Hamilton Amateur Astronomers

Event Horizon

February 2001 Volume 8 Issue 4

The Death of our Constellations

Sorry, Cassiopeia.
Forgive us, Orion.
Pardon us, Pleiades.

You're dead in the sky!

Sorry.

We earthlings made you up
Saw you,
Realized you
from our here and now
as part of our desperate attempt
to make the universe ours.

My Martian friends however
argue convincingly
that you don't exist
except as figments of earthling imagination.

Sorry.

It makes it a lot easier for us
if we know you understand
we sincerely regret this.

It isn't easy for us either
by the way
being aliens
alone

in our virtual-reality universe.

David Hillen

inside...

Chair's Report

We have some great speakers and events coming up over the next few months. Peter Jedicke of the London RASC will be our speaker in March. I'm not sure what his topic will be, but I heard him speak at a star party this past summer and it was an interesting, informative talk.

Ivan Semeniuk of the Discovery Channel will be our speaker in April. He will be updating us on recent and happening events in astronomy. If you have heard him before you know what a great, entertaining speaker he is.

The Canadian Astronomical Society (CASCA) is having its annual meeting in Hamilton this year, hosted by the Physics and Astronomy Department at McMaster. The Helen Sawyer Hogg Public Lecture is by Dr. Jill Tarter of SETI - one of the most prominent and interesting astronomers around! Her lecture is sure to draw a huge crowd and everyone is welcome. Our club is one of the sponsors of this event and we will have our logo on the publicity posters.

As usual, please be sure to check our meeting location just prior to each meeting. Have a great month, and if we ever have some clear skies be sure to get out for some observing.

Margret Walton
margw@icom.ca

HAMILTON AMATEUR ASTRONOMERS

Event Horizon is a publication of the Hamilton Amateur Astronomers (HAA).

The HAA is an amateur astronomy club dedicated to the promotion and enjoyment of astronomy for people of all ages and experience levels

The cost of the subscription is included in the $25 individual or $30 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

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http://www.science.mcmaster.ca/HAA/

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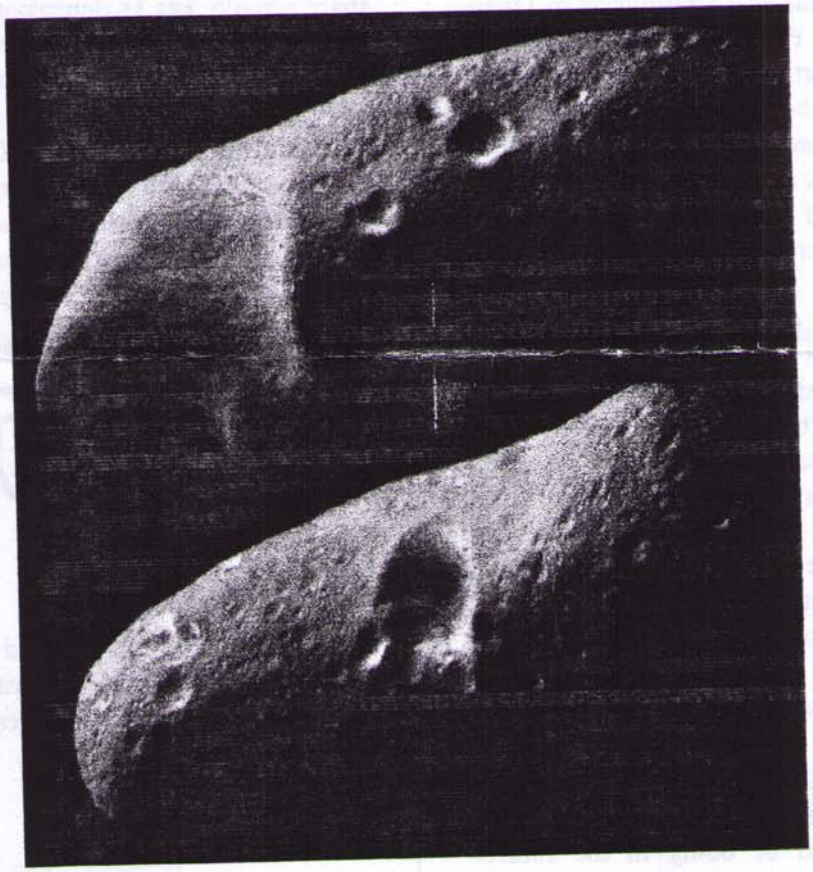
NEAR-Shoemaker: Descent to an Asteroid

NASA's Near Earth Asteroid Mission, orbiting the asteroid Eros has just completed all of it's scientific objectives, and is now preparing for another first - a controlled descent to the surface of an asteroid. The main goal is to obtain close-up pictures of the boulder-strewn surface of Eros.

Launched in February 1996, the NEAR spacecraft travelled for 5 years and 2 billion miles before entering into orbit about Eros on February 14, 2000 for a year long study of this small celestial body. The data obtained included a detailed shape model of Eros (34x11x11 km) culled from some 11 million laser pulses; radar and laser data on Eros' weak gravity and it's solid but cracked interior; X-ray, gamma-ray and infrared readings on its surface composition; and about 160,000 images covering the entire surface of the asteroid.

The mission will end on February 12th. NEAR-Shoemaker's four hour descent will begin at 10:31 am EST with a maneuver to leave it's current 35 km orbit. On the way it will take images in near-real time (2/min) which will help determine it's surface position.



This will also help to set the timing for 4 final breaking burns during the last hour of descent as the speed decreases from 20 mph to 5 mph. The last clear pictures will be from an altitude of 500 m and will have a resolution of about 10 cm. After that, NEAR mission operators will use the blurring photos, altitude data from the laser rangefinder, doppler tracking, and the loss of signal to learn where the spacecraft touches down, predicted for 3 pm EST. Deep Space Network stations in Madrid, Spain and Goldstone, California will simultaneously cover the maneuvers. The landing site is situated with the saddle shaped basin Himeros on Ero's southern hemisphere.

Eros Data:

Dimensions: 34 x 11 x 11 km
Mass: 6.687×10^{15} kg
Density: 2.700 g / cm^3
Escape velocity: 3.1-17.2 m/s

Gravitational Acceleration: 2.5 - 5.5 mm/s^2

Ray Badgerow

Space and Time Since Einstein

Space and Time Since Einstein was the title of Thursday's thesis. Dr. Green showed how String Theory is attempting to meld and ameliorate the inconsistencies among *special relativity and the subjectivity of space-time*, *general relativity and the warping of space-time*, and *quantum mechanics and space-time*. Also, presented were the concepts of parallel universes and time travel and quantum entanglement and the meaning of separate universes. Space-time has both a space dimension and a time dimension. Relativity says that in space-time light approaches at the same speed always. Our common conceptions of motion (i.e. two vehicles approach at their combined speeds or one moves away from the other at only the difference between their velocities, etc.) are accurate only at 'slow' speeds but not at ultra-high velocities. He used a video graphic to show that:

distance = space
duration time

By changing the vectors, the distance covered in the same direction in all cases will vary, even though the time spent travelling is the same in all cases.

Time is not the same for everyone. Very high speeds and strong gravitational fields will slow time down, as Einstein showed. We move through both space and time, and motion through space eats up motion through time and, therefore, time slows down. If you are sitting still, time moves at light speed. Therefore, light does not pass through time at all.

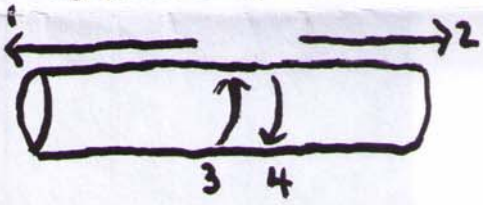
In General Relativity, time decelerates in a field of intense gravitational force. This force results in more highly accelerated motion and it also warps space and space-time to 'communicate' gravity.

In blackholes there are very huge masses in very tiny volumes. The event horizon of such a body is the point of no-return and time slows down immensely at this juncture.

Quantum Mechanics and Space-time: From 1900 to 1930, classical physics failed to describe the micro-realm. Consequently, Quantum Mechanics was developed. This led to a replacement of classical determinism by Quantum Probability, which has much experimental support. In the wave-particle duality (Heisenberg), the solid inelastic body is replaced by a wave, which itself has an area in front of it of uncertain wavelets. Since Quantum Mechanics is probabilistic and observations are not, this leads us to a many-worlds interpretation (I would assume to be on the same model as the Schrodinger's Cat thought-experiment).

Time travel present us with a variety of conundrums. It would be possible to travel into the past and kill your grandfather! It would also be possible to journey back and give someone information that would have serious consequences for something that you would be doing in the future! These are called time paradoxes. However, the 'many worlds' of Quantum Mechanics yields a consistent framework here, so, is time travel possible? It would seem to be so if one were to follow one of the following models: 1) the Godel Rotating Universe; 2) Tipler's Rotating Cylinder; 3) the Newman, Unti, Tamburino (NUT) Universe; 4) Gott's Cosmic Strings or 5) Thorne's Wormholes (as depicted in Carl Sagan's "Contact").

String Theory and Space-time: Solid particles are replaced by vibrating strings op.cit. The differing vibrational patterns are the fingerprints of the different particles. The purpose, here, is to unite General Relativity and Quantum Mechanics because space actually has 3+ dimensions. In the 1980's, there were 9 space and 1 time dimensions. In the 1990's, there were 10 space and 1 time dimensions. In the 1920;s the dimensions are seen as large and are directly visible. In much more recent time, they are small and not directly visible. A rotating cylinder can give us 4-D.



This can be spread out to yield a space-time fabric complete with tiny spheres which allows an extra dimension. (5)

(Continued on page 8)

Planet-finding for Dummies

This month offers a particularly nice evening view of three planets: Jupiter, Saturn and Venus. It is a perfect opportunity to teach those of you new to astronomy how to find your way around the sky.

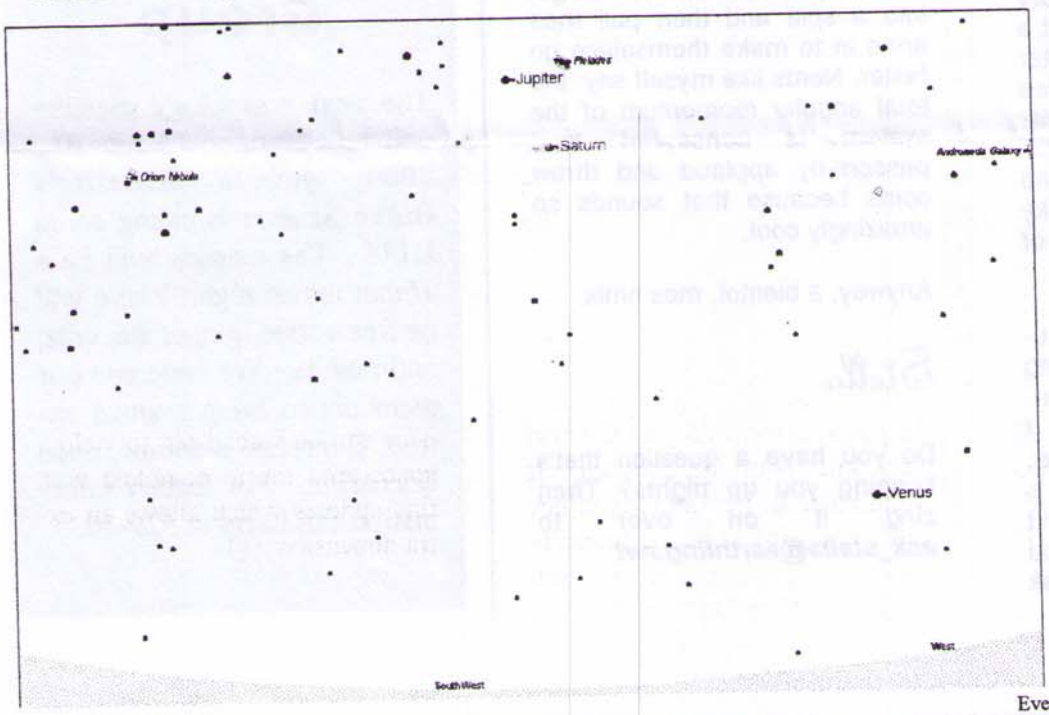
The sky chart shows only those stars visible on a good, clear night within Hamilton's city limits. It is drawn for February 15 about 8:00 p.m. but, for our purposes, can be used pretty much throughout the month. The horizon is marked as a grey band along the bottom of the chart.Stars are shown as unlabelled black dots on a white background. The brighter a star appears in the sky, the larger its black dot. The three planets as well as the Orion Nebula, Pleiades and Andromeda Galaxy are labelled. (These deep-sky objects can be seen from my light-polluted backyard near Limeridge Mall in Hamilton. With a little effort, you should be able to make them out, too. Binoculars really help!)

To find these things, step outside, face southwest* and look UP. The brightest "star" you'll see will be Jupiter. With ordinary binoculars, Jupiter appears as a disk (as opposed to a star which still looks like a point of light in binoculars) and up to four of Jupiter's moons can often be seen lined up on either side of the planet.

Depending on how good your eyesight is, the "hazy patch" or small cluster of stars to the right and slightly above of Jupiter is the Pleiades (called "subaru" to the Japanese. Take a close look at the grill ornament on a Subaru car – it's a duplicate of this grouping of stars. Just make sure that grill ornament isn't heading in your direction at the time!)

Saturn is below and to the right of Jupiter. To see Saturn's rings, you'll need a telescope with a magnification of at least 30x.

Venus is much lower to the horizon – almost due west and very bright! Because Venus is so close to the horizon and its light is passing through the thickest part of our atmosphere, it twinkles brightly and colourfully. Many UFO sightings are made by people mistaking Venus' flashing light as a mysterious flying object.



Fifteen years ago, a friend gave me simple instructions like these that enabled me to find Saturn. It was the beginning of a wonderful journey. I hope I've whetted your appetite to learn more about the night sky!

Ann Tekatch

*If you haven't got a clue which way is southwest, you can face in the direction the sun set and turn halfway to your left. That should be good enough!

Ask Stella: The Inherent Spinnyness of Black Holes

Salut, mes amis astronomiques! Stella's back this month with another great question, this time from Chris Smith, a high-schooler from Edmond, Oklahoma. Chris wants to know about that endlessly fascinating subject: black holes. He writes:

If black holes do rotate on an axis, please explain how they start to rotate.

To which Stella responds: pas de probleme!

The short answer to your question:

Yes, black holes do spin on their axes. This is because spinning black holes come from spinning stars. In fact, practically everything in space rotates about some axis or other.

The earth spins about once every 24 hours. The sun takes about a month to do the same. Jupiter does a wicked 360 in only nine hours. It's part of what accounts for those tremendous winds stirring up the planet's hydrogen and methane clouds. Even the Milky Way rotates on a timescale of once every 250 million years.

So spinning black holes fit naturally into this picture of a spinning universe. Of course, this might lead you to ask about what gets stars and galaxies going 'round in the first place, but I can answer that, too.

The enormous gas clouds which give birth to stars and galaxies all have a tiny bit of initial spin. As the clouds condense, the amount of "spinnyness" (or what geekily inclined call angular momentum) in the cloud stays the same, since there's very little friction in the cold emptiness of space. This is another expression of Newton's First Law: a body in motion remains in motion unless acted upon by an unbalanced, external force.

But the spinnyness is a product of the cloud's radius, mass, and rotation speed. So if the cloud's radius is decreasing and its mass stays the same the cloud has to spin faster to make sure everything comes out even. Giant molecular clouds are very concerned about math, you see.

It's the same reason why the skaters you see on TV can get into a spin and then pull their arms in to make themselves go faster. Nerds like myself say: the total angular momentum of the system is conserved, and passers-by applaud and throw coins because that sounds so amazingly cool.

Anyway, a bientot, mes amis.

Stella

Do you have a question that's keeping you up nights? Then zing it on over to ***ask_stella@earthling.net***

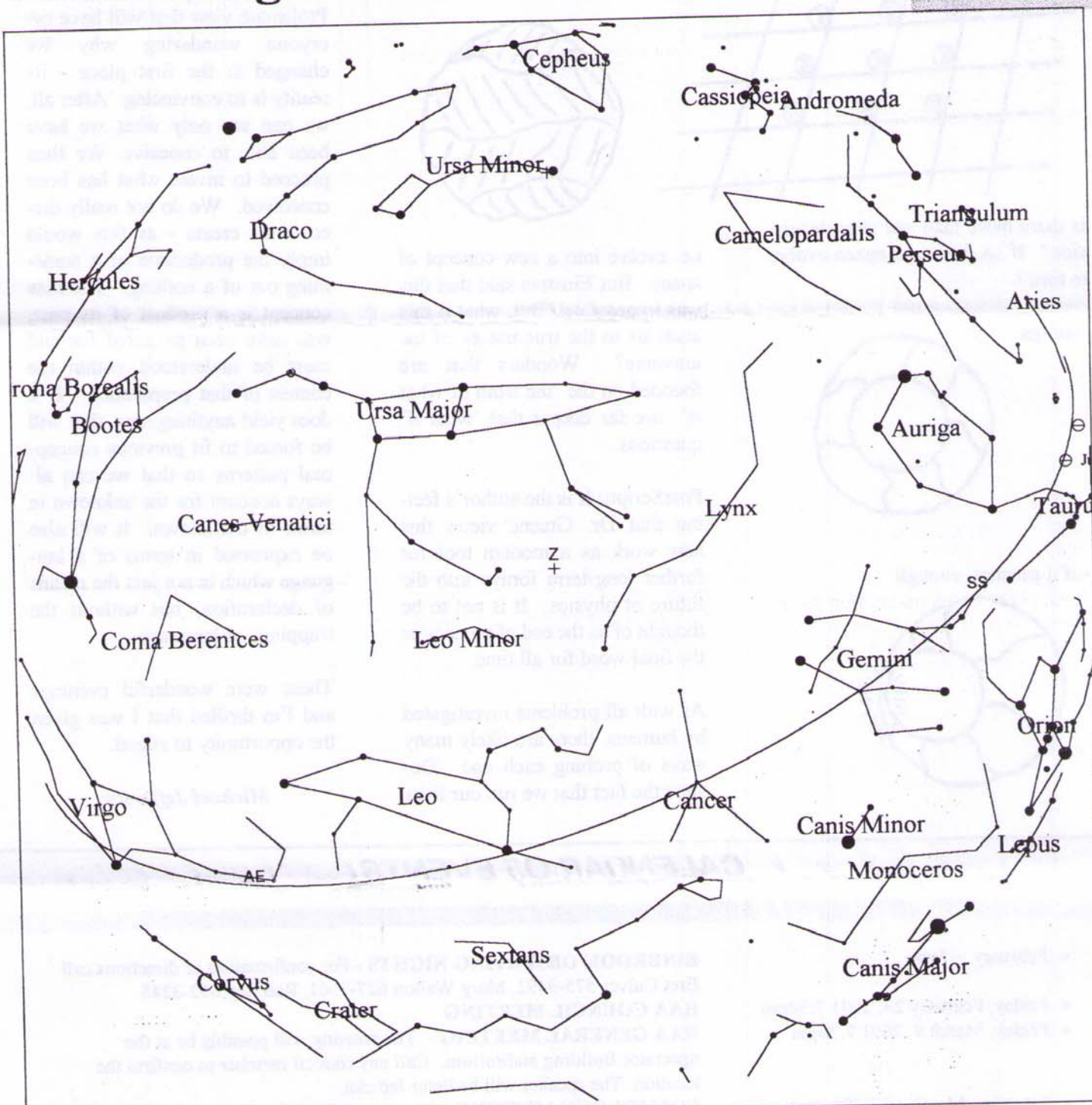
MEETING LOCATION

As we are having difficulty with our room booking at the Hamilton Spectator, some or all of our meetings may have to be held elsewhere. Please check the web, or your email, or the HAA discussion group, or phone any council member before each meeting to confirm its location. If anyone knows of a suitable room (for free!) could you please contact Margaret Walton at 627-7361 or ***margw@icom.ca.***

Cosmology Discussion Group

The next cosmology meeting will be Saturday, March 10th, 2000, 8pm. In McMaster's Burke Science Building room B148. The meeting will be a 16mm movie night. There will be free coffee, ginger ale, cola, and timbits. We welcome our members to bring a small entree. Everyone welcome, open discussion. For further information call Larry at 529-1037.

March Night Skies



ECU V3.0 (Star Atlas Mode) - March Night Skies

UTC: 2001/03/16 at 03:30
LMT: 2001/03/15 at 10:30pm

RA=09h45.5m Dec=+43°17'
Field=180.0° Azim=340°40' Alt=+90°00'

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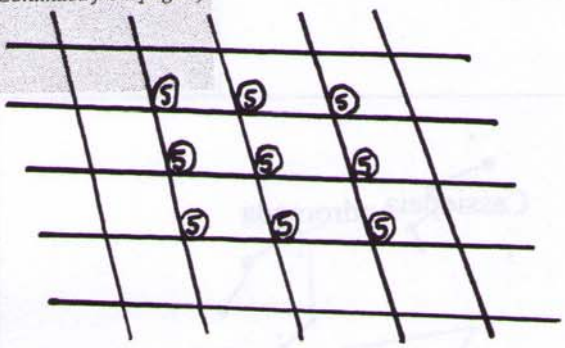
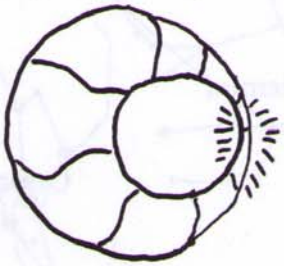


Is there more than one time dimension? If so, how can space evolve in time?

-strings

- if it pinches, enough



- it can become

i.e. evolve into a new concept of space. But Einstein said that this was impossible! But, what if this leads us to the true nature of the universe? Wonders that are founded on the 'the truth of what is' are far deeper that 'what if' questions.

PostScript: It is the author's feeling that Dr. Greene views this new work as a modern tool for further long-term forays into the future of physics. It is not to be thought of as the end of physics or the final word for all time.

As with all problems investigated by humans, there are likely many ways of probing each one. Despite the fact that we run our lives based on the 'Copernican' model of the solar system, it is possible to construct a system based on the Ptolemaic view that will have everyone wondering why we changed in the first place - its reality is so convincing. After all, we can see only what we have been able to conceive. We then proceed to invent what has been conceived. We do not really discover or create - as this would imply the production of a something out of a nothing. The new concept is a product of its past, will have been prepared for and must be understood within the contest of that preparation. If it does yield anything new, that will be forced to fit previous conceptual patterns so that we can always account for the unknown in terms of the known. It will also be expressed in terms of a language which is not just the means of declaration, but without the trappings of language.

These were wonderful evenings and I'm thrilled that I was given the opportunity to attend.

Michael Jefferson

CALENDAR OF EVENTS

- February ~ 8pm
- Friday, February 23, 2001 7:30pm
- Friday, March 9, 2001 7:30pm
- Saturday, March 10, 2001 8pm
- Friday, April 13, 2001 7:30pm

BINBROOK OBSERVING NIGHTS - For confirmation or directions call Bret Culver 575-9492, Marg Walton 627-7361, Rob Roy 692-3245

HAA COUNCIL MEETING

HAA GENERAL MEETING - The meeting will possibly be at the Spectator Building auditorium. Call any council member to confirm the location. The speaker will be Peter Jedicke.

COSMOLOGY MEETING - 16 mm movie night. Contact Larry for more information 529-1037

HAA GENERAL MEETING - The meeting will possibly be at the Spectator Building auditorium. Call any council member to confirm the location. The speaker will be Ivan Semeniuk.