SEATTLE ASTRONOMICAL SOCIETY

The

Webfooted Astronomer

May 2002

UW Visiting Scholar to Discuss Cataclysmic Variables at May Meeting

By George Best

> ### May Meeting
>
> Albert Linnell
> Visiting Scholar
>
> University of Washington
> Astronomy Department
>
> Wednesday, May 15
> 7:30 p.m.
>
> Physics-Astronomy Building
> Room A102
> University of Washington
> Seattle
>
> Come early at 7 p.m. for coffee and to visit with your fellow members.
>
> Bring your slides to show after the program.

THE speaker for the May 15 meeting of the Seattle Astronomical Society will be Albert Linnell. He will talk about cataclysmic variables.

Linnell is a visiting scholar at the University of Washington. He got his PhD from Harvard in 1950. He then taught at Amherst from 1949 to 1966.

While there, he started the five colleges observatory. The five colleges are Amherst, University of Massachusetts, Mt Holyoke, Smith, and Hampshire. From 1966 to 1976, he was chairman of the astronomy department at Michigan State University. Linnell is currently professor emeritus at Michigan State University.

The Seattle Astronomical Society meeting will be held Wednesday, May 15 at 7:30 p.m. in room A102 of the Physics/Astronomy building.

Dark Skies Northwest will hold its monthly meeting prior to the SAS meeting from 6:30-7:30 p.m. in room A216 of the Physics-Astronomy Building. Dark Skies Northwest is a section of the International Dark Sky Association.

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Little Bear's Corner

Doing Research With Your Small Scope

By Tim McKechnie

IT'S interesting how closely related amateur astronomy is to amateur radio. I've never been a "ham" myself, but I have used two-way radios and been an avid short-wave listener since 1962 when a neighbor got me hooked as a kid.

Back in those Neolithic days most hams constructed their own equipment—transmitters, receivers, antennae, etc. However technology and disposable incomes have changed the hobby. Now very few operators actually build their electronics. It would be too time consuming and require too much knowledge and test equipment to build the new computerized and synthesized transceivers that are in use today.

About 10 years ago, amateur radio enthusiasts started a trend to go back to the basics and see just how much could be done with the less sophisticated radios with the least amount of power. Operators started to build some simple sets again, either with transistors or, better yet, with old electron tubes. They dusted off their old AM, double sideband tube transmitters and rediscovered how much fun and challenge you could have with these simple sets. C.W. operators (Morse code) tried to see just how far they could communicate with the least power. A few of these people managed to effectively converse in code with other operators elsewhere in the world with just a couple of watts of power!

Rediscovering the small scope

This trend in amateur radio is synonymous with what is happing now in amateur astronomy—the rediscovery of the fun, convenience, and challenge of small aperture telescopes. I don't know if this is a primal reaction to the ever increasing mechanization of humanity or whether it's a function of the necessity to be portable while traveling to acceptable observing sites.

Whatever the reason, more and more people are finding that a well-made small telescope can deliver views of the heavens that will not only satisfy the occasional, but can be used for serious research projects. Three of these come to mind: variable star monitoring, supernovae patrol, and lunar/asteroid occultations.

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Little Bear's Corner *(Continued from page 3)*

Variable star observing

Certainly the visual photometry of the brightness of variable stars has been the pre-eminent amateur contribution to modern astrophysics. The study of the light fluctuations from these stars has been instrumental in our understanding of just what makes a star work. The professional astronomers simply do not have the time or resources to continually monitor the brightness of the thousands of variable stars visible through a small telescope, thus the efforts of organized amateurs who routinely and persistently watch these stars has been decisive. Hundreds of these stars are bright enough to be seen with just binoculars and hundreds more come within the range of telescopes less than 6 inches (152mm.) in aperture.

The central organization and repository of this data since 1911 has been the American Association of Variable Star Observers. They have traditionally required their volunteers to have minimum telescope apertures of 6 inches for reflectors and 4 inches (102mm.) for refractors but there is a fair amount of flexibility. Leslie Peltier, one of the most productive observers of all time, started his variable observing career in 1917 with a 2-inch refractor, even though the AAVSO required a minimum aperture of 3 inches. If you want to observe, there are stars for you to look at regardless of your optics. Today the AAVSO also has observing programs for people using binoculars or their unaided eyes. So if you have, for example, an 80mm. (3-inch) refractor or a 102mm. (4-inch) Maksutov, they will provide finder charts for stars within the range of your instrument and would be very appreciative to have your estimates.

Supernovae searching

Surprisingly, another area where the owner of a small scope can do useful observing is the search for supernovae in external galaxies. Surprising because the common assumption is that this is an area where big light grasp is all important. Not so! Large aperture

Beginning Astronomy Meeting May 18

The next Beginning Astronomy Meeting will be held at Karl and Judy Schroeder's on May 18. The meeting starts at 1 p.m. and generally runs till about 5 p.m. Dinner is provided and followed by evening observing, weather permitting. Bring a chair, something to drink with dinner, and lots of questions. Topics include telescopes, charts, viewing, planning, star parties, clothing. Interested individuals should contact the Schroeders in advance, (206)-362-7605 or e-mail Karl Schroeder, KSchroe225@aol.com.

telescopes do pick up more light and make more of these faint galaxies visible and brighter but they also show many more foreground stars in our own galaxy, which can be confused with the sudden appearance of a supernova outside our galaxy. Small telescopes show fewer of these faint stars so the unexpected flare-up of a supernova in another galaxy is more apparent. Many supernovae in the nearby spirals can reach a visual magnitude +9 or so making them easily visible in a 2.4-inch (60mm) refractor. In fact the late Walter Scott Houston, one of the great deep sky observers and writers, has said that a 2-inch refractor is a perfectly reasonable scope for this type of observing. There are easily more than one hundred galaxies visible to a 4½-inch (114 mm) reflector which could be on a regular patrol program where any interloper of +10 magnitude or brighter would be instantly recognized.

Lunar and asteroid occulations

In addition to the two aforementioned projects, lunar and asteroid occultation timings are useful observations for refining the orbit of the Moon and for measuring the diameters of asteroids. An 80mm refractor is still one of the finest instruments for exploring the Moon and learning about its geology. The six Apollo landing sites make a very interesting geological study in any telescope. And while small apertures are not ideal for comet hunting, who knows? Anything is possible!

So do not be intimidated by the big dogs on the observing field. Big scopes do not equal big observing programs. Your little bear of a scope is quite capable of holding its own and within its limits of doing valuable work limited only by the imagination. Furthermore it's handy, affordable and fun! It's easy to find galaxies with an 18-inch Dobsonian. With a 3.5-inch (90mm) refractor, it's a challenge and an achievement!

Join the SAS Board for 2003

Elections for club officers will be held November 20, 2002. This year's election is important because ***all*** of the positions will be open. Term limits in the club by-laws limit a term to 2 years.

If you have been considering throwing your hat into the ring, then please contact either myself or one of the other officers: Mary Ingersoll, president; George Best, First VP-Programs; Karl Schroeder, Second VP-Education; Ron Leamon, Third VP-membership; Brian Allen, Fourth VP-Publicity; Judy Schroeder, Treasurer; Greg Donohue, Secretary

—Mary Ingersoll

Celebrate National Night Without Lights on May 5

WHEN poet Jane Taylor wrote her poem, The Star, in 1806, the little stars that comprise the Milky Way were visible to anybody who looked up into the sky. Each night a lamplighter would spark a flame to the gas lamps lighting the streets of London where she lived. In the windows, people read books by the light of candles, cooking fires or lanterns.

An abrupt end to our nighttime seeing came when Tomas Edison commercialized the carbon filament light in 1879. The birth of the lighting industry marked the slow, insidious process of turning the darkness into daytime.

If Taylor were to write her verse today, it might more likely read "twinkle, twinkle little star, how I wonder where you are." People living in many cities are lucky if they can spot even the largest stars at night. Two-thirds of all Americans cannot see the Milky Way from their homes.

Sadly, light pollution will cause many people to miss one of this century's greatest celestial treats. On May 5, Mars, Saturn, Venus and Mercury will join in one tight clump with Jupiter above and to the left providing a planet-watching opportunity that won't be repeated for a century.

In honor of this celestial event, the grassroots activist International Little Star Society (ILSS) is promoting the first Night Without Lights on Sunday, May 5, 2002. Through collective and individual efforts, we can reclaim our starry skies, even if it's for just one night.

Call or write to your local or state officials and encourage them to join the effort. Ask them to turn off streetlights, spotlights on municipal buildings and floodlights in parks. Ask schools to turn off stadium lights when they aren't in use. Where lighting is necessary, ask that it be aimed down instead omni-directional. Floodlights can be shielded and more efficient modern lights can reduce light pollution while saving significant energy costs.

How else can you join this effort?

- Turn off unnecessary lights around your home and office. Shut off automatic timers. Close drapes.

(Continued on page 7)

- If you own a business, turn your lights off at closing time and consider switching to more efficient lighting methods when lights are necessary.
- Ask your favorite restaurant to dim their lights or serve by candlelight. Ask your church to turn its lights off for the night.
- Tell your friends and neighbors about Night Without Lights.
- Step outside and enjoy point out some planets and constellations to your children and neighbors.

Besides allowing everybody to enjoy a rarely seen view of the stars and planets, this event will also save significant energy costs. The International Dark-Sky Association (IDA) has estimated that $2 billion is wasted each year in U.S. alone to light night sky.

While both ILSS and IDA recognize that good lighting is necessary. Nobody advocates shutting off runway lights or traffic signals. But today we have too much of a good thing. We are moving quickly to a time when nighttime lights will be indistinguishable from daylight.

(Continued on page 10)

UW Astronomy Department Colloquia

The UW Astronomy Department hosts free weekly colloquia. They begin at 4 p.m. in room A102 of the Physics-Astronomy Building.

May 2: "Astrometry with HST, a New Gold Mine," Ivan King, Department of Astronomy, University of Washington

May 9: "Age and Metallicity of Cluster Populations," James Schombert, Department of Physics, University of Oregon

May 16: "Bar-driven dark halo evolution and the cusp-core

Controversy," Martin Weinberg, Department of Astronomy, University of Massachusetts/Amherst

May 23: "The Metal Content of Galactic Winds," Crystal Martin, Department of Astronomy, Caltech

May 30: "The origin of water on the Earth and Mars," Jonathan I. Lunine, Theoretical Astrophysics, University of Arizona

June 6: "Accelerating Star Formation," Steve Stahler, Department of Astronomy, University of California/Berkeley

For more information, see http://www.astro.washington.edu/dept/colloquium.html.

From the President's Pen . . .

SAS Observatory

By Mary Ingersoll

A**FTER** months of searching, wandering, and a bit of head-scratching, the plans to finally establish a SAS Observatory is coming into place. Last year's membership survey told us that the majority of you who responded wanted to have a permanent facility for the club. We looked into distant sites, neighborhood sites, mobile observatories, and virtual observatories. We now have found a site in Seattle that will provide us with easy access, ample parking, good neighbors, and what we consider to be the darkest skies in the city of Seattle. The site is at an empty ammunition bunker at the Magnuson City Park (a.k.a. Sandpoint).

The site is located on the south end of the park. The beach is to the east, the "whale sculptures" to the north, parking lot to the west and forested park to the south. (See pictures taken by Bill Torgerson at http://seattleastro.org.) The bunker is nestled under a grassy knoll and is large enough to store our loaner scopes, other equipment, club library, club records, an office, and would be able to accommodate small classes/meetings. (This site would not take the place of our UW meeting site.) The bunker will become primarily an educational facility as we conduct star parties (and other learning experiences) for our members, the general public, Project ASTRO groups, and youth/school groups.

The grassy area above the bunker (with the parking lot near by) would be ideal for our monthly star parties. No more dragging your scope from the parking lot to the viewing area. You can park within just a couple of feet of the "telescope field" to unload your equipment and then move your car to the large parking lot a few feet away. (And no sprinklers washing down your scope!) Members who have observed from this site already recommend it as being "excellent." Steve Kulseth has done astrophotography there with great results. Our long-term goal is to build a small observatory above the bunker.

I will be giving a more detailed presentation regarding the "Bunker Project" and the leasing of this property from the city of Seattle at our June meeting. I would ask that everyone interested please attend. A membership vote will be taken at that meeting. I believe we have found the right place, and with your support we will see our hopes fulfilled.

May 2002

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2 Space Day at Museum of Flight	3	4 ◑ IIS Event at Pacific Science Center
5 Eta Aquarid Meteor Shower Peaks	6	7	8	9	10	11 Poo Poo Point
● 12 Mother's Day	13	14	15 SAS Meeting	16	17	18 Green-lake, Cromwell Park Star Parties
◐ 19	20 SAS Board	21	22	23	24	25 Tele-scope Makers
○ 26 Astro-photo-graphy	27 Memorial Day	28	29	30	31	

Night Without Lights *(Continued from page 7)*

It isn't just the view and energy costs at stake. The growing electric glow of civilization has had a profound effect on nature. Confused migratory songbirds crash into skyscrapers. Insects and other animals once guided by moonlight are now misguided by streetlights. Nocturnal animals that evolved to hunt and forage in darkness are instead caught in the glare of ever-brighter headlights. Even people's natural body clock is affected by the lack of darkness.

Energy producers and other proponents of more lights groundlessly argue that lighting is a safety issue, but no studies have shown a link between more light and improved safety. The reality is that more lighting simply gives us the feeling of security, not more security. This human misperception explains, in large part, the past one hundred years of inappropriate outdoor lighting.

Instead of burning a streetlight all night long to aid the occasional pedestrian, pedestrians could be encouraged to carry their own lights. A flashlight aimed at the sidewalk on a dark night is much better protection than a hundred wasteful streetlamps spread out along a roadside. Limiting light pollution also would protect pedestrians' night vision, helping them to see objects better.

Headlights are more than adequate for drivers to safely travel over city streets if they are moving at safe speeds. In fact, modern, brighter headlights may be less safe, since they can destroy the night vision of oncoming drivers.

Security lights that burn all night may actually help criminals find their way into buildings and create shadows in which they can hide. Lights triggered by motion sensors provide more effective security.

It is our hope that Night Without Lights will resemble Oct. 21, 1931, when, at 8:59 p.m. Central time, lights were turned out across the country. Even the lights on Broadway were dimmed and the torch on the Statue of Liberty was extinguished. For one minute America was almost back to the age of kerosene and gas lamps.

What was the occasion of that moment of darkness? The nation was paying its respects to Thomas A. Edison who had died three days earlier.

In honor of this first Night Without Lights, we have drafted a new verse to Jane Taylor's poem: Turn off all the city lights; Let's have darkness just one night; We've lost the diamonds in our sky; I look around and wonder why; Turn off all the city lights; Let's have darkness just one night.

Minutes

Galactic Halo

By Greg Donohue

Bruce Weertman reported on the recent Northwest Dark Skies Association Conference held in Oregon City. He showed several images of the conference attendees and the beautiful surroundings at the facility. IDA (International Dark Sky Association) membership is now around 8,800. Other good news is that the IES is working on a national lighting code for potential adoption by its members. This would help standardize lighting across the nation, in much the same way as we now have national standards for electrical wiring in our homes. Bruce and the local and national organization are making significant progress on many fronts. Congratulations!

University of Washington Professor Emeritus Dr. George Wallerstein addressed the SAS general membership on the topic of "The Origin and Composition of the Galactic Halo."

To understand what our galaxy looks like from the outside, we can look at other galaxies. In the center of most is a bright bulging core, surrounded by a thin plane of obscuring gas and dust. Extending out from the bright core is a spherical, or slightly ellipsoidal collection of stars known as the halo. In addition to going far above and below the spiral arms (perpendicular), the halo also extends far out beyond the arms (parallel) as well.

The Milky Way has such a halo, which has been the subject of intense study for more than a century. But just where are we located in relation to the halo? One of the very first to attempt to find out our location was Kapteyn. Around the turn of the century, he used quantitative counts from photographs of stars in various directions to try to help us "find our place in the suns," as it were (sorry, bad play on words). The star counts did not vary significantly with direction, so Kapteyn concluded that we must be in the center of the galaxy (where things would, presumably, look the same in all directions).

Shapley (Mt. Wilson and Harvard), and Heber Curtis (Michigan) also attempted to study our place in the galaxy. Shapley was interested in the distribution of globular clusters. He compared the magnitudes of the clusters' brightest stars to the brightness of Arcturus to provide some indication of their distances. (This turns out to not be the best way of doing things, since Arcturus is in fact a couple of magnitudes dimmer than the brightest globular cluster stars. However, he did not factor in obscuration by interstellar dust. These two factors tended to almost exactly cancel each other, so he got good answers, for the wrong reason.)

Based on his studies, Shapley concluded that we were not at the center of the galaxy—a view that contradicted the views of both Kapteyn and Curtis. Shapley's view ultimately prevailed and held sway, as it does to this day. The original estimate of our offset from the center of the galaxy—30,000 light years—has been refined over the years so that the currently accepted value is closer to 25,000 light years.

What sorts of things to we find in the galactic halo?

Red Giant stars are abundant there, and are easily visible owing to their intrinsic brightness being several hundred times that of our own sun (absolute magnitudes around –2). Variable stars known as RR Lyrae stars are also numerous (10's to 100's per globular) in the halo. These stars have periods of from about ¼ to ¾ of a day. Some 50-60 Cepheid-type variables, with periods ranging from 1 to 25 days, are also found among the stars of the globular clusters. Pickering (Harvard) was the first to find a Cepheid in a globular cluster—M3 to be specific.

Baade's 3–4-hour-long red and blue exposures of the Andromeda galaxy showed our galactic neighbor to have red giants throughout its halo similar to those in our own Milky Way. This information provided an independent way to determine the distance to Andromeda that could be compared with the value Hubble was obtaining using Cepheid variables.

Until about 1950, it was thought that the composition of stars were roughly the same. But in 1951, Chamberlain and Aller found large metal deficiencies in halo stars. Determining the composition of stars used to be accomplished by taking spectra and doing long detailed analysis of the spectral lines.

But work by Dr. Wallerstein around 1962 provided a much easier and quicker way to determine metallicity of stars. He found a correlation between metal deficiency and star color (UVB). Using a term called [Fe/H] – the logarithmic difference of the iron abundance in the star over the iron abundance in our own Sun, he plotted this factor versus the star's excess UV light. On this scale, [Fe/H] = 0 for the Sun, whereas a star with [Fe/H] = -2 would have an iron abundance 1/100th (10^{-2}) that of the Sun.

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__Minutes__ (Continued from page 13)
Later, others also found a correlation between metal abundance and the ages of stars. Lower metallicity corresponds to increased age. The age of the globulars is about 10^{10} (10 gigayears), which we know believe to be the same as the age of our galaxy.

These correlations paved the way for the first theories on the origin of the halo, and in fact of the whole galaxy. But problems of origins are difficult to work out when, as in the case of the formation of the galaxy, they physical characteristics are described by differential equations. To solve such equations explicitly, one must either know something about the initial conditions, or some boundary conditions. But neither of these conditions are known for origin problems, including galactic origins.

One is left to making educated guesses and then following those through to their conclusion. The first serious effort to do this began around 1960, giving rise to what became know as the "collapse model."

In the late 1970s, we had begun to learn more about other objects surrounding our galaxies. Among these are collections of moving stars in the process of being captured by our galaxy. We now know of 20–30 smaller galaxies (dwarf spheroidals and dwarf ellipsoidals) surrounding our galaxy's halo.

Using this new information, in 1978 two astronomers at Mt. Wilson came up with an alternative to the collapse model. In their model, the halo was formed by the capture of these small galaxies. Some of the larger of these galaxies surrounding our halo contain perhaps 10 million stars, whereas an average globular has a population of about 100,000 stars (but they range from 10,000 all the way up to 1 million). There are also some looser structures surrounding the halo. In 1991 astronomers found a group of moving stars in Sagittarius, with M54 near its center. This collection of stars turns out to be one of the dwarf spheroidals in the process of being captured, which lends some support to the new capture model.

There is strong evidence that the globular clusters in our galaxies' halo did not come from stripping clusters from the dwarf spheroidals. Globulars are found to have about 10 times more type-II Cepheids than the dwarf spheroidals. Further, dwarf spheroidals have more than 10 times as many "anomalous" Cepheids as to the globulars. We do not yet have complete data on the abundances of these two types of Cepheids in the halo, but when we do find out, this may help us find out from whence came the material in the halo. So stay tuned… .

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