Hamilton Amateur Astronomers

Event Horizon

March 2000 Volume 7 Issue 5

Constellation(s) of the Month - Corvus, Crater, Sextans

Margaret Walton

This is a great time of the year to investigate these three constellations. They are in the same area of the sky and all have a midnight culmination between the middle of March and the beginning of April. The nights are also getting milder, making observing a little more comfortable.

Crater and Corvus

Apollo was thirsty and sent the Raven with a chalice (Crater) to fetch the water of life. Raven spied some figs and waited by the tree for the figs to ripen. By the time he got the water, he was very late. He spied a watersnake and brought it along, claiming the snake had delayed him. Apollo knew this was a lie and cursed him with eternal thirst. He placed all three in the sky, with Hydra, the watersnake, keeping the Raven (Corvus) forever from the water.

Objects to See in Crater and Corvus

NGC4361. Planetary Nebula. This is a bright, large, round nebula of magnitude 10.9 and is located in Corvus.

NGC4038/4039. Antennae or Ring-tail Galaxy. This is a bright, large, round galaxy of magnitude 10.9. It has a pair of long, thin arms and is colliding with NGC4039. (Corvus).

NGC4033. Galaxy. This is a bright, small, slightly elongated galaxy of magnitude 11.8. (Corvus).

NGC3962. Galaxy. This is a bright, large, irregular/round galaxy of magnitude 10.6. (Crater).

NGC4462. Galaxy. This is a bright, small, elongated galaxy with a very bright nucleus of magnitude 11.9. (Corvus).

NGC3887. Galaxy. This is a bright, large, irregular/round galaxy with a bright nucleus and dark lanes. Magnitude is 11.0. (Crater).

NGC3865. Galaxy. This is a faint, large, diffuse galaxy of magnitude 12.0. There are many small galaxies in the same field. (Crater).

NGC3892. Galaxy. This is a bright, large, round galaxy with a very bright nucleus. Magnitude is 11.5. (Crater).

NGC3672. Galaxy. This is a bright, large, elongated spiral galaxy with many arms. Magnitude is 11.4. (Crater).

NGC3511. Galaxy. This is a

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Chair's Report

I have returned (long since) from my scientific pursuit of the effects of solar energy on the human psyche, as well as how this is affected by the presence of copious quantities of Margueritas. Don't forget that this excursion to the sun of Florida included a side study of heavenly bodies – or at least, that was the plan. The net results were as follows:

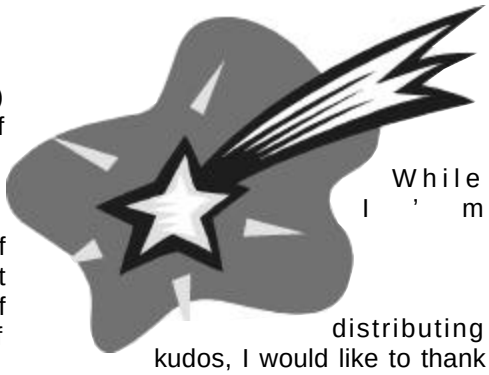
a) The effect of solar energy is a wonderful soporific sensation and the elimination of stress.

b) The effect of a quantity of Margueritas is a wonderful soporific sensation and the elimination of stress.

c) The effect of the combination of a) and b) is tantamount to a comatose state, i.e., lovely!

The result of the side study of heavenly bodies was less than successful, partly because the median age of guests and inhabitants of New Smyrna Beach is 85 years, and partly because said inhabitants were bundled in coats, hats, and mitts (picture, if you will, Southern Ontario in February – with sand). We complained bitterly to the local Chamber of Commerce concerning the lack of heavenly bodies, and they arranged for a space shuttle to be launched in our honour.

Once again, I would like to thank **Stewart Attlesey** for Chairing the main meeting in February and allowing me to get away for a fun week in the sun and sand.



While I'm distributing kudos, I would like to thank **Ev Butterworth** for her role in membership. She has taken on new responsibilities at work and has found that she is strapped for time. I am pleased to announce that her position on the Board has been filled by the ever-reliable and efficient **Ann Tekatch**.

It should also be noted that **Rob Roy** has done stalwart duty in his constant and vigilant efforts at the Binbrook Conservation Area. For those who haven't been there for a while, we have a wonderful warm-up area thanks to Rob. If you are amongst the missing, shame!

We are looking for members to give exchange talks at other clubs. If you have always wanted to take your astronomical knowledge to exotic climes, or just strut your stuff, please contact me.

Finally, if any members have suggestions or requests for guest speakers, please let me know. This has been proven to be the best way to get great speakers.

Grant Dixon, Chair
grant.dixon@home.com

(Please note my new e-mail address – if you send a message to my old NetAccess address, I won't get it.)

HAMILTON AMATEUR ASTRONOMERS

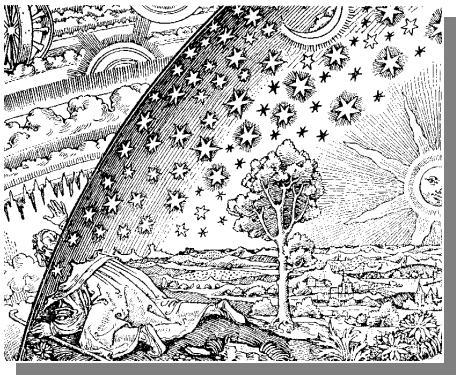
Event Horizon is a publication of the Hamilton Amateur Astronomers (HAA).

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 $15 individual or $20 family membership fee for the year. Event Horizon is published a minimum of 10 times a year.

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

Mailing Address
PO Box 65578 Dundas, ON L9H 6Y6



Corvus, Crater, Sextans

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very faint, large, elongated galaxy in pair with NGC3513. Magnitude is 11.0. (Crater).

NGC3513. Galaxy. This is a very faint, large, s-shaped spiral galaxy with two strong arms. It is in pair with NGC3511. Magnitude is 11.5. (Crater).

Sextans

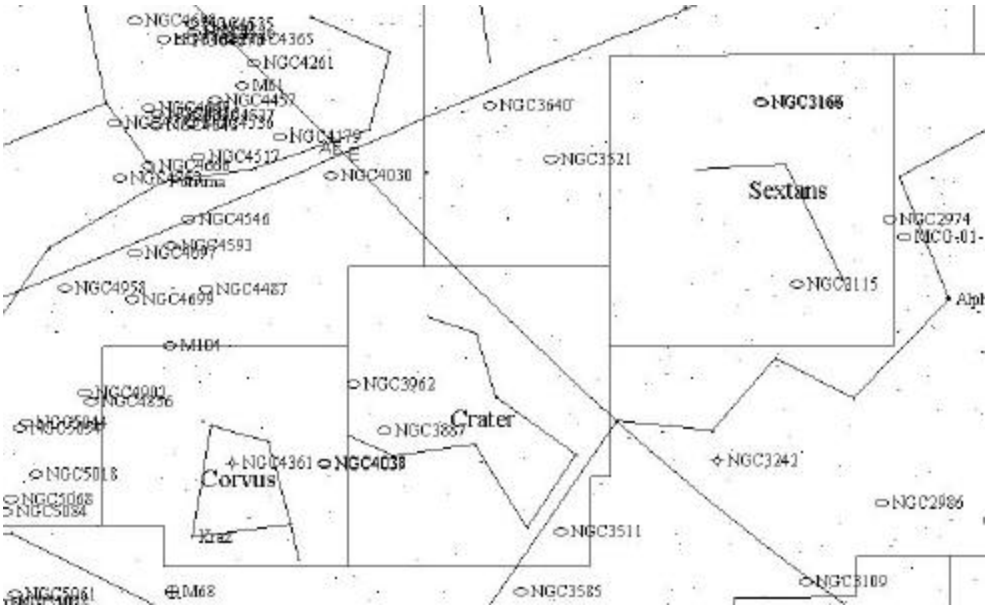
Sextans is a modern constellation created in the 1600's by Johannes Hevelius to commemorate the sextant, used to measure stellar positions.

Objects to see in Sextans.

NGC3115. Spindle Galaxy. This is a lens shaped galaxy and is very bright, large and elongated. Magnitude is 9.7.

NGC3166. Galaxy. This is a bright, small, round galaxy interacting with galaxy NGC3169. Magnitude is 10.6.

NGC3169. Galaxy. This is a bright, large, elongated galaxy with a dark lane. It is interacting with galaxy NGC3166. Magnitude is 10.5.



"Hooked On The Shadow": A Solar Eclipse Documentary

Ray Badgerow

"Hooked On The Shadow " is a startling new documentary that examines the profound experience of witnessing a total solar eclipse,and introduces us to the world of eclipse chasing - fast becoming one of the most obsessive sub-cultures of our time.

Meet the eclipse chasers - a fanatical group whose lives have been forever changed by what they see in the sky. Discover why nature's most deeply-moving spectacle drives thousands to some of the remote regions of the Earth.

From the Caribbean Islands to the deserts of of ancient Bablyonia,"Hooked On The Shadow" takes us inside the shadow of the Moon to explore the natural phenomenon that has taken science to the edge of it's understanding and fed our dreams of the future.

Produced in association with Space: The Imagination Station by Toronto filmmaker David Makepeace who joined my expediton to Turkey last year,this 24 minute film is the first documentary for televison to capture chasers at both the 1998 and 1999 solar eclipses,and features images from award-winning eclipse photographer Andreas Gada, and a stirring original score by the young Toronto composer Mike Alonzo.

Quantum Forces.

John Lawson

In the 'Event Horizon' of last November, I wrote of the speed of light and the tenet that in the Quantum Region, where probability Psi is a factor, c is the most probable velocity of particles. It may be better to say that the velocity c is the only universal constant - used in interactions between particles - which remains constant in the quantum region.

It will be argued that particles of mass cannot travel at velocity c because that would entail infinite energy. I showed that ultimately, when the space and time quanta approach zero, the speed of light approaches either zero or infinity. In addition, in the quantum region, particles must be treated as waves. So relativity may not apply. That is a subject on its own.

The assumption is made here that c is the only velocity relevant in the quantum region.

There are many references citing behaviour of quarks, their 'Assymptotic Freedom', the fact that we do not observe them in a free state,and the idea that the required separation energy results in the creation of new particles. But I have not seen any description of a mechanism responsible for quark behaviour.

The following is my attempt at finding such a mechanism. The concepts may not be new, but I have not come across them, or anything similar, so I offer them as my own, to be treated as hypotheses, still to be proven, for interest.

The approach can be readily developed into a concept of the neutron and other nuclei,quarks and all. I hope it is not considered out of place in HAA, because, amateurish though it may be, it has direct ties to cosmology.

Probability 'Psi' makes the mass and other measureable quantities dependant on distances, so the only constant inside the Quantum Region is the velocity c. Using this, I believe it is possible to predict and quantify forces to which quantum particles, ie., quarks, are subject. This is the so-called 'colour force' because quarks are believed to come in threes, like the primary colours, red, blue and yellow.

Newton gave us the equation (1) F = m*a where m = mass and a = acceleration.

Nowadays, physicists have expanded that definition to (2) F = dP/dt. where P = m*v = momentum and t is time. So Force is the rate of change of momentum with time.(3) F = dP/dt = d (m*v)/dt =m*dv/dt = m*a. Same thing.

But that is incorrect. P is a product m*v and the derivative of a product has two terms. So,
(4)F = dP/dt
= m*dv/dt + v*dm/ dt.
The first term is Newton's equation in the Classical region (m is constant and v is variable), and the second is the term applicable in the Q.R. where v is constant and m is variable.

We - and particles -

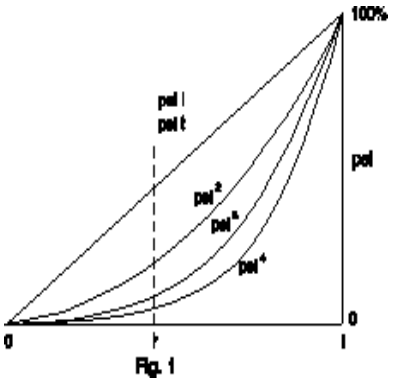


Fig. 1

measure particles by their properties, including mass. At quantum distances, these include the Probabilities Psi (l) and Psi(t) as shown in the previous article. Fig. 1. shows a graph of psi(l), psi(t), and psi^2 (psi[l] and psi[t] change together for constant c.)

Every particle has its own quantum radius l, where psi is 100%, ranging down to 0% at

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its centre. The value of l depends on the particle mass. Planck's Constant contains 'm*l' in its make-up.

(5) (m[e]*137.036)*R[o] = m[e]*(137.036*R[o]) = const.

R[o] is the Classical Electron 'Radius', a quantity which is very important in atomic theory. For any primary, ie. non-structured - particle, its mass and 'radius' are inversely proportional. 137.036 is the reciprical of 'alpha' which is a permitted scaling factor in the hierarchy of particles.

Quantum interactions begin when the centre of one reaches the Q.R. of the other. This is most effective when both are the same size. Psi of each is 100% at this point.

As two like particles move closer together, their psi values drop but continue to have a common value. Psi[1] = psi[2] at all times.

I believe it can be shown that interactions between quarks are possible if and only if they are identical (except for ~~spi~~n direction.) Only then can a mutual reference ~~frame be~~ found. This point is presented here without proof.

~~If~~ r = ~~distance,~~ centre to centre. l = quantum length. t is quantum ~~time. c =~~ l/t.

(6) m = 100% mass m[r] = m*psi^2 = mass m measured from distance r = $m*r^2/l^2$. m[r] changes with r. The rate of change is dm/dr.

(7) $m[r] = m*psi^2 = m*r^2$ / l^2

$$\frac{dm}{dr} = \frac{2*m*r}{l^2}$$

$$\frac{dm}{dt} = \frac{dm}{dr} * \frac{dr}{dt} = \frac{dm}{dr} * c$$

$$= \frac{2*m*c*r}{l^2}$$

If F[r] = force at r and v = c = const.

(8) $F[r] = v*dm/dt = 2*m*c^2*r$ / l^2

(9) $F(max) = \frac{2*m*c^2*l}{l^2} = \frac{2*m*c^2}{l}$

c^2/l has the dimensions of a 'pseudo' acceleration.

The mass energy between r = 0 and r, is the force required to provide the mass at r, times the distance r, ie., Int F[r]*dr. E[r] = Int(F[r].dr) where int = integral from r = 0 to r = r.

(10) $E[r] = \text{Int} \frac{(2*m*c^2*r)}{l^2} dr$

$$= 2*m*c^2*\text{Int}(r) \frac{dr}{l^2}$$

$$= 2*m*c^2 (r^2) \text{ sup } r \text{ sub } 0 \; (2*l^2)$$

$= m*c^2*psi^2$

When r = l, psi = 1, E = $m*c^2$.

If two particles are r apart, to move them to l apart, they must be given (11) $E(l-r) = m*c^2 (1-psi^2)$

When particles such as quarks come within quantum distances, they lose mass till they reach some permitted level. Not all levels are allowed. The lost mass forms other particles, which also are restricted in values. This is evident because all neutrons are identical, as are all protons, etc.

There is no evidence of force between quarks, that I can see, other than the mass change if they leave their relative stations.

This gives the appearance of quarks being free to move provided they do so within a certain distance of each other. The containing force is not centric between quarks but resembles the side of a 'mass deficit well' in which they are contained.That is another subject on its own.

Numerology and Nuclei.

John Lawson

This follows from the previous article "Quantum Forces." It is semi-empirical though based on theory.

There is a number I call a[um] (a-umlaut). a[um] = 2.708 429 576.

Add 4 to it. a[um] + 4 = 6.708 429 576
Multiply by 2*137.036. (137.036 is the inverse of alpha, the Fine Structure Constant used much is spectroscopy. It was introduced by Sommerfeld early in the 1900s, and is one of the permitted ratios in physics).

6.708 429 574*2*137.036
= 1838.592 711.

The ratio of the neutron mass to the electron mass is m[N]/m[e] = 1838.683 662, a difference of .090 951 m[e].

Multiply
{6^3*2*a[um]+1}*137.036. The answer is 160 474.853. Multiply that by .000511 to give 82.002 65. (1m[e] = .511 Mev or .000511 Gev, the new way of expressing mass.) The mass of the W Boson particle is given as 82Gev, which is only .00265 different.

Multiply
(7^2*5*2*a[um]+1)*137.036.
The answer is 182 001.69.
That, multiplied by .000511
gives 93.002 864. The mass of
the Z Boson particle is given as 93 Gev., .002 864 off.

Multiply
(2*a[um]^2 + 4*a[um]*137.036 =
2010.480 033
1484.609 422

3495.089 455

Multiplying this by .511 gives 1785.990 711. The Tau Lepton particle is quoted as having a mass of either 1784 or 1786 Mev. Again, the difference is small.

Re-arrange (4 + a[um])*2 as follows.
(2+2+a[um])*2 = 4+2+a[um]
2+a[um]
and say these represent particles. They can be thought of as quarks. Multiplying each by 137.036 gives 548.144, 274.072, and 371.152. Rounding off and signifying spin direction by arrows gives
548.<- + 274.<- + 371.<-
274.-> + 371.->
= 1838.592<-.

This assumes Pauli's Exclusion Principle applies inside nuclei as well as for orbitting electrons in atoms, so that no two particles in a nucleus can be identical.

From the previous article, quantum force is a mass defect force. This suggests that all these particles split off from some heavier single particle, into fractions which are permitted. They are confined together by their mass defects.

There is no force between them but they all appear to be confined down the same well' unable to get out until their original mass is restored. If that occurs, of course, they are no longer the same particles, hence we can never see quarks in isolation.

It suggests a common ancestor, which has a mass of more than 1838m[e]. This could be the 2010.48m[e] component of the Tau. As the product of a particle mass and its quantum radius is a constant, equal to m[e]*137.036*R[o], we can find the Q.R. of that component, and calculate the limiting distance between quarks.

Q.R.[2010] = R[o]/2*a[um]^2
R[o] = 2.817 940 92*10^-15 cm.
So R[2010] =
2.817 940 92*10^-15

2*2.708 429 576^2

= 1.920 732 092*10^-14 cm. The limiting distances are based on this dimension.

Why do the quarks settle on their final masses? They could be 548<- + 548<- + 742<-. But that is not allowed for two very good reasons, the Exclusion Principle and the Conservation of Spin.

Perhaps both these could be satisfied by turning one 548 upside down. But the handedness or chirality of matter does not allow that. A 548<- turned to become 548-> is just that. It has not changed its spin because chirality affects not only the direction of spin, but also the 'polarity' of particles. They 'know which end is up'.

In order to change <- to -> a particle must emit a neutrino, a particle which has no properties except a half-spin. The quark has to emit 2 neutrinos.
(1) 548<- ----> 548-> + n<- + n<-
so that the total spin is not changed.

Or it could do it differently. One 548 can split into two.
(2) 548<- --> 274<- + 274-> + n<-

The 742<- also can split.
(3) 742<- --> 371<- + 371-> + n<-

Two neutrinos are still emitted but they are smaller. In (1), the neutrinos are based on 548m[e], for a total of 1096m [e]. In (2) and (3), the two neutrinos are based on 274 + 371 = 645m[e], some 40% lighter. Less energy is required.

In addition, by splitting into 7 particles, instead of 5, the quarks reach a higher level of entropy or dissipation. The universe works by dissipation. Each of the pairs are bound together by their 'well' and act as one quark.

Each partner in a pair is free to move in its well, but it cannot approach its partner because by the psi rule it would lose mass. This would become available as energy. So the two members of a pair probably use this to orbit the common centre of gravity, 180 degrees apart. The centrifugal force from this motion keeps them apart, 'running round the wall of their mass deficit well'.

It may be possible to detect this motion as a resonance in nuclei.

I read an article in the Toronto Star, Sunday, 20th Feb., Page F6. It seems to me that the above may be connected to that article. It deals with the Big Bang. One more connection between particle physics and cosmology.

Incidentally, for the curious, a[um] = (1 + 1/137.036)^137.036.

Gluons are another matter.

I hope this is of interest.

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Chronicles of a Winter Star Party

Kind of sorry to have missed the last two meetings, but we had this opportunity to once again attend the Winter Star Party at Big Pine Key in Florida, so we took it. For those members unaware, the WSP was canceled in 1999 due to three devastating hurricanes. One would have had to be there in 1998 to realize how much damage to the site had been done: the trees bordering the highway, (US1), were mostly all blown away. Parking the large RV's along that area solved the problem somewhat, but still there was a lot of light coming from the many vehicles traversing the route. Astrophography was out of the question, but we did get some good seeing.

Every night, the seeing was excellent until around 2230 hours, when the clouds moved in. Up to that point, the sky was clear and beautifully transparent. I was looking at Saturn with my 8" LX200, using a 12mm eyepiece in conjunction with a 2X Barlow. It was magnificent. Many went to bed, set their alarms for 0300 hours, got up and on a few occasions, were rewarded. Other times the situation was not good. Friday night and Saturday night, everything changed for the better. There were hoots and hollers as the sun sank in the west, leaving a beautiful clear starlit sky. All through the night we roved the site peering through the vast numbers of telescopes, chit chatting and generally pickling up a lot of good information.

Eta Carina was a good sight, as well as the Horsehead through the 36 incher. Of course, we renewed old friendships and did a lot of visiting as well as some deep sea fishing. One new scope shown by a vendor was a telescoping telescope. The 10 inch Dob folded down into a package 18 inches by 18 inches by 28 inches and weighed 38 pounds. What a neat package. It contained the mirror, the telescoping struts, a laser finder, a rack and pinion focuser to accommodate a 2 inch eyepiece, wing nuts for collimating the primary mirror, spider, and to top it off, an aluminum padded case, which when not in use attaches to the side of the mount with Velcro. The price of $2480 US was a bit steep, but the concept was faultless. For anyone interested, the fellow makes them all by hand, and there is a 5 month lead time. There were some other home built scopes, some of which were pretty interesting.

Again, it was good to go south and spend some time in the sun. Our reliable starship Odyssey, captained by yours truly and our faithful First Officer Oksana, made the trip very uneventfully,

HAA Star Party

The HAA Spring Star Party, originally scheduled for June 2 - 4, will not be held this year. Instead, we invite our members to attend the following star party, which sounds very interesting. The web site is excellent.

Star Cruise 2000

The more than 530 members of the Amateur Astronomy Association of Pittsburgh (Pennsylvania) invite you to attend the second annual "Laurel Highlands Star Cruise", June 1 - 4, 2000.

Star Cruise 2000, as it's being called, will be held at the Tall Oaks Campground, in the Allegheny Mountains about Uniontown, PA. Guest speakers from NASA, regional universities and the AAAP; special activities; a swap table; and vendors are planned. This is a tremendous dark-sky site. Dark sky photos are available on our website for your perusal. There's a CHANCE to see Omega Centauri and Centaurus A from this site.

There are a lot of area attractions for the non-astronomer (detailed on our web site), so bring the whole family.

If you visit our website you'll see arrangements are still being finalized. But there's a ton of info there already.

Laurel Highlands Star Cruise Website: ***http://members.aol.com/lhstarcruise***

AAAP Website ***http://trfn.***

Messier Marathon Month

Ev Rilett

This is March and for many astronomers, this means the “Messier Marathon”. They say, all 110 Messier objects can be viewed in a single evening. For all of you planning to attempt this or even just find some new objects, the best of luck to you. I thought I would introduce our members to the man who created this list of famous objects. I’ve borrowed this text from the web and I hope you enjoy Messier’s story.

The French astronomer Charles Messier was born in Lorraine on June 26, 1730. When he was 11 his father died and being the tenth of twelve children Messier consequently had little opportunity for education. As a boy he developed an avid interest in astronomy after seeing the brilliant six-tailed comet of 1744. Even though Messier came from a poor family and had limited schooling he was hired at the age of 21 as a draftsman by Joseph-Nicholas de l'Isle, Astronomer to the French Navy. Messier soon learned to use astronomical instruments and became a skilled observer.

Edmund Halley had predicted that the comet of 1682 would return in late 1758 or early 1759. Using charts that de l'Isle had incorrectly prepared, Messier began searching for the comet with a small reflector. On January 21, 1759 he located the comet but de l'Isle initially refused to let Messier announce his discovery. (As fate would have it the comet was first sighted on Christmas Night of 1758 by a German farmer and amateur astronomer named Palitzch.) Undaunted by the embarrassment of the late announcement, Messier from that time onward devoted himself to searching for comets. In the coming years he held a near monopoly on comet discoveries claiming to have found 21 by 1798.

Charles Messier used over a dozen telescopes during his career but his favorite was a 7.5 inch 104x Gregorian reflector. Later when the apochromatic refractor became available he utilized several 3.5 inch 120x apochromatics.

On August 28, 1758 Messier found by chance a small nebulous (cloudy) object in the constellation of Taurus while observing a comet he had discovered two weeks earlier. This object, a supernova remnant known today as the Crab Nebula (M1), was later to become the first entry on a list of comet-like objects that eventually became the most famous catalog of galaxies, nebulae and star clusters in astronomy. Ironically, Messier became famous historically for his catalog of time-wasting "**objects to avoid**" when comet hunting and not for the comets he discovered.

Messier began compiling reports of discoveries by other astronomers. In fact, only 17 of the 45 objects in the first installment of Messier's catalog published in 1774 were discovered by Messier himself. (The first object that Messier is given credit for discovering is the globular cluster M3 which was first located on May 3, 1764.) By 1780 the number of objects in his catalog had increased to 80.

Because of Messier's undeniable success as a comet hunter King Louis XV of France nicknamed him the "**Ferret of Comets**". Messier collaborated with the younger astronomer Pierre Francois Andre Mechain who was a successful comet hunter as well. During 1780 and 1781 he discovered some 32 new nebulous objects and reported their positions to Messier.

On April 13, 1781 Messier added the one hundredth object to the catalog. Three subsequent observations by Mechain were included hastily without verification and what was to be the final revision of the catalog was published in 1781. Forty of the 103 objects listed had been discovered by Messier and 27 by Mechain. In November of 1781, Messier suffered a severe fall and further work on his catalog was ended.

The French Revolution was a disastrous period for Messier and his compatriots. In 1794 Messier lost his Academie pension and naval salary and the navy stopped paying the rent on his observatory. President de Saron, the talented mathematician who was one of the first men to realize that William Herschel's Uranus was in fact a planet, was guillotined a few days after computing the orbit of a comet that Messier had discovered the previous year. Mechain lost his estate and all of his savings. With the coming of Napoleon Bonaparte the lives of Messier and Mechain improved greatly. Mechain was made the director of the Paris Observatory and both he and Messier were

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Bret's Observing Notes

The next Binbrook observing nights are March 31, April 1st, 7th, 8th. Call Bret Culver 575-9492 or Marg Walton at 627-7361 or Rob Roy at 692-3245. Also give me a call on my cell phone at 518-5297 after 8pm on observing nights only please.

On March 31, I would like to hold a Messier Marathon. A Messier is when you observe all 110 Messier objects from dusk til dawn. See the March issue of Sky and Telescope for more information. I will open the park an hour before dusk. Brink a coffee cup as I will be brewing coffee on my Coleman stove. If it's cloudy I'll hold the marathon on April 1st.

Bret Culver

(Continued from page 6)

John Lawson.

Did you know that...

the first person to explain in print that there is earthshine on the Moon was Leonardo da Vinci.

Rob Roy

Messier ...

(Continued from page 8)

admitted to the new Academy of Sciences and the Bureau of Longitudes. Messier received the cross of the Legion of Honor from Napoleon himself.

Messier made his last discovery in 1798. He continued to observe until he suffered a debilitating stroke. Two years later on April 12, 1817 he died at the age of 86.

In the twentieth century 7 objects known to have been logged by Messier were added to the Messier Catalog. M110, the final entry, was added in 1967. Today it is known that M40 is merely a binary star and M73 is only an asterism. M102 is thought to be a duplication of M101 but NGC 5866 is often accepted as being M102. The true identity of M91 is also questionable. Because of an error in their coordinates M47 and M48 were at one time deemed to be "lost" Messier objects.

Charles Messier was limited as a scientist but he was an astute observational astronomer who studied sunspots, eclipses and occultations in addition to discovering many comets and nebulous objects. He was so totally dedicated to astronomy that when his wife lay dying it was with the greatest reluctance that he left

CALENDAR OF EVENTS

- Tuesday, March 21, 7pm

- March 31st - 1 hour before dusk
- April 1, 7, 8 ~ 8pm

- Friday, April 14, 2000 7:30pm
- Tuesday, April 18, 2000 7pm

HAJA - We will meet at McMaster University, in the Burke Science Building, room B148. For more information contact Rosa Assalone 540-8793
MESSIER MARATHON - See Bret's Observing Notes above.
BINBROOK OBSERVING NIGHTS - For confirmation or directions call Bret Culver 575-9492, Marg Walton 627-7361, Rob Roy 692-3245
HAA GENERAL MEETING - At the Spectator Building auditorium.
HAJA - We will meet at McMaster University, in the Burke Science Building, room B148. For more information contact Rosa Assalone 540-8793