MACARTHUR ASTRONOMICAL SOCIETY Inc.

Journal

PRIME FOCUS

Volume 9 Issue 11 November 2004

President's Report

Most Recently

Take one variable Specific Impulse Magnetoplasma Rocket Concept, add a Helicon Double Layer Thruster and for a bit of spice throw in a Turbo Molecular Pump. There you have it! A recipe for interstellar space travel courtesy of master chef Michael West.

Michael's talk was very fascinating. Now I have more of a handle on ion propulsion systems and plasma engines. Michael is off to the USA to present a paper he has been working on. I believe it could be on aircraft wing development but don't quote me. This was Michael's second visit to us and he has accepted another offer to return to us sometime next year.

What would happen if you held a party and no-one came? Well, despite some fantastic organization on the night that's what happened when we held our recent public night at the Dudley Chesham Sportsground at the Oaks.

We have a few thoughts as to what happened, maybe the weather, the previous week's great turnout at the observatory, or not enough advertising. But what I must say is thank you to all the members who turned out. Also thanks to the volunteer fire brigade. Better luck next time.

In February next year Peter Elston will be our guest speaker, Peter will be presenting a movie he made on chasing a solar eclipse. Peter is a Qantas pilot and organised a flight over Antarctica chasing the shadow of the eclipse with a jumbo jet. Should be a great night. Also in January Dick Everett has agreed to bring us all the latest news on the astronomical front. Thanks Dick.

The List of Dates

19/11/04	Campbelltown Rotary Observatory Public Night
04/12/04	The Oaks
05/12/04	End of Year Event, venue TBA
11/12/04	The Forest
01/01/05	The Oaks
08/01/05	The Oaks
17/01/05	General Meeting
05/02/05	The Oaks
12/02/05	The Oaks
21/02/05	General Meeting
05/03/05	The Oaks
12/03/05	The Forest, TBA

Before heading out please check in with John Rombi or myself on 0410 445 041, things can change very quickly. Normally around this time we take a break from The Forest and the Observatory as the Universities take their breaks over Christmas.

Please note that there is no general meeting in December. I am sure I will catch up with most of you before our January return. If not, please have a great and safe Christmas and happy stargazing.

Noel Sharpe President

Ursula's Internet News

On the website "Astronomer.com" is another link "Spaceflight Now". There is a report on newfound star clusters that may be the final fossils of the Milky Way. Just when astronomers thought they might have dug up the last of our galaxies fossils, they have discovered something new in the galactic equivalent of our own backyard.
Globular clusters with stars estimated to be approx 13 billion years old have been discovered by the Spitzer Space Telescope and the University of Wyoming infrared observatory. They are 9000 light years from Earth and they are hidden in the dust of the Milky Way.

I think, if there are stars nearly as old as our Universe, there must have been stars before the Big Bang, and that space was not all empty. ***[Maybe some of you might like to debate that philosophical point with Ursula over a cuppa after the meeting. It should involve some lively discussion on the meaning of the word 'before' and what actually happened during the Big Bang. Ed.]***

Another report from "Spaceflight Now". Probe preparing to plunge into Titan's atmosphere! On the 14.01.05 the Huygens probe will plough into the orange atmosphere of Saturn's moon Titan. Some scientists have seen a large bright area on Titan that they have named Xanadu, along with the mountains of rock and ice. Titan has a thick, methane rich nitrogen atmosphere. Scientists think that Titan has a resemblance to a young Earth. Wonderful!!

Ursula Braatz. ■

What IC This Month
November 15 – January 2005

Overhead at 8.30 pm

Northwest Deneb low down in Cygnus, Altair above, the stars of Delphinus underneath Capricornus and Aquarius. Next comes Lacerta the Lizard and the Great Square of Pegasus with Mira the variable star in Cetus. Andromeda is followed by Aries and later Taurus and the mighty Hunter Orion himself.

Southwest we have the Pointers low, with Scorpius and Sagttarius above. Next are Fomalhaut, Grus and Tuc 47 below Achernar. Then comes Reticulum with Canopus rising in the east and later Sirius

During January watch out for Puppis and Vela in the south, and Perseus, Auriga, Monoceros, Gemini, Hydra, and Cancer rising in the north.

The Moon Diary

First Quarter Moon	19/11, 19/12
Full Moon	27/11, 27/12
Last Quarter Moon	05/12, 03/01/05
New Moon	12/12, 10/01/05
First Quarter	17/01/05

Evening Sky Planets

Mercury rises in Scorpius around 8.45 pm. It will sit low above the western horizon for the next few days before sinking to pass the Sun on Dec 6th. Rising then round 5.00 am in Ophiuchus it will chase and catch Venus for Christmas when they will stay paired up till our next meeting in January.

Neptune rising in Capricornus followed by **Uranus** in Aquarius are visible all night. Both will gradually sink toward the Sun during the summer months and be setting in the twilight by late January.

Saturn rises in Gemini to the right of Castor and Pollux between midnight and 11 pm in November; 11 – 9 pm during December and as early as 7 pm for January. It is at opposition on the 14th January so this is the best viewing time till February. Moving westward the ringed planet will still be in sight of the Manger for Christmas.

Morning Sky

Jupiter rises in Virgo between 4am and 1 am through November and December. It will stay in Virgo for the next couple of months forming a triangle with the crescent Moon and Spica on 8th December. In January it will rise before midnight.

Venus starts the month half-way between Jupiter and Mars in Virgo. By December it is within 3° of Mars closing to 1.2° on the 6th. On 10th December a very thin crescent Moon will be above Venus with the red planet sandwiched between. A little later on 29th December Venus will have a similar close rendezvous with Mercury before sunrise on its way to superior conjunction in March next year.

Mars rises in Libra in the dawn light at 4.30 am before moving quickly to Scorpius and on to Ophiuchus for January. Early December check out the god of War and goddess of Love as they dance on into January in the morning light. They will be at their closest over Christmas but in the daylight. Details in Astronomy 2004/5.

Comets

K4 reappears in our southern sky at mag. 7 in Centaurus. During December it will pass through Vela, Carina and Pictor.
T7 at 12th mag. is still visible in Crater if you want to search very carefully.

Meteors

It's **Leonid** time again! No guarantee of anything other than low activity but look up round Nov 15-21 towards the northeast in the morning.

The **alpha Monocerids** come along in November as well. Normally only 5 per hour there is some expectation that at ten year cycles they may come in 30-45 minute bursts of 400 or more an hour. I'd like to see that!

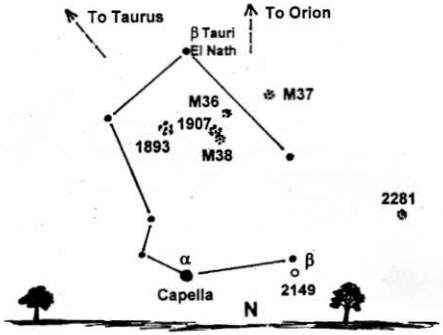
In mid-December look for the **Geminids,** and check Astronomy 2004/5 for more

Portraits in The Sky

Auriga the Charioteer

is marked out by one of the horns of Taurus (El Nath) and the bright flashing fiery light of Capella low down on the northern horizon. The chariot driver is portrayed carrying a she-goat on his shoulder and two or three kids (small goats) on his arm. Capella has been called the 'she-goat star' since Roman times.

Legend claims that Auriga is Erechtheus, son of the Roman god Vulcan and his wife Minerva, who invented the chariot to carry his crippled body about.



α Aur (Capella) is one of my favourite stars because it is never still. Its coruscating light twinkles and flashes yellow, green, blue, white and orange red. In fact observers down the ages have disagreed about the colour of this beauty. 35 light years away it is similar to our Sun but 250 times larger and a binary double.

The next brightest star is β, to the right of Capella, called **Menkalinin,** 2.1 mag and also a multi-star. A faint planetary nebula **IC2149** is just 1° north at 11.0 mag.

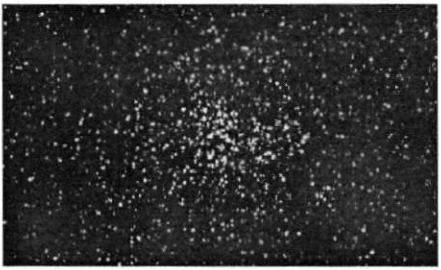
There are three Messiers in Auriga, all open clusters.

M36

M36 is a bright open cluster with pronounced arms of 8th mag stars. A bit like a high-tension electricity pylon, I call him "Pylon Man". M36 can be found 6-8° almost directly north of El Nath (β Tauri). On your way you will pass a rich open cluster **NGC1893** of 60 stars with nebulosity at 7.5 mag.

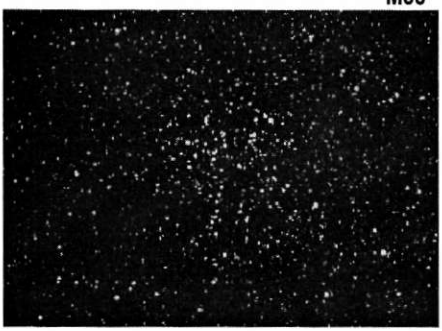
The next is **M37** – A very large rich open cluster about the size of the moon. Clearly visible with binoculars it appears misty even with a telescope and 26 mm eyepiece.

M37



M38 is smaller than M37 but rich in stars. Some people say it has the shape of the Greek letter pi (π).

M38

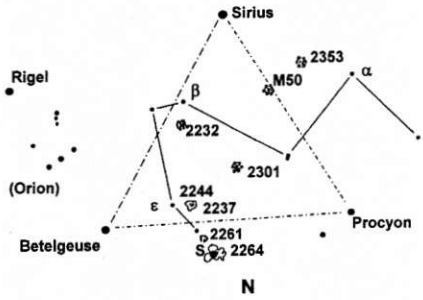


Less than ½° south you will see **NGC1907** an open cluster of 30 stars with nebulosity at 8.2 mag. While you are enjoying the ride with The Charioteer look up to the zenith to find:-

Monoceros – The Unicorn

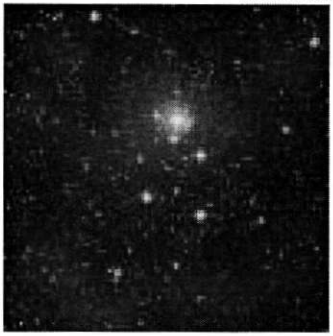
Monoceros appeared on Persian celestial globes a century before western astronomy credited Jacob Bartsch for its invention in 1624. Called The Unicorn (a mythical figure) was perhaps a mistake for the Rhinoceros.

Situated between Orion and Canis Minor with the Milky Way running through the centre, it fills the space inside what some northern people call **'The Winter Triangle'** (Sirius-Procyon-Betelgeuse) to balance the 'Summer' one. It has more than 50 open clusters, several nebulae, and contains one of the stars where extra solar planets have been detected. The head is aimed towards Betelgeuse, with M50 in the belly of the animal. The stars are 4th mag or fainter and the width of 30° makes it hard to spot the shape.



In line with and about 15° away from the belt stars of Orion is β **Mon** a fine triple system of blue-white stars in a curving arc. Component A is a true binary and C has a companion star, making this a quintuplet. About 5° to the north of β is the open cluster **2232,** about 20 stars the size of a full moon.

NGC2232



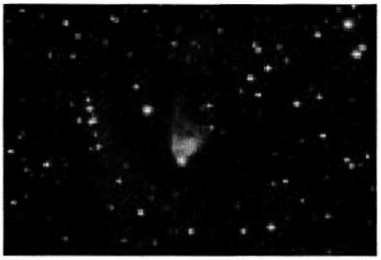
Midway between Betelgeuse and Procyon lies the area of most interest. A little to the south will bring you to **S Mon** an intense luminous blue-white double star within the open cluster **2264** - **The Christmas Tree Cluster.** Measuring 40x20 arc min with S Mon at the northern end, 30 stars cluster together surrounded by nebulosity.

NGC2264

The nebulosity is the visible part of an enormous cloud of hydrogen gas and tiny solid particles with many newly formed stars visible in infra-red. **The Cone Nebula** with its straight tapered sides is the largest of these dust clouds, but shows well only in photographs.

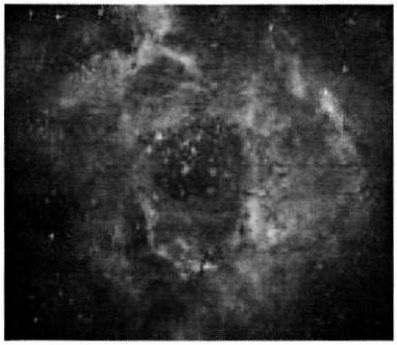
On the southern side of this area is **2261** a very small (3'x 2') bright curious wedge shaped nebula in a fine star field. High magnification will bring this into view.

NGC2261



Moving south another nebula comes into view about 3° to the right of the yellow and blue double star **ε Mon**. **NGC2237-9** is a pale pink nebula almost 1° across with scattered edges called **The Rosette.** Boosting magnification will reveal the rectangular open cluster NGC **2244** inside the nebula circle.

NGC2244



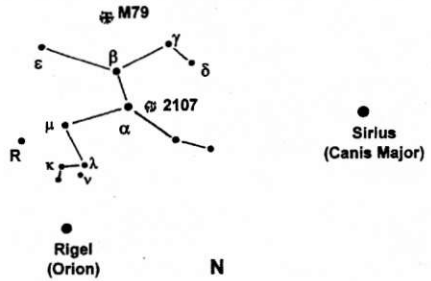
Just under midway between Sirius and Procyon you find **M50** an open cluster with a red star at the centre, easily visible in binoculars. Another pretty cluster of pairs and groups **2353** is 4° further south, one of several within 7° around M50.

If the Unicorn were running flat out it might not see:-

Lepus – The Hare

crouching under the feet of Orion to the west. This is an ancient constellation representing a hare hiding at the feet of the Hunter to escape being pursued across the sky by Canis Major, the hunter's dog. It has also been called The Giant Hunter's Chair.

The Arabs saw the brightest four stars as camels drinking from the river Eridanus. The Egyptians saw the Boat of Osiris, and the Chinese saw a plain old Shed. Other cultures make a link with a Rabbit in the Moon. It is said that when the Eagle (Aquila) sets, then Lepus the Hare rises. Overshadowed by Orion it is still an interesting sight.

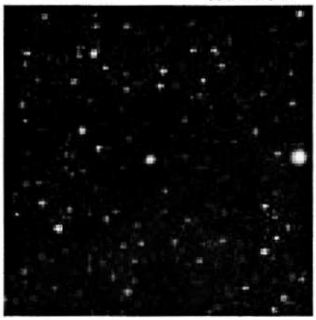


α (Arneb) is a yellow and grey double star, mag 3 and 9.

β (Nihal) is a yellow giant. An attractive double pair for binoculars is γ yellow and red-orange.

The stars **α, β, ε, and μ** (The Camels) make an easily recognised trapezium. Binoculars and small scopes reveal the open cluster **NGC 2017** about 2° from **α,** has five stars from 6 - 10th mag. Two of the stars are close binaries and 150 mm will split them for a total of seven stars in all.

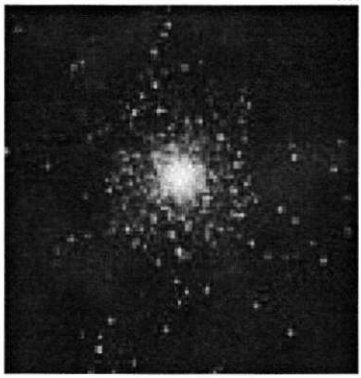
NGC2017



A trio of 5th mag stars **λ, ν and κ** south of Rigel and north of ***mu Lep*** are the hare's ears facing R Lepus.

The beautiful **Hind's Crimson Star** or **R Lep** is a long-period carbon variable, deep red in colour. Described as like a 'drop of blood on black velvet' it ranges from 5 to 12 mag over 430 days. Small scopes show the colour well when it is bright. Starting with **α** extend a line to **μ** and beyond about 5° SW to find it.

M79



M79 is a beautiful globular cluster at a quite unusual location in the sky: Most globulars are grouped around the Galactic center, but this is one of the few which are in the central stellar bulge of our Milky Way galaxy. It is little over 40,000 light years from us. A good object but can be difficult for small telescopes and binoculars. In the same low power field you will find a deep yellow double star discovered by John Herschell - **h 3752**.

Keep you eyes on the Christmas stars this year.

Good seeing IC

Finding NGC253

To some people, finding the beautiful edge-on spiral galaxy NGC253 (in Sculptor) is a snack. And it is... on a perfectly dark night, with binoculars, with basic directions from a star map.

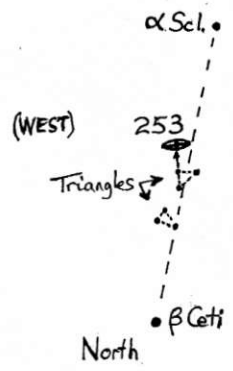
But getting the blighter in your telescope eyepiece, especially when it is directly overhead, can be another matter.

NGC253

I recently had a need to be able to find it quickly while giving a planned talk to some people and I didn't want to embarrass myself by thrashing around looking for it. So here is my simple solution. (My apologies to those of you who can find it without delay with your eyes closed or have Go-To scopes.)

First you have to locate Sculptor from you sky maps. Not so easy as its brightest star is mag. 4.3. I find it by moving generally east from Fomalhaut in Piscis Austrinus.
Then locate α Sculptoris and β Ceti. (Cetus is 'below' or north of Nculptor.
Now NGC253 is just a tad over halfway from β Ceti to α Scl. That's where you will be generally looking through your finderscope. But as 253 is not very visible in your finderscope, you'll need some guide stars.

Here's the clue. Halfway between β Cet and α Scl, there are two distinct triangles in line. You can't miss them in your findrscope. If you extend the line of the western side of the triangle nearest Sculptor by its length again, it will land smack on top of NGC253. See the sketch below.



Good hunting. RB

A BRIEF ANALYSIS OF MATTER Part 2

By Fran Kish

[This is the second installment of Frank's mammoth paper. I hope you are enjoying and learning from it as much as I am. Ed.]

1) WHAT IS MATTER?

The two major scientific disciplines, Physics and Cosmology in general, which deal with the subject of *matter*, might give us the relevant answers in the following:

1.1 PHYSICS is a discipline that deals with an organized body of tested ideas about the real world through continued research. Physics is the science of energy, (Joule, 1851), this axiom was adopted by Kelvin, stating that atoms were to be regarded merely as manifestations of energy, which idea is confirmed by modern physics.

Description of Matter by Modern Physics:
Matter is a specific arrangement of atoms that is distinct from any other that a substance might possess. Matter in the form of elementary particles demonstrates mass and charge, having a wave-like aspect. Matter can be created from energy. Both matter and light have intrinsic properties of both waves and particles. Wave motion is the fundamental basis of all material beings and their motion in the physical reality. The wave function therefore incorporates everything there is to know about a particle, regarding all its possible positions and movements. This is considered by some physicists as being a quasi "Quantum-Social Security Number".

Furthermore:
a) All *matter* is made up of five stable elementary particles: *Electrons, Protons* and *Neutrons*, all these 3 components constitute the visible materials.
Neutrinos, Photons (*and Graviton?*), these are the carriers of *energy*, created by interactions among the visible materials.

b) In the physical reality, through Einstein's *Law of Equivalence*, all *matter*, and ultimately all *energy* are subject to the *Laws* and *Forces of Nature*. These Laws are set *immutable* in that all *energy/matter/particles* must conform to them, but without being able to *react* back and *alter* them.

Forces of Nature considered being the *Causes* of interactions among *matter* of all kinds, and these are: *Strong Nuclear Force, Weak Nuclear Force, Electromagnetism* and the *Gravitational Force.*

c) Ultimately, in the *Microcosm, matter* is controlled by the Laws of *Quantum Mechanics*, and if it is proven to be correct, "one has to give up either ordinary logic or physical reality".
In the *Macrocosm, matter* is controlled by the Laws of the *Gravitational Force.*

d) Through Einstein's *Law of Equivalence* of *energy* and *matter*, it is appropriate at this point to describe briefly the nature of *Energy* as well.
Energy is the capacity for producing *effect.* Therefore energy is *recognized* through its *effects*, and these are:
(i) *Stored Energy* such as Mechanical, Thermal, Electrical, Chemical, Nuclear and Potential Energy.
(ii) *Transient Energy* such as Heat and Work, (Mechanical and Fluid flow).

The *Total Energy* of all forms of energies in a *closed system* remains *constant*.
Heat in a system is a transfer of energy through the *incoherent* (multi-directional) motion of its particles. Heat is measured by the change of temperature.

Temperature indicates quantitatively the molecular equilibrium of the kinetic heat energy, between the *Set-Point* of the thermometer and an *Object*.
Work in a system is a transfer of energy through *coherent* (unidirectional) motion of its particles. Work is *not* a form of *energy*, but the name only of a method for transferring *energy* through change. *Work* may be completely converted into *heat* by using *energy*.

1.2 COSMOLOGY has three main branches: *Physical* Cosmology, *Philosophical* Cosmology and *Cultural* Cosmology, which is not the subject of this paper.

a) Physical Cosmology considered a branch of physics and astronomy is a study of the physical Universe, its structure, the processes in it and its history.

b) Philosophical Cosmology or *Philosophy* of *Nature*, was first developed within the *Systematic Aristotelian Philosophy*, is a study of philosophical issues associated with natural sciences. Its aim is the search for truth in reality, while its material object is *being as such*, that is found in every knowable real thing, in its ultimate, rational explanation. Philosophy in general enters into and often enmesh with the Physical Cosmology because of the frequent *changes* in our physical picture of the Universe, and the multitude of conflicting *observational data* which require radical *revision* in our conceptualization of it.

A conceptual revision, just as logical thinking, according to the principles of the Aristotelian *Rules of Logic*, demands that the specific *description* and definition of a physical entity *prior to* a relevant question must be clearly *identified*. (Although such similar rule may exist in other philosophies, but with the essential difference that others lack a comprehensive system, a *framework of reference* for the *identification* of a specific *description*.)

Scientists are proposing multitude of novel ideas in the interest of progress all the time. The problem, however, is that many of those proposals are complex by nature and/or full of assumptions, which conflict with assumptions proposed by other scientists. This problem is compounded by the all too frequent and illogical practice of trying to prove the *assumption* of a new view-point with other *assumption*.

Philosophy asserts that: "Any assumption, which relies on other assumption to prove an idea/term/theory or a fact, it is philosophically an unacceptable explanation."

Heisenberg wrote: "Science must be based upon language as the only means of communication and there, where the problem of unambiguity is of greatest importance, the logical patterns must play their role". Further he states that the fundamental problem of our mutual understanding lies in the intrinsic uncertainty of the *meaning* of words. Hence the word "*definition*" comes from the Aristotelian Philosophy, which created "Organon", a system of logical thinking, in order to determine and set boundaries in modes of expression, thereby setting the solid *basis* for the scientific language.

c) **Cultural Cosmology** is a study of the creation myths of different cultures, their function, meaning and orientation, (i.e. the domain of cultural anthropologists).

Description of Matter by Physical Cosmology: *Matter* is best understood through Einstein's demonstration of the Equivalence of *energy* and *mass*, which results from the famous formula of $E=mc^2$. This implies a possibility for converting *energy* into *mass* and vice versa.

Kelvin hoped to establish a "material physics" based solely on energy. He had an idea that all material phenomena could be explained in terms of the transformation of energy from one form into another. Einstein confirmed this idea by his energy-equivalence equation.

Within the *Physical Cosmology*, an in-depth description of *matter*, together with other related theories associated with the origin, nature and the fate of the Universe, are *detailed* in the so called *Cosmological Models*.

There are some 10 to 15 such *Models* published so far. Some of them contain often strangely new theories that conflict with those already accepted by the scientific community.

The so called *Einstein-deSitter Cosmological Model,* which provides the most realistic analogue for a *marginally-bound* Universe, has been accepted by the scientific community as *the "Modern Cosmological Model"*. This model assumes that the thermodynamic properties of the Universe in its first milliseconds after the Big Bang, (i.e. at the very beginning of the Universe), caused the high-temperature drop to go through a phase-transition from its high-temperature, (i.e. massless plasma), phase to a low-temperature massive phase.

This reasoning is based on the successful description by *Particle Physics,* that is the particles at the very high temperatures of the Big Bang did interact at energies over a thousand times stronger than nuclear energies.

The same happens when electron and neutron meet. The energy confined in the particles' mass is liberated and dissipated in the form of gamma rays. The same happens also in the decay of the neutron.

Scientists agree that one of the most conspicuous properties of *energy* being locked up is *mass*. It may be said that matter is *energy "condensed."* Others say that *mass of a particle* represents highly ordered *"energy"*. After scientists having pulled *matter* into its ever smaller constituent pieces, they are so far unable to clearly define its true elementary structure and precisely what *matter* is. P. Davies suggests that besides the *analytical* view of *matter,* it may also have a *synthetic* aspect, analogous with the "Uncertainty Principle" of Quantum Mechanics, whereby we may be unable to determine simultaneously how *matter works* while analyzing what it is *made of.*

Description of Matter by Philosophical Cosmology: There are *two* substantial and complementary *principles* recognizable in every physical body, these are:

a) The *passive* ***matter***, "of which things are made", being in its utmost purity and as Plato called it a kind of *non-entity, i.e.* incapable of

separate existence, but only in conjunction with something else that is the *form.*

b) The *active* ***form***, which is so to speak, the *living idea* of the physical body that *determines* and makes the purely passive *matter* what *it is.*

In summary then, *matter* is a *quantifiable bodily substance*, and yet it is wholly indeterminate *entity* by itself, whose *real identity* is acquired only by its active *qualifiable form*, i.e. the principle of determination.

Expressing the same idea in a simple way: *matter* as such is a bodily substance that can only be *recognized* in the physical reality through its qualitative properties, in other words: Is there such a thing as *matter* without *shape?* "There is no *entity* without *identity*".

(To be continued...)

Frank Kish ■

Finding Uranus and Neptune

Uranus and Neptune are currently shining at mags. 5.8 and 7.9 in Aquarius and Capricornus respectively. Believe it or not, for those of you without Go-To scopes, they are relatively easy to find. All you need to do is a bit of star hopping. The trick is to know which stars to hop.

First, the easiest – Uranus. Broadly, it lies slightly to the west of the point one third of the way from the Y of Aquarius to Fomalhaut in Piscis Austrinus. What is most helpful is that it provides the 4th point of a 4° long parallelogram made of stars of similar magnitude. This is shown comfortably in your finderscope's field of view. There is a smaller asterism as a guide just 4° from it in line with the Y. Put your telescope on the easternmost star of the parallelogram and have confidence that it is Uranus. I nailed it with my binoculars. (See the sketch below.)

To find Neptune, a little trickier as it is much fainter. First locate theta (θ) Capricorni, in the middle of the bend between β and γ. Working from β to θ, there is a 'bent' line of 3 mag. 6 stars across the line. Neptune lies halfway between this line of stars and θ, but off centre as shown on the sketch below. Patiently find these stars and θ in your finderscope, move to the point shown for Neptune (your finderscope may not reach mag. 7.9) and bluish Neptune should be in your scope's eyepiece. (Note – there is another mag 6.5 star within 23" of Neptune. Don't confuse them.) Have fun! RB