



Northwest Skies

The Official Newsletter of the Tacoma Astronomical Society
Tacoma, Washington State, USA

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75 Years of Amateur Astronomy in the Pacific Northwest

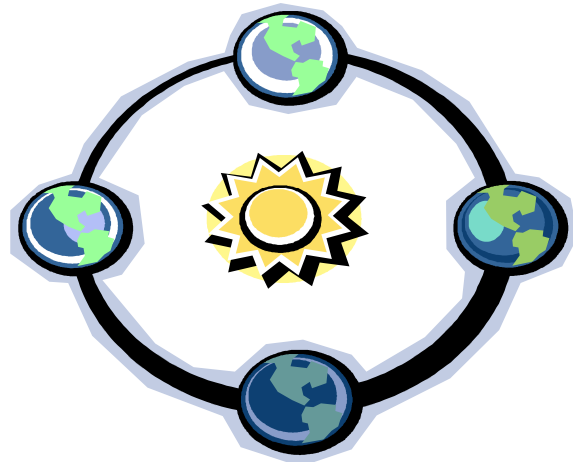
September—October 2006

The President's Message

by Dave Armstrong

Our fourth annual Astronomy Fair held last weekend was an enjoyable and successful event for all who attended. A special thanks to everyone within the society who volunteered for the event. The planning, coordination and assistance throughout the day is creditable to the Board of Trustees but especially to the efforts of Alice Few, Matt Flood and Ken Board. Special thanks also to Ken Slavens for his energy and efforts everywhere throughout the fair.

Joe Witherspoon and Ray Stinson are some of our hardest working volunteers with everything they do for our outreach program. Much of the revenue that they bring in from stomp rockets and donations helps subsidize student programs, running costs and events such as the Astronomy Fair. Our outreach program continues to be very much in demand as it is popular and entertaining. Joe and Ray are always looking for additional volunteers to manage the demand for



their events. Please contact Joe if you would like to assist. It is a lot of fun.

We also need many volunteers to 'man' or 'woman' the booth at the Puyallup Fair. It runs from September 8th through September 24th. We need enough people for 3 shifts a day. It is a lot more fun when there are two people on duty per shift. Remember you get free entry tickets to the fair. This is one of our best expositions that allows us to present what we do within the community and the activities we offer. Many of our new members hear about us

first during the fair. There are still available timeslots for the booth and signing up gets you free parking and admission into the fair.

It is often said and perhaps it can never be said strongly enough how much the society appreciates the efforts of all our volunteers. You offer your own time and energy into providing activities, events and information for other members or those interested in the society and what it offers. Thank You!

Keep looking up,

Dave Armstrong

Northwest Skies is a bi-monthly publication of the Tacoma Astronomical Society. All opinions expressed in this newsletter are those of the contributors and not necessarily those of the Tacoma Astronomical Society.

Original article contributions are strongly encouraged and may be submitted as an email attachment to

editor@tas-online.org

Many stars observed in the night sky are binary systems. However, new observations regarding the behavior and nature of ultra compact binary stars has been published. Bert Brown summarizes these unusual systems.

People to Contact

You can also contact us via email through our website at

www.tas-online.org

Our mailing address is:

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What's Up In Astronomy

by Bert Brown

"Ultra compact Binary Stars" is the title of a feature article in the July 2006 issue of Physics Today, pp.26-31. The author is Prof. Gijs Nelemans of the Radboud University Nijmegen in the Netherlands.

Tacoma Astronomical Society members are aware that many of the stars we see are actually binaries, two stars orbiting around each other. The behavior of ordinary binary pairs can usually be described by Kepler's laws and Newton's laws of motion. But in recent years some of the binaries have been found to exhibit weird properties—stars that have run out of fuel degenerate into compact objects by one of several methods.

Ordinary stars turn hy-

drogen into helium by the processes of nuclear fusion. The heat generated helps balance the inward force of gravity and these stars (like our sun) are more or less stable over long periods of time.

Eventually the star runs out of hydrogen, and then what happens depends on the size and mass of the star. While gravity is by far the weakest of the four known forces in the universe, it can nevertheless overcome the others if it can act in a small enough space.

For stars with a mass less than 8M (where M is the mass of our sun), upon running out of hydrogen to burn, the core collapses while the outer layers of the star expand greatly, becoming a 'red giant'. Betelgeuse is such

a star. Eventually these outer layers are lost into space and the star becomes a 'white dwarf', hot and small, perhaps about the size of the Earth. The winter star Sirius is believed to have a white dwarf binary companion.

For stars between a mass of 8M and 25M, the core collapse provides enough heat to start fusing helium into heavier elements, up as far as the element iron which is the end of the line for nuclear fusion. Without an energy source the core collapses further, and the extreme pressure forces electrons and protons to combine into neutrons; it becomes a 'neutron star' with a radius of about 10 km. For stars with masses > 25M even the neutron star cannot support itself

and a black hole is formed; the star becomes a singularity but the gravity is still very present—don't venture too close! It is these neutron stars and black holes which are discussed in the present article, for many such objects are part of a binary pair, either a compact star and an ordinary star, or two compact stars.

It was around the end of the 1960s that astrophysicists recognized that some binary systems were probably both ultra compact objects, for they had orbital periods of less than an hour. As the stars orbit, they lose energy through emission of gravitational waves, and thus get even closer. As they approach one another, material from one star may start falling on the other in a process called accretion, in some cases by directly falling onto the surface of the companion, in other cases forming an 'accretion disc' which allows material to be expelled in collimated jets in opposite directions.

About 30 compact binary pairs are now known and they fall into two main classes: (a) Ultra compact x-ray binaries, in which accretion by one of the objects causes its core to

heat up to millions of degrees Kelvin, producing abundant x-rays. (b) The accretion from a compact star falls onto a white dwarf, which heats *only* to 100,000 degrees Kelvin and light emission is of optical and ultraviolet wavelengths. The prototype object of this second type is the system AV CVn, that is, star AV of the constellation Canes Venatici (the hunting dogs).

With so few examples to work with, it is not surprising that many competing theories have been proposed on the details of what is actually happening in these systems. One type of possible system is a compact star with a red giant companion; as the giant expands, it engulfs the other in what is called the 'common envelope' phase. Eventually as the outer parts of the giant expand into space, the result is a close compact binary.

Most of the compact x-ray binaries are found in globular clusters, where stars are grouped closer together and interactions are more frequent than in the rest of the galaxy. Observations of x-ray pulsations have enabled astronomers to determine the rotations of

some neutron stars---they are spinning several hundred times per second as they maintain most of their original angular (rotational) momentum.

Gravitational-wave loss of energy was mentioned above, and readers will recall earlier discussions in this column of the "LIGO" (Laser Interferometer Gravitational-Wave Observatory) experiments trying to detect such waves. A new system is on the drawing board, 'LISA', Laser Interferometer Space Antennas: three spacecraft flying in a triangular formation with sides of about 5 million kilometers. Laser signals exchanged between the craft may undergo slight phase shifts due to gravitational waves. This system is proposed for launch around 2015—that is, if funding is kept available.

Not many people are working on ultra compact binaries; the author claims to know most of them. He discusses various theories he and they have put forth to try to explain the evolution of such systems, but most such theories will likely be revised in the future. Stay tuned.

Membership Subscriptions for 2006

Membership subscriptions for 2006 are now due. Please mail your membership renewal to

**The Tacoma
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PO BOX 8881
Tacoma, WA 98418**

or bring your check along to the next General Meeting and hand them to John Pettit, our Treasurer.

Membership dues are the primary income for the society and it allows us to fund member activities and parties as well as the Outreach and Student Programs. Your membership is very important to us.

The annual fees are:

Family:	\$35.00
Adult:	\$25.00
Student:	\$15.00
Senior:	\$10.00

Thank you.



Snacks for the General Meeting

Our thanks to these volunteers for providing snacks at our next meeting.

September

*We need a
volunteer!*

October

*We need a
volunteer!*

We will be providing coffee and tea during the break as usual. Thank you!



Astrophotography 5: Imaging the Sun & Planets

by Jarvis Krumbein

The last article covered the steps necessary to photograph the Moon with your telescope. This time we will go into what will be necessary to photograph some of our planets and the imaging of the Sun.

The planets, with the exception of Jupiter, Saturn and Venus, are generally too small and dim to be easily photographed. Even Jupiter, Saturn and Venus will not be easy. A future article will describe the methods and equipment required for video photography of the planets which has many advantages over film photography.

In general, the same methods for photographing small Moon details will be used for the planets. For example, a Barlow lens or eyepiece projection will almost always be required to have an image large enough at the film plane to be useable and then the image is still going to be quite small. For comparison, the angular diameter of the Moon is approximately 30 minutes of arc while Jupiter is only about 30 seconds of arc so it will only be 1/60th the size of the full Moon. While Saturn will be about half

Jupiter's size, the rings will span about the same diameter as Jupiter. Venus at its closest will appear about twice as large as Jupiter with a diameter of about 1 arc minute. One of the results of the high magnification required is that the brightness of the planet is greatly reduced. Where we were able to use exposures of 1/30th to 1/1000th of a second for the Moon, exposures will probably need to be in the order of 1/30th second for Venus at its brightest and a full second or more for Jupiter and Saturn.

This will require a very sturdy and vibration free mount and great care taken while making the exposure. A good clock drive is an absolute ne-

cessity. One method of making these longer exposure requires a black card or cloth to completely block the light coming into the telescope while the photographer opens the shutter of the camera set to B using a locking cable release. After several seconds are allowed to permit all vibrations to stop, the card or cloth is removed from the front of the scope, being careful not to shake or jar the scope, for the required exposure time. The card or cloth is then put back over the tube and the shutter is then closed. It's a good idea to remove the card or cloth from the tube but to hold it so the light is still blocked for a second or two to let the vibrations die down before finally removing the block



Saturn imaged with 12.5" Newtonian at f15. 900 frames stacked in Registax.
Credit: **Chuck Jacobson**

for the exposure.

The photographer will have to experiment in order to determine the proper exposure times until some experience is had. Using the fastest film speeds possible will help to achieve the shortest exposures.

The Sun is a much easier subject. The following **WARNING** should be heeded as serious injury and/or damage to valuable equipment can result. First, never look at the Sun through the scope unless a proper sun filter is correctly installed on the scope. This filter should be in front of the objective of the scope. There are many fine solar filters available that use either a metallic coated plastic film or glass to reduce the Sun's intensity by a factor of 1000 or more. Eyepiece filters should never be used as the high temperatures can cause a filter to crack or break and allow the undimmed light to enter the eye. Instant blindness or serious injury can result. I speak from experience and have a blind spot in one eye from a childhood experiment with viewing the Sun. Cameras can also be damaged in the same way as the eye. This warning also applies

to the finder scope. The finder scope should always be covered when the telescope is pointed at the Sun. It only takes a fraction of a second to destroy the crosshairs in the finder. The same warning about blindness also applies to the finder so it should always be covered.

Because of the brightness of the Sun, very short exposures and much slower films can be used. Again, experiment will determine what the proper exposures will be.

The tables for the Moon's size at the film plane from last issues article are also

applicable to the Sun as they both appear to have about the same angular diameter. The advent of relatively inexpensive solar telescopes such as the Coronado PST offers the photographer a new tool for photographing the Sun and getting detailed pictures that were previously impossible without spending many thousands of dollars.



The Sun imaged with Olympus digital camera through MaxView 40 mm lens, attached to Meade 8" LX200 GPS Telescope.

Credit: **Ken Board**

Jarvis Krumbein extends his previous article on astrophotography into imaging the planets and the Sun. He also emphasizes the caution one should take with the Sun

Magazine Subscriptions

Don't forget to use your member benefit by receiving a discounted annual subscriptions to either Sky & Telescope or Astronomy magazines.

Sky & Telescope
\$32.95 / year

Astronomy
\$34.00 / year

Contact the Treasurer, John Petitt, for more information.

September Schedule of Events

- **September 1st:** Student Observing Night. 9:00 PM

- **September 5th:** General Meeting. Please note we are meeting at **Wyatt Hall, Room 109** at UPS until further notice. 7:30 PM.

- **September 16th:** Public Night at Pierce College, Sunrise Building. Program will be 'Scale of the Solar System' presented by Joe Witherspoon. 9:00 PM.

- **September 19th:** Trustees Meeting. 7:30 PM.

- **September 22nd:** Student Meeting. 7:00 PM.

- **September 22nd:** Klickitat Star Party starts.

- **September 30th:** Public Night at Pierce College, Sunrise Building. Program will be 'Star Hopping and Planispheres' presented by Alice Few. 9:00 PM.

- **Outreach Events:** As we move through the summer our Outreach Program has become more popular than ever. Unfortunately, there is simply not enough room here to detail all the exciting events Outreach is providing so please

check the website for further details. For more information and to participating in these events please contact Joe Witherspoon or Ray Stinson.

September 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 Student Observing.	2 Outreach event.
3	4	5 General Meeting.	6	7 ○	8 Outreach event.	9 Outreach event.
10	11	12	13	14 ☾	15 Outreach event.	16 Outreach event. Public Night.
17	18	19 Trustees Meeting.	20	21	22 ● Student Meeting. Klickitat Star Party	23 Outreach event.
24	25	26	27	28	29	30 ☽ Outreach event. Public Night.

October Schedule of Events

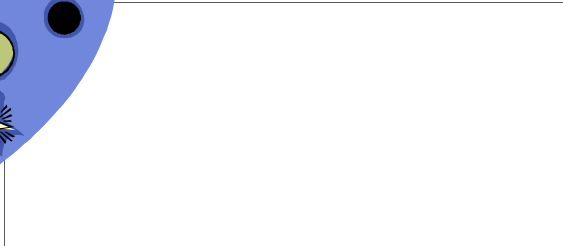
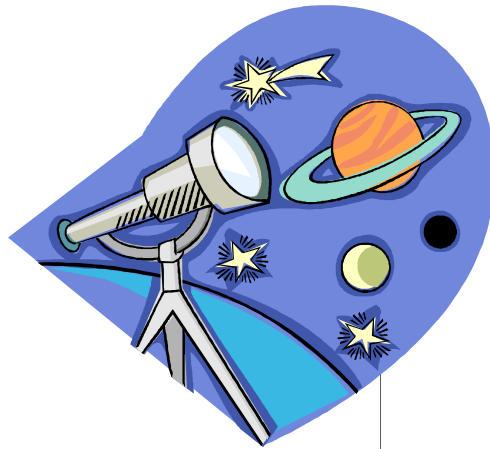
- **October 3rd:** General Meeting. Please note we are meeting at **Wyatt Hall, Room 109** at UPS until further notice. 7:30 PM.
- **October 13th:** Student Observing Night. 9:00 PM
- **October 14th:** Public Night at Pierce College, Sunrise Building. Program will be 'Comets, Asteroids and Other Scary Stuff' presented by Ken Board. 7:30 PM.
- **October 17th:** Trustees Meeting. 7:30 PM.
- **October 20th:** Student Observing Night. 9:00 PM
- **October 20th:** Klickitat Star Party
- **October 27th:** Student Meeting. 7:00 PM.
- **October 28th:** Student Field Trip to Museum of Flight and Challenger Mars Mission. 7:30 PM.
- **October 28th:** Public Night at Pierce College, Sunrise Building. Program will be 'Trick or Treat' presented by Ken Slavens. 7:30 PM.

October 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3 General Meeting.	4	5	6	7 ☉ Outreach event.
8	9	10	11	12	13 Student Observing.	14 ☾ Outreach event.
15	16	17 Trustees Meeting.	18	19	20 Student Observing. Klickitat Star Party	21 Outreach event.
22 ●	23	24	25	26	27 Student Meeting.	28 Outreach event. Student Trip. Public Night.
29 ☽	30	31				

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Northwest Skies



First Class

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PO BOX 8881
Tacoma, WA 98418

We need your articles.

If you are interested in contributing an article or would like to make a suggestion as to what you'd like to read in **Northwest Skies** then please do contact the Editor. We are always in need of original contributions.

Deadline for submitting articles for inclusion in the next edition of **Northwest Skies** is the last Thursday of the month before publishing.

We're on the web!
WWW.TAS-ONLINE.ORG

Dr. James A. Van Allen

1914—2006

by Bert Brown

Dr. James A. Van Allen of the University of Iowa, died August 9, aged 91. Best known for his discovery of the radiation belts in the upper atmosphere which bear his name. He was a leader in the study of the solar system by space probes such as the 1977 Galileo mission to Jupiter. Averse to the manned space program, stating that science could be accomplished much less expensively with missions that did not need to provide for the safety and comfort of humans. Dr. Van Allen was active in his field until the very last; he published an arti-

cle in the August, 2006 issue of American Journal of Physics entitled 'Encounter of an Asteroid

with a Planet'. I think our member Dana Rush knew him at the University of Iowa.



Photo of James Van Allen at National Air & Space Museum. © NASM