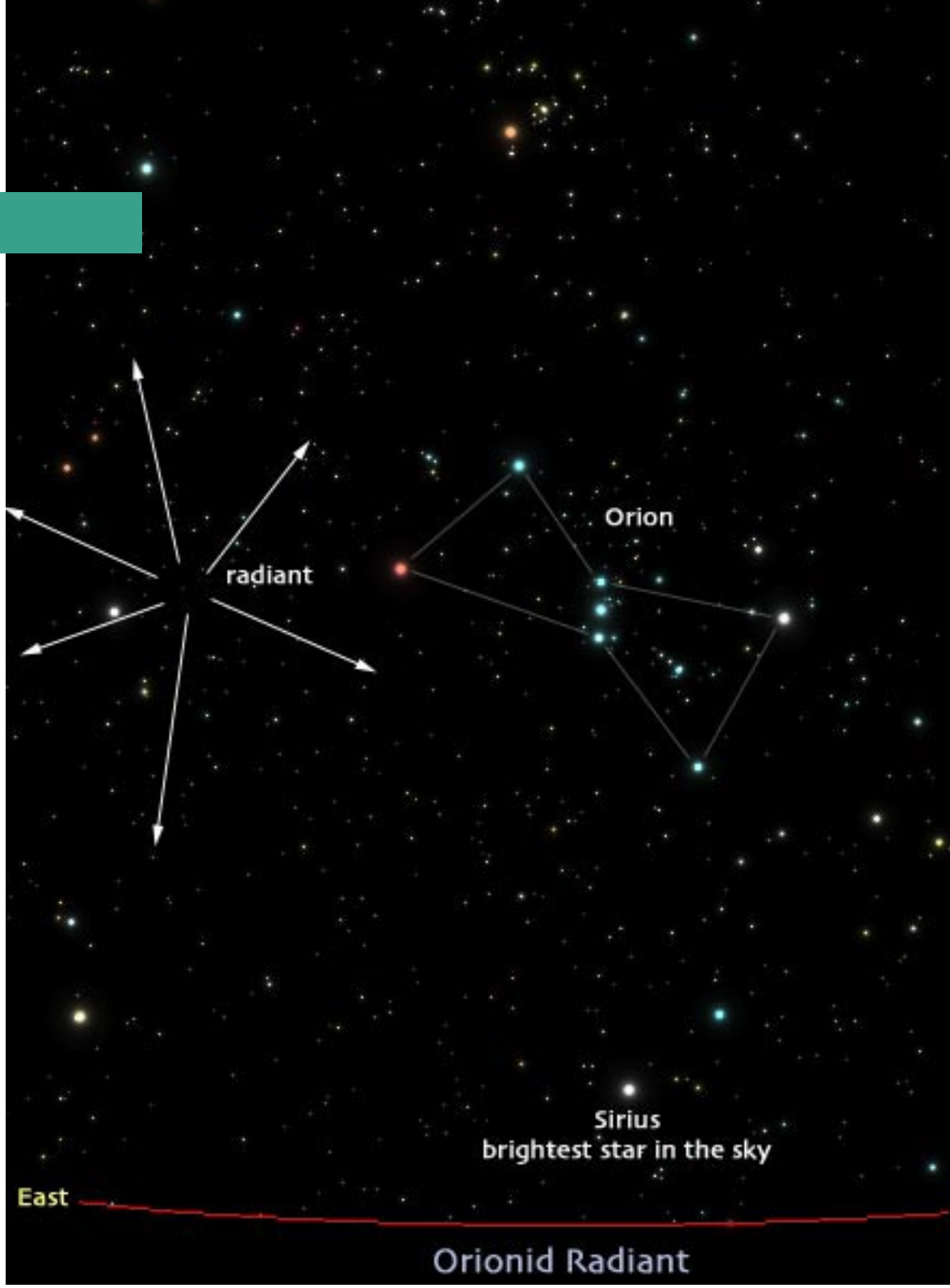
This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

MORE SKYDATA

The Orionid Meteor Shower

The Orionid shower generally possess a strong interest due to the stream's link to Halley's comet. This link was indirectly made in 1911, when Charles P. Olivier recorded the similarity between the orbit of the Orionids and that of the Eta Aquarids of May. Since 1868, this latter stream had been known to be related to Halley's comet, however, this link between Halley's comet and the Orionids is not considered definite.

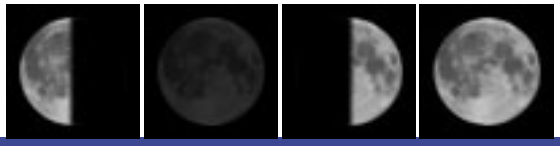
One very unusual feature of the Orionids is that they tend to display unpredictable maximum. In 1981, observers reported very low rates of less than 10 meteors per hour during the period of October 18 to 21 (maximum predicted for October 21), but high rates of near 20 per hour were noted on the morning of October 23. A study published in Czechoslovakia during 1982, revealed the Orionids generally posses a double maximum. What appears to be the best explanation of the Orionids' irregular occurring date of maximum, was made by A. Hajduk (Astronomical Institute of the Slovak Academy of Sciences, Czechoslovakia) in 1970.



Hajduk examined the reported activity of the Orionids for the period of October 14 to 28 during the years 1900 to 1967. He particularly noted that the "stream density varies along the orbit," and "there is no fixed periodically recurring position of maximum or secondary maxima." Hajduk concluded that the density changes were not random and that the displacement of activity "can be explained by the presence of debris field filaments along the stream orbit."

A strong confirmation of Hajduk's filamentary structure theory was made during 1975, when radar equipment was utilized during the period of October 17 to 29. Radio-echo rates were found to slowly increase but, suddenly, at a time generally attributed as the maximum of the Orionids, rates drastically declined. Just as curious was the finding that rates had doubled during the next 24 hours, and then were followed by the normal decreasing rates for every day thereafter.

It was concluded that as Earth entered the Orionid stream, it first intersects a halo with a slight variation of density, then a gap and then another steep increase." It was claimed that this apparent structure confirmed the presence of filaments. ✶



Last Qtr Oct 6 | New Oct 14 | 1st Qtr Oct 20 | Full Oct 28

OCTOBER SKYDATA

Highlights

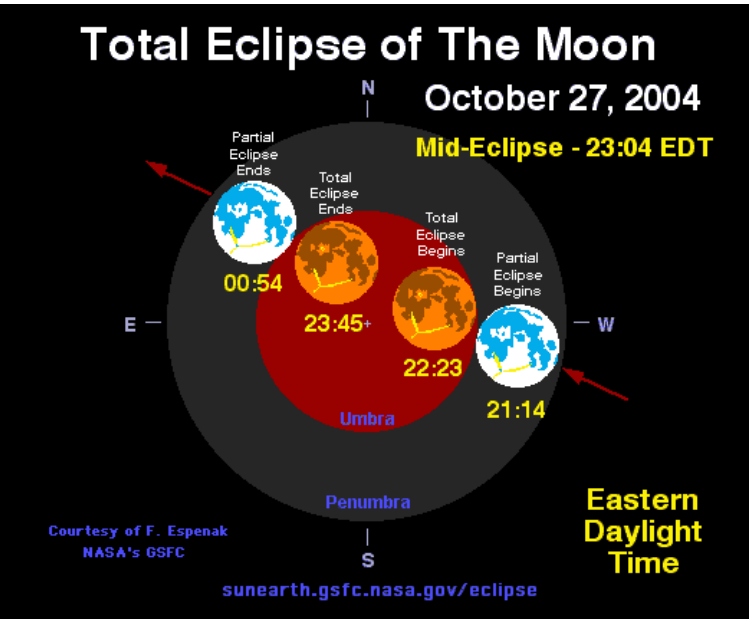
October 3	12:00	Venus is .2 deg south of Regulus
October 7	06:00	Saturn is 5 deg south of the Moon
October 9	18:56	Peak of Draconid meteor shower
October 14	23:43	Jupiter is 1.6 deg south of Moon
October 15	24:23	Moon and Uranus within 4deg
October 20	23:00	Peak of Orionid meteor shower (60 per hr) See page 4.
October 27	20:07	Total Lunar Eclipse (see below)
October 28		Harvest Moon
October 31	04:00	Mars 3 deg north of Spica
October 31		Daylight savings time ends

October's Total Lunar Eclipse

From start to finish, October's lunar eclipse lasts about three hours and forty minutes (not including the penumbral phases which are very difficult to see). The partial eclipse begins as the Moon's eastern edge slowly moves into the Earth's umbral shadow. During the partial phases, it takes just over an hour for the Moon's orbital motion to carry it entirely within the Earth's dark umbra. The color and brightness of the totally eclipsed can vary considerably from one eclipse to another. Dark eclipses are caused by volcanic dust which filters and blocks much of the light reaching the Moon. But since no major volcanic eruptions have taken place recently, the Moon will probably take on a vivid red or orange color during the total phase. After the total phase ends, it is once again followed by a partial eclipse as the Moon gradually leaves the umbral shadow.

The total phase of a lunar eclipse is called totality. At this time, the Moon is completely immersed within the Earth's dark umbral shadow. During the October 27-28 eclipse totality will last about 81 minutes. This is considerably shorter that the maximum duration possible of 1 hour and 47 minutes.

The major phases of the eclipse occur as follows. The partial eclipse commences with first umbral contact at 21:14 EDT. Totality begins at 22:23 and lasts until 23:45. The partial phases end at 00:54. ✶



ANATOMY OF THE ECLIPSE

Event	Time EDT
Sun Set:	17:57
Moon Rise:	18:11
Partial Eclipse Begins:	21:14
Total Eclipse Begins:	22:23
Mid-Eclipse:	23:04
Total Eclipse Ends:	23:45
Partial Eclipse Ends:	00:54
Moon Set:	07:51

Prime Observing Window

Saturday Oct 9 thru Monday Oct 18

Sun & Moon Rise & Set Times

Date	Sunrise	Set	Moonrise	Set	Phase
Oct 6	06:59	18:30	23:48	15:01	Last Qtr
Oct 14	07:07	18:17	07:35	18:38	New
Oct 20	07:14	18:08	14:36	23:39	1st Qtr
Oct 28	07:23	17:57	18:11	07:51	Full

Planetary

Visible Planets in the Night Sky

October 1, 2004

	Rise	Transit	Set	Mag
Mercury	06:35	12:36	18:37	1.7
Venus	03:25	10:13	17:01	- 4.2
Mars	06:27	12:27	18:28	1.8
Jupiter	06:17	12:20	18:24	- 1.7
Saturn	00:47	08:06	15:26	0.2

October 15

	Rise	Transit	Set	Mag
Mercury	07:44	13:08	18:32	- 0.9
Venus	03:52	10:20	16:49	- 4.2
Mars	06:18	12:05	17:53	1.7
Jupiter	05:37	11:36	17:36	- 1.7
Saturn	23:52	19:13	14:34	0.2

October 31

	Rise	Transit	Set	Mag
Mercury	07:53	12:41	17:29	1.5
Venus	03:25	09:29	15:33	- 4.1
Mars	05:08	10:41	16:15	1.7
Jupiter	03:50	09:45	15:41	- 1.7
Saturn	22:51	17:41	12:32	0.2

All data calculated for Suffern, New York:
Latitude: 41:06:48 N; Longitude: 74:08:38 W

Articles this page by Ed Siemenn; Ephemris data from US Naval Observatory

The RAC Essentials

SEPTEMBER CALENDAR

201-768-2238 or 845-47STARS — **Message Hotline: The latest information or last minute changes to club events.**

Prime Observing	**Period: October 9 through 18**
Fri/Sat, Oct 8/9	Observing at Wawayanda*
Saturday, Oct 9	"Up All Night" at Lake Taghkanic*
Saturday, Oct 16	Joy of the Universe Anthony Wayne

LOCATIONS

North Rockland
High School Planetarium
Hammond Road, Thiells, NY
Rockland Community College
College Road, Suffern, NY
Lower Hudson Valley
Challenger Center
Rt. 59, Suffern, NY
Anthony Wayne
Recreation Area*
Exit 17, P.I.P., NY
Silvermine Ski Area*
Exit 18, P.I.P., NY
Wawayanda State Park*
973-853-4462,
Highland Lakes, NJ
Tahgkanic State Park*
Taconic State Parkway,
Ancram, NY

**Special permits required to observe at these locations. Contact Frank Bifulco for permit copies.*

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