Hamilton Amateur Astronomers

Event Horizon

April 2004 Volume 11 Issue 6

Planet Party *by Glenn Muller*

Over a hundred visitors came to Bayfront Park, Sunday evening March 28, 2004, to view the 5 major planets through HAA's scopes. Though Mercury hid behind a retreating cloud bank, the 1st Quarter Moon more than made up for it. It was a good night, made more so by the efforts of members who brought equipment and shared their knowledge. Many thanks to all who came out.

Comet Watch *by Bob Christmas*

There are two possibly-bright comets visible this spring. They are C/2001 Q4 (NEAT) and C/2002 T7 (LINEAR). By the looks of their orbits, C/2001 Q4 (NEAT) will be much more favourably placed in the sky for Northern Hemisphere observers after about May 9, 2004.

Here's the web site for the NASA Jet Propulsion Laboratory Comet Observation Home Page. It's full of information on these and other comets:

`http://encke.jpl.nasa.gov/`

An Announcement

Two years ago the Hamilton Centre's Double Star Project was successful in getting members out developing their observing and recording skills. HAA members were given the opportunity to take part.

HAA members who may not have a copy of the 2002 Double Star Handbook may have one free of charge by contacting Mike Spicer at `DeBeneEsse2001@AOL.com` or by phoning (905) 388-0602.

Upcoming Events

Event: HAA meeting

Date: Friday May 14, 2004 7:30PM

Location: Hamilton Spectator Building

Admission: Free. Everyone is welcome!

Astronomy Day: April 24

Astronomy Week: April 19-25

Chairs Report *by Glenn Muller*

With the worst of winter behind us, March turned out to be a good month for the HAA's outreach initiative. On the 10^{th}, Patricia Marsh, Gail Muller and I helped the 1^{st} Cayuga Guides earn their astronomy badge, then, on the 28^{th}, the Club held its third Bayfront Park Planet Party in recent months. After the spectacular success of the Mars opposition viewing last August; and the small but game crowd that came for a chilly look at Saturn in January; members who brought their scopes and knowledge to the planet round-up last month were well-prepared to give the visitors a fine show.

And visitors we had! With over a hundred participants, the viewing area took on a block party atmosphere. Of course, it helped that the sky was clear, and frostbite wasn't a concern, but neither would I dismiss the effect of Spring Fever on the general populace, myself included. I'd actually observed this, a couple of weeks earlier, when a steady flow of first time buyers unbuttoned parkas and priced equipment at a friend's new astronomy shop. Interest is growing, and the benefits to all are obvious.

Moving from outdoor topics to an indoor one, your club is now the proud owner of a shiny new computer projector. With digital images now the preferred presentation medium, I'm sure you'll agree that this is a good investment of Club funds. Another asset receiving attention is the 8" Newtonian donated to the HAA some years ago by Everett Cairns. It has been proposed that the scope be taken to Mountsberg Conservation Area for use by the staff there on public star nights. This will likely be a cooperative venture and anyone interested in participating can get more details from Mike Jefferson at `rasc2010@hotmail.com`.

Mike Jefferson and John Gauvreau were also on board for the 44^{th} annual Bay Area Science & Engineering Fair (BASEF) where Junior High student Brian Le was presented with the coveted HAA award. His project, "Astrophysics for All", showcased the research and development of simple and interesting ways to introduce astrophysics and astronomy into a school curriculum. Well done, Brian!

Last, but not least, Binbrook observing nights continue to be the convenient way to bag DSO's while socializing with those of like mind. These sessions are particularly beneficial for anyone new to astronomy. The "Activities" schedule on the website is frequently updated so check regularly, and drop us a line if you're able to go. Clear skies.

Glenn invites your comments on these topics or any aspect of the club. He can be reached via `chair@amateurastronomy.org`

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.

HAA Council

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An Offer

Thinking of buying your first telescope but wondering what kind to get? Before you buy, consider this offer from Mike Spicer: a "loaner" 5 inch telescope with electronic alt-az controls. The scopes are lightweight, easy to set up and very easy to use. Mike is offering newer members of our club one of these telescopes to try out for a month or so. Interested? You can reach Mike by email at deBeneEsse2001@AOL.com or by phone at (905) 388-0602.

HAA Pins

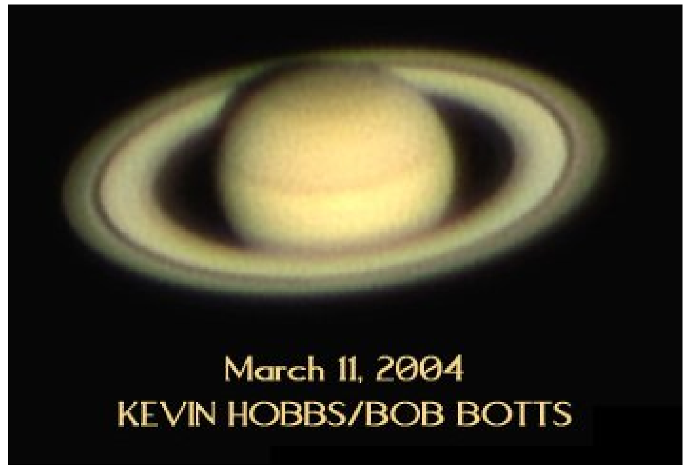
To commemorate our 10 year anniversary, a special pin has been created.

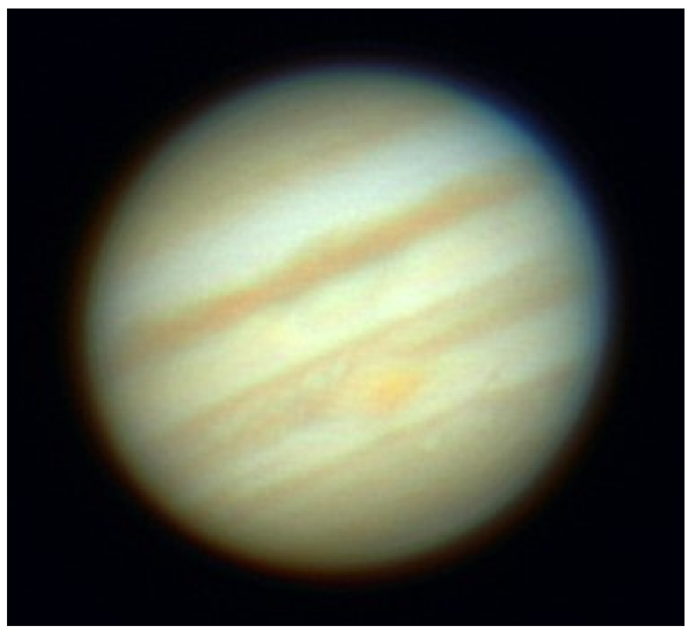
You can order one of these beautiful pins for $6 at the next meeting or by contacting membership@amateurastronomy.org

Eye Candy *by Bob Botts*

People sometimes look at my images of the planets and comment on how much work must have went into getting those images... I, whenever possible make courteous responses to those kind words by parapharasing Newton... "If I've captured some nice images of Jupiter, a lot of the credit should go to those who have wrote the software"... (but, to myself) I also believe that if I've made any progress at all in my images, it's because I haven't sat on the couch for 40 years waiting for the Leafs to win the Stanley Cup...)

> If I have seen further it is by standing on the shoulders of giants.
> **Isaac Newton, Letter to Robert Hooke, February 5, 1675**





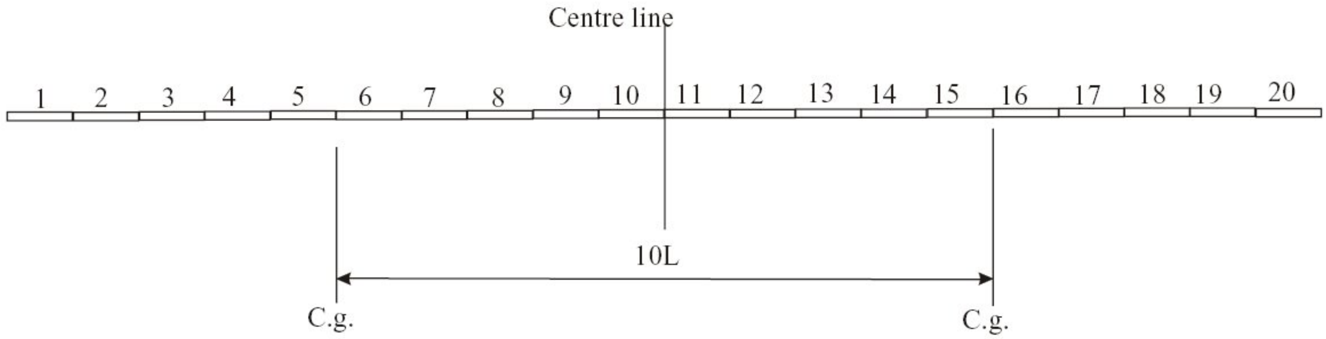
Here's Saturn and Jupiter from March 11, 2004. Saturn is well placed in the evening sky these days, and has to be one of the all time favorites for viewing. Photos by Kevin Hobbs and Bob Botts.

Gravitation and Geometry

by John Lawson

Every high school science student meets the equation $F = G\frac{m \cdot M}{r^2}$ where m and M are masses and r is the distance between their centres of gravity. This is correct for spherical bodies that are small in relation to the distance r. For other geometries it is long known the force may be different.

Assume two rods consisting of smaller sections of mass M, length L taped together, lie end to end, almost touching. This is shown below.



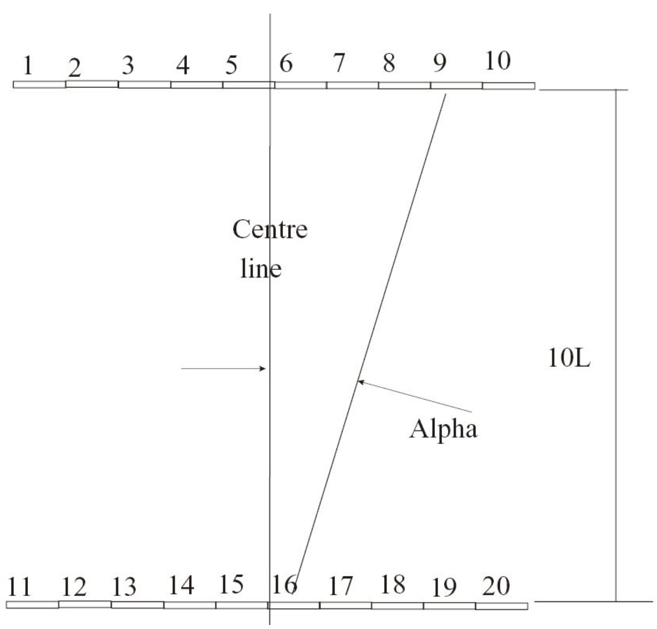
If each section has mass $1M$, the standard equation gives a force of:

$$F = G\frac{(10M)^2}{(10L)^2} = G\frac{M^2}{L^2} = GF \text{ (for Gravitational Force)}$$

However, if we sum the forces felt by each segment from all the segments on the other side of the centre line, the answer is different. We can tabulate the lengths that are the variables and collect them together. This takes up a lot of space so I have put them in an Appendix 'A'.

The total force across the centre line is $F = G\frac{M^2 \times 3.188107}{L^2} = 3.188107 \times GF$. For rods of 3 elements, the "string" factor is 1.9983 and for 20 elements, the factor is 3.8802.

If we rearrange the rods to lie parallel to each other at a distance of 10L - the same distance as between the cgs. of the in-line rods - and sum the individual forces on the elements as before, we have to account for the different angles and distances between the elements. This also has been tabulated, in Appendix 'B'.



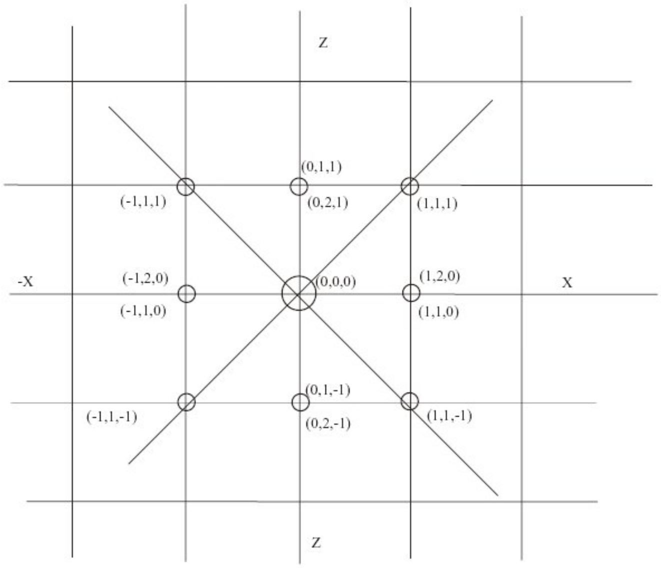
For rods of 3 elements, the reduction factor is .841, for 6 elements, the reduction factor is .8314, for 10 elements, the reduction factor is .8290 and for 20 elements, the reduction factor is .8287. So, extending the rods beyond 3/3 is very ineffectual and lateral effects may therefore be neglected.

The same reasoning can be applied in cosmology, only a little differently. The theory of the Big Bang posits that the whole universe came from a point of zero size, called a singularity. It grew in size as plasma till it cooled sufficiently for atoms to form, about 380,000 years after point zero. It is assumed these atoms were hydrogen.

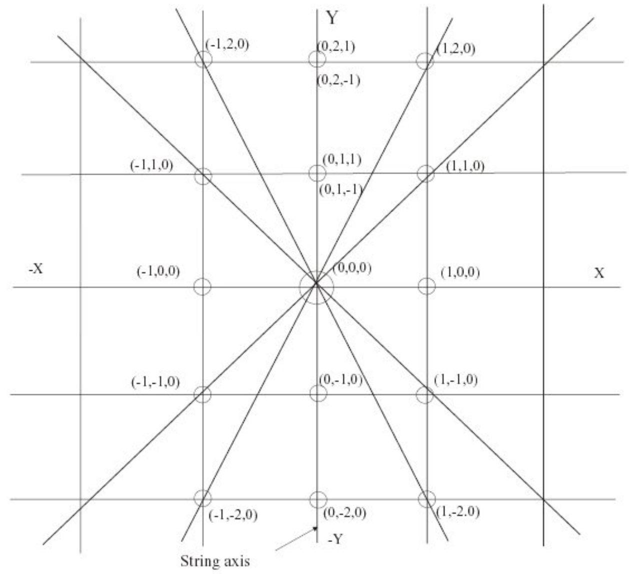
Space was filled with this hydrogen gas. For simplicity, assume that each atom was electrically neutral, static, and equally distributed on a three-dimensional grid of L spacing. This is strictly a simplification to establish a principle. At each grid point there was an atom of mass M so that in a larger grid of NL spacing there were N^3 masses of M.

If in each grid these atoms coalesced to the centre point in this larger grid, the gravitational force between groups would be $F = G\frac{(N^3M)^2}{(NL)^2} = N^2GF$.

It seems that as coalescing took place, gravitation grew stronger, but that is not so. All that happened was that it became more concentrated. The $1L$ grid lines grouped together into N^2 "strings" with larger spaces between. To investigate the "string" effect, one has to look at one original grid line, whether it is on a $1L$ grid or bunched with $(N^2 - 1)$ other lines on a NL grid.



Looking along string axis



If we look at the $Y - Y$ axis as being the "string" line - the linear configuration axis of the rods above - then the $X - X$ and $Z - Z$ axes are the parallel configuration axes of the rods. Along the $Y - Y$ axis, each atom experiences a force of at least $3.88 \times GF$. However, there are other strings. From the chosen atom, position (0,0,0), there is a line through each corner (1,1,0) (-1,1,0) (0,1,1) (0,1,-1).

These lines are at 45° to $Y - Y$ so they are weaker because the spacing is $1.414L$. Their vector on $Y - Y$ is:

$F = 3.88 \times cos^3 45° \times GF = 1.372 \times GF$. Four strings give a total of $5.488 \times GF$

Another series of strings are through (1,2,0) (-1,2,0) (0,2,1) ((0,2,-1). They are at an angle of 26.6° and their spacing is 2.236L so their vector along $Y - Y$ is $F = 4 \times 3.88 \times (\frac{cos 26.6}{5}) \times GF = 2.7763 \times GF$.

Another series of strings are through (1,1,1) (1,1,-1) (-1,1,-1) (-1,1,1) diagonally across the grid. The spacing is $1.732L$ and the angle is 54.74° so their vector along $Y - Y$ is $F = 4 \times 3.88 \times (cos^3 54.74) \times GF = 2.986 \times GF$.

There are other strings but those illustrate the principle. The total string factor through (0,0,0) is seen to be at least

$3.880 + 5.488 + 2.776 + 2.986 = 15.130$.

This, of course, is an idealized state. In most locations in space the grid lines will be disrupted to some extent. Small variations may not matter but large variations could destroy the string effect.

It is suggested that originally the string effect existed. It would extend throughout space but its strength would be limited. The force between adjacent particles is 1, but the force between particles 1000L apart is .000001, and so on. However, at every point in space, where the grid existed, the effect was passed on from one particle to the next. This amounted to a tension across space that could be greater than gravitation by a factor up to, say 15 times - in places.

As matter coalesced, this string effect persisted until the universe ran out of distributed matter to coalesce. Once that happened, the effect disappeared. The extra tension was gone. Potential energy was expended and the space was at higher entropy and a higher temperature than before. This is one case where concentration increases entropy.

It raises questions.

Would the string effect cause a significant decrease in the rate of expansion of the universe? Note that the concept of the universe 'bursting out' then coasting the rest of the way does not hold. After this effect reduced the rate of expansion it would not recover. For the observed acceleration to take place, it must have been present from time zero and still continue, merely being reduced for a time.

Would the string effect speed up the formation of galaxies and stars as is suspected to have happened.

Would variations in the posited grid be enough to cause more coalescing in some local areas, thus forming discrete galaxies instead of one rather large one?

The coalescing of atoms would go on in stages, of course, each being on a greater scale than the previous. The same logic applies each time. Introducing random spacing and motion between atoms does not wholly negate the logic, merely making it more complicated. They also act to limit the force ratios.

This does not mean that gravitation is getting weaker. It has just become less effective due to the changing geometry of distribution of matter in the universe.

by John Lawson

John lives in Burlington with his wife. His children are all grown with kids of their own. John has been in the HAA practically from its start and has been interested in theoretical physics and cosmology all his life.

Appendix A

	11	12	13	14	15	16	17	18	19	20
1	10	11	12	13	14	15	16	17	18	19
2	9	10	11	12	13	14	15	16	17	18
3	8	9	10	11	12	13	14	15	16	17
4	7	8	9	10	11	12	13	14	15	16
5	6	7	8	9	10	11	12	13	14	15
6	5	6	7	8	9	10	11	12	13	14
7	4	5	6	7	8	9	10	11	12	13
8	3	4	5	6	7	8	9	10	11	12
9	2	3	4	5	6	7	8	9	10	11
10	1	2	3	4	5	6	7	8	9	10

These values have to be inverted and squared. They can be summed diagonally. The total is:

$$Sum = 1\left(\frac{1}{1^2} + \frac{1}{19^2}\right) + 2\left(\frac{1}{2^2} + \frac{1}{18^2}\right) + 3\left(\frac{1}{3^2} + \frac{1}{17^2}\right) + \cdots$$

1.000000
.002770
.500000
.006173
.333333
.010381
.250000
.015625
.200000
.022222
.166667
.030612
.142857
.041420
.125000
.055556
.111111
.074380
.100000
3.188107

Appendix B

Side step ($= x \cdot L$)

	0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1	1
2	1	2	1	1	1	1	1	1	1	
E 3	1	2	2	1	1	1	1	1		
l 4	1	2	2	2	1	1	1			
e 5	1	2	2	2	2	1				
m 6	1	2	2	2	2	1				
e 7	1	2	2	2	1	1	1			
n 8	1	2	2	1	1	1	1	1		
t 9	1	2	1	1	1	1	1	1	1	
10	1	1	1	1	1	1	1	1	1	1
Total	10	18	16	14	12	10	8	6	4	2

The lengths between centres are the hypotenuses of the triangles formed by the distance $10L$ and the sidestep $x \cdot L$.

	L'	$\frac{10}{L'}$	$\left(\frac{10}{L'}\right)^3$	$N\left(\frac{10}{L'}\right)^3$
0	10	1.0	1.0	10.00
S 1	10.05	.995	.985	17.73
i 2	10.198	.981	.943	15.09
d 3	10.44	.958	.879	12.31
e 4	10.77	.928	.800	9.60
s 5	11.18	.894	.716	7.16
t 6	11.66	.857	.630	5.04
e 7	12.21	.819	.550	3.30
p 8	12.93	.773	.462	1.85
9	13.45	.743	.411	.82
				82.90

This gives a reduction factor of $\frac{82.90}{10^2} = .829$

Sciencecraft

by Patrick L. Barry and Tony Phillips

Probes that can distinguish between "interesting" things and "boring" things are vital for deep space exploration, say JPL scientists.

Along with his colleagues in NASA's Space Technology 6 Project (ST6), JPL's Steven Chien is working to develop an artificial intelligence technology that does just that. They call it the Autonomous Sciencecraft Experiment, and it's one of many next-generation satellite technologies emerging from NASA's New Millennium Program.

As humanity expands its exploration of the outer solar system-or even neighboring solar systems!-the probes we send suffer from two unavoidable handicaps. First, commands radioed by mission scientists on Earth take a long time to reach the probe: six hours for the planned New Horizons mission to Pluto, for example.

Second, the great distance also means that data beamed back by the probe trickles to Earth at a lower bandwidth-often much less than an old 28.8 kbps modem. Waiting for hundreds or thousands of multi-megabyte scientific images to download could take weeks. And often many of those images will be "boring," that is, they won't contain anything new or important for scientists to puzzle over. That's certainly not the most efficient way of using a multi-million dollar probe.

Even worse, what if one of those images showed something extremely "interesting"-a rare event like a volcanic eruption or an unexpected feature like glaciers of methane ice? By the time scientists see the images, hours or days would have passed, and it may be too late to tell the probe to take a closer look.

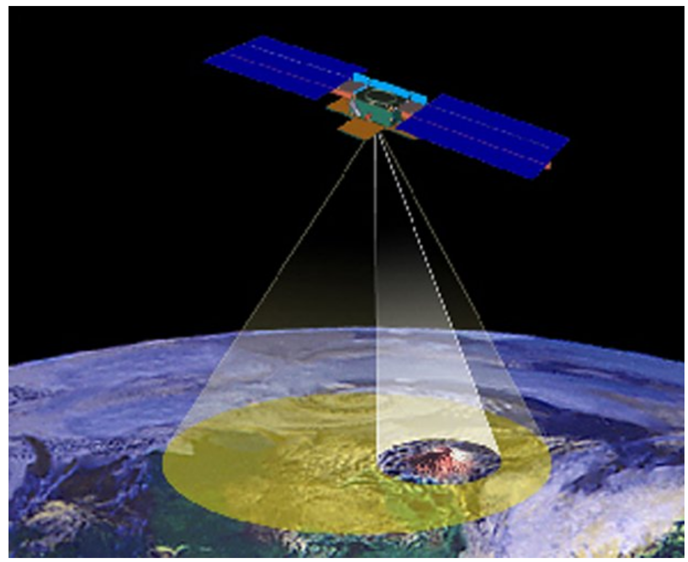
But how can a probe's computer brain possibly decide what's "interesting" to scientists and what's not?

"What you really want is a probe that can identify changes or unique features and focus on those things on its own, rather than just taking images indiscriminately," says Arthur Chmielewski, one of Chien's colleagues at JPL.

Indeed, that's what Chien's software does. It looks for things that change. A mission to Jupiter's icy moon Europa, for instance, might zero in on newly-formed cracks in the ice. Using artificial intelligence to set priorities, the probe could capture a complete movie of growing fractures rather than a single haphazard snapshot.

Until scientists can actually travel to deep space and explore distant worlds in person, they'll need spacecraft "out there" that can do some of the thinking for them. Sciencecraft is leading the way.

Learn more about Sciencecraft at `nmp.nasa.gov/st6`. Kids can make a "Star Finder" for this month and learn about another of the ST6 technologies at `spaceplace.nasa.gov/st6starfinder/st6starfinder.htm` .



The Autonomous Sciencecraft technology that will be tested as part of NASA's Space Technology 6 mission will use artificial intelligence to select and transmit only the scientifically significant images.

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

Council meetings

All club members are welcome to attend the council meetings. Contact `info@amateurastronomy.org` for details.

WHO ARE HYPATIA'S DAUGHTERS?
Part II - Female astronomers to 20th c.

by Rita Griffin-Short

During the 17th and 18th centuries females interested in doing astronomy were restricted to assisting as daughters, sisters or spouses of astronomers working in this new field of science. They were trained to do the grunge work of computing but were allowed their turn at the telescope besides attending to domestic duties. They had no identity independent of their masters and were not remunerated. Higher education was denied them, and with few exceptions would be until after WWII when they were grudgingly welcomed. While some 8 million American ex-servicemen benefited from the G.I.Bill that offered 5 years of study, fully paid, to attend colleges and universities, only about 400,000 females did so. I have no stats for Canada, though veterans were offered grants to pursue further education, I don't know how females fared, I doubt not much better than did their American or British sisters. The climate was decidedly chilly especially in the sciences.

By the end of the 19th c. when one might expect a change, two biologists, Geddes and Thomson could write, "what was decided among the prehistoric protozoa cannot be annulled by Act of Parliament"! Fortunately, not all men thought this way but they were few. In spite of such hostility, women made a contribution to astronomy becoming roll models in often unwelcoming environments. Let's look at five who succeeded in their own way as practitioners, interpreters and academics: Caroline Lucretia Herschel (1750-1848), Mary Fairfax Somerville (1780-1872), Maria Mitchell (1818-1889), Agnes Mary Clerke (1842-1907), and Cecilia Helena Payne-Gaposchkin (1900-1979).

Caroline Herschel, arrived in England from Hanover in 1772 to be her brother's housekeeper and assistant. He had been appointed George III's private astronomer upon condition that he move from Bath to Slough near Windsor. There he erected an observatory and workshop and where Caroline quickly made herself indispensable. Using a 27" focal Newtonian mounted on an altazimuth frame, she swept the sky searching for comets, finding several. She helped William build the instruments that they sold, including a 10' and a 40' reflector for the king. After William's death in 1822, she continued his work, and published his compilation catalogue of all star clusters and nebulae, as well as her own revised Flamsteed (1st Astronomer Royal) catalogue of 561 stars. This work earned her the Gold Medal from the Royal Astronomical Society in 1828 and election in 1835 to the Royal Society as an honourary member. Their home at 19 New King St., Bath, is now a museum, the only museum in Britain devoted to astronomy.

Mary Fairfax Somerville, daughter of Admiral Sir William Fairfax, was born in Scotland. One year at a boarding school was not enough, she wanted more and educated herself in Latin and French and mastered the most difficult mathematical concepts of the day. Only after winning a medal in a mathematical competition was she taken seriously. She read, digested and translated for publication in 1831, Marquis de Laplace's (Pierre Simon) great Mecanique Celeste, as Mechanism of the Heavens , completely annotated! She is responsible for bringing Britain up to speed in a field in which it was lagging. The book became a standard text at Cambridge University to whose hallowed halls she was not admitted! In 1834 she also published Connections of the Physical Sciences amongst other expository works. She was a strong voice for emancipation and education for women, and in 1879 Somerville College, Oxford was named in her honour. The Royal Astronomical Society conferred 'honourary' membership but the Royal Society decided to commission a bust, "paying...tribute to the powers of the female mind".

In America, by the mid 19th c. doors were beginning to open to female astronomers with the entry of the Quaker Maria Mitchell. Her father was a noted amateur astronomer who encouraged her interest. At age 12 she acted as his timekeeper during an 1831 annular eclipse. She became a celebrity in 1847 when she discovered and calculated the position of a new comet that won her the King of Denmark's Gold Medal. Nevertheless she continued her part-time work as librarian at the Nantucket Athenaeum, helping her father at his observatory. In 1849 she was hired, at a salary of $300.00 a year, to compute planetary tables of the position of Venus for the annual American Ephemeris and Nautical Almanac. The American Academy of Arts and Sciences elected her as its first female member, supported by the geologist Louis Agassiz. In 1862 Matthew Vassar was looking for a prominent female scientist to join the faculty of his new women's college and offered Maria the job. She was given an observatory and residence on campus and with her father remained there until her death. She began a rigorous training program that would make Vassar a major astronomical research centre. When she discovered that she was being paid a less than her male colleagues she worked to change that. She encouraged in her students a respect for remuneration, "why", she wrote, "should girls be brought up with the idea that paid labor is ignoble?". Many learned societies and institutions honoured her and she was elected to New York City's Hall of Fame as a symbol of female astronomers.

Agnes Clerke was born too soon to be admitted to university, but she made a name for herself nevertheless. Agnes was born in Ireland into an Anglo-Irish, highly cultivated, family. Her father, a bank manager, was also a classical scholar with a degree from Trinity College, Dublin. Agnes and her sister, Mary Ellen, were educated at home in a liberal Catholic and Protestant environment. The family travelled on the continent and lived for some time in Florence where the sisters took up languages. The family eventually settled in London where the sisters decided to become writers. Agnes chose to write about astronomy and sent her first article 'Copernicus in Italy', to the Edinburgh Review which it accepted. She would write for it for the next 30 years, as well as for many other journals. She was asked to contribute, as chief history of science contributor, to the Dictionary of National Biography and to the 9th edition of Encyclopaedia Britannica. Her reputation was established when she published, in 1885, History of Astronomy in the 19th Century. She did much to explain the new field, then called, astronomical physics, that would become astrophysics. The book went into several printings. In 1888 she joined David Gill at the Cape Observatory for some observing of her own. She had been disappointed that the recent transit of Venus had not provided the value for the distance between Earth and Sun, "the end for which it had been undertaken, the grand campaign had come to nothing". Writing to Ellen, Gill said she spent her nights 'flirting with the spectra of variable stars'. Honourary membership was conferred in 1903 by the Royal Astronomical Society.

The first 2 decades of the 20th c. saw more females entering the field of astronomy and astrophysics. At Cambridge, a brilliant Cecilia Payne (later Gaposchkin) became a unique example of international, intellectual exchange, mentored by Sir Arthur Eddington at Newnham College, Cambridge. Cambridge, where Einstein's new theory was being tested by Sir Arthur, its Plumian Professor of Astronomy, Director of its Observatory and his colleague at Greenwich, Sir Frank Dyson, formerly Scotland's Astronomer Royal, now England's, had jointly announced, in 1919, their success in observing, that May, a total eclipse by means of measuring the deflection of light by the Sun's gravity field, thus verifying Einstein's prediction from his 1915 theory of general relativity. Sir Arthur arranged for Cecilia to move to Harvard College in 1923 where she became its first graduate student in its new astronomy program, directed by Harlow Shapley. She became interested in the application of Meghnad Saha's equation of ionization to the Fraunhofer lines, which she decided would be her thesis research using Harvard's spectra collection. She became Harvard-Radcliffe's first woman to receive a Ph.D. for her work at Harvard Observatory. Her 1925 dissertation was described by Otto Struve as "the most brilliant Ph.D. thesis ever written in astronomy". During her 40 years' career at Harvard she published some 150 papers and 4 books. Her specialty was the spectra of very large, luminous stars, but also stellar photometry where she established a standard scale for the magnitudes and colours of stars. Academic recognition was slow, she was not named 'astronomer' until 1938, and a professorship did not appear until 1956!

Further Reading:

Bruck, Mary. Agnes Mary Clerke and the Rise of Astrophysics. Cambridge:2002

Patterson, Elizabeth Chambers. Mary Somerville and the Cultivation of Science 1815-1840. Boston:1983.

Kass-Simon and Patricia Farnes. Editors. Women of Science. Righting the Record. Indiana UPress:1990.

Wayman, Patrick A. "Cecilia Payne-Gaposchkin: astronomer extraordinaire", in Astronomy & Geophysics. February, 2002.

by Rita Griffin-Short

For Sale

As you may know, the TALscopes store of Kingston, Ontario has gone under and its stock has been liquidated. Mike Spicer was able to buy several lots of brand new eyepieces and other accessories, and is offering the following items to members of the club at the very low price of $29.95 each:

- new multicoated 25 mm superplossl 1.25" eyepiece
- new multicoated 12.5 mm. plossl 1.25" eyepiece
- new 1.25" barrel 2x multicoated shorty barlow lens
- new 1.25" barrel 3x multicoated shorty barlow lens
- new 1.25" barrel 4x multicoated shorty barlow lens

Mike was also able to obtain one new 6" TAL Newtonian reflector telescope on a beautiful clock-driven equatorial mount with solid pier mounting. This telescope offers exceptionally good wide-field views of the sky, sharp to edge of field due to its hand-figured RFT parabolic mirror. This new telescope, recently displayed for HAA members, is for sale at $ 895. You can reach Mike by email at `deBeneEsse2001@AOL.com` or by phone at (905) 388-0602.

Web Watch

Group: Science @ NASA

Description: A Gathering of Planets

Site: `http://science.nasa.gov/headlines/y2004/19mar_planets.htm`

Description: Cold Peril: The Continuing Adventures of Ulysses

Site: `http://science.nasa.gov/headlines/y2004/17mar_ulysses.htm`

Description: Mysterious Sedna:

Site: `http://science.nasa.gov/headlines/y2004/16mar_sedna.htm`

Description: Venus and the Pleiades

Site: `http://science.nasa.gov/headlines/y2004/31mar_pleiades.htm`

Description: Evicting Einstein

Site: `http://science.nasa.gov/headlines/y2004/26mar_einstein.htm`

Description: AstroTour in Chile

Site: `quasarchile.cl`

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www.starlight-theatre.ca

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May 2004

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12	13	14 HAA General Meeting	15 Observing Night
16	17	18	19	20	21 Observing Night	22 Observing Night
23	24	25	26	27	28	29
30	31		For observing info, call Stewart Attlesey 827-9105, Rob Roy 692-3245, Glenn and Gail Muller 945-5050, http://amateurastronomy.org/events.php			

April 2004

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25	26	27	28	29	30	

June 2004

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