

2019 Stellafane Convention

The 83rd Convention of Amateur Telescope Makers on Breezy Hill in Springfield, Vermont

43° 16' 41" North Latitude, 72° 31' 10" West Longitude

Thursday, August 1 – Sunday, August 4, 2019

"For it is true that astronomy, from a popular standpoint, is handicapped by the inability of the average workman to own an expensive astronomical telescope. It is also true that if an amateur starts out to build a telescope just for fun, he will find before his labors are over that he has become seriously interested in the wonderful mechanism of our universe.

And finally there is understandably the stimulus of being able to unlock the mysteries of the heavens by a tool fashioned by one's own hand."

—Russell W. Porter, Founder of Stellafane, March, 1923

SOME STELLAFANE HISTORY



In 1920, when a decent astronomical telescope was far beyond the average worker's means, Russell W. Porter offered to help some Springfield machine tool factory workers to build their own. Together, they ground, polished, and figured mirrors, completed their telescopes, and began using them, soon becoming thoroughly captivated by amateur astronomy. By 1923 they had formed a club, the Springfield Telescope Makers, and had built Stellafane (originally "Stellar Fane"), our now legendary Clubhouse. By 1925 their activities had drawn the attention of magazine editors including Web Waldron at *Collier's* and Albert Ingalls at *Scientific American*. They visited the club, and soon published articles about telescope making.

This generated interest across the country, and the club decided to invite other amateurs to visit. On July 3, 1926, 29 people came to Breezy Hill, and The Stellafane Convention was established. It's been held every year since, except during World War II. The Convention grew rapidly, and today nearly a thousand enthusiastic amateurs make the pilgrimage to Springfield.

STELLAFANE EAST

In 1986, faced with the loss of access to a neighboring field that had been the Convention's camping area, the STM, with the support of members who mortgaged their homes, purchased a 40-acre farm across the road from the original Stellafane site. This became known as Stellafane East. In 1998, STM member Harty Beardsley donated another adjacent 45 acres, ensuring that the Convention has room for growth.

THE MCGREGOR OBSERVATORY

The McGregor Observatory at Stellafane East was constructed by the club between 1989 and 1995. It houses a unique instrument—a 13" f/10 Schupmann telescope on a massive computer controlled alt-az mount. For a time it was the largest operating Schupmann in the world. This design, which combines reflective and refractive elements, yields a coma-free and essentially apochromatic image, and is ideal for planetary observation. The Schupmann is operated during Convention. Photo by Dennis di Cicco.



BE SURE TO VISIT THE ORIGINAL STELLAFANE SITE

Since so much of the Convention takes place at Stellafane East, it's all too easy to miss the fun of seeing the original Stellafane Clubhouse and the Porter Turret Telescope on Breezy Hill. Catch the shuttlebus near the Food Tent or the main camping area, or just take the short walk down the road opposite the entry "fruit stand" where you checked in. The original site, including the Clubhouse and the Porter Turret Telescope, was designated a National Historic Landmark in 1989. It remains the location for the Stellafane Convention's optical and mechanical competitions for amateur-built telescopes.

THE STELLAFANE CLUBHOUSE



The Clubhouse was designed by Russell Porter and constructed by the members. The pink color may simply have been that of donated paint, but it has been hallowed by long tradition. Many fascinating memorabilia of the club's earlier days can be seen here. Although it's now a tight fit with today's larger membership roster, the Springfield Telescope Makers still hold some meetings at the Stellafane Clubhouse. Photo is from the 1930s.

THE PORTER TURRET TELESCOPE

The Porter Turret Telescope was constructed in 1930 by the club. Porter had endured more than his share of winter cold on polar expeditions early in his career. Following Hartness's turret refractor design, he devised a way to build a reflecting telescope that also allowed the observer to remain indoors on the coldest winter nights.



Extensively renovated in the 1970s and fitted with new optics, the Porter Turret remains an excellent instrument. Photo is from the 1930s.

THE ANDREW SIMONI OBSERVATORY

Now completed on Breezy Hill, this new building houses a restored 1930s spectrohelioscope, donated and restored by STM members. An invention of George Ellery Hale, the spectrohelioscope produces an image of the sun in any desired visual wavelength. The spectrohelioscope will operate as weather permits during Convention.

Schedule of Events and Presentations

KIDS=ACTIVITY FOR CHILDREN **TEENS**=ACTIVITY FOR TEENS **NTA**=FOR THOSE NEW TO ASTRONOMY **INT**=INTERMEDIATE **ADV**=ADVANCED
ATM=AMATEUR TELESCOPE MAKING **COMP**=TELESCOPE COMPETITION **ALL**=SUITABLE FOR EVERYONE **MCE**=MAJOR CONVENTION EVENT **OBS**=OBSERVING

PLEASE SEE DESCRIPTIONS ON FOLLOWING PAGES FOR MORE INFORMATION

THURSDAY, AUGUST 1, 2019

8:30am - 5pm	Hartness House Workshop: Advanced Telescope Making	Hartness House	Hosted by Tom Spirock (Separate registration and fee for this workshop)
noon - 4pm	Large RV Permit Holders MUST arrive	Entry Gate	PLEASE DON'T ARRIVE BEFORE NOON!
3pm - 10pm	Early Entry Permit Holders CAN arrive	Entry Gate	PLEASE DON'T ARRIVE BEFORE 3PM!
6pm - 9pm	Hartness House Workshop: Advanced Telescope Making	Hartness House	Dinner & Keynote Hosted by Tom Spirock (Separate registration & fee)
8:30pm - midnight	Observing Olympics <i>Observing Fields</i>	Coordinated by Eileen Myers	Telescopes & Binoculars OBS
9pm	Observing with the Hartness Turret Telescope	Hartness House	Weather Permitting OBS
9pm - midnight	Observing at the Porter Turret Telescope and the McGregor Observatory		OBS

FRIDAY, AUGUST 2, 2019

9am	Registration Gate Opens		
9am - noon	Mirror Coatings <i>West of Clubhouse</i>	Presented by Alan Ward	ATM
9am - 6pm	Cook Spectrohelioscope open for Solar Observing	<i>Simoni Observatory</i>	Weather Permitting OBS
9am - 6pm	Porter Turret Telescope open for Solar Observing	Weather Permitting	OBS
10am - 6pm	Shuttle Bus Operates	Bus Stops: Pine Island, Food Tent, Pink Clubhouse	
10am - 6pm	McGregor Observatory open		OBS
10am - 4pm	TELESCOPE MAKING DEMO	Tent North of T-Shirt Sales	Organized by Read Predmore ATM
10am - 10:30am	Intro & Rough Grinding	Presented by Glenn Jackson	ATM
10:30am - 11am	Fine Grinding	Presented by Rick Hunter	ATM
11am - 11:30am	Making Dental Stone Tools	Presented by Junie Esslinger	ATM
11:30am - noon	Making Pitch Laps	Presented by Phil Rounseville	ATM
1pm - 1:45pm	Polishing & Figuring	Presented by Dick Parker	ATM
2pm - 4pm	Testing (Bring your own mirror)	Presented by Dave Kelly (Bring your own mirror)	ATM
11am - noon	Astronomy Activities for Children: Our Star the Sun	<i>McGregor Library</i>	Presented by Kris Larsen Ages 5-12; Limited to first 25 KIDS
11am - noon	Using New Hardware & Software to Increase Telescope Accuracy	<i>Flanders Pavilion</i>	Presented by Dan Gray ADV ATM
noon - 1pm	Free Time <i>Relax or Enjoy Lunch</i>	No on-site talks or demos scheduled	ALL
1pm - 2pm	Checking Out Einstein	<i>Flanders Pavilion</i>	Presented by Richard Berry INT
1pm - 2pm	Introduction to 3D Printing for Amateur Astronomers	<i>McGregor Observatory Library</i>	Presented by Corey Mooney INT ATM
1pm - 5pm	Stellafane Teen Robotic Project (Requires Advance Signup)	<i>Bunkhouse</i>	Presented by Paul Fucile Teens 12-17 TEENS
1:30pm - 5:30pm	Mirror Coatings <i>West of Clubhouse</i>	Presented by Alan Ward	ATM
2pm - 3pm	Solar Observing Hour <i>Observing Fields</i>	Please set up your Solar Scope and Share	OBS
2pm - 3pm	Introduction to Stellafane	<i>McGregor Observatory Library</i>	Presented by Kim & Dennis Cassia ALL
2pm - 3pm	Talk: Imaging Satellite Galaxies of the Milky Way	<i>Flanders Pavilion</i>	Presented by Al Takeda INT
2pm - 6pm	Breuning Observatory (Domed Observatory) open		OBS
3pm - 4pm	The Gregorian: An Alternative for the Planetary and Lunar Observer	<i>McGregor Observatory Library</i>	Presented by Phil Rounseville ATM
3pm - 4pm	A Dipper Full of Stars	<i>Flanders Pavilion</i>	Presented by Richard Sanderson NTA
3:30pm - 4:30pm	Demo: Imaging Satellite Galaxies of the Milky Way	<i>By the Breuning Domed Observatory</i>	Presented by Al Takeda INT
4pm - 5pm	Binoculars	<i>Flanders Pavilion</i>	Presented by Phil Harrington NTA
4pm - 5pm	Astronomy Activities for Children: Star Friends	<i>McGregor Observatory Library</i>	Presented by Kris Larsen Ages 5-12; Ltd. to first 25 KIDS
5pm - 8pm	Hartness-Porter ATM Museum Open	<i>Hartness House</i>	Hosted by Bert Willard, Curator ALL

5pm – 7pm	Free Time	<i>Relax or Enjoy Dinner</i>	No on-site talks or demos scheduled	ALL	
5pm – 8pm	Telescope Competition Registration	<i>Clubhouse</i>	Optical and Mechanical Registration	COMP	
6:30pm – 7:30pm	Friday Evening Videos	<i>Flanders Pavilion</i>	Astronomy documentaries for the whole family	ALL	
7:30pm	Friday Evening Informal Talks	<i>Flanders Pavilion</i>	Brad Vietje, MC	Short presentations by Convention Attendees	MCE
8:30pm – midnight	Observing Olympics	<i>Observing Fields</i>	Coordinated by Eileen Myers	Telescopes & Binoculars	OBS
9pm – midnight	Observing at the Porter Turret Telescope, McGregor Observatory, and Bruening Observatory		<i>Weather Permitting</i>		OBS
10pm	Telescope Optical Competition Begins	<i>Fields around Clubhouse</i>			COMP
10pm–	Registration Gate Closes				

SATURDAY, AUGUST 3, 2019

7am –	Registration Gate Opens				
7am – noon	Swap Tables	<i>Swap Table Area – North of Main Camping Area</i>		MCE	
8am – 6pm	Porter Turret Telescope open for Solar Observing		<i>Weather Permitting</i>	OBS	
8am – 6pm	McGregor Observatory open			OBS	
8am – 9:30am	Telescope Competition Registration	<i>Clubhouse</i>	Mechanical (and Optical if needed) Registration	COMP	
9am – noon	Mirror Coatings	<i>West of Clubhouse</i>	Presented by Alan Ward	ATM	
9am – 5pm	Shuttle Bus Operates	<i>Bus Stops: Pine Island, Food Tent, Pink Clubhouse</i>		ALL	
9am – 6pm	Cook Spectrohelioscope Observing	<i>Simoni Observatory</i>	Solar Observing	<i>Weather Permitting</i>	OBS
10am – 5pm	TELESCOPE MAKING DEMO	<i>Tent North of T-Shirt Sales</i>	Organized by Read Predmore	ATM	
10am – 10:30am	Intro & Rough Grinding		Presented by Read Predmore	ATM	
10:30am – 11am	Fine Grinding		Presented by Read Predmore	ATM	
11am – 11:30am	Making Dental Stone Tools		Presented by Junie Esslinger	ATM	
11:30am – noon	Making Pitch Laps		Presented by Phil Rounseville	ATM	
1pm – 1:45pm	Polishing & Figuring		Presented by Dick Parker	ATM	
2pm – 3pm	Dobsonian Basics	<i>Tent north of T-Shirt Sales</i>	Presented by Ken Slater	ATM	
3pm – 5pm	Mirror Silvering Demo	<i>Tent north of T-Shirt Sales</i>	Presented by Peter Pekurar	ATM	
10am – 11am	Total Solar Eclipse Seen From Chile July 2, 2019	<i>Flanders Pavillion</i>	Presented by Alan Sliski	INT	
10am – 11am	Introduction to Stellafane	<i>McGregor Observatory Library</i>	Presented by Kim & Dennis Cassia	ALL	
10am – 11:30am	Telescope Field Walk	<i>Meet at Front of Clubhouse</i>	Led by David McGaw	NTA	
10am – 1pm	Telescope Mechanical Competition	<i>Fields around Clubhouse</i>		COMP	
11am – noon	Bath Interferometer – Figure a "Perfect" Mirror	<i>Flanders Pavilion</i>	Presented by George Roberts	ADV ATM	
11am – noon	Astronomy Activities for Children: Ultimate Guide to Ultima Thule	<i>McGregor Library</i>	Presented by Kris Larsen	Ages 5-12; Ltd. to first 25	KIDS
noon – 1pm	Free Time	<i>Relax or Enjoy Lunch</i>	No on-site talks or demos scheduled		ALL
1pm – 2pm	Backyard Astronomical Spectroscopy with a Small Telescope	<i>Flanders Pavilion</i>	Presented by Stephanie & Paul Schuler		ADV
1pm – 2pm	From Greenwich to the Galaxies: A Century of Margaret Burbidge	<i>McGregor Observatory Library</i>	Presented by Kris Larsen		ALL
1:30pm – 5:30pm	Mirror Coatings	<i>West of Clubhouse</i>	Presented by Alan Ward		ATM
2pm – 3pm	Solar Observing Hour	<i>Observing Fields</i>	Please set up your Solar Scope and Share		OBS
2pm – 3pm	Astronomy Activities for Children: Pluto & Pals – Dwarf Planets	<i>McGregor Library</i>	Presented by Kris Larsen	Ages 5-12; Ltd. to first 25	KIDS
2pm – 3pm	Is sCMOS the Next Imaging Revolution?	<i>Flanders Pavilion</i>	Presented by Gary Walker		ADV
2pm – 6pm	Breuning Observatory (Domed Observatory) open				OBS
3pm – 4pm	Latest Lucky Imaging Results Using the Stellafane Schupmann	<i>McGregor Observatory Library</i>	Presented by Tom Spirock		INT
3pm – 4pm	Getting Started in Amateur and Pro/Am Astronomical Research	<i>Flanders Pavilion</i>	Presented by Brad Vietje & Mario Motta		ADV
4pm – 5pm	Introduction to Telescopes	<i>McGregor Observatory Library</i>	Presented by Alan French		NTA
4pm – 5:30pm	Advanced Observing	<i>Flanders Pavilion</i>	Presented by Larry Mitchell		ADV
6pm – 7pm	Free Time	<i>Relax or Enjoy Dinner</i>	No on-site talks or demos scheduled		ALL

continued...

7pm	Saturday Evening Program & Keynote Talk	<i>Amphitheater (Flanders Pavilion if rain)</i>	Includes Keynote, Shadowgram, Raffle & Awards	MCE
8:30pm - midnight	Observing Olympics	<i>Observing Fields</i>	Coordinated by Eileen Myers Telescopes & Binoculars	OBS
9pm - midnight	Observing at the Porter Turret Telescope, McGregor Observatory, and Bruening Observatory		<i>Weather Permitting</i>	OBS
10pm	Discover and Enjoy the Night Sky	<i>(Held regardless of weather)</i>	McGregor Observatory Library Presented by Steve Dodson	NTA
10pm	Telescope Optical Competition	<i>Fields around Clubhouse</i>	(only if not held Friday)	COMP

SUNDAY, AUGUST 4, 2019					
8am - noon	Convention Cleanup	<i>Please clean up around your campsite</i>	Please put trash in the dumpsters	ALL	
9am - noon	Hartness-Porter ATM Museum Open	<i>Hartness House</i>	Hosted by Bert Willard, Curator	ALL	
10:30am - 11:30am	Observing Olympics	<i>last awarding of pins</i>	<i>Hillside below McGregor Observatory</i>	Coordinated by Eileen Myers	OBS

Event and Presentation Details

FOR CHILDREN

There will be four 1-hour astronomy workshops for children; each session has a different activity. These astronomy workshops have been held at the Stellafane Convention since 1995. Led by Dr. Kristine Larsen, Professor of Astronomy at Central Connecticut State University and a member of the Springfield Telescope Makers, each of the four 1-hour workshops includes several activities geared for children ages 5 – 12. Younger children are welcome but will need help from a parent. **Due to space limitations, each workshop is limited to 25 children on a first-come basis. Late-comers may be turned away.** Each workshop has a different astronomical activity as listed below

Our Star the Sun

Friday 11am – noon; McGregor Library. Ages 5-12, Limited to first 25. Learn about our special star and make a 3-d model to take home.

Star Friends

Friday 4pm – 5pm; McGregor Library. Ages 5-12, Limited to first 25. Learn about some of the bright stars and constellations. Make a starfinder to bring home and leave with a special invitation to observe one very lucky star.

Ultimate Guide to Ultima Thule

Saturday 11am – noon; McGregor Library. Ages 5-12, Limited to first 25. Learn about the cosmic "Flat snowman" Ultima Thule and make a model to take home.

Pluto & Pals – Dwarf Planets

Saturday 2 pm – 3 pm; McGregor Library. Ages 5-12, Limited to first 25. Learn about what makes Pluto special and make a model of the Pluto-Charon system to take home.

FOR TEENS

Stellafane Teen Robotic Project

Friday 1 pm – 5 pm; Bunkhouse. Presented by Paul Fucile (Teens 12-17)

This Year's Teen Program participants will learn about the science and technology behind NASA's New Horizons mission, and specifically for this year the flyby of Ultima Thule on New Years Day 2019. This will be a hands-on class working in teams to construct New Horizons inspired technology that will be demonstrated at the Convention. Attendance will be first-come first-served. If you are 100% sure your Teen will attend the Convention and will want to attend this event, then you'll need to get them on the list. Please email us directly at robots@stellafane.org. You will receive a manual reply to let you know your status. When space is filled, we will add the next two names to a waiting list. If space is not filled through preregistration we will accept others on a first-come first served basis at the event, until the class is full. **Note: There will be a lot of specialized instruction so you will need to be on time! Since we will be working with tools and other mechanisms, only closed toe shoes will be allowed.**

AMATEUR TELESCOPE MAKING

Mirror Making Demo: Grinding Tools, Rough Grinding, Fine Grinding, Pitch Laps, Polishing, & Figuring

Friday 10am– 4pm and Saturday 10am – 5pm (see specific times & topics in schedule on previous pages); Tent north of the T-shirt sales area, organized by Read Predmore. This is a HANDS-ON mirror making demonstration. Gain first-hand experience working on mirrors at every stage of grinding, polishing and testing. Experienced ATMs will help explain each step of the

process and answer any questions you may have. The 24" mirror we have been working on for several years will be available for grinding- please sign the log book when you work on it.

Mirror Testing by Autocollimation

Friday 2 pm – 4 pm; tent north of the T-shirt sales area. Bring your mirror for testing by Dave Kelley.

Mirror Silvering Demo

Saturday 3pm – 5pm; tent north of the T-shirt sales area. Peter Pekurak will demonstrate a new spray silvering process which includes the application of a nano protective over coating to help preserve reflectivity. This demo will show how amateurs can coat mirrors at home using readily available and cost effective materials.

Dobsonian Basics

Saturday 2 pm – 3 pm; tent north of the T-shirt sales area. Ken Slater, creator of the Stellafane Dobsonian described on the STM website, takes you through the basics of constructing a simple and inexpensive astronomical telescope that performs well and can be made with common hand tools.

Free Mirror Aluminizing

Friday 9:00 am – noon and 1:30 pm – 5:30 pm; Saturday 9am – noon and 1:30pm – 5:30pm; west of the Stellafane Clubhouse, presented by Alan Ward. Alan's portable coating machine will be coating attendees' mirrors on a first-come, first-served basis. Please sign up for a coating time-slot at the machine. Bring a stripped mirror, maximum diameter of 10-inch, and two bags of ice to keep the machine cool. Mirrors having existing coatings need to be stripped by Alan Ward ahead of time. No other charge for coating.

FOR THOSE NEW TO ASTRONOMY

Introduction to Stellafane

Friday 2pm – 3pm; McGregor Observatory Library.

Saturday 10am – 11am; McGregor Observatory Library

Presented by Kim & Dennis Cassia. Are you familiar with these terms: "The Pink", "Tent Talks" or "The Turret"? If not, if this is your first time attending the Stellafane Convention, or if you are returning and want to learn more about who the Springfield Telescope Makers are, as well as what is going on during the Convention, then this presentation is for you. Topics include, but are not limited to: A short history of Stellafane, a description of our site, including the buildings and landmarks, descriptions of the scheduled talks and activities, services available at Stellafane, local services off site, etc., in addition to answering any questions you may have about the Convention.

A Dipper Full of Stars

Friday 3pm – 4pm; Flanders Pavilion. Presented by Richard Sanderson. Using images of constellations, planets and celestial objects, Richard will treat you to a tour of the summer nighttime sky, showing you many of the prominent summer constellations. You will also learn how and why the sky appears to move throughout the night, and from season to season, and understand the significance of the North Star.

Binoculars

Friday 4pm – 5pm; Flanders Pavilion. Presented by Phil Harrington. Binoculars are NOT just for beginners, as this talk will stress. After various binocular-related terms are defined, Phil will offer consumer tips to help the audience weed out astronomically worthy binoculars from a vast ocean of models currently available.

Telescope Field Walk

Saturday 10am – 11:30am; Meet at Front of Clubhouse. Led by David McGaw. During the Telescope Field Walk an experienced Amateur Telescope Maker will guide small groups through the fields around the Pink Clubhouse, where the telescopes that will be participating in the mechanical competition will be set up. They will describe the various types of optical designs and mounting configurations that will be on display, point out the subtle details that go into award winning telescopes and be available to answer your questions.

From Greenwich to the Galaxies: A Century of Margaret Burbidge

Saturday 1pm – 2pm; McGregor Observatory Library. Presented by Kris Larsen. From being the first female Director of the Royal Greenwich Observatory to the first female president of the American Astronomical Society, the career of Eleanor Margaret Peachey Burbidge has been a constellation of first magnitude accomplishments. As she approaches her 100th birthday, we celebrate this remarkable woman's scientific accomplishments and social struggles, a veritable who's who of 20th century astronomy.

Introduction to Telescopes

Saturday 4pm – 5pm; McGregor Observatory Library. Presented by Alan French. Adults and youngsters often become interested in astronomy and acquiring a telescope for exploring the heavens. With the confusing array of telescopes on the market, buying your first telescope or a telescope for a child can be intimidating. In this program Alan French will cover telescope basics (types, mounts, and eyepieces), telescopes suitable for children, and introduce you to observing and finding sights in the night sky with small backyard telescopes.

Discover and Enjoy the Night Sky (Held regardless of weather)

Saturday 10pm; McGregor Observatory Library. Presented by Steve Dodson. Using free Stellarium software, Steve will introduce beginners to observing the sky, including identifying the constellations, the Milky Way, and planets. Weather permitting we shall work outdoors after a brief, fun introduction in the Library.

INTERMEDIATE LEVEL TALKS

Checking Out Einstein

Friday 1pm – 2pm; Flanders Pavilion. Presented by Richard Berry. Richard will describe the preparation, observation, and data reduction for the Einstein-Eddington Gravitational Deflection Experiment conducted at the Alpaca Meadows Observatory during the August 2017 solar eclipse. Although it was a difficult experiment to perform, the results suggest that Einstein was right. Richard recommends that anyone who would like to try this experiment prepare well in advance, and set up and practice their data reduction procedures before the eclipse.

Introduction to 3D Printing for Amateur Astronomer

Friday 1pm – 2pm; McGregor Observatory Library. Presented by Corey Mooney. Corey will explain when and how to use 3D printing for ATM projects. He will give advice on how to design parts for 3D printing using CAD, where to find existing 3D printable designs online, and how to order a 3D printed part online. Corey will give tips on buying and using your own 3D printer and where to find additional learning resources.

Imaging Satellite Galaxies of the Milky Way

Talk Friday 2pm – 3pm; Flanders Pavilion, Demonstration **Friday 3:30 pm – 4:30 pm** by the Breuning Domed Observatory. Presented by Al Takeda. Surrounding our Milky Way galaxy are faint satellite galaxies that are gravitationally bound to us. While they are dim they can be photographed with standard daylight cameras and moderately sized telescopes. Al will discuss how to image those optically dim galaxies. Topics will include the type of cameras and optics to use and helpful filters. He will briefly talk about how to post-process those captured images. Al will demonstrate some of these techniques after his talk next to the Breuning Observatory (Domed Observatory).

Total Solar Eclipse Seen From Chile July 2, 2019

Saturday 10am – 11am, Flanders Pavilion. Presented by Alan Siski. Alan will describe his visit to the Cerro Tololo Inter-American Observatory and what it was like to see the July 2nd Total Solar eclipse in Chile.

Latest Lucky Imaging Results Using the Stellafane Schupmann

Saturday 3pm – 4pm; McGregor Observatory Library. Presented by Tom Spirock. With the goal of maximizing image quality, over the past few years the Springfield Telescope Makers have been making incremental improvements to the 13-inch Schupmann Medial Telescope, initially installed in the McGregor Observatory in 1995. Thomas Spirock will present a description of the unique characteristics of the Schupmann type telescope, focusing on why it is an ideal instrument for planetary imaging, a status report on the recent improvements, and the most up-to-date results of the application of the "lucky-imaging" technique.

ADVANCED LEVEL TALKS

Using New Hardware & Software to Increase Telescope Accuracy

Friday 11am – noon, Flanders Pavilion. Presented by Dan Gray. Dan's talk will include: Primer on control of servo motors for telescopes; Examples of converting amateur mounts; Discussion of the "Cascade" mode, closing the loop between servo motors and telescope axis using high resolution encoders; Live demonstration of software (in the daytime with a simulated camera) including making a mount model (using Platesolve 3) all sky plate solving; Running automatic mount model scripting; Changing terms in PointXP for best results; Using Skyview; Satellite Tracking.

The Gregorian: An Alternative for the Planetary and Lunar Observer

Friday 3pm – 4pm; McGregor Observatory Library. Presented by Phil Rounseville. First conceived by James Gregory of Scotland (1638-1675) and first built in 1673 by Robert Hooke, the Gregorian offers a very interesting alternative to the Cassegrain family of telescopes for observers who want a very long effective focal length with relative ease of fabrication and a very high quality linear field of view. Fabrication and system characteristics will be discussed along with system advantages and pitfalls to avoid.

Bath Interferometer – Figure a "Perfect" Mirror

Saturday 11am – noon, Flanders Pavilion. Presented by George Roberts. "Foucault and Ronchi testing are dead! Long live the Bath!" George is somewhat joking—Foucault and Ronchi still have their uses, but a Bath is very cheap to make, easy to use, and tests your mirror to a higher accuracy. George will talk about the accuracy of a Bath (hint: it agrees with Zygo within 1/100 wave), how to make one, how to use one, and will demonstrate one live. Learn about this new technology to help you figure a "perfect" mirror.

Backyard Astronomical Spectroscopy with a Small Telescope

Saturday 1pm – 2pm; Flanders Pavilion. Presented by Stephania & Paul Schuler. Paul will present the basics of fiber optic fed spectroscopy and instrumentation, including using a six-inch telescope to take spectra of the Sun and emission nebulae. Stephania and Paul will present recent spectra and discuss what was observed. Lastly, Paul will present some pointers to get started in the field of Astronomical Spectroscopy.

Is sCMOS the Next Imaging Revolution?

Saturday 2pm – 3pm; Flanders Pavilion. Presented by Gary Walker. CMOS chips offer small pixels, high speed, low noise, high dynamic range and most important, lower cost. While this works well for DSLR's, cell phone cameras, security cameras, and machine vision applications, how does this affect Astro Imaging? At the 2016 Northeast Astro-Imaging Conference (NEAIC), the word from vendors was that for the point and stare application of long exposures common to Astronomy, the CCD was still the detector of choice. However, the latest evolution of CMOS technology may now have closed the technology gap with CCD. Gary Walker will talk about how sCMOS (Scientific CMOS) can best be used for the point and stare applications that Astro Imagers need.

Getting Started in Amateur and Pro/Am Astronomical Research

Saturday 3pm – 4pm; Flanders Pavilion. Presented by Brad Vietje & Mario Motta. Brad Vietje will start off showing how anyone with basic amateur skills can get involved with true astronomical research, using the resources of the AAVSO to rapidly climb the learning curve and contribute to science. He will specifically talk about binary stars, variable stars, and photometry. Then Mario Motta will discuss how these skills can be used in helping to find new exoplanets. With the launch of the TESS satellite there will soon be a need for many confirmatory follow-up observations of potential transits. Since TESS is looking at brighter stars within 300 light years, anyone with modest equipment can contribute. Examples of how to do this will be shown and how to get started will be explained.

Advanced Observing

Saturday 4pm – 5:30pm; Flanders Pavilion. Presented by Larry Mitchell. Larry Mitchell's talk will cover this year's observing program: "Visual Observing – More Hidden Gems of Stellafane – 2019". Larry will discuss in some detail what these objects are, why they are there, and what they are doing. His emphasis will be on visual observing and what these magnificent objects really look like through a telescope, rather than from a camera image.

OTHER PROGRAMS SUITABLE FOR EVERYONE

Solar Observing

Friday and Saturday 2-3 pm; (weather permitting) in the observing fields near the Pink Clubhouse and the McGregor Observatory. All attendees with solar filters or projection set-

continued...

ups are encouraged to share the Sun with other attendees. The McGregor will be set up for solar observing as well.

The Hartness-Porter Museum of Amateur Telescope Making

Open Friday from 5 pm to 8 pm and Sunday from 9 am to noon. The Porter/Hartness Museum of Amateur Telescope Making is located in the underground rooms at the Hartness House Inn in Springfield. Admission is free. Follow the signs in town to the Hartness House at 30 Orchard Street. Many of the items on display are by or about Russell W. Porter, including the Springfield and Garden telescopes. His artwork traces his arctic exploration years to his work on the 200" Palomar telescope, culminating in his famous cutaway drawings. Other items of interest include early telescopes and mirror making parts. The Hartness turret telescope, with its 10" Brashear objective, may also be inspected.

Friday Evening Videos

Friday at 6:30 to 7:30 pm in the Flanders Pavilion. Short astronomy documentaries for the whole family.

STELLAFANE OBSERVING OLYMPICS

Thursday and Friday evenings from 8:30 to midnight, and Saturday following the Key-note program until midnight, in the Observing Fields below the McGregor Observatory, Co-ordinated by Eileen Myers. A challenge to observe at least 15 deep sky objects, accessible in small to large amateur telescopes, has been developed for us by Larry Mitchell, who is in charge of the Texas Star Party Advanced Observing Program. Try your observing skills and earn a pin for your efforts. A Binocular Observing List has also been developed by Phil Harrington, well known for his writings on binocular astronomy. This year's Observing Olympics will have fun new lists of objects to search for and learn about. More information is available at stellafane.org/convention/2019/2019-observing.

THE STELLAFANE RAFFLE

The famous Stellafane Raffle offers spectacular donated prizes to lucky winners, typically including thousands of dollars worth of optical gear and many desirable astronomy and telescope-making books. Your odds of winning are really good. The money raised goes to support next year's Convention and to make capital improvements to the Convention site. Tickets are available next to the T-shirt table (across from the Food Tent) and from designated STM members roaming the site. We appreciate the generosity of our donors, and your support by purchasing raffle tickets. Thank you all very much!

Advice, Guidelines, and Policies

To ensure your enjoyment and safety at The Stellafane Convention, please read this section carefully.

Emergencies and First Aid

In case of emergency please contact Security (by the gate) or any STM member. If you have a family service radio, you may contact Convention staff via channel 7 (please avoid non-emergency use of this channel at Convention). First aid kits are located in the Bunkhouse, the McGregor Observatory, and the Clubhouse. We have trained medical staff on site.

Where to Set Up your Telescope

We strongly recommend that you set up your telescope in the fields around the Clubhouse or in the field to the south of the McGregor Observatory. Your telescope does not have to be entered in the competition, and **all telescopes are welcome, commercial or homemade**. You may not set up your telescope in a designated parking area. The darkest conditions are available near the Clubhouse, as far south as possible. Please consult the site map as well as the signs posted throughout the Convention site for the designated parking locations. Note: You can drive up to the Clubhouse area in daylight hours to drop off and pick up your telescope but there is no extended parking as space is extremely limited. Please move your car to a designated parking area at Stellafane East as soon as possible.

Lighting Policy

Stellafane does not allow open white lights on clear nights, except for one half hour after the Friday and Saturday evening talks end. Vehicular travel after this time is strongly discouraged and is done only at the risk of the operator. Red filter paper for flashlights is available at the Clubhouse and at the Bunkhouse. We thank you for your cooperation.

Laser Pointer Policy

Lasers pointers can be a helpful tools for astronomers, but can be dangerous if not properly used. Direct viewing of a laser-pointer beam, even briefly and at a distance of a kilometer or two, has the potential to cause temporary blindness – the same effect you get right after a flash photo is taken – or afterimages. These effects last anywhere from seconds to minutes.

FRIDAY EVENING INFORMAL TALKS

Fri 7:30 pm; Flanders Pavilion. Brad Vietje, MC. Short presentations by Convention Attendees. If you wish to contribute a short talk during this session, please register online. Talks are limited to 10 minutes and 20 slides. The time limit will be strictly enforced! A digital projector will be available for your use.

SATURDAY SWAP TABLES

Saturday 7 am to noon. The Swap Tables (located at the northeast edge of the main camping/parking area) are provided to give amateurs an opportunity to trade, buy or sell their surplus astronomical and telescope related items. (Important: see Swap Table Policy, Page 7.)

SATURDAY KEYNOTE PROGRAM

Saturday 7 pm; in the hillside amphitheater. (In case of inclement weather, the program will be held inside the Flanders Pavilion). John Gallagher, of the Springfield Telescope Makers, will be master of ceremonies.

- Greetings, announcements, children's raffle and raffle drawing
- Stellafane Shadowgram: John Gallagher
- Presentation of Telescope Competition Awards
- Stellafane Keynote Talk by DR. ALAN STERN, principle investigator of the New Horizons mission, who will give us a mission update and tell us what we observed and learned about Ultima Thule, a Kuiper Belt Object and the farthest solar system object ever visited by a spacecraft. With data still streaming back from New Horizons, Dr. Stern will give us the very latest from this historic mission.

SUNDAY CLEANUP

Sunday 8 am - noon, please clean up around your campsite and parking area. All trash should be deposited in one of the large dumpsters by the Food Tent or Exit Lane. Please make sure there are no obstacles to grass mowing in the fields—any rocks, stakes, or other hazards should be returned to the woods or taken to the dumpsters. If you would like to take down rebar and string, we would appreciate that. Pile rebar and string on the side of the road, where it will be easy for us to find and pick up. Thanks!

Glare, which is a reduction or loss of central vision, lasts only as long as exposure to the beam. All these effects could be disastrous if they struck a person operating machinery, driving a car, or flying a plane.

To help use your laser tools safely, the Springfield Telescope Makers, Inc. has adopted these recommendations as policy. These are based on the suggestions from the Laser Institute of America and published in May 2005 by *Sky and Telescope*.

- Laser pointers are designed to illuminate inanimate objects.
Never shine a laser pointer toward any person, aircraft, or other vehicle.
- Never look directly into a beam of a laser pointer of any type.
- Do not allow children to use a laser pointer unsupervised.
Laser pointers are not toys.
- If your telescope is equipped with a laser pointer that has a "constant on" setting, do not leave the instrument unattended with the laser switched on.
- Do not aim a laser pointer towards mirrors or other shiny surfaces.
The reflected beam may inadvertently strike someone in the eye.
- Do not aim a laser pointer skyward if you hear or see an aircraft of any kind flying overhead.
- Laser pointers shall not be used in the Clubhouse observing fields.
- Additional laser use restrictions may be put into place by the Springfield Telescope Makers, Inc. as situations arise.
- The Convention staff, at its sole discretion, may terminate or prohibit use of lasers by any person on Springfield Telescope Makers, Inc. property.

Swap Table Policy

For the sake of historical continuity, to preserve the uniqueness of the Stellafane Convention and to encourage conventioneers to build their own instruments, the Springfield Telescope Makers, Inc. do not allow commercial sales, of any kind, at the Stellafane Convention. All swap table sales must comply, in concept, with the above objective but are also specifically subject to the following criteria:

- Only surplus astronomical, telescope and telescope making related items may be sold.
- Each person will be allowed 16 square feet of table or ground space.
- Items which have the appearance of being specifically purchased or manufactured for sale at the Swap Tables may not be sold.
- All sales must take place within the designated Swap Table area only between 7 am and noon, the Saturday of the Stellafane Convention.

The Springfield Telescope Makers, Inc. may choose to grant a limited exception to the above policies to astronomy related organizations for their fundraising. Any request for an exemption must be made, in writing, at least one month prior to the Convention. If granted, the President of the Springfield Telescope Makers, Inc. will notify the requesting organization in writing.

Any member of the Springfield Telescope Makers, Inc. has the authority to determine whether a party is in compliance with the established regulations. Any person who is found to be in violation of the stated policies will be required to comply. Failing compliance, the offending party will be asked to leave the Convention and may be escorted from the premises by Convention Security.

The Springfield Telescope Makers, Inc. encourages those with questions regarding this policy to contact the Club via the Stellafane web page at www.stellafane.org. During the Convention, any questions regarding this policy, the appropriateness of items being displayed, or any information being disseminated, should be directed to a member of the Springfield Telescope Makers, Inc.

Food Service

The main Food Service Tent is located just to the south of the Bunkhouse. Note: This Food Service Tent is open all night if you need a snack and/or coffee during your observing session.

Food service will be available for Thursday dinner and for Friday breakfast if you are using our Early Entry Permit option.

Shuttle Bus

The Shuttle Bus makes two stops in Stellafane East, one by the Food Tent and one by the main Camping Area (See Stellafane East Site Map). It makes one stop on Breezy Hill near the Clubhouse.

Family Service Radios

The Convention staff uses family service radio channel 7 to facilitate communications during the Convention. **Please avoid use of channel 7 when you are at the Convention site, except in emergencies.**

2 Meter Repeater: W1STM

There is usually a 2 meter Ham Radio repeater, call sign W1STM, operating at 14,527 MHz on site.

Cell Phone Service

Be advised that cell phone service is "spotty" in hilly southern Vermont. Good coverage is generally available near interstates and town centers, but gets less reliable as you move off into the countryside. At Stellafane, you might have to move about the site to get a connection, but most carriers do have a useable signal at least in some (higher) areas of our site. If you can see Mt. Ascutney to the north, you will likely have service.

Campfires Not Allowed

Open campfires are not permitted. If you are camping and/or cooking on the Stellafane site, you must use approved cooking equipment such as a portable grill or camp stove. Do not cut any trees. Also, always be careful about disposal of cigarette butts.

fane site, you must use approved cooking equipment such as a portable grill or camp stove. Do not cut any trees. Also, always be careful about disposal of cigarette butts.

Golf Carts and ATVs

No personal golf carts or ATVs will be allowed at Convention. Only golf carts and ATVs being used for official Convention purposes will be allowed.

Generators and Recharging

Use of generators is discouraged at Convention. Properly muffled RV generators and quiet portable generators of 1,000 watts or less may be used between the hours of 9 am to 6 pm in the camping areas only. Generators may never be used in the observing fields, after dark, or at other locations at Stellafane. The generator must not create a hazard. Any complaint of unsafe operation or excessive noise will immediately cause the generator to be banned from operation.

There are outlets along the walls of both the McGregor Observatory and the Flanders Pavilion that may be used for recharging batteries and portable devices. However, the Springfield Telescope Makers accept no responsibility for unattended property.

Pet Policy

The Springfield Telescope Makers, Inc. welcomes you to bring your pets to the Stellafane Convention, provided the following rules are followed:

- Pets must be confined, leashed or otherwise under the physical control of a person at all times. Leashes may not exceed 6 feet in length. Pets that are tethered at the campsite cannot be left unattended for more than 30 minutes. Pets may not be tied to trees, bushes, tables or shelter facilities, even when the owners are present.
- Pets must be well-behaved at all times. Pets must be confined in the owner's camping unit during quiet hours (11 pm – 8 am).
- Pet owners are required to pick up after their pets and properly dispose of all pet droppings in trash receptacles.
- Any pet that is noisy, dangerous, intimidating or destructive will not be allowed to remain at the Convention.

Failure to comply with the above rules will result in you and your pet being asked to leave the Convention; you may be escorted from the premises by Convention security. The Springfield Telescope Makers, Inc. thanks you in advance for helping to make the Stellafane Convention more enjoyable for everyone. Enjoy the Convention!

Stellafane Endowment Fund

The Endowment Fund is intended to ensure that the birthplace of amateur telescope making is preserved for future generations by providing adequate funding to cover the basic costs of maintaining the Stellafane Clubhouse, the Porter Turret Telescope and the McGregor, Bruening, and Simoni Observatories, and other existing and future buildings and properties owned by the Springfield Telescope Makers, Inc. If you are interested in supporting the endowment fund you may do so by mail or online with our Donation Form at stellafane.org/help/donate-form.html. Thanks!

Lost and Found

The lost and found is located at the T-shirt table across from the Food Tent.

Stellafane Website

We Want Your Photos and Videos!

The Stellafane website (<http://Stellafane.org>) offers extensive how-to information and links on telescope making, and detailed Stellafane history. You'll also find accounts and photos from past Conventions there, and of course we will post many photos from this Convention in the weeks following the event, as well as the list of competition winners.

Your submissions are very welcome—please send your photos (or links to those you've uploaded to sharing sites) to webmaster@stellafane.org. Videos are welcomed as well, but please don't send them directly; use a sharing service like YouTube or Vimeo and send us a link.

+ EMERGENCIES AND FIRST AID +

IN CASE OF EMERGENCY PLEASE CONTACT SECURITY (BY THE GATE) OR ANY STM MEMBER. If you have a family service radio, you may contact Convention staff via channel 7 (please avoid non-emergency use of this channel at Convention). **First aid kits are located in the Bunkhouse, the McGregor Observatory, and the Stellafane Clubhouse.** We have trained medical staff on site.

The Telescope Competition

The Heart and Soul of Stellafane

*If you have built a telescope or a special gadget, or restored a historical instrument,
we strongly encourage you to enter it in the competition!*

Note: You can drive up to the Clubhouse area during daylight hours Friday or Saturday to drop off and pick up your telescope, but there is no extended parking as space is extremely limited. Please move your car to a designated parking area at Stellafane East as soon as possible.

Telescopes may be entered in either competition or both competitions if you wish.

First Homemade Telescope Certificate

In order to further encourage and recognize telescope building, we are offering a certificate of recognition for first time telescope makers. You do not have to enter the competition if you do not want to, but you must bring your first homemade telescope to Breezy Hill and display it. Please register ahead of time online and check in at the Clubhouse. You will be awarded a certificate recognizing your efforts in building and displaying your first homemade telescope at Stellafane, and your name will be shown on the screen at the Saturday night program.

Master Class

In order to encourage first-time entrants to enter their scopes without feeling that they must be ready to compete with previous first-place winners and optical professionals who enter their amateur work, we have established a separate competition class for entrants with a track record of high achievement. Rules are available at the registration table.

Optical Competition

2019 OPTICAL JUDGING CHAIR: RICK HUNTER

Registration for the optical competition will take place on Friday from 5 pm to 8 pm in the Clubhouse. Keep in mind that if you have registered your instrument online, you must still check in at the Clubhouse Friday from 5 pm to 8 pm or your telescope will not be judged! Set up your scope on Breezy Hill before you check in and inform the judges of the location of your scope. If the position of your scope changes it is your responsibility to report its new location to the judges in the Clubhouse. Failure to do so will result in your scope not being judged!

All telescopes in the competition must be fitted with an eyepiece with a focal length, in millimeters, approximately equal to the focal ratio of the instrument. Your instrument must be properly collimated before judging begins at 10 pm. Also, be prepared to point your scope at the star Altair when the judges arrive. Please note that the judges may inspect your telescope more than once. Therefore, you should remain on the field with your instrument until the preliminary results are announced via loudspeaker. Note that judging can last until 2 or 3 am!

If the weather permits the completion of the judging on Friday night, the optical judging will be closed for the duration of the Convention and optical awards will be presented during the Saturday evening program. If the optical judging cannot be completed Friday night, it will be continued on Saturday night, weather permitting. Additional optical entries may be accepted on Saturday, at the discretion of the judges. To inquire about this possibility, please ask a judging representative in the Clubhouse from 5 pm to 8 pm on Friday or from 8 am to 9:30 am on Saturday.

In the event that the competition will have to be continued Saturday, some telescopes that were judged on Friday might need to be judged again. Please inquire with the judges if your scope will need to be available again on Saturday. If the optical judging cannot be completed by the end of Saturday night, a partial field of optical excellence awards may be given, at the discretion of the judges.

Please note that it is the intention of the Stellafane judging committee to have the optical competition completed Friday night, weather permitting. Therefore, to ensure that your instrument is judged you must be registered for the Friday night judging.

Clarification on "small" vs. "large" Newtonians: The small category includes any mirror of 12.5 inches optical diameter or less; the "large" category is for mirrors that are greater than 12.5 inches in diameter.

Mechanical Competition

2019 MECHANICAL JUDGING CHAIR: CHRIS HOUGHTON

Registration for the mechanical competition will be between 8 am and 9:30 am Saturday morning in the Clubhouse. Keep in mind that if you have registered your instrument

online, you must still check in at the Clubhouse Saturday morning or your telescope will not be judged. The telescope judging for mechanical excellence will begin at 10 am so please register your telescope as early as possible.

Only telescopes that are operative both mechanically and optically will be accepted in the mechanical competition. The judges will visit the telescopes in several small groups. You must attend your telescope until the end of the competition is announced via the loudspeaker. Be prepared to describe any special construction techniques and components to the judges. Awards for mechanical design, craftsmanship, special gadgets, restoration of historical instruments and junior telescopes, made by persons less than 16 years of age, will be awarded at the Saturday evening talks.

Mechanical design vs. craftsmanship: the mechanical award is for the design of the instrument, how unique it is compared with prior art, and its effectiveness in providing a useful instrument, while the craftsmanship award is for execution (how well the design was translated into a workable and functional instrument).

LAST YEAR'S COMPETITION WINNERS

OPTICAL

Gregory J. Vinci, Tolland, CT, 6-inch f/7 Newt/Dob—1st Place Small Optical

Steve Hannah, Walpole, MA, 6-inch f/7 Newt/Dob—2nd Place Small Optical

Tim & Julia Roske, Albany, NY, 8-inch f/5.9 Newt/Dob—3rd Place Small Optical

MECHANICAL/CRAFTSMANSHIP

Tim & Julia Roske, Albany, NY, 8-inch f/5.9 Newt/Dob—1st Place Mechanical;
1st Place Craftsmanship

Scott D. Reeves, Valley Cottage, NY, 12½-inch f/6 Newt/Dob—
2nd Place Mechanical (Tie); 2nd Place Craftsmanship

René Pressé, Ville-Ste Catherine, QC, 8-inch f/6 Newtonian on Equatorial Platform—2nd
Place Mechanical (Tie); 3rd Place Craftsmanship

Zane D. Landers, Stamford, CT, 6-inch f/4.5 Newt/Dob—1st Place Junior Mechanical

Noah Kothe, Medway, MA, 1½-inch f/3.4 Refractor—2nd Place Junior Mechanical

Zane D. Landers, Stamford, CT, 16-inch f/4.9 Newt/Dob—3rd Place Junior Mechanical

MASTER CLASS

Matt Considine, Randolph, VT; **Dave Groski**, Hoskessin DE; **Jim Daley**, New Ipswich, NH;
Bert Willard, Carlisle, MA. Antique Restoration: Hale Spectrohelioscope—
Optical Special Award; 1st Place Antique Restoration Award

Roy Diffrient, Monkton, MD, 28-inch f/3.63 Newt/Dob—1st Place Mechanical,
1st Place Craftsmanship. Innovative Components: Truss Flexure Compensator, Sling-Wiffle
Tree Mirror Edge Support, Disengageable Motorized Collimator, Cam Lock Mirror Cove

Alan Ward, Sudbury, ON, 6-inch f/10 Refractor—2nd Place Craftsmanship

David M. Groski, Hoskessin, DE, 6-inch f/170 Solar Projection Telescope—3rd Place
Craftsmanship

SPECIAL AWARDS

Mark L. Sproul, Shohola, PA, Observatory Dome—1st Place Special Award

Matthew J. East, Hilton, NY, 7½-inch f/8.2 Newt/GEM—2nd Place Special Award (Tie)
Innovative Component: Kinematic/Kelvin-clamp mirror cell

Sara Schechner, West Newton, MA, Quilt hanging from 1853 Refractor on
1800 English Tripod—2nd Place Special Award (Tie)

Steve Dodson, Sudbury, ON, Articulated Mount—Innovative Component:
Cable actuated balancing system

Peter Wright, Skillman, NJ, 2¾-inch f/5.7 Binoculars on AltAz Mount—
Innovative Component: 3D printed cross axis binocular mount for small refractors

John Colt, Williston, VT, 3D Printed Precision Tripod Aiming Adapter—
Innovative Component: 3D printed tripod adjuster

Martin Hamar, Wilton, CT, Sun Compass for Daylight Polar Alignment—
Innovative Component: Sundial based polar alignment aid