

Northwest Skies

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

74 Years of Amateur Astronomy in the Pacific Northwest

January—February 2005

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The President's Message

by Bob Isaacs

Happy New Year and welcome to 2005. I can't believe that the first decade of the 21st century is already half over. I hope that all of you have had a wonderful holiday season and are ready for the upcoming year. I look forward to once again serving as your President. I would like to take this time to welcome our new Board members, John Petit, Ken Board and Nate Andrews. It is also with great sadness that I and the rest of the board must say goodbye to Dave Sherrod, our former Treasurer, who is resigning his position on the Board as of the new year. We will be announcing a replacement shortly.

Congratulations have to be given to our Astronomer of the Year recipients, Matt Flood and Joe Witherspoon, who share the honor for all of the hard work they did last year and to Sion Heaney for his phenomenal work on our website and newsletter.

As the new year begins,

the first order of business, as always, will be your membership renewal. As all of you know, The Tacoma Astronomical Society has one of the most active outreach and student programs on the west coast. As well as the standard operating costs associated with running an organization of this size. This is largely made possible by the support of our members. We can't do what we do without your help.

This year we have many opportunities to present ourselves to the public. As always, Joe Witherspoon has a full schedule of outreach events throughout the year. He can use all of the help he can get. He has done a fantastic job the last few years in giving a lasting impression of this club to the public. In August, we will once again have our Astro-Fair at Pierce Collage. This has been a growing event the last three years and we couldn't do it without a lot of dedication from our

members. In September, it will be time to "Do the Puyallup" once again as we run our traditional booth in the Hobby Hall. Keep an eye out for the sign up sheets.

The biggest opportunity we have this year will be the passage of Mars again from mid October through November. It should be just as impressive as it was two years ago.

Our Public Nights will, as always, be a chance for us to show our stuff at Pierce Collage. They are getting closer to the start of construction of their new science building and we are all looking forward to its completion.

Once again, this looks like another exciting year for Tacoma Astronomical Society and I hope that all of you will enjoy it as much as I.

Happy New Year and Clear Skies

Bob Isaacs

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. Personal advertising is accepted without charge from members in good standing.

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

editor@tas-online.org

In his first article of 2005, Bert Brown acknowledges the legacy of Albert Einstein's initial contributions to the field of physics made a century ago and greets the 'World Year of Physics'.

People to Contact

You can also contact us via email through our website at

www.tas-online.org

Our mailing address is:
**The Tacoma
 Astronomical Society
 PO BOX 8881**

President	Bob Isaacs	253.874.2432
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Secretary	Joan Koch	253.535.1252
Treasurer	Síon Heaney	253.460.0599
Newsletter Editor	Síon Heaney	253.460.0599
Program Director	Matt Flood	253.564.3302
Information Officer	Bill Briggs	360.893.1153
Historian	Matt Flood	253.564.3302

What's Up In Astronomy

by Bert Brown

Four years ago in 2001 the *What's Up In Astronomy* column had a series of four articles on Einstein's theories of relativity. *The Special Theory* had first appeared in 1905, when Einstein was a clerk in a Swiss patents office. He actually published five major papers that year, each of which profoundly affected much of physics in the 20th century. In recognition of the centennial of that amazing outpouring of knowledge, the International physics community has designated 2005 as the 'World Year of Physics'. In recognition of this, the U.S. House of Representatives, on July 7th 2004, passed a resolution supporting physics research and education; and a Senate committee passed a similar resolution on September 15th 2004.

Physics and astronomy are closely related subjects; indeed, astronomy might be called 'the physics of the universe'. So this report will briefly summarize some of Einstein's contributions to physics and astronomy from 1905 onwards. My main reference source here is the September 2004 issue of *Scientific American*.

The first two of the 1905 papers were about what we now call 'statistical mechanics', the study of the properties of large numbers of particles. The atomic theory was just getting started in those days and Einstein helped develop it. His first 1905 paper, *A New Determination of Molecular Dimensions*, was actually submitted as his Ph.D. thesis. He had almost

given up the idea of working for an advanced degree, calling the process a "comedy". In this paper he related the viscosity of a liquid to the size of dissolved sugar molecules. The second paper was titled *On the Motion of Small Particles Suspended in Liquids at Rest Required by the Molecular Kinetic Theory of Heat*. This was a theory of 'Brownian Motion', the jiggling of particles in a fluid caused by random collisions with fluid molecules.

The third paper was actually Einstein's favorite of the group and earned him the Nobel Prize in 1921. In it he presented his theory of the photoelectric effect; light striking certain metal surfaces causing the ejection of electrons and thus pro-

ducing a current. "Whether electrons are ejected at all depends not on the light intensity", he said, "but rather on the frequency of the light. If the frequency (or energy) of the light is too low, no electrons are emitted". This was a major contribution to the quantum theory of light, which had been first proposed by Max Planck; light 'particles', now called photons, have an energy given by $E = hf$, where f is the light frequency and h is a constant (Planck's constant). So all the uses of modern photocells are based on this theory.

Einstein's fourth paper in 1905 was *On the Electrodynamics of Moving Bodies* and was the beginning of his 'Special Theory of Relativity'. In it he states the concepts of space and time are not absolute, but depend on the motion of an observer, and the speed of light is a constant independent of the observer's motion. These were revolutionary proposals which were consistent with Maxwell's electromagnetic theory of the mid-19th century, but which conflicted with what people had previously believed; that light propagated through something called the 'ether', and would have a different speed depending

on an observer's motion.

In the fifth paper Einstein proposed the equivalence of matter and energy, and a couple of years later formulated the now famous equation $E = mc^2$, with c being the speed of light. Conversion of mass, m , to energy, E , is of course what drives the luminous output of the stars and also, unfortunately, nuclear bombs on Earth.

Einstein's next major contribution was probably his most important one; the 'General Theory of Relativity' which appeared in 1916 during the middle of World War I. Basically this is a new theory of gravity, in which he states that matter warps space and time, and the orbits of celestial objects are a result of their coasting through this warped space and time. Although recognized as a major piece of theory, experimental verifications were slow to come. One was the bending of starlight by the sun during a total solar eclipse in 1919. Another was the advance of the perihelion, a slight rotation of the axis of its elliptical orbit, of the planet Mercury. Nowadays there have been other experimental verifications. One such experimental proof is in

the use of GPS (Global Positioning Systems) which depend on accurate clocks orbiting in satellites. Both special and general relativity affect the rates of those clocks. Special relativity slows them down a little and general relativity causes them to speed up since they are in a weaker gravitational field. Another current proof is the gravitational 'lensing' of light by one star being behind another, an effect now widely observed in the heavens. Of course general relativity is currently a major factor for those studying the structure of the universe, its expansion rates, and the history and origin of the universe, etc.

So Albert Einstein was a major contributor to several fields of physics such as atomic theory, relativity and quantum theory being the most important. In later years he questioned the 'standard' interpretations of quantum theory and tried unsuccessfully to link the gravitational, electromagnetic, and nuclear theories. To this day scientists are still working on that unification. But it is appropriate that we celebrate that famous year of 1905 in 2005.

Happy New Year!

Membership Dues for 2005

Membership subscriptions for 2005 are now due. Please mail your membership renewal to **The Tacoma Astronomical Society, PO BOX 8881, Tacoma, WA 98418**, or bring your check along to the next General Meeting.

Membership dues were raised two months ago to address rising expenditures such as insurance and membership costs. The new annual fees are:

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

As explained at the November General Meeting the raising of Membership fees was a regrettable but no less necessary for maintaining operating costs. This is the first rise of fees since 1987.

Thank you.



Snacks for the General Meeting

The following good people have volunteered to bring cookies or other snacks to our upcoming general meetings:

January

Tami and Sion
Heaney

February

TBD

Thank you for making our meetings more enjoyable.



Reflective Optics for Astronomical Telescopes

By Jarvis Krumbein

Among the most popular and wide spread telescope types are the Schmidt and Maksutov Cassegrains (SCT & MCT). Manufactured mainly by Celestron and Meade, these telescopes offer the performance of a large long focus Newtonian (f10) in a very compact package. A typical 8" f10 Newtonian would have a tube about 7 feet long while the equivalent SCT tube is about 16 inches long. Both the Schmidt and Maksutov types use a spherical primary mirror.

A spherical mirror, especially of a short focal length (f2 or f3), while easy to make and test, has lots of spherical aberration. Spherical aberration means that the light coming into the telescope from a star does not come to a sharp focus. The light near the edge of the mirror focuses closer to the mirror while the

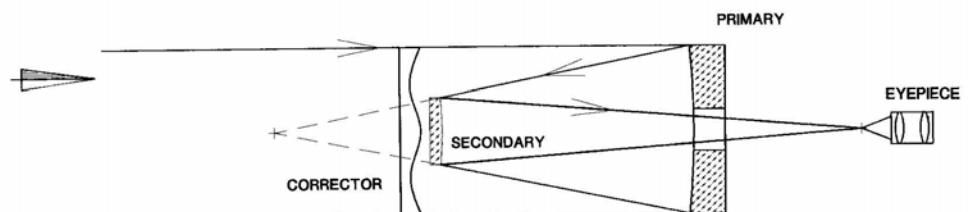
light near the center focuses farther away. A parabolic mirror of the same focal length would focus all the light from the mirror to the same distance but would be very difficult to make and test.

A corrector lens is placed in the light path before the primary mirror to eliminate the spherical aberration of the primary. This lens can be either a thin lens with a complex surface (Schmidt) or a thick deep meniscus lens (Maksutov). Whichever type is used has little or no power (it neither magnifies nor reduces the image) but does have negative spherical aberration to just eliminate that of the primary mirror.

The secondary mirror for both the Schmidt and Maksutov is spherical as was the Dall-

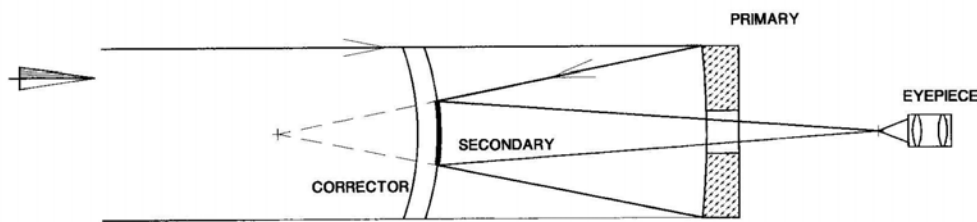
Kirkham secondary discussed in the previous article. A separate mirror is used for the Schmidt while the Maksutov has a large spot on the back of the corrector aluminized which acts as the secondary. Performance of both types is comparable to the DK. The Questar Maksutov telescope is a special case and has better performance than either of the normal SCT and MCT types because the primary mirror is aspherical, being figured to reduce coma. The Maksutov Cassegrain is usually not found in sizes over 7" due to the cost of the thick corrector lens which must be made of high quality optical glass. Again, Questar is the exception manufacturing up to a 12" Maksutov Cassegrain. The Schmidt corrector is relatively thin and can be made using glass of the same quality as ordinary eyeglasses

SCHMIDT CASSEGRAIN



PRIMARY AND SECONDARY ARE SPHERICAL SURFACES
CORRECTOR HAS A HIGH ORDER ASPHERIC CURVE

MAKSUTOV CASSEGRAIN



and can be much less expensive. As a result, 16" SCTs are fairly common and larger sizes are available.

When used for photography, a focal reducing lens is often employed. This is placed near the focal plane and has several functions. First it reduces the focal length and increases the speed of the system to an f6.3 equivalent, and then secondly it flattens the focal plane.

The method used to focus these telescopes is also different in that the eyepiece remains fixed in place and the primary mirror is moved toward or away from the corrector and secondary mirror. Small changes in position of the primary mirror result in large changes in focus so that the telescope can be focused much closer than the normal Newtonian or Cassegrain and be used for terrestrial viewing such as bird watching.

Because very small shifts in the mirror position can change the focus, a lock is often employed to fix the mirror in place when the scope is used for photography.

Most of these telescopes use a fork type mount which can be used as either an Alt-Azimuth or Equatorial type. Drive motors are contained in the base of the mount and computer control is commonly available which allows the observer to easily find objects to view. The drive motors and computers also make tracking for photography

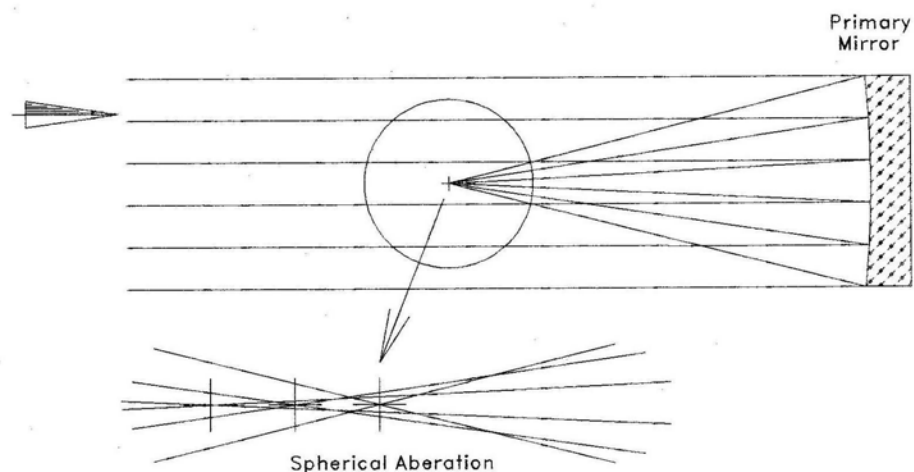
relatively easy.

As with the more conventional Cassegrain types, very careful baffling is required to keep stray light out of the field of view at the focal plane.

This and the two previous articles cover the vast majority of reflector type telescopes used by astronomers, amateur and professional. The next article will look at some of the more unusual telescopes that are made by amateur telescope makers.

In his continuing series on the structure and design of various optical systems for astronomical telescopes Jarvis Krumbein details the variations on the Cassegrain optical configuration.

In this article Jarvis focuses upon the design and specifications of the Schmidt and Maksutov Catadioptric Cassegrain telescopes



January Schedule of Events

- January 4th:**
 General Meeting at UPS, Thompson Hall, Room 130. Presentation will be given by Nate Andrews.
 7:30 PM.
- January 8th:**
 Public Night at Pierce College, Sunrise Building. Program will be 'Fun with your new scope'.
 7:30PM
- January 18th:**
 Trustees Meeting. Síon Heaney's home; 8218 North 9th Street., Tacoma, 98406
 7:30PM
- January 22nd:**
 Student Meeting. Room 203 Cascade Building, Pierce College.
 7:00PM
- January 22nd:**
 Public Night at Pierce College, Sunrise Building. Program will be 'Saturn and Cassini Mission'.
 7:30PM



The Tacoma Astronomical Society 2005 Officers. Left to Right; Joan Koch (Secretary), Síon Heaney (Treasurer), Bill Briggs (Vice President) and Bob Isaacs (President)

January 2005

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3 ☾	4 7:30PM General Meeting	5	6	7	8 7:30PM Public Night
9	10 ●	11	12	13	14	15
16	17 ☽	18 7:30PM Trustees Meeting	19	20	21	22 7:30PM Public Night
23	24	25 ○	26	27	28 7:00 PM Student Meeting	29
30	31					

The 2004 TAS Christmas Party

The TAS Christmas Party was held at the Fife City Bar and Grill. We had a good turn out from both long standing members, such as Al and Vee George, Leo Romo and George Hiles, as well as newer members. Many student members were also present for the celebrations. In addition to an excellent meal enjoyed by all there were many prizes, gifts and awards

were presented.

The student members hosted Astro-Jeopardy with the participation of the audience resulting in many prizes for all.

Individual contributions to TAS over the past year were recognizing by the presentation of the Astronomer of the Year Award was shared by Joe Witherspoon for his

by Sion Heaney

work with Outreach and Matt Flood for his presidency. Dan Gifford received the Student Astronomer of the Year award. Sion Heaney received the President's Award.

The new TAS Board Officers for 2005 were voted in, with Bill Briggs voted to Vice-President in absentia, and are shown on the opposite page.

February Schedule of Events

- **February 1st:** General Meeting at UPS, Thompson Hall, Room 130. Presentation to be determined. 7:30 PM.
- **February 5th:** Public Night at Pierce College, Sunrise Building. Program will be 'Extra Solar Planets'. 7:30PM
- **February 15th:** Trustees Meeting. Sion Heaney's home; 8218 North 9th Street., Tacoma, 98406 7:30PM
- **February 19th:** Public Night at Pierce College, Sunrise Building. Program will be 'Remote Control Telescope'. 7:30PM
- **February 25th:** Student Meeting. Room 203 Cascade Building, Pierce College. 7:00PM

February 2005

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1 7:30PM General Meeting	2 ☾	3	4	5 7:30PM Public Night
6	7	8 ●	9	10	11	12
13	14	15 7:30PM Trustees Meeting	16 ☽	17	18	19 7:30PM Public Night
20	21	22	23	24 ○	25 7:00 PM Student Meeting	26
27	28					

Northwest Skies



First Class

If undelivered, please return to

Tacoma Astronomical Society
c/o The Newsletter Editor
8218 North 9th Street
Tacoma, WA 98406

Phone: 253-460-0599
Email: editor@tas-online.org

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

The Year Ahead

I've got a good feeling about 2005. I believe we are going to see some positive turning points for the Tacoma Astronomical Society as the efforts and energy put into the transition from PGO to Pierce College begin to pay dividends. TAS has continued to expand it's activities beyond just supporting the general membership. We have more interest than ever in our Outreach program. This affords our society a lot of public interest and recognition in our efforts to bring Astronomy to schools, libraries and other community groups.

Our partnership with Pierce College continues to grow and strengthen as we are seeing more and more Pierce College students at our Public Nights. We look excitedly forward to the construction of the planetarium in the Science Building and

We have seen a lot of attrition from the general membership since the closure of the Pettinger-Guiley Observatory but we are focused to bring back old members and attract new members in an effort to raise membership numbers higher.

By Sion Heaney

Our Public Night programs are more diversified, informative and entertaining than ever. Our network of expertise and support for newcomers is growing stronger. Our efforts and work towards improving the infrastructure and services offered by the Society continues to move forward.

We have goals and a mission for 2005. If one could summarize those goals succinctly then 'No Astronomer Left Behind' would be an appropriate catchphrase. We trust that TAS is everything you hope for in 2005.