

# skynews



*this month*

## **Dr. Andisheh Mahdavi** **Dark and Luminous Matter in Clusters of Galaxies**

**May 14, 2008, 7:30 PM, Elliott Lecture Theatre, Rm 060, UVic**

Clusters of galaxies are dominated by dark matter. We can see the

gravitational effect of this dark material on the orbits of cluster members, the thermodynamics of the hot gas, and the lensed shapes of galaxies behind the cluster. I will show that combining multi-wavelength data for a single relaxed cluster can yield powerful constraints on its dark matter distribution and on the equation of state of the intra-cluster plasma. At the same time, as the bullet cluster teaches us, multi-wavelength observations of merging clusters can yield significant and perhaps even more interesting constraints on dark matter properties. Both relaxed and merging clusters are well-represented in the Canadian Cluster Comparison Project, an X-ray, optical, and radio survey of fifty nearby clusters. I will conclude by discussing an unusual, massive, X-ray bright core nearly devoid of galaxies at the heart of Abell 520, and will explore its implications for our understanding of the fundamental nature of dark matter.



**Bio:** Andisheh Mahdavi is an observational and computational astrophysicist focusing on clusters of galaxies, the largest gravitationally bound cosmic objects. Mahdavi specializes in marshalling data from orbiting X-ray satellites and ground-based optical and radio telescopes to understand the physics of dark and ordinary matter in clusters

Mahdavi received his BA (1995) and PhD (2001) from Harvard University, following which he joined the University of Hawaii as a Chandra Postdoctoral Fellow. Since 2005, he has been at the University of Victoria. Mahdavi has served as a U. S. Fulbright scholar, lived extensively in Europe, the Middle East, and North America, and has received the Harvard Hoopes, Goldberg, and CUE Teaching prizes.

*on the cover***NGC4490 and SN2008ax-detail**

by John McDonald

In early March a star exploded forming a super nova appeared in galaxy NGC 4490 in the constellation Canes Venatici. It is reasonably bright as is the background galaxy. It shows up quite well in this image from my backyard taken through a small telescope.

Date and location - 2008-04-03, Victoria BC.

Equipment - Williams 105mm with modified Canon 350D and 0.8x focal reducer on HEQ5 mount.

Exposures - 37 light and 13 dark frames at ISO 400 for 60s with 20 flat frames for calibration.

Processing - ImagesPlus and Photoshop

*Upcoming Events*

**Monthly Victoria Centre Meeting** - May 14, 7:30 PM, Elliott Lecture Theatre, Rm 060, UVic. Dr. Andisheh Mahdavi, Dark and Luminous Matter in Clusters of Galaxies

**Astronomy Day** - May 10 at the Centre of the Universe. Exhibits on display from 10 am - 4 pm. Public observing from 7 pm - 11 pm.

**Monthly Victoria Centre Meeting** - June 11, 7:30 pm, Elliott Lecture Theatre, Rm 060, UVic. Member's Night.

**Celebrating Solstice** - June 21, 11am - 2 pm, Beaver Beach - co-sponsored by CRD Parks and Victoria Centre.

**Island Star Party** - July 4-5, Hosted by our friends Cowichan Valley Star Finders; location is the Victoria Fish and Game Association, Malahat, BC.

**RASCals Star Party** - August 29-31. Hosted by Victoria Centre; location is the Victoria Fish and Game Association, Malahat, BC,

*President's Report***President's Message  
May, 2008****Observatory Project**

Bruno and his volunteers are working on finishing outside of the building. We will have a nice observing area in front of the observatory when they are finished. The automatic roof opener is installed, and we expect to bring the Paramount ME to mount on the pier in mid-May. The computer systems and weather station are ready to go, as the Technical Committee continues work with documentation, and other important details. We haven't chosen an opening date for our new observatory yet, but it is now only a few weeks away. Observatory Project

**Events**

As I write this in early May, Astronomy Day is only a few days away. Victoria Centre always puts a great deal of effort into this event, and May 10th will be no exception. This year all of our Astronomy Day activities will be held at the Centre of the Universe atop Observatory Hill. Daytime activities start at 10am and run through to 4pm. Then we take a break for a few hours before the nighttime activities happen between 7pm and 11pm. Since we are not holding Astronomy Day at the Royal BC Museum this year, we expect to see less tourists, but more locals. The CU has waived their admission fee for the day, so invite your friends and family - print off some Astronomy Day Posters (68k pdf) and give them out as reminders.

**RASC General Assembly - "Astronomy Night in Canada"** - If you are planning to attend the GA in Toronto in June, hopefully you have already registered and taken advantage of the Early-Bird pre-registration savings. If not, there is still time to pre-register and arrange for your accommodation on the York University campus. There are some important issues to be discussed at this year's GA, so if you wish to have your vote counted, please contact Chris Gainor, our National Rep (contact info). He can provide you with proxy voting forms, so he can represent your views when the issues are presented at the GA. The GA also is an

opportunity to have some fun and socialize with your fellow amateur astronomers. There are some interesting activities planned by the three Toronto area Centres who are sponsoring this year's GA.

### Observing

Elizabeth van Akker achieved a major milestone in her observing last month: she was awarded the the Messier Certificate. Elizabeth's modesty prevented us from doing a formal presentation at a meeting, however congratulations Elizabeth, from all members of Victoria Centre. Bill Weir reports he has completed the RASC Deep Sky Challenge list, which is quite an accomplishment since "challenge" is the keyword here. Even Bill's legendary observing skills have been put to the test with this list. Of course, being the obsessive observer that he is, there are several other lists he is working on!

Our cold and cloudy April weather did not give us much opportunity for observing, however a few of our members persevered. Several of our members observed supernova SN2008ax in the NGC4490 galaxy, and John McDonald took a wonderful photo of this event for us all to enjoy.

*contact us on-line*

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*address change? information incorrect*

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## What Mars Fossils Might Look Like By Susan Brown, Space.com

Fossil microbes found along an iron-rich river in Spain reveal how signs of life could be preserved in minerals found on Mars. The discovery may help to equip the next generation Mars rover with the tools it would need to find evidence of past life on the planet.

The Rio Tinto arises from springs west of Seville. These springs percolate up through iron ores that were deposited by geothermal activity more than 200 million years ago. Spring water dissolves iron sulfide minerals from the ores, and this stains the river red. The iron sulfide minerals also dissociate to form sulfuric acid.

With a pH between 1.5 and 3, Rio Tinto is as sour as vinegar, yet it supports a surprising variety of life. Bacteria, algae, single-celled organisms called protists and fungi all thrive in the acid headwaters.

Rio Tinto has attracted the attention of exobiologists because this environment can create the iron mineral hematite, which has been found on Mars. On Earth, hematite only forms with liquid water. Since liquid water is seen as a prerequisite for life elsewhere, the mineral's presence on Mars tantalizes those who hope to find signs of life, past or present, on our neighboring planet.

By examining incipient fossils along Rio Tinto's shores and comparing them with much older fossils left on terraces now high above the river, David Fernández-Remolar of the Astrobiology Center in Torrejón de Ardoz, Spain and Andrew Knoll of Harvard University hope to better understand how similar minerals may have preserved a record of life on Mars.

### Washed up

Pools at the edge of the river evaporate in the heat of the Spanish summer and leave behind mineral deposits. When Fernández-Remolar and Knoll looked at those evaporating pools, they saw microbes that had become coated with nanoparticles of iron minerals that had precipitated out of the water. The most common mineral they observed was a rust-like iron oxide called goethite. Layers of fine-grained goethite surrounded the youngest fossil microbes, preserving the rod-like shapes of individual bacteria as well as filaments formed by bacterial colonies.

The minerals surrounding the fossils changed as the sediments cemented

to form rock. Finely grained minerals encased fossils found in the youngest terrace, but those from a rock layer 700 to 800 years old had larger crystals. Over time, the minerals altered chemically as well. Rustlike goethite slowly loses hydrogen and oxygen atoms to become more stable hematite over time. In fossils from the oldest terraces, hematite had begun to replace the goethite. These findings were recently reported in the journal *Icarus*. "The iron-rich rocks of Mars's Meridiani Planum, where the rover Opportunity explores, may have formed through roughly similar geochemical processes", says planetary geologist Timothy Glotch of the State University of New York in Stony Brook.

"Rio Tinto is a decent analog for what we see on Mars," Glotch said, noting that spectral analyses suggest Martian hematite originally formed as goethite or a similar mineral that was later altered to hematite. "It's a story similar to what they see in Rio Tinto."

#### Visit required?

The Martian hematite rocks are far older than the Rio Tinto rocks. They may date back to as much as 3 to 4 billion years ago, a time that coincides with the earliest evolution of life on Earth. A lack of tectonic activity on Mars is likely to have left them relatively untransformed. For that reason, "Mars would be a very good place to look for preservation of microbial structures," Fernández-Remolar says.

Planetary scientist Carol Stoker of NASA's Ames Research Center at Moffett Field, California, agrees that if life was abundant when the Meridiani sediments formed, the fossils would likely be similarly preserved. But she isn't holding out much hope for any rover to find fossils. Successful identification of fossil life requires careful field work by geologists who select many of the most promising samples to analyze, she says.

Fernández-Remolar and Knoll thinly sliced the Rio Tinto rocks to see the microbial structures. Although future rovers could be equipped with more powerful micro-imagers, they still wouldn't be able to peer inside the rocks. The next generation rover is expected to pulverize samples and to analyze the dust, a process that would obliterate the shape of anything that happened to be preserved.

Even missions designed to bring samples of Martian rocks back to Earth are unlikely to be able to select and ship back enough rocks to make detection of fossils probable, says Stoker. "The missions most likely to find definitive evidence of fossil life on Mars will be those conducted by human crews," she claims.

*observers group*

RASC Victoria Centre and the NRC have signed a License to Use Land Agreement which gives members of Victoria Centre expanded access to NRC property on Observatory Hill.

If you are a member in good standing of Victoria Centre RASC, consider yourself an "active observer", and wish to take advantage of this opportunity, please send an email to the 1st or 2nd Vice President. More information on this program see: <http://victoria.rasc.ca>

*Awards*

On 1 May the Astronomical Society of the Pacific announced the winners of their 2008 awards. Two individuals with strong Canadian astronomy connections, Sidney van den Bergh and Jean-Charles Cuillandre (CFHT, who performed part of his PhD research in astronomical instrumentation at the DAO many years ago), are featured: <http://www.astrosociety.org/membership/awards/08winnerspub.html>

Sidney's award will be presented to him on Thursday, 22 May at the CASCA meeting in Victoria by ASP Board member Prof. Lynne Hillenbrand, California Institute of Technology.

**by Chris Gainor**

Many of us are enjoying the newfound spending power of the Loonie, but some of us know that the upswing in our currency has its downsides, too. Take the national RASC as an example.

When the Canadian dollar was low relative to the U.S. dollar, the RASC sold many Observers Handbooks and other products to American customers. Today those products are harder to sell, and the result is that the income of the national society has taken a serious hit.

National has taken a number of measures to deal with falling revenues, including making the RASC Journal an electronic publication, but the financial problems persisted. With the assistance of a special Board Pilot Committee elected last year, the national executive and national council have decided on a course of action to bring the RASC's national books back into balance.

A survey of the membership showed that most members preferred to continue receiving the current package of benefits, including the Observer's Handbook, the Journal in electronic form or printed for an extra fee, and a subscription to SkyNews magazine, among other things.

Therefore, the executive and the Board Pilot Committee recommended that dues be increased by \$7 a year to allow members to continue to receive the current services from the national society and bring the society's revenues into line with expenses. National council passed this recommendation at a meeting on March 30.

But there is one more step. At the RASC's annual general meeting in Toronto on June 30, members will vote on this proposal to raise dues. If this proposal goes through, annual RASC dues will increase to \$66 a year, \$44 of which will go to the national society and \$22 to the centres, including the Victoria Centre in the case of Victoria Centre members.

If the members at the AGM reject the dues increase, the national executive will be empowered to negotiate a new agreement with the publishers of SkyNews magazine which would see the printed version of the magazine become an optional service for RASC members for an additional fee, with all RASC members still having access to an electronic version of the magazine.

While members are invited to attend the national AGM and the associated astronomical activities at the General Assembly in Toronto, any member can vote by proxy at the national AGM.

As our national representative, I will be attending the AGM and I will be happy to cast proxies from Victoria Centre members, regardless of what side of the dues question they stand on. Proxy forms and information will be mailed to all RASC members in advance of the AGM, and I can be contacted at Victoria Centre meetings, at the Astronomy Café, by email: NationalRep@victoria.rasc.ca, or phone: (250) 380-6358.

The national society has also been occupied bringing itself up to date with changes in federal tax regulations. The national RASC and the Victoria Centre are both registered charities, but the national society will have to change the way it shares revenue with the centres.

This change will not have a great impact on the Victoria Centre, except possibly for life members. At the moment, the national RASC is working on a new revenue sharing scheme to deal with life members. The national society will be consulting soon with life members.

As the result of a difference over the procedures used to deal with the Canada Revenue Agency, Scott Young of Winnipeg has resigned as national president of the RASC. He has been replaced for the balance of his term by Dave Lane of Halifax, who had been first vice-president. A new executive will be elected at the AGM in Toronto.

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***Astronomical Distances*****by John McDonald**

After imaging the supernova SN2008ax (footnote 1)) and looking at Bill Weir's sketches (footnote 2)) I started thinking about how long the light of that supernova took to get here (about 25 million years) and the complications of describing how far away galaxies really are. For any galaxy we can see in amateur equipment, the distance is small compared to the size of the universe. Measuring it in light years is a reasonable thing to do. So it makes sense to say that supernova 2008ax is a (now long gone) star in a galaxy 25 million light years away. However, for very distant objects such as those in the Hubble deep field images, the use of

light years can lead to much confusion.

Imagine a galaxy that is at a light travel time distance of 10 billion years so the light we are seeing has been enroute to us for 10 billion years. We might think it is 10 billion light years away. However, the universe has been expanding while that light has been enroute so the galaxy is actually now at a larger distance. It is in fact now roughly 17.5 billion light years away!

The amount of expansion of the universe increases with distance. It does not affect the “nearby” galaxy that SN 2008 is in very much (25 million light years is not a great distance compared to the size of the universe). But for the distant galaxies that can now be seen by Hubble and large ground based telescopes, the expansion of space that has occurred while their light travelled to earth has to be considered.

Redshift,  $z$  is a more useful measure for very distant things ( $z$  is roughly 1.9 for our 10 billion light years example above) and there are other measures as well; “Luminosity distance”, “Angular Diameter distance”, “Comoving distance” as well as the “Light travel time distance (ie light years)”.

I found a neat website that has a fairly clear explanation of the different scales and a graph that compares them, as well as a link to the computer code used to make the graph (footnote 3)).

If all of this is a bit much to get your head around, you can take some comfort in knowing that all of the scales give pretty much the same value for the distances of objects we can see with our scopes. We don't see much beyond a redshift of 0.1 (1.3 billion light years) and for distances less than this the expansion of the universe is too small to matter much. So long as amateur telescope and imaging technology does not get a great deal better, we can continue to use light year measures for the things we see.

- 1) <http://rascvic.zenfolio.com/p1028029664/?photo=h1D209589#488674697>
- 2) <http://rascvic.zenfolio.com/p566114947/?photo=h38076FAE#19169204>
- 3) <http://www.atlasoftheuniverse.com/redshift.html>

*RASC victoria council*

*this month*

*monday nights*

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**Astronomy Cafe**

Fairfield Community Centre,  
1330 Fairfield, Victoria  
7:30-11pm  
Call John at 250.480.0928 for directions and information. New comers are especially welcome. Come and enjoy!

**ASTRONOMY  
CAFÉ**



*second wednesday of the month*

**Monthly Meeting**

7:30 PM, Elliott Lecture Theatre,  
Rm 060, UVic.

*as sky and interest dictate*

**New Observers Group**

Hosted by Sid Sidhu.  
1642 Davies Road, Highlands.  
Call 391-0540 for information and directions.

*by email*

**Observer/CU Volunteers/ Members email lists**

Contact Joe Carr to subscribe to these email lists for important, timely, member-related news.