

Triton Fun Company

Science Newsletter March 2008

# Science Newsletter

## March 2008

### Rings in the Sky:

Khvolson-Einstein Rings from gravitational lensing of galaxies

T. Dockweiler

#### Special points of interest:

Einstein rings

Triton Fun stuff

Superfluous questions

*Einstein Rings* or *Khvolson-Einstein Rings* as they are often known, are circular or arc-like objects that appear in the sky around galaxies, nebula or other objects. They arise from the gravitational lensing or refraction of light from an object that is behind another object as seen from Earth. In what would probably please Khvolson and Einstein, incredibly, a double ring in Leo has recently been discovered!

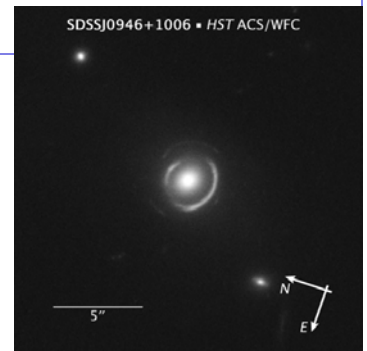
The Russian physicist Orest Danilovich Khvolson (1852-1934) is the first person to publish the idea of the possibility of a ring resulting from the gravitational deflection of light. He announced it in a brief article in 1924 in a German astronomical journal. His name is sometime spelled "Chwolson". The Russian anglicized version is more correctly "Khvolson" (sometimes "Khvol'son").

Khvolson taught at St. Petersburg University and was an honorary member of the Soviet Academy of Sciences (1920). He is most noted for producing a multi-volume physics course used for many decades in Russia and Europe in various languages. He was an inventor of certain designs of the *actinometer* and *pyrheliometer*, instruments which both can measure properties of the Sun's radiation and are commonly used in weather

research. His pioneering work involved research on electrical physics, light analysis, magnetic, chemical, and aerosol physics. Two craters near each other on the far side of the Moon honor his work and are named "Khvol'son" and "Khvol'son C".

A cosmic ring is correctly known as a Khvolson Ring, but Chwolson Ring is also acceptable. Khvolson deserves full credit. Khvolson's 1924 article used the term "ring". Twelve years later, Albert Einstein, at the prodding of the Czech scientist Rudi W. Mandl (who resided in New York and who was aware of the ring potential), prepared a brief article at the end of 1936 which provided calculations and noted the idea of the "illuminated circle". Recently found unknown letters may also indicate that credit is due to Emil Arnold Budde (1842-1921), a German electrical engineer and president of the International Electrochemical Commission, who corresponded to Einstein in 1916 pertaining to the ring possibility. "Budde Rings" would also then be appropriate.

The new double ring J0946+1006, announced January 10, 2008, is to the west of the star Regulus and just east of the star Subra (Omicron Leonis) in the constellation Leo.



**Khvolson-Einstein Rings:**  
from gravitational lensing of  
light from background galaxies

It was discovered by a team of 7 people (Raphael Gavazzi, et al.) as part of the Sloan Lens ACS Survey using the Hubble Space Telescope. Ring 1 is about 3 seconds of arc diameter at magnitude 19.8. Ring 2 is 36 times fainter and is almost 5 seconds of arc diameter at magnitude 23.7. The massive foreground elliptical galaxy is about 3 billion light years away and warps the light of two galaxies about 6 and 11 billion light years away, respectively, into two concentric rings. Each ring has multiple images of its smeared galaxy. Ring 2 is of the farther galaxy. Analysis of the rings have determined that the foreground galaxy region that produces the gravitational lensing field is composed of about 73% dark matter! The authors anticipate that future multiple rings may be found.

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We are always looking for **contributors** to the Science Newsletter. If you would like to write an article about a science subject you are excited about, or contribute a superfluous question, or if you would like to be on our **mailing list** for future newsletters, please e-mail us at:

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Einstein rings in the sky: continued

Photos/Info: NASA/Hubble Space Telescope/ University of California, Santa Barbara

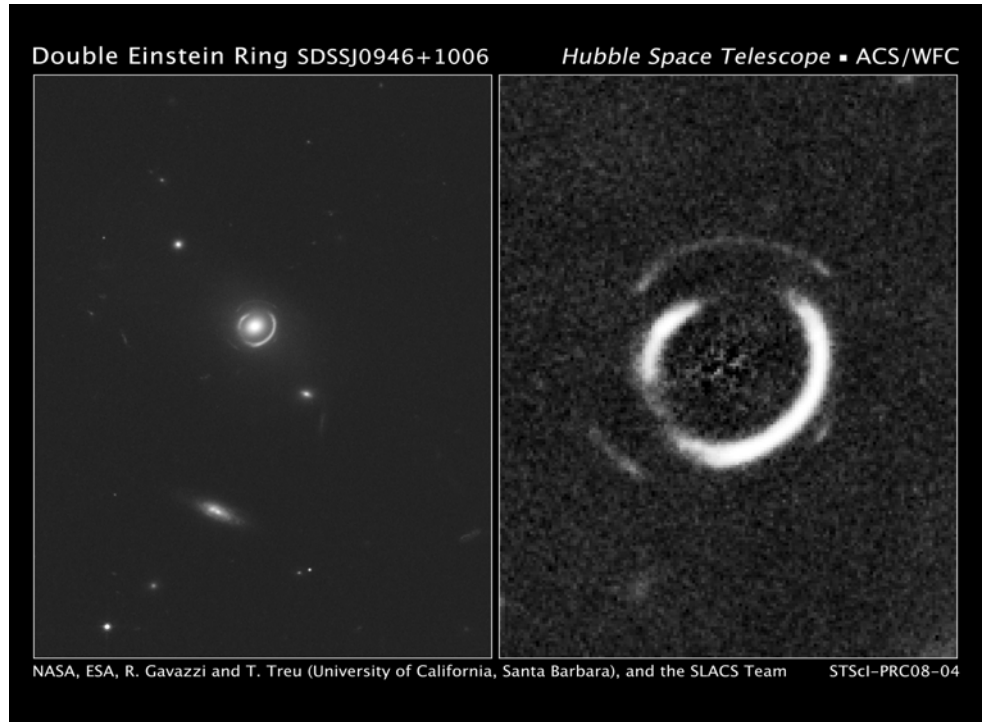
A recent substantial discovery of 67 new gravitational lenses was just announced on February 19, 2008 by the COSMOS survey project, and at least 4 new Khvolson-Einstein Rings are within that group. All known gravitational lenses and Khvolson-Einstein Rings will be used as examples for future automated computerized searches encompassing various entire image archives such as those obtained by the Hubble and Spitzer telescope surveys.

Cosmic rings can be used for measuring mass dynamics and distribution of galaxies and their groups in the Universe. Cosmography of dark matter and cosmological voids is another area along with further precise measurement of the Hubble Constant. When more cosmic ring systems are located, the accuracy of measuring the mass in the Universe will be greater and will further determine various physical properties. In addition, gravitational lens work is being used to explore planetary systems around other stars.

Luminous arcs of rings were discovered in 1985 based on earlier work on clusters of galaxies in 1976, and announced at the beginning of 1987. It was unknown at the time what they were but these arcs were suspected as being gravitationally formed. The first potential Khvolson-Einstein Ring found was announced in 1988 and confirmed by later observations.

**References:**

(1.) R. Gavazzi, et al., "The Sloan ACS Survey. VI: Discovery and analysis of a Double Einstein Ring", *Astrophysical Journal*, 2008, 15 pages, preprints 2008. To be published.  
 (2.) C. Faure, et al., "First catalog of strong Lens Candidates in the COSMOS Field", *Astrophysical Journal Supplement Series*, 2008, 31 pages., To be published.



Hubble images of the new Einstein rings found in the constellation Leo



**Orest Khvolson**

Russian physicist who first conceived the idea of a ring produced by the gravitational deflection of light; he published the concept in 1924

3.) O. Chwolson, *Astronomische Nachrichten* 221, pp. 329-330 (1924) ["Regarding A Possible Form Of Double Stars", *Astronomical Notes*].  
 (4.) T. Dockweiler, "Weird Physics: Einstein Rings", *Science Newsletter*, Triton Fun Company, Vol 1, Issue 1, page 2, May 2006; <http://www.tritonfun.com> (See Newsletter Archive)

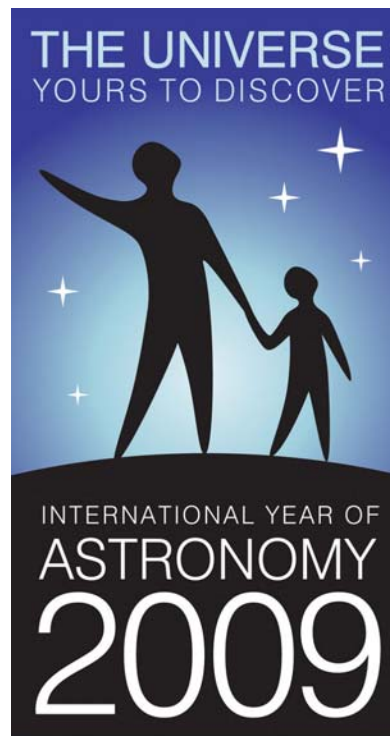
## TRITON FUN PRODUCTS

2009 has been declared the "International Year of Astronomy". Events and activities to further the excitement of astronomy are being planned by IYA committees in over 100 countries. The logo for the IYA2009 is shown below. For more info on upcoming IYA2009 events, go to: <http://www.astronomy2009.org>

Triton Fun is an authorized distributor of T-shirts, sweatshirts and long-sleeve tees sporting this new logo. Part of the proceeds from the sale of these shirts will go to support astronomy clubs and astronomy activities connected with IYA2009 in California.

These shirts can be ordered online on our website:  
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\*\* Send us your superfluous questions for a future issue ! They can be on any subject. The funnier, the better. M.D., our editor, appreciates the help and will send you a free Triton Fun coffee mug as compensation for your question. Or write an article for us and be read by professional and amateur astronomers and scientists in the U.S. and Canada ! \*\*

## Superfluous Questions:

1. Whose 9th inning home run won the World Series for the Toronto Blue Jays in 1993 ?

- a) Paul Molitor    b) John Olerud    c) Joe Carter    d) Roberto Alomar

2. In what year did Australia become independent from the United Kingdom ?

- a) 1901    b) 1912    c) 1917    d) 1940

3. What are the islets of Langerhans ?

- a) a rock band from Boston    b) islands near Indonesia    c) cells in the pancreas    d) barristers in Langerhans, Scotland

4. In the TV show *Will and Grace*, what actor played Karen Walker's mother, Lois Whitley ?

- a) Blythe Danner    b) Debbie Reynolds    c) Suzanne Pleshette    d) Judith Ivey

—> ANSWERS in next months issue of the Science Newsletter ! <---

\*\* ANSWERS to February's Superfluous Questions: 1. d) June Foray 2. d) December 3. c) Epimetheus 4. c) South America