

SEC2014

International Solar Eclipse Conference

New Mexico, USA



2014 October 23 - 24 - Sacramento Peak Observatory

2014 October 24 - NM Museum of Space History

2014 October 25 - 26 - The Lodge Resort, Cloudcroft

2012 Annular Eclipse from Elida, NM, ©2012 by F. Espenak, www.MrEclipse.com



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Intro



A Crossroad on Physics & Eclipses of the Sun

Over the last few decades, there have been dramatic changes in solar eclipse traveling. Solar Eclipse specialists meet most of the time in the

shadow of the Moon. Solar Eclipse meetings out of totality are rare, or are mainly focused on solar physics. The Solar Eclipse Mailing List and before the Solar Eclipse Newsletter has been successful as a vehicle in bringing together solar eclipse enthusiast, professionals and amateurs alike. Because there was no central eclipse in 2000 we had been presented with a perfect opportunity for an International Solar Eclipse Conference.

We had had this project in mind for some time, but mainly due to planning eclipse travels it has been put on hold. The aim of the conferences is to bring together professionals and amateurs, addicts, enthusiasts, and chasers, as with the mailing list and the newsletter, sharing information, knowledge, and experience. For the same reason we organized an international Solar Eclipse Conferences in 2004 and 2007.

Two days of lectures are given in each of the disciplines: predictions, mathematics, solar physics, weather forecasting, eye safety, diameter measuring, edge and central, and ancient eclipse research. Of course the latest and forthcoming solar eclipses should be great topics of discussion, along with the once-in-a-lifetime Venus Transit. Friday evening is a social event with reception and informal meetings. And where possible the conferences is combined with a lunar eclipse, partial solar eclipse and a visit to a solar observatory.

The SEC2000, SEC2004 and SEC2007 conferences were organized by Patrick & Joanne Poitevin. Each conference has been supported by various groups and individuals. We also would like to thank those participants. Without you all it would not have been possible! The last international Solar Eclipse Conference (SEC 2011) was organized by SPACE, New Delhi, India.

Thank you!

We have 137 registrations out of 19 different countries. Thanks to the speakers and presenters to support the conference. No one received support or donations and all were willing to contribute to the conference. Thank you so much for the various venues who will host us. We are using the facilities of Sacramento Peak Observatory and New Mexico Museum of Space History free of charge. The Lodge Resort has been supporting with accommodation reduction and the staff has been an enormously help with the preparations of the conference.

Their webpages:

Sacramento Peak Observatory at www.nso.edu

New Mexico Museum of Space History at www.nmspacemuseum.org

The Lodge Resort at

http://www.thelodgeresort.com/index.cfm?src=ppc_yahoobing_brand_72rate

Thank you to the AAG (Amateur Astronomers Group) Alamogordo for their support in setting up an extra partial solar eclipse outreach post at the parking lot at NM Museum of Space History and their Star Party nights on the golf course of The Lodge Resort on Friday night after the SEC2014 Reception and Saturday night after the SEC2014 Dinner. All free entrances and free participation. Their webpages at

<http://www.astronomersgroup.org/Gallery2/StarParty/AAGStarParty.html>

TravelQuest kindly supported and sponsored the SEC2014 Reception catering on Friday evening at the NM Museum of Space History. Thank you Aram, Trish, Kari, Christine and team. TravelQuest will have a trade stand at the conference but please visit already their latest offerings at

BALI:

<http://www.travelquesttours.com/tours/2016-bali-new-year-total-solar-eclipse/welcome/>

INDONESIA CRUISE:

<http://www.travelquesttours.com/tours/2016-indonesia-borneo-cruise-to-totality/welcome/>

There is no SEC conference or Mark Margolis from Rainbow Symphony does support and donate Eclipse Shades. A big thank you to Mark and his team. See his latest webpages at

<http://www.rainbowsymphony.com/soleclipse.html>

Thank you to the AAS (American Astronomical Society) for your support. Very much appreciated. See their link at <http://aas.org/>

Celestron provided their latest Skyris CCD camera to try out on the Sun See <http://www.celestron.com/>

Some people we would like to list for a big thank you by helping in one way or another with the organisation of SEC2014. In alphabetical order: Jay Anderson, Derryl Barr, Celestron, Ralph Chou, Fred Espenak, Michael Gill, Shadia Habbal, Bill Kramer, Bill Livingston, Barbara Moore, Jay Pasachoff, Glenn Schneider, Joerg Schoppmeyer, TravelQuest and Michael Zeiler.

Donations received from (in alphabetical order): Ricardo Alcoser, Bengt Alfredsson, Amateur Astronomers Group (Alamogordo), Jay Anderson, Audie Barnette, Derryl Barr, John Beattie, Stephen Bedingfield, Fred Bruenjes, Jens

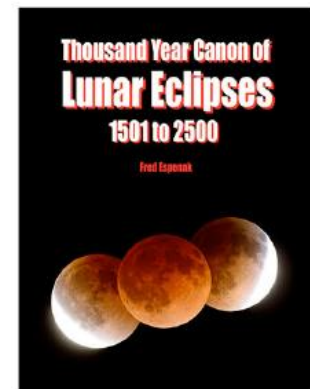
Buus, Greg Buchwald, Keiko Chaki, Ralph Chou, Terry Cuttle, Kris Delcourte, Jackie Diehl, David Dunham, Joan Dunham, Letitia Ferrer, Rick Fienberg (AAS), Lloyd Franklin, Jay Friedland, Michael Gill, Thomas Goodey, Joel Harris, Jan Hellemans, Steve Keil, Hamid Khodashenas, David Larson, Mark Littmann, Robert Lucas, Mark Margolis (Rainbow Symphony), Robert Minor, Joel Moskowitz, Richard Nugent, Derald Nye, Jay Pasachoff, Luca Quaglia, Robert Ray, Torsten Rothenwaldt, Eckehard Schmidt, Larry Stevens, John Tilley, TravelQuest, Nick Turner, Sheridan Williams, Jen Winter, Michael Zeiler.

A big thank you to Michael Zeiler for scouting the SE2014 sides and contribution to our SEC2014 NewsFeeds with plenty of pictures and loads of information and maps. Michael also arranged this Program to be printed in hard copy. His webpages <http://eclipse-maps.com>

Thank you to Denise Kramer to provide a long list of activities for spouses or pre/post conference activities. The list will be in the SEC2014 Program (see later in this Program).

Fred Espenak offered SEC2014 reduction for his new Eclipse Canons (if ordered before 01 October 2014).

- 1) Thousand Year Canon of Solar Eclipses 1501 to 2500
(<http://astropixels.com/pubs/ap001.html>)
- 2) Thousand Year Canon of Lunar Eclipses 1501 to 2500
(<http://astropixels.com/pubs/ap002.html>)



The "Thousand Year Canon of Solar Eclipses 1501 to 2500" contains maps and data for each of the 2,389 solar eclipses occurring over the ten-century period centered on the present era. The eclipse predictions are based on the Jet Propulsion Lab's DE406 - a computer ephemeris used for calculating high precision coordinates of the Sun and Moon for thousands of years into the past and future.

The 2,389 solar eclipse maps are arranged twelve to a page and include the eclipse type, calendar date and time of greatest eclipse, Saros series number, lunar node, Delta T, gamma, Sun's altitude, and central eclipse duration or eclipse magnitude.

The "Thousand Year Canon of Lunar Eclipses 1501 to 2500" contains diagrams, maps and data for each of the 2,424 lunar eclipses occurring over the same period. As with the solar eclipse canon, the maps/diagrams for

each eclipse are arranged twelve to a page and include the eclipse type, calendar date and time of greatest eclipse, Saros series number, lunar node, Delta T, gamma, eclipse magnitudes, and phase durations.

For complete details and to place an order, please visit:

<http://astropixels.com/pubs/sec2014.html>

All orders had to be placed by October 1 to take advantage of this offer, Fred will be giving a presentation on the new canons at SEC2014.

Sacramento Peak Observatory has Partial Solar Eclipse T-Shirts available. If someone would like to pre-order a T-shirt, Jackie Diehl of NSO will be happy to set aside T-shirts for pickup at the conference. She will need a size and the quantity ordered. Shirts will be \$20.00 a shirt. Write to Jackie Diehl jdiehl@nso.edu



We cannot image SEC2014 without the support, the help and patience of Bill Kramer who constantly updated the SEC2014 webpages. Thank you so much Bill!!! Me, and hopefully many others will buy you a nice well deserved drink!

Keep an eye on the webpages at

<http://www.eclipse-chasers.com/article/SEC2014.html>

Have a lovely SEC2014!

Patrick & Joanne

Patrick & Joanne Poitevin

Program SEC2014

Thursday 23 October 2014 - Sacramento Peak Observatory

08:15	08:55	Continental Breakfast 40 min
08:55	09:00	Announcements/Logistics by Patrick Poitevin
Chair: Michael Zeiler		
09:00	09:30	Bringing Solar Science to School Children and the General Public (Roger Kennedy, US)
09:30	09:40	Q&A
09:40	10:10	Photographing Solar Eclipses (Fred Espenak, US)
10:10	10:20	Q&A
10:20	10:50	Break/Snacks 30 min
10:50	11:20	How to observe the eclipse safely with eclipse glasses (Ralph Chou, Canada)
11:20	11:30	Q&A
11:30	12:00	Solar Eclipses at Sunrise/Sunset, special effects (Joerg Schoppmeyer, Germany)
12:00	12:10	Q&A
12:10	12:45	Tour Sacramento Peak Observatory (optional)
12:30	13:30	Lunch (those on tour eat a bit later) 60 min
13:30	14:00	Solar Eclipse Observation: My Experience (Jan Sladeczek, Czech Republic)
14:00	14:10	Q&A
14:10	14:40	Break/Snacks 30 min
14:40	15:30	Prepare for Partial Solar Eclipse/Solar Observing
15:30	17:50	Partial Solar Eclipse Observing (First contact 15h35 - Last contact 17h49)
17:50	18:30	Break/pack-up
18:30	21:30	BBQ

Friday 24 October 2014 - Sacramento Peak Observatory

08:15	08:55	Continental Breakfast 40 min
08:55	09:00	Announcements/Logistics by Patrick Poitevin
Chair: Serge Koutchmy		
09:00	09:30	Landscape Eclipse Photography (Kris Delcourte, Belgium)
09:30	09:40	Q&A
09:40	10:10	Measuring the diameter of the Sun during solar eclipses (Jean-

		Pierre Barriot, Tahiti)
10:10	10:20	Q&A
10:20	10:50	The Legacy of Solar Telescope Designer George A. Carroll (John Briggs, US)
10:50	11:00	Q&A
11:00	11:30	Break/Snacks 30 min
11:30	12:00	When the eclipse comes home (Derryl Barr, US)
12:00	12:10	Q&A
12:10	12:45	Additional Tour Sacramento Peak Observatory if needed - solar observing for those not joining the Tour (own telescopes)
12:45	13:45	Lunch (those on tour eat a bit later) 60 min
Chair & Moderator: Sheridan Williams		
13:45	15:35	Workshop TSE2017 (Panel: Jay Anderson, Fred Espenak, Shadia Habbal, Michael Zeiler)
15:35	16:05	Break/Snacks - continue at workshop for those wanted 30 min
16:05	16:35	ATST (Advanced Technology Solar Telescope)
16:35	16:45	Q&A
16:45	18:00	Travel to NM Museum of Space History for opening reception SEC2014

Friday 24 October 2014 Reception NM Museum of Space History

18:00	21:00	SEC2014 Reception - Catering kindly sponsored by Travel Quest
18:00	18:20	Opening SEC2014 - Announcements by Patrick Poitevin
21:00	21:30	Travel to The Lodge Resort
21:30		Star Party The Lodge Resort golf course (AAG, Alamogordo)

Saturday 25 October 2014 - The Lodge Resort

07:30	08:30	Registrations
08:30	08:45	SEC2014 Opening - Announcements by Patrick Poitevin
Chair: Fred Espenak		
08:45	09:15	Observing Solar Eclipse in Space: a dream that is coming true (Hamid Khodashenas, Iran)
09:15	09:20	Q 5 min
09:20	09:50	The ISO Standard for Solar Viewers (Ralph Chou, Canada)
09:50	09:55	Q 5 min
09:55	10:25	Outcomes of TSE 2012 in Australia and thoughts for 2017 (Terry Cuttle, Australia)
10:25	10:30	Q 5 min

10:30	11:00	Break 30 min
11:00	11:30	Techniques used and results of high resolution video obtained at the 2010 and 2012 TSEs (Nick James, UK)
11:30	11:35	Q 5 min
11:35	12:05	Measurements of the solar edge and of the diameter of the Sun using total eclipses (Serge Koutchmy, France)
12:05	12:10	Q 5 min
12:10	13:10	Lunch 60 min
Chair: Ralph Chou		
13:10	13:40	Groups Photo (Nelson Quan, China) 30 min
13:40	14:10	Saros maths (Ray Brooks, US)
14:10	14:15	Q 5 min
14:15	14:45	Lunar eclipse dust accumulations (Tom Murphy, US)
14:45	14:50	Q 5min
14:50	15:20	Unique science with total solar eclipses (Shadia Habbal, US)
15:20	15:25	Q 5 min
15:25	15:55	Break 30 min
15:55	16:25	White-Light observations and polarimetric analysis of the solar corona during the eclipse of 1 August 2008 (Victor Fainshtein, Russia)
16:25	16:30	Q 5 min
16:30	17:00	UMBGRAPHILLIC ESOTERICA: A Retrospective Beyond Science and Technology (Glenn Schneider, US)
17:00	17:05	Q 5 min
17:05	17:35	Two New Eclipse Canons and an Eclipse Website (Fred Espenak, US)
17:35	17:40	Q 5 min
17:50		End of Day 1 by Patrick Poitevin
19:00	23:30	SEC2014 Dinner - The Lodge Resort
23:30		Star Party The Lodge Resort golf course (AAG, Alamogordo)

Sunday 26 October 2014 - The Lodge Resort

07:30	08:30	Registrations
08:30	08:45	SEC2014 Opening – day 2 – Announcements by Patrick Poitevin
Chair: Jay Anderson		
08:45	09:15	Plans of the International Occultation Timing Association (IOTA) for 2017 (report from the Columbia Workshop) and Other “Eclipse” Opportunities (David Dunham, US)
09:15	09:20	Q 5 min
09:20	09:50	Science at Recent Solar Eclipses (Jay Pasachoff, US)

09:50	09:55	Q 5 min
09:55	10:25	Do we need scientific observations of the solar corona during eclipses? (Voyto Rusin, Slovak Republic)
10:25	10:30	Q 5 min
10:30	11:00	Break 30 min
11:00	11:30	Automation of Eclipse Contact Timing Modifications Using Digital Lunar Profiles (Bill Kramer, Jamaica)
11:30	11:35	Q 5 min
11:35	12:05	The Old and the New: Thomas Jefferson's solar eclipse, photographing eclipses through a pinhole and eclipse-induced waves in the ozone layer (Forrest M. Mims III, US)
12:05	13:05	Lunch 60 min
Chair: Jay Pasachoff		
13:05	13:30	Chasing Shadows (Nelson Quan, China)
13:30	13:35	Q 5 min
13:35	14:05	More Morsels (John Tilley, UK)
14:05	14:10	Q 5 min
14:10	14:40	Developing STEM lesson plans integrating Common Core standards in conjunction with the 2017 total solar eclipse (Charles Fulco, US)
14:40	14:45	Q 5 min
14:45	15:15	New frontiers in eclipse cartography (Michael Zeiler, US)
15:15	15:20	Q 5 min
15:20	15:50	Break 30 min
15:50	16:20	Three Years of Eclipses: Where to Go? (Jay Anderson, Canada)
16:20	16:25	Q 5 min
16:25	16:55	The Eclipse MegaMovie Project (Scott McIntosh, US)
16:55	17:00	Q 5 min
17:00	17:30	The Ultimate Chase (Xavier Jubier, France)
17:30	17:35	Q 5 min
17:35		End of SEC2014 by Jay Pasachoff and Patrick Poitevin

Logistics, Catering and general Information

Fred Espenak has designed the SEC2014 Program cover.

Thursday 23 October 2014

Pre-conference Day 1 at Sacramento Peak Observatory. Continental breakfast, morning and afternoon coffee/tea/snacks, lunch and evening BBQ at Sacramento Peak Observatory.

Fred Espenak has designed in collaboration with Mark Margolis (Rainbow Symphony) the SEC2014 Eclipse Shades. Mark will have Sun Shades for the partial eclipse at Sacramento Peak Observatory as well as on the NM Museum of Space History where AAG will have their partial solar eclipse outreach on the parking.

For those whom want to observe the partial solar eclipse of 23 October 2014 and do not have a booking for Day 1 at Sacramento Peak Observatory, the Amateur Astronomers Group AAG from Alamogordo organizes a partial solar eclipse outreach. You are all welcome on October 23rd from 3pm to 6pm MDT at the New Mexico Museum of Space History parking lot. Entrance is free.

Sacramento Peak Observatory offers their facilities free of charge. Our meeting place is in the visitor's center of the Sacramento Peak Solar Observatory. NSO staff is invited to attend any of the presentations. Their fees are covered by Sacramento Peak Observatory.

Lunch could either be served just outside the meeting room or at the observatory cafeteria that is a five-minute walk across the grounds. There are four picnic tables outside the back door to the meeting room.

Proposed **areas for the eclipse viewing** are highlighted (in yellow on the digital version) on the map in the back of this program.

The area by the Dunn Solar Telescope is a grassy area with great exposure to a southwestern horizon for the eclipse. It is somewhat hilly, but for those just using eclipse glasses, it would work perfectly to observe the eclipse.

The area near the ISOON telescope is better for those that may have instrumentation for the eclipse. There is a large concrete pad available for telescopes (I'm tentatively planning on setting up a small Coronado PST), and there *may be* limited electrical service available from the old ISOON building.

There is ample parking at the observatory. The main parking lot may fill up with our group, but there are other parking areas scattered around the observatory grounds.

Friday 24 October 2014

1. Sacramento Peak Observatory pre-conference Day 2

Pre-conference Day 2 at Sacramento Peak Observatory. Continental breakfast, morning and afternoon coffee/tea/snacks and lunch at Sacramento Peak Observatory.

Sacramento Peak Observatory offers their facilities free of charge. Our meeting place is in the visitor's center of the Sacramento Peak Solar Observatory. NSO staff is invited to attend any of the presentations. Their fees are covered by Sacramento Peak Observatory.

Lunch could either be served just outside the meeting room or at the observatory cafeteria that is a five-minute walk across the grounds. There are four picnic tables outside the back door to the meeting room.

There is ample parking at the observatory. The main parking lot may fill up with our group, but there are other parking areas scattered around the observatory grounds.

2. New Mexico Museum of Space History SEC2014 Opening Reception

SEC2014 Reception with Tomato Bruschettas, Handmade Mini Meatballs, Baked Stuffed Mushrooms, Lemonade, and Raspberry tea at New Mexico Museum of Space History.

New Mexico Museum of Space History kindly allows us free usage of the Museum for our SEC2014 openings reception.

Self-serve and a few tables and chairs are on the first floor. The museum is an excellent venue for an evening reception and the view is spectacular! Everyone can mingle and walk through the museum. The reception area is one floor above the entrance. The room has a split level arrangement. The upper side along the windows have a spectacular view and you can watch the sunset from this vantage. The city of Alamogordo is below and White Sands is clearly visible in the distance. The lower part of the room is where the catering take place.



We are very pleased TravelQuest kindly sponsors the catering of the SEC2014 reception at the NM Museum of Space History!

John Briggs will have Jay Pasachoff's very interesting Carroll spar solar telescope from Williams College set up at the NM Museum of Space History.

The city of Alamogordo, population of 35,000, is home to the New Mexico Museum of Space History. Alamogordo is adjacent to White Sands Missile Range and can be considered to be the birthplace of the U.S. rocket technology. After WW2, the U.S. brought Von Braun and captured rocket engineers to White Sands where they launched a series of V-2 rockets. This is an interesting museum with many artifacts from the U.S. space program. See <http://www.nmspacemuseum.org/> . The New Mexico Museum of Space History is on the edge of the city of Alamogordo. The area around Alamogordo is desert and the mountains above are wooded.

A project of the museum you might find interesting:
<http://nmspacetrail.com/>

3. The Lodge Resort Star Party

After the SEC2014 Reception we have a Star Party at The Lodge Resort golf course hosted by the Amateur Astronomers Group of Alamogordo.

The main viewing area on the golf course is a wooden deck just behind the golf shop. Since there is a small flight of steps to this deck, the very large telescopes can be set up on a grassy tee-off area nearby. The night sky is indeed dark. The Lodge Resort will turn off all nearby lights.

This area is about a two minute walk from the rear side of the Lodge. Easy access, but people should be encouraged to bring a flashlight, preferably with red cellophane taped on.

Saturday 25 October 2014

1. SEC2014 Conference Day 1

Day 1 of the SEC2014 Conference at The Lodge Resort. Health break with assorted yogurt, whole fresh fruit, granola bars and trail mix, vegetable tray with ranch dip, iced tea and bottle water. Deli sandwich buffet with salami, turkey and ham, assorted cheeses, and all the fixins', assorted breads, chips, green salad with two dressings, and chocolate fudge brownies, includes iced tea and coffee service. Cookie break with assorted freshly baked cookies, homemade brownies iced soft drinks, bottled water, fresh brewed coffee and herbal teas.

The Lodge was founded in 1899 and the present building was built in 1911. On the walls of the hallways you will see many exhibits of the history of the Lodge, Cloudcroft, and famous visitors.

The conference hall, the Pavilion is an old wooden structure 1/4 mile down the hill from the Lodge. It is a 12 minute walk. Should attendees chose to drive instead of walk, there is ample parking.

The Pavilion has three parts: the meeting room, the side-room where the breakouts and lunch will be served, and 8 lodging units.

Registration for SEC2014 is just inside the breakout room. The entrance to the meeting room and breakout room are immediately adjacent.

If someone enters the meeting room while the conference is in progress, it is better for that person to enter via the inside door from the breakout room rather than the front entrance to prevent sunlight from spoiling the darkened meeting room. Signs are put in place.

Lunch and refreshments will be served in the breakout room and food and drink can be taken to the round tables in the meeting room.

2. SEC2014 Dinner

The SEC2014 Dinner at The Lodge Resort is a Southwestern buffet with Chi mayo chicken and grilled sterling salmon with chipotle & cherry barbeque, poblano chile or roasted garlic whipped potatoes, chef's choice of vegetable with southwestern pasta salad, green salad, assorted rolls with butter, and peach cobbler.

3. The Lodge Resort Star Party

After the SEC2014 Reception we have a Star Party at The Lodge Resort golf course hosted by the Amateur Astronomers Group of Alamogordo.

The main viewing area on the golf course is a wooden deck just behind the golf shop. Since there is a small flight of steps to this deck, the very large telescopes can be set up on a grassy tee-off area nearby. The night sky is indeed dark. The Lodge Resort will turn off all nearby lights.

This area is about a two minute walk from the rear side of the Lodge. Easy access, but people should be encouraged to bring a flashlight, preferably with red cellophane taped on.

Posters will be in the break out room. We have 4 easels for posters and we can also utilize the walls. We can staple or tape posters on the wooden walls. The existing tables in the room can be used for sponsors and/or trade items. Only delegates who asked upfront for trade and posters will be able to use the allocated room.

Sunday 26 October 2014

Day 2 of the SEC2014 Conference at The Lodge Resort. Health break with assorted yogurt, whole fresh fruit, granola bars and trail mix, vegetable tray with ranch dip, iced tea and bottle water. Pasta buffet with choice of penne alfredo and lasagna, garlic bread, chef's choice of vegetable, tossed green salad with two dressings, chocolate mousse parfait, included iced tea and bottle water. Fiesta break with seven layer bean dip served with tortilla chips and fresh salsa, iced tea, iced soft drinks and bottled water.

The Lodge was founded in 1899 and the present building was built in 1911. On the walls of the hallways you will see many exhibits of the history of the Lodge, Cloudcroft, and famous visitors.

The Lodge was founded in 1899 and the present building was built in 1911. On the walls of the hallways you will see many exhibits of the history of the Lodge, Cloudcroft, and famous visitors.

The conference hall, the Pavilion is an old wooden structure 1/4 mile down the hill from the Lodge. It is a 12 minute walk. Should attendees chose to drive instead of walk, there is ample parking.

The Pavilion has three parts: the meeting room, the side-room where the breakouts and lunch will be served, and 8 lodging units.

Registration for SEC2014 is just inside the breakout room. The entrance to the meeting room and breakout room are immediately adjacent.

If someone enters the meeting room while the conference is in progress, it is better for that person to enter via the inside door from the breakout room rather than the front entrance to prevent sunlight from spoiling the darkened meeting room. Signs are put in place.

Lunch and refreshments will be served in the breakout room and food and drink can be taken to the round tables in the meeting room.

Posters will be in the break out room. We have 4 easels for posters and we can also utilize the walls. We can staple or tape posters on the wooden walls. The existing tables in the room can be used for sponsors and/or trade items. Only delegates who asked upfront for trade and posters will be able to use the allocated room.

Abstracts

“Bringing Solar Science to School Children and the General Public”

by Roger Kennedy

The main focus of our outreach program has been pre-K thru 12 grade students and their communities. Fundamental to our outreach are the three overarching priorities for STEM education in America:

- increasing STEM literacy so all students can think critically in science, math, engineering and technology;
- improving the quality of math and science teaching
- expanding STEM education and career opportunities for underrepresented groups, including women and minorities

To achieve these goals we provide solar observation with Hydrogen-alpha and white light filtered telescopes. Research has indicated that less than 5% of the world’s population ever gets this opportunity.

In addition we present current solar science research and images. These topics are seldom addressed in detail by most public school teachers, librarians or other community resources.

We mentor the staff of these organizations so that they are more familiar with a rudimentary awareness of our sun.

The presentation will focus on our introductory approach to solar science.

“Photographing Eclipses”

by Fred Espenak, Scientist Emeritus, NASA's Goddard Space Flight Center

In the 44 years the author has been active in the eclipse field, he has photographed (or tried to photograph) every solar eclipse on each eclipse

expedition he has participated in. He'll share some of the most important lessons and tips he's learned in imaging the eclipsed Sun be it partial, annular or total.

“Observing today’s partial eclipse safely”

by Dr. B. Ralph Chou

Safe methods for observing a solar eclipse are presented. The science behind solar eclipse glasses is reviewed.

“Solar Eclipses at Sunrise/Sunset, special effects”

by Joerg Schoppmeyer

In contrast to most other observers, I even travel to partial and annular solar eclipses (preferable at sunrise/sunset) worldwide to observe and photograph unique special effects at eclipse time like color flashes and other color effects, atmosphere effects like looming and at total solar eclipses lunar shadow impacts on the landscape, even after totality. Some examples of horizon eclipses will show that it's not always necessary to head for the ultimate image processed corona picture at the best observing place with the sun high in the sky. See a “firework of colors”, a “total annular” eclipse and “dark moments” after totality.

Sacramento Peak Observatory Tour

Groups for Thursday (Group 1 and 2) and Friday (Group 3 and 4) Tours

First name	Second name	Country	Thursday SPO	Friday SPO
Ricardo	Alcocer	USA	2	X
Bengt	Alfredsson	Sweden	X	3
Jay	Anderson	Canada	1	X
Lynn	Anderson	USA	X	3
Derryl	Barr	USA	1	X
Pam	Barr	USA	1	X
Jean-Pierre	Barriot	French Polynesia	2	X
John	Beattie	USA		3
Stephen	Bedingfield	Canada	2	X

Lynn	Bedingfield	Canada	2	X
John W.	Briggs	USA	1	X
Daniel	Brookshier	USA		3
Sue	Brown	UK	1	
Aaron	Brown	USA	X	4
Fred	Bruenjes	USA	2	X
Greg	Buchwald	USA	X	3
Vicki	Buchwald	USA	X	3
Jens	Buus	UK	X	3
Keiko	Chaki	Japan	X	3
Ralph	Chou	Canada	X	3
Johnny	Cox	USA	X	3
Tony	Crocker	USA	2	
Terry	Cuttle	Australia	X	3
Kris	Delcourte	Belgium	2	X
Jean Luc	Dighaye	Germany	X	4
Hamid	Djodeiri Khodashenas	Iran	X	3
Frances	Donovan	UK	2	X
David	Dunham	USA	X	4
Joan	Dunham	USA	X	4
Paula	Eisenhart	USA	2	X
Fred	Espenak	USA	X	4
Patricia	Espenak	USA	X	4
Victor	Fainshtein	Russia	X	4
Leticia	Ferrer	USA		3
Lloyd	Franklin	USA	X	4
Susan	Franklin	USA	X	4
Jay	Friedland	USA	X	3
Benno	Friedland	USA	X	3
Allan	Fromm	USA	X	3
Charles	Fulco	USA	1	X
Michael	Gill	UK	X	4
Monika	Glowe	USA	1	X
Donald	Glowe	USA	1	X
Thomas	Goodey	Romania	X	4
Shadia	Habbal	USA	2	X
Jan	Hellemans	Belgium	2	X
Khati	Hendry	Canada	1	
Nicole	Hollenbeck	Germany	1	
Melissa	Hulbert	Australia	X	4
Nick	James	UK	1	

Xavier	Jubier	France		3
Stephen	Keil	USA	0	0
Roger	Kennedy	USA	1	
Linda	Kennedy	USA	1	
Sally	Kilburg	Canada	1	X
David	Kodama	USA	X	4
Jean	Kodama	USA	X	4
Serge	Koutchmy	France		3
Bill	Kramer	Jamaica	X	3
David	Larson	USA	2	X
Eleonor Burns	Larson	USA	2	X
Mark	Littmann	USA	X	4
Robert	Lucas	Australia	2	X
Soheil	Malekzadeh	USA	X	3
Mark	Margolis	USA	X	4
Douglas	McCarty	USA	2	X
Dan	McGlaun	USA	X	4
Klaus	Meissen	Germany	X	4
Robert	Minor	USA	X	3
Norma	Minor	USA	X	3
Mike	Molitor	USA	2	X
Derald	Nye	USA	2	X
Liz	O'Mara	USA	1	
Arim	Pakrooh	USA/Iran	X	3
Jay	Pasachoff	USA	1	X
Naomi	Pasachoff	USA	1	
Gillian	Perry	UK	X	4
Roger	Perry	UK	X	4
Joanne	Poitevin	UK	X	4
Patrick	Poitevin	UK	X	4
Matthew	Poulton	France		3
Nelson	Quan	China	1	X
Robert	Ray	USA	1	X
Barbara	Ray	USA	1	
Mike	Reynolds	USA		3
Helen	Robinson	Australia	2	
Torsten	Rothenwaldt	Germany	X	4
Ruben	Ruiz	Mexico	1	X
Stan	Runge	Canada	1	
Eckehard	Schmidt	Germany	X	4
Joerg	Schoppmeyer	Germany	1	

Austin	Shea	USA	1	X
Kent	Silliman	USA	2	X
Carol	Silliman	USA	2	X
Jan	Sladeczek	Czech Republic	X	3
Craig	Small	USA	2	X
Larry	Stevens	USA	X	3
Paul	Sunde	USA	X	4
Barbara	Sunde	USA	X	4
John	Tilley	UK		3
Gene	Torncello	USA	2	X
Janet	Torncello	USA	2	X
Nick	Turner	UK	2	X
Andrea	Turner	UK	2	X
Polly	White	USA	1	X
Sheridan	Williams	UK	2	X
Jim	Windlinger	USA	X	4
Jen	Winter	USA	2	X
Michael	Zeiler	USA	1	X
Evan	Zucker	USA	1	X

1 = Group 1 on Thursday 23 October

2 = Group 2 on Thursday 23 October

3 = Group 3 on Friday 24 October

4 = Group 4 on Friday 24 October

X = attending/present

□ = speaker/presenter

“Solar Eclipse Observation: My Experience”

by Jan Sladeczek, Czech Republic, Prague

email: sladeclipse@seznam.cz

Solar Eclipse, especially Total Solar Eclipse is the beautiful natural phenomenon, when there is visible the external layer of Solar Atmosphere - Corona.

I started to observe Total Solar Eclipse in 1999 and in the period 1999-2005 I specialized on the observation Solar Corona and recording by camcorder. Since 2005 I have started to photograph Solar Corona by camera.

I have observed also Annular Solar Eclipse and Transfers of planets Mercury and Venus across the Solar Disc, but my great interest is the Total Phase.

I participated in the international scientific expedition to Mongolia to Total solar Eclipse 2008. My camera was on great parallactic mount and I could concentrate on the observation of Solar Corona. Since 2008 to this time I use parallactic mount, optimal cameras and direction notebook for later processing.

The choice of the position for the Solar Eclipse observation is important also regarding the weather forecast in a given region.

My last two journeys, Australia 2012 and Uganda 2013, were successful. Our international team took the pictures of Solar Corona for later processing by Miloslav Druckmüller from Technical University of Brno. Miloslav and his daughter Hana are the great experts for mathematical processing of images.

“Partial Solar Eclipse Observing”



Local Circumstances of 23 October 2014 Partial Solar Eclipse at Sacramento Peak Observatory

Latitude 32.78828N

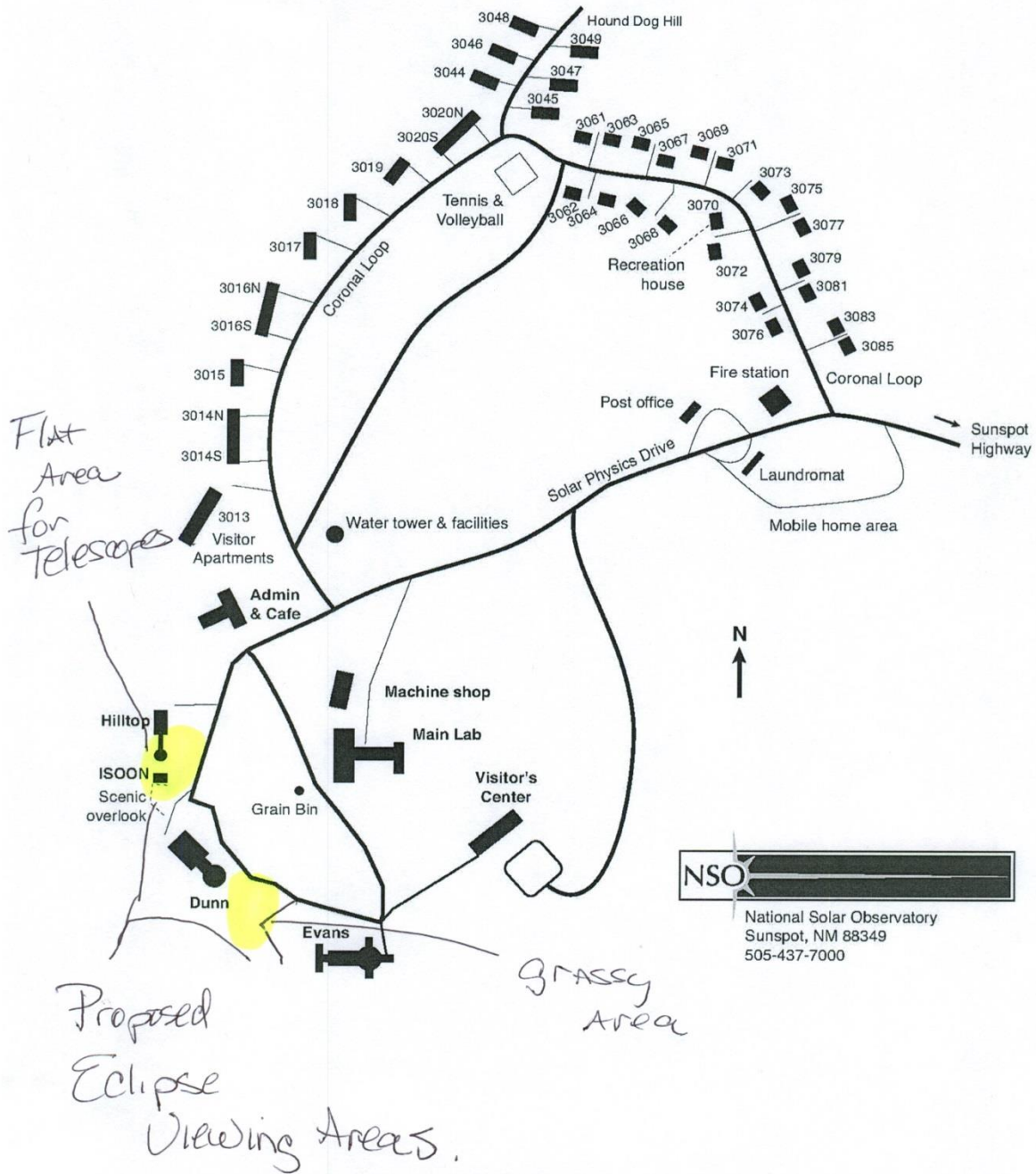
Longitude 105.81941W

- First Contact - 3:34:21 PM MDT, Altitude 30.4 deg.
- Max. Eclipse - 4:45:42 PM MDT, Altitude 18.0 deg.
- Magnitude 0.4332, Moon/Sun size ratio: 0.95374 Obscuration 31.46%
- Last contact - 5:49:05 PM MDT, Altitude 5.6 deg.

Areas for the eclipse viewing are highlighted (in yellow below).

The area by the Dunn Solar Telescope is a grassy area with great exposure to a southwestern horizon for the eclipse. It is somewhat hilly, but for those just using eclipse glasses, it would work perfectly to observe the eclipse.

The area near the ISOON telescope is better for those that may have instrumentation for the eclipse. There is a large concrete pad available for telescopes, and there *may be* limited electrical service available from the old ISOON building.





"Landscape Eclipse Photography"

by Kris Delcourte

As a passionate photographer and eclipse chaser as well as a keen traveller, I have been struggling with the following dilemma: how to produce a great eclipse picture in combination with enjoying the observation of the eclipse and how to achieve this without preventing to travel around in a flexible way in a remote corner of the world.

After trying out several options, I started to focus on photographing the eclipsed sun in its natural surrounding: the landscape. This offers several advantages but especially allows you to create something unique and to travel relatively light weight.

This presentation is about sharing my experiences and passing on some useful hints. We shall discuss the importance of planning, of the location survey and selection, of mobility, the equipment, the processing. All of this these will be illustrated with lots of photographic material.

"Measuring the diameter of the Sun during solar eclipses"

by Pierre Barriot, Professor of Geophysics, University French Polynesia;
Head of the Geodesy Observatory of Tahiti

Modelling the solar diameter from light curves taken during solar eclipses

We present in this discussion the technique of light curves to model the solar diameter, one of the key to understand the inner working of the Sun, which is in dynamical equilibrium between its own weight and the pressure of radiation coming from its thermonuclear core. Basically, the light curve during a solar eclipse can be seen as a modulation of the Sun brightness from the disc center to the limb by the figure of the Moon, as a function of

the distance between the two bodies. The first main problem of this technique is the exact meaning of the diameter of the Sun, which is basically a ball of hot gases with no well-defined surface, the second main problem being the modelling of the absorption and scattering of the solar light by the atmosphere (mainly molecular scattering and aerosols absorption). We illustrate the discussion by results from three measurements campaigns, the first one in the Tuamotu archipelago (French Polynesia) in 2010, the second one in Queensland (North Australia) in 2012, and the third one in Gabon (Equatorial Africa) in 2013.

“The Legacy of Solar Telescope Designer George A. Carroll”

by John W. Briggs

Remembered among solar astronomers as a leading craftsman of modern instrumentation, George A. Carroll (1902-1987) was legendary in the Southern California telescope making community. In Texas at the age of sixteen, Carroll built and flew his own aircraft, becoming one of the youngest aviators in the United States. He eventually became an employee of Lockheed's "Skunk Works" in Burbank. His earliest known commercial telescopes were high-end amateur instruments built by R. R. Cook. As described in a brochure describing his later telescope work, he had "experience in so many branches of technology that it is unbelievable." By the time Carroll's designs were built by Thomas Tool & Die in Sun Valley, his telescopes were well known in the solar community and in use at National Solar Observatory, Caltech, and at many other research institutions. Among the most remarkable were large solar spars for Lockheed Solar Observatory in California and Ottawa River Solar Observatory in Canada. His instrumentation also equipped educational facilities including observatories at UCLA, Westmont College, Pasadena City College, Bevard Community College, and many others. A Carroll telescope boasting a particularly distinguished educational history was a small astrograph built in 1953 for Professor George Moyon of Hollywood and subsequently used for the long-running Summer Science Program in Ojai, California. Later solar instruments built by Carson Instruments were closely derivative of Carroll designs.

“When the eclipse comes home”

by Derryl Barr

In 1992 I made the happy discovery that in 25 years my hometown was due to hit the 375 year eclipse location lottery and land in the path of totality.

How would I go about reversing my whole eclipse experiencing process? How would I “be at home” for this coming umbral event? In this presentation I set about to illustrate the preparation – thus far 22 years in the making – of the host for a total solar eclipse adventure. The following considerations will be highlighted: What are the likely weather conditions in my region on eclipse day, and how good are our chances of actually seeing the eclipse? What plans for mobility if weather doesn't cooperate could be activated for both inter regional and local relocation? What additional activities of both a general and eclipse related nature are available to potential visitors? How can I best prepare the local population for both the events in the sky and on the ground? What local history, legends or traditions might fit into the eclipse experience? What groups are available to help spread the word and assist in bringing about a rewarding experience for all involved? Keeping always in mind: The Eclipse is Coming.

“Advanced Technology Solar Telescope: Science, Design and Current Status” (Now called the Daniel K. Inouye Solar Telescope)

by Stephen Keil, National Solar Observatory

The 4m Advanced Technology Solar Telescope (ATST) will be the most powerful solar telescope and the world’s leading ground-based resource for studying solar magnetism that controls the solar wind, flares, coronal mass ejections and variability in the Sun’s output. Because of the difficulty encountered in measuring magnetic fields on the Sun, they are the “dark energy” challenge for solar physics.

As its highest priority science driver, ATST shall provide high resolution and high sensitivity observations of the dynamic solar magnetic fields throughout the solar atmosphere, including the corona at infrared wavelengths. With its 4 m aperture, ATST will resolve features at 0.03 arcseconds at visible wavelengths and obtain 0.1 arcsecond resolution at highly magnetically-sensitive, near-infrared wavelengths. A high order adaptive optics system delivers a corrected beam to the initial set of state-of-the-art, facility class instrumentation located in the coudé laboratory facility. The initial set of first generation instruments consists of five facility class instruments, including imagers and spectro-polarimeters. The high polarimetric sensitivity and accuracy required for measurements of the illusive solar magnetic fields place strong constraints on the polarization analysis and calibration.

Development and construction of a four-meter solar telescope presents many technical challenges, including thermal control of the enclosure, telescope structure and optics and wavefront control. A discussion of the

science drivers and observational requirements of the ATST will be given, followed by a summary of the construction issues and status of the telescope and its instrumentation.

“Observing Solar Eclipse in Space: a dream that is coming true”

by Hamid Khodashenas

After observing seven total solar eclipses at seven continents in the last twelve years and making scientific documentaries about them; now, a solar eclipse in space is our next target. We are planning to provide a series of photographs and films to show the variations in solar corona, based on precise observations out of the earth's atmosphere during a cycle of solar activities. In parallel, we are going to set up the preliminary calculations to do such observation from the space.

Breathing an aesthetic perspective into the science will make it more appealing.

This attraction can be also used to absorb astro-tourists in the future. As a whole, we believe that the results of this project can be far beyond our current imagination; thus, we are going to call for contributions among the participants of this conference to improve this.

“The ISO Standard for Solar Viewers”

by Dr. B. Ralph Chou

The ISO standard for solar viewers was developed as part of the project to replace the outdated European standard for sunglasses and filters for direct observation of the Sun. The scientific rationale for the new international standard for solar viewers is presented.

“Outcomes of TSE 2012 in Australia and thoughts for 2017”

by Terry Cuttle

A great deal of planning and preparation was undertaken prior to the Total Solar Eclipse of 14 November 2012 in North Queensland. This included assisting the Queensland Government to prepare a safe eclipse viewing message; development of a school education program with booklets,

classroom activities and PowerPoint presentations; preparation of public information brochures and posters; assistance with planning to Local Authorities and Emergency Service; media briefings; site investigations and general advice to eclipse groups and the public. This presentation will examine the outcome of these activities, explaining what worked and what could have been improved. The focus of all this will be to assist those contemplating preparations for future eclipses suggesting opportunities and potential pitfalls. This is expected to be especially helpful with preparations for the 2017 North American eclipse which has many similarities to the Queensland eclipse.

“Techniques used and results of high resolution video obtained at the 2010 and 2012 TSEs”

by Nick James

The subject of my talk will be high resolution video imaging of eclipses. I will describe the techniques and equipment that I use and will discuss the various post-production and image processing approaches that can be adopted. I will cover some of the phenomena that are visible in the videos that I have produced, particularly the cloud shadow bands that were seen in 2010 and 2012. I'll also cover some equipment developments that I think will make a significant impact in the near future.

“Measurements of the solar edge and of the diameter of the Sun using total eclipses”

by SERGE KOUTCHMY, *Institut d'Astrophysique de Paris, UMR 7095, CNRS and UPMC, 98 Bis Bd Arago, F75014 Paris (France)*
CYRIL BAZIN, JEAN MOUETTE, JEAN-YVES PRADO, PHILIPPE LAMY,
PATRICK ROCHER AND JAIME VILINGA, *Paris IAP and IMCCE (France), Toulouse- CNES(France), Marseille LAM (France), Luanda (Angola)*

ECLIPSE OBSERVATIONS OF THE SOLAR EDGE AND IRRADIANCE VARIATIONS

The variation of the solar diameter and its value are the subject of hot debates due to the possible effect on the Earth climate and also because different interpretations of long period solar variability were given, including variations of the total irradiance. We shortly review the topic and show that rather long term variations, corresponding to a length well over a solar magnetic cycle, are interesting to consider. The very recently launched

mission "Picard" is entirely devoted to the topic but will just permit a short term evaluation. At the time of the last solar total eclipses of 2008- 13, several experiments were prepared to precisely measure the transit time of the Moon considered as an excellent cosmic etalon. In addition to the results collected using the specially developed eclipse photometers, new results were obtained using fast observations of flash spectra (slit less spectra), including their precise chrono-dating. Surprising new results will be illustrated and discussed. A new definition of the edge of the Sun, free of spurious scattered light effects strongly affecting all out of eclipse evaluations, is emerging from these observations, in agreement with the most advanced attempts of modeling the outer layers of the photosphere and its magnetism. The region near the minimum of temperature is indeed concerned as well as the definition of the edge of the quiet Sun where low first ionization potential (low FIP) elements produce a rich emission lines spectrum. Chromospheric high FIP emission lines extend further out from regions where the concentrated magnetic field is funning out making spicules and jets. We finally argue for a definite answer concerning the solar diameter measurement from eclipses based on a better precision of lunar profiles reconstructed from lunar altimetry space experiments like the Kaguya mission, which will be launched in the decades to come.

"Saros Maths"

by Ray Brooks

An appealing look at a familiar subject, Saros Series.

We will inspect a typical 18 year Saros step; not merely each eclipse but those New and Full Moons which were and will be eclipses.

"Lunar eclipse dust accumulations"

by Tom Murphy

After 40-plus years sitting on the lunar surface, reflectors placed by the astronauts have suffered a slow buildup of dust. Several lines of evidence point to this conclusion, the most convincing and dramatic being the behavior of the reflectors during lunar eclipse. The total lunar eclipse of Dec. 21, 2010 provided a cosmic light switch by which to test the hypothesis that solar absorption by dust was creating thermal gradients in the corner cube prisms comprising the reflector array. The resulting double-peak in reflector performance (at the beginning and end of total phase) to levels

never before seen at full moon served as convincing confirmation. Another total eclipse on April 15, 2014 will provide a second opportunity to study this phenomenon. This talk will tell the story of reflector degradation, highlight eclipse results, and discuss mechanisms for dust mobility on the Moon.

“Unique science with total solar eclipses”

by Shadia R. Habbal, Institute for Astronomy, University of Hawaii

Despite the current proliferation of space-based telescopes to observe the solar disk and the extension of the corona off the limb, there is a present a region of the corona that can be explored only with total solar eclipses. This region is where the complexity of the solar magnetic field unravels and where steepest gradients in the intensity of the emission occur. This region is thus essential for understanding the expansion of the solar atmosphere into space. This presentation will start with a brief overview of the advantages of total solar eclipse observations, and will follow with some key scientific discoveries that have taken place in the past 5 - 10 years.

“White-light observations and polarimetric analysis of the solar corona during the eclipse of 1 August 2008”

by Victor G. Fainshtein

In order to study the solar corona during eclipses, a new telescope was constructed in the ISTP SB RAS under the direction of Dr. V.I. Skomorovsky. Three coronal images were obtained simultaneously through a single objective of the telescope as the coronal radiation passed through three polarizers (whose transmission directions were turned 0° , 60° , and 120° in the chosen direction); one image was obtained without a polarizer. The telescope was used to observe the solar corona during the eclipse of 1 August 2008. We obtained the distributions of polarization brightness, K-corona brightness, the degree of K-corona polarization and the total polarization degree; the polarization direction, depending on the latitude and radius in the plane of the sky, was also obtained. We calculated the radial distributions of electron density depending on the latitude. The properties of all these distributions were compared for different coronal structures. We determined the temperature of the coronal plasma in different coronal structures assuming hydrostatic equilibrium.

"UMBGRAPHILLIC ESOTERICA: A Retrospective Beyond Science and Technology"

by Glenn Schneider

Thirty One. This (to date) is the number of times I have been privileged to stand (of fly, or sail) in the lunar umbral shadow. We (umbraphiles) mark the stages of our lives by those fleeting transcendental moments that quasi-periodically bring us into personal syzygal alignment with the Moon and Sun, responding to the siren's song of Totality. It's not the number that has meaning, but what we make of each TSE (or what it makes of us!). "Totality". The mere mention of the word fires neural pathways in the cerebral cortices of eclipse chasers that puts any other stimuli to shame. But WHY do we chase eclipses? Ask a hundred umbraphiles and you will get (at least) a hundred different answers. The diversity of TSE-related talks at this conference alone hint at the reasons many of us elaborate upon to friends, relatives, and colleagues our passion for all things TSE, often with focus on science, and technologies - but fueled by celestial grandure that can only be experienced and not explained or conveyed. By ask why do we REALLY chase eclipses and we admit (if not profess) that only in those instants of Totality, nature reveals itself to us as no other event within human cognition, with a depth that reaches into our psyche. Each totality is an umbraphillic opiate not only for the intellect, but for the soul. Science has motivated, technologies have enabled, but transcendental perception is what etches into our mind's eye and has us returning from Saros to Saros and node to node for more. (Let's face it, total solar eclipses are just plain cool). Today, we may be in a "Golden Age" of eclipse-chasing with the contemporary tools of technology and globally-collective wisdom at our fingertips. But, it is the product of our shared efforts (and addiction to coronal photons), that both bind us in spiritually in common conviction, and physically in co-location, in those isolated moments of space-time that celestial mechanics demands. This is not new, nor confined to our current generation. Umbraphillia has been with us long before the term has recently come into the popular vernacular, and will be along as the Sun will continue to shine, and occasionally be snuffed out at mid-day by the moon. Herein I offer some retrospectives from the fringes, as well as the main stream, of eclipse chasing enabled by science and technology.

"Two New Eclipse Canons and an Eclipse Website"

by Fred Espenak, Scientist Emeritus, NASA's Goddard Space Flight Center

The "Thousand Year Canon of Solar Eclipses" and the "Thousand Year Canon of Lunar Eclipses" should be in print by the time of the SEC2014 conference. These new publications are based on modern JPL Developmental Ephemerides for the Sun and Moon and feature larger eclipse maps and diagrams compared to those in the NASA "Five Millennium Canons." The author will share insights on print-on-demand books gained while developing these new eclipse canons.

He will also introduce a new website focusing on predictions of past and future eclipses. It is based on the best content from the NASA Eclipse Website, but will feature a completely redesigned and highly graphical interface for a more intuitive user experience. Much of the content will be derived from the new "Thousand Year Canons". The new website which is privately owned and maintained will be free from bureaucratic oversight and government shutdowns.

"Plans of the International Occultation Timing Association (IOTA) for 2017 (report from the Columbia Workshop) and Other "Eclipse" Opportunities"

by David Dunham, US

This presentation complements Richard Nugent's presentation on IOTA's work with measuring the solar diameter with solar eclipse observations. I will report on IOTA's involvement with the 2017 TSE Planning Workshop that was held in Columbia, MO on the 3rd anti-anniversary of the 2017 TSE. I will also give a quick overview of IOTA's work with asteroidal and lunar grazing occultations, events that provide opportunities for making interesting and valuable observations, and travel, between the relatively long intervals between central solar eclipses.

"Science at Recent Annular and Total Eclipses"

by Jay M. Pasachoff, Williams College and Chair, IAU Working Group on Eclipses, email: eclipse@williams.edu

I describe some scientific projects involving imaging and spectra that my colleagues, students, and I have carried out at the total solar eclipses of 2012 (Australia) and 2013 (Gabon) as well as with the Jansky Very Large Array at the annular eclipse of 2012 (New Mexico, USA). I discuss images and spectra over the most recent solar-activity cycle, stressing motions in the corona and coronal temperature measured from spectra.

I also describe the outreach and coordination web pages of the International Astronomical Union's Working Group on Eclipses: <http://www.eclipses.info>.

“Do we need scientific observations during total solar eclipses?”

by Vojtech Rušin, Astronomical Institute, Slovak Academy of Sciences,
059 60 Tatranská Lomnica, Slovak Republic

The solar corona - the upper most part of the solar atmosphere - is a medium that directly connects our nearest star, the Sun, with the Earth – through particles in the solar wind and magnetic fieldlines. Its scientific research began in 1860. This took place during a total solar eclipse when it was firmly confirmed that the corona is part of the Sun. According to our current knowledge, the corona consists of three independent components (electrons, ions and dust particles), is very tenuous ($\approx 10^8$ particles per cm^{-3}), hot (up to 5×10^6 K), dynamic and highly structured (loops, streamers, polar rays, coronal holes, etc.). These structures are created and maintained by solar magnetic fields, both global and local. Although the solar corona has been observed for a long time, by both ground-based and space-borne coronagraphs and at different wavelengths (X-rays, EUV and radio), some fundamental questions remain still unsolved, like heating mechanisms, origin of structures (helmet streamers, polar rays/plumes), their life-time, mass transport from the solar surface to the solar corona, acceleration of particles into the solar wind connected with individual coronal structures, distribution of fine coronal structures (around 0.5 arcsecs), etc. To solve these open questions we need more sophisticated instruments, mathematical methods of coronal data processing, cooperation between eclipse groups, both amateur and professional, as well as with other ground based and space observations during eclipses. A big progress has been done in studies of the emission coronal structures, and e.g. spicules type II, etc. The solar corona is an unusual mechanical system, constructed mainly out of magnetism. And, to fully understand this system, observations with a higher temporal, spatial and temperature resolution are needed!

Tatranska Lomnica, February 10, 2014

“Automation of Eclipse Contact Timing Modifications Using Digital Lunar Profiles”

by Bill Kramer, IAU/WGSE

Digital Lunar profiles have existed since the 1960s. They have been regularly enhanced through diligent occultation timings, mathematical corrections for systematic errors, and now space missions. What exists today is a detailed profile of the Moon through the entire libration cycle. This profile can be used to refine eclipse predictions once local circumstances are computed using traditional smooth limb methods. This talk provides an overview of an automated method utilizing digital lunar profiles to correct contact times at C2 and C3. Contact times for C2 and C3 are determined mathematically using a circular Moon and Sun for any given location. These contact times may be off by as much as 2 to 5 seconds because of the lunar profile. When high mountains exist near the position angle of contact then the photosphere is obscured for a few seconds longer. If a valley is found at that location, the photosphere is visible earlier. While methods have existed to determine contact time corrections since the early 1980s (Herald 1983) they required a human touch. A fully automated version of the same process was created in 2009 and made available to others through the Internet. The general process involved is explained during this talk (computer programming knowledge not required).

“The Old and the New: Thomas Jefferson’s solar eclipse, photographing eclipses through a pinhole and eclipse-induced waves in the ozone layer”

by Forrest M. Mims III

The most intriguing aspect of solar eclipses is the variety of observations and measurements that can be made of them. Consider that the solar eclipse of 1811 provided Thomas Jefferson with the best estimate of the longitude of his home, Monticello. Fascinating photographs can be made of eclipses by substituting the optics of a digital camera with one or more pinholes. Both bow and wake waves in the ozone layer have been observed during and immediately after solar eclipses. The presentation will conclude with a musical arrangement made by converting the intensity of sunlight before, during and after a solar eclipse into representative audio tones.

“Chasing Shadows”

by Nelson Quan

CHASING SHADOWS brings to light the little-known world of solar eclipse chasing, as told through a young Australian astronomer, Dr. Geoff Sims, who began chasing the Moon’s shadow during his days as an undergraduate in

2002. Geoff is part of a sub-culture of solar eclipse chasers who may fly, trek, and occasionally camp (at the mercy of sometimes harsh conditions), to position themselves in the right location at the right time just to observe, document and photograph "totality". Geoff has so far observed solar eclipses from remote parts of Australia, Turkey, Mongolia, French Polynesia, China and southern Ethiopia.

"More Morsels"

by John Tilley

This presentation has been inspired by Jean Meeus's collection of 5 books, "Mathematical Astronomy Morsels". These Meeus books could perhaps be renamed for this Conference - "Fascinating Facts about Solar (and Lunar) Eclipses". Don't let the word "Mathematical" put you off!

Within these volumes of "Morsels" there are some 100 articles on solar and lunar eclipses covering some 530 pages. Some of the topics are what you might expect - longest and shortest durations, the number of lunations between successive eclipses, the patterns the penumbral and umbral shadows make on the Earth, the saros and inx etc etc.

"More Morsels" will take one or two topics from Meeus and extend them and will also present one or two new morsels. The exact content is liable to change, but "More Morsels" will probably include - Solar eclipse visibility by country and continent; the hidden relationship between solar and lunar eclipses in the Leingartner diagrams and elsewhere.

There may well be one or two other morsels, some exercises to try at home and most definitely a brief quiz - but no prizes!

"Developing STEM lesson plans integrating Common Core standards in conjunction with the 2017 total solar eclipse"

by Charles N. Fulco, Port Chester Public Schools; State University of NY/Purchase College, Email: saros61@gmail.com, Phone: 914-552-0871

I describe ways that the K-12+ education community can learn in advance about the 2017 TSE, in order to properly plan and develop lesson plans integrating Common Core national standards for STEM. In addition, I discuss ways for districts and other institutions to dispel traditional mis-information,

myths and “bad” science regarding eclipses, while promoting “hands-on” methods of observation and recording this event.

“New Frontiers in Eclipse Cartography”

by Michael Zeiler, Eclipse cartography at eclipse-maps.com, technical writer at esri.com

Eclipse maps combine space and time to tell the story of the greatest show on Earth. I will tell the past, present, and future story of eclipse cartography through these topics:

- The evolution of eclipse maps from 1654 to the present through key historic maps.
- The utility of eclipse maps for guiding eclipse observers to a successful viewing of an eclipse.
- The information model of eclipse maps and how they communicate every predictable phenomena.
- The application of eclipse maps for expedition planning and site location.
- The artistry of eclipse maps and how the public can be inspired to seek this magnificent sight.
- Current developments in expressing high-precision predictions through eclipse maps.
- New forms of eclipse maps as animations and interactive web maps.
- And finally, an unveiling of a digital eclipse atlas I’ve been developing in collaboration with Xavier Jubier and Fred Espenak.

“Three Years of Eclipses: Where to Go?”

by Jay Anderson

The coming three years will be active ones for those wanting to stand under the lunar shadow, and the eclipse tracks span much of the globe in latitude. This presentation will discuss the weather prospects for 2015, 2016, and 2017, with emphasis on the latter two. The discussion will utilize satellite records of cloud cover, surface observations from sites along the track, and personal observations gathered during site surveys at locations along the shadow track of each of these events. The presentation will make recommendations for the best weather sites and provide tips to handle the weather on eclipse day.

“The Eclipse Megamovie Project”

by Scott McIntosh

The 2017 Total Solar Eclipse (TSE) presents us with a fantastic opportunity to observe the majesty of the solar corona in our own backyards, learn a little about our Star, engage the public, and to educate the next generation of budding astronomers and physicists on the age-old interaction of the Sun and the Earth. The Eclipse Megamovie Project (EMP) aims to bring these streams together by encouraging lay-observers and professionals alike to take images of the TSE in progress as it transits the continental US such that a million(+) frame movie of solar evolution over the 95 minute transit can be built. In the build-up to the big day, as well as on that day, we will be engaging the public about the Sun, safe eclipse viewing and all manner of things. We conducted a small test at the 2014 Eclipse in tropical North Queensland and I will discuss the outcomes and lessons learned from that experience as we begin to spin-up for the 2017 "Great American Eclipse". We would love to increase participation in our project and need your help.

“The Ultimate Chase Into the Stratosphere”

by Xavier M. Jubier, Member of IAU Working Group on Solar Eclipses,
Paris, France

The hybrid solar eclipse of 2013 was a unique opportunity to observe the circumsolar chromosphere and Baily’s beads, and at the same time try to determine the real shape of the Moon’s umbral shadow. To achieve the latest it was necessary to fly high above the Western Atlantic Ocean and into the tropopause, about a thousand kilometers east of Bermuda and near the transition point, to see the Moon casting its shadow onto the high cloud tops for a near-zero second eclipse. Planning and execution of such a demanding flight will be discussed during this presentation and we will then see what’s going to be done in 2015 at an even higher altitude in the lower stratosphere.

Biographies

Amateur Astronomers Group (AAG)

Stargazing Friday and Saturday night

The Amateur Astronomers Group (AAG) was founded in 2006 by a group of

dedicated amateurs to promote astronomy and science, technology and engineering in southern New Mexico. We work primarily with Oliver Lee State Park, however we have also traveled to support outreach events at other state and national parks in New Mexico, public and private schools in the area, along with public libraries. The AAG works with NASA's Night Sky Network, NASA's Space Place, Solar Dynamics Observatory and National Solar Observatory at Sunspot, NM to promote educational outreach in region and an appreciation of the night sky.



Roger Kennedy

Bringing Solar Science to School Children and the General Public

- Solar Outreach Coordinator for TAAS (The Albuquerque Astronomical Society)
- Outreach educator for CBSAP (The Charlie Bates Solar Astronomy Project)
- Member of the New Mexico chapter of the National Science Teachers Association
- Outreach Science Educator, Planetarium/Observatory of the New Mexico Museum of Natural History and Science
- 47 years of College and High School teaching experience
- Graduate Training and Advanced degrees from New Mexico Institute of Mining and Technology, West Chester University, Temple University, Bowling Green State University and College of the Atlantic.



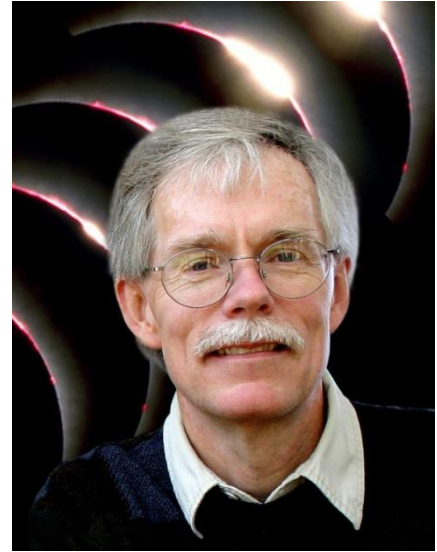
Fred Espenak

Photographing Solar Eclipses
Two New Eclipse Canons and an Eclipse Website

Fred Espenak is a scientist emeritus at Goddard Space Flight Center and is NASA's expert on eclipses. He maintains NASA's official eclipse web site (eclipse.gsfc.nasa.gov) as well as his personal web site on eclipse photography (www.mreclipse.com). Fred has published numerous books and

articles of eclipse predictions and he is the co-author of the popular book "Totality - Eclipses of the Sun". His magnum opus, the "Five Millennium Canon of Solar Eclipses", includes a map of every solar eclipse occurring between 2000 BC and AD 3000.

His interest in eclipses was first sparked after witnessing a total solar eclipse in 1970. Since then, he has participated in 34 eclipse expeditions around the world including Antarctica. Fred's eclipse photographs have appeared in both national and international publications, and he has lectured extensively on the Sun, eclipses and photography. In 2003, the International Astronomical Union honored him by naming an asteroid "Espenak" http://solarsystem.nasa.gov/news/display.cfm?News_ID=5019



Now retired and living in rural Arizona, Fred spends most clear nights losing sleep and photographing the stars (www.astropixels.com).

B. Ralph Chou

The ISO Standard for Solar Viewers
How to observe the eclipse safely with
eclipse glasses

Dr. B. Ralph Chou is Professor Emeritus of Optometry and Vision Science at the University of Waterloo School of Optometry and Vision Science in Waterloo, Ontario, Canada. His research interests are industrial and environmental eye protection, particularly from impact and optical radiation hazards. He has been a consultant to industry and the Government of Canada on eye protection against ultraviolet radiation. He serves on several standards technical committees of the Canadian Standards Association and the International Organization for Standardisation, and as a member of the Eclipse Information Committee of IAU Commission 46. He was a contributor to the NASA eclipse bulletins from 1997 to 2010. Following his second 4-year term as President of the Toronto Centre of the Royal Astronomical Society of Canada, Ralph is now the Co-Chair of its David Dunlap Observatory



Management Committee, conducting public outreach programmes with Canada's largest optical telescope.

Joerg Schoppmeyer

Solar Eclipses at Sunrise/Sunset, special effects

Jörg was born on May 9, 1966. After the eclipse May 30, 1984 he started computer programming to have predictions for future eclipse. Programming was very easy for him so from 1986-1992 he studied computer science with a focus on compiler building and massive parallel algorithms on transputer cpu's. Since 1992 he works for kühn&weyh Software

GmbH (k&w) , a typical German medium-sized business. k&w is a software producer for enterprise output management solutions (OMS) , the headquarter is in Freiburg, Germany and they have a branch in Pilsen, Czech Republic. Since many years Jörg is part owner, CEO and Head of Development at k&w.



Jörg is addicted to astronomy and an eclipse chaser since 1976. His first real expedition was for the annular eclipse May 30, 1984, which he observed successfully at sunset in Morocco. Since then he has observed 40 solar eclipses, 13 total, 13 annular and 14 partial eclipses. He also observed 26 total and 10 partial lunar eclipses. For 10 years from June 2001 to June 2011 Jörg observed respectively traveled for every solar and every umbral lunar eclipse. This series was interrupted by the solar eclipse July 1, 2011 which was only observed by satellites.

With a very few exceptions all travel is organized by himself and "payed" with miles and points (frequent flyer miles). In 2012 he made a self-organized round the world tour for a solar eclipse, a lunar eclipse and the venus transit. Involved were 4 airlines and altogether 800.000 points were burned for this once in a lifetime journey.

Jan Sladeczek

Solar Eclipse Observation: My Experience

I was born in Prague. I have been living here up to now.

I studied geography at the Faculty of Environment of Charles University. Within Geography I studied meteorology and environment. I visited the lectures of astronomy at the faculty of mathematics and physics.

I graduated in 1986 and started to work at the Czech Hydrometeorological Institute of Air Quality Department. In 1989 I passed the doctoral examination. My profession is Air quality specialist. I concentrated especially on problems of Air quality monitoring network and verification of air quality data.



My interest on the astronomy started at the secondary school in 1980. During the study at the Charles university I often visited planetarium and observatory in Prague. Since 1990 I have been the member of Czech Astronomical Society (CAS). My main interest was planetology and astronautics. I have been member of Astronautical and Planetary sections of CAS. My free time job was consumer electronics.

Since 1999 I have started to observe Total Solar Eclipse. I specialized on the observation and the photography of Solar Corona. I travel to Solar Eclipse round the world. I feel as astrophotographer and I try to photograph Solar Corona always on a higher level for later processing. Since 2009 I have been the member of Solar section of CAS.

Kris Delcourte

Landscape Eclipse Photography

Kris Delcourte studied Mathematics with a specialization in Astronomy at the Catholic University of Leuven (Belgium). In 1980, during his promotion year, he travelled with some fellow students to Kenya to observe his first total solar eclipse.



After graduating in Astronomy, he did a second degree in Computer Science. Professionally, he worked for many years in the ICT sector, mostly managing developments of applications related to the Air Traffic Flow Management of Europe.

Since 2011, he joined Europe's Air Traffic Management (ATM) research program: the Single European Sky.

Ever since he witnessed his first eclipse in 1980, Kris became passionate towards this great natural phenomenon and was continuously looking forward to see one eclipse after another. In total he has experienced 14 total and 5 annular eclipses.

Since 2009 Kris is leading the working group "Eclipses" from the Belgian amateur astronomy society (called VVS).

Kris is also an experienced photographer and graduated in photography after doing part-time evening courses from the Academy of Fine Arts in Leuven (Belgium). You can find his works regularly posted at the site:

<http://www.flickr.com/photos/krisdelcourte/sets/>.

Jean Pierre Bailliot

Modelling the solar diameter from light curves taken during solar eclipses

Jean-Pierre Barriot is full professor of Geophysics at the University of French Polynesia (capital city of Papeete, URL: www.upf.pf), and head of the Geodesy Observatory of Tahiti, a joint observatory of NASA, CNES and UPF. He is (and was) involved in several space missions in collaboration with NASA to explore Venus, Mars and asteroids. He participated in photometric measurements during the solar total eclipses of 2010 (Tuamotu), 2012 (Queensland) and 2013 (Gabon).



John W. Briggs

The Legacy of Solar Telescope Designer George A. Carroll

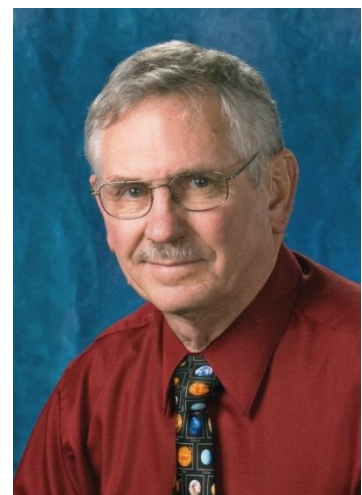
John W. Briggs is Astronomer in Residence for the Michele and David Mittelman Family Foundation at the HUT Observatory near Eagle, Colorado, USA. John's present work includes CCD photometry for asteroid rotation studies, seeing measurement with differential image motion monitors, solar system astrometry, and educational projects involving schools, science centers, and related organizations. He is also active in the history of astronomy, especially regarding history of telescopes and related instrumentation. Recently a visiting scientist at Phillips Academy in Andover, Massachusetts, John served for many years as an instrumentation engineer based at the University of Chicago's Yerkes Observatory. Among projects during that time were pioneering experiments with sodium laser guide "stars" now commonly used in adaptive optics; instrument commissioning for the Sloan Digital Sky Survey; field engineering for the Advanced Technology Solar Telescope Site Survey; and three visits to Antarctica, including a winter-over at South Pole Station for Chicago's Center for Astrophysical Research in Antarctica. In earlier days John served as a parallax observer at Wesleyan's Van Vleck Observatory. In residence at Mount Wilson, he observed chromospherically active stars for the long-running HK Project. He also served as an editor at Sky & Telescope magazine in Cambridge, Massachusetts, and is a past president of the Antique Telescope Society. John conducts the Hartness House Workshop series in conjunction with the annual Stellafane convention in Springfield, Vermont. A current project underway is to relocate a 95-cm Boller & Chivens observatory reflector from its original site at Princeton University to a new dark site in the Cloudcroft, New Mexico, area.



Derryl Barr

When the eclipse comes home

Derryl Barr has been interested in astronomy nearly his whole life. Some of his astronomical highlights are first observing Saturn in a newly acquired 3" reflector in August of 1958, attempting to observe partial phases of the 1970 March total solar eclipse, observing totality for the first time in 1991, and observing both 21st century transits of Venus. When he discovered that his hometown of North Platte, Nebraska, lay in the path of totality in 2017, he set about to determine both the chances of successful observation from the



general region, and the overall quality of the observing experience that the region could provide.

Stephen L. Keil

ATST (Advanced Technology Solar Telescope)



Dr. Stephen L. Keil was director of the National Solar Observatory from May 1999 through July 2013. Currently he is a research scientist at the National Solar Observatory. In addition to leading the NSO, he served as the Project Director for the Advanced Technology Solar Telescope (ATST) from 2003-2011. The ATST is a 4-meter aperture solar telescope currently under construction that will revolutionize our understanding of magnetic process on the sun that lead to solar variability and activity that impact the earth and space environments. Prior to joining the NSO, Dr. Keil led the Air Force's Solar Environmental Disturbances task for 16 years. His research interests include the interaction of waves and convection with magnetic fields in the solar atmosphere, the origins of solar activity, the launch and propagation of coronal mass ejections, and the development of predictive models for space weather forecasting. He served as the program manager for the joint AF/NASA/University of Birmingham (UK) Solar Mass Ejection Imager which flew on the joint Navy/Air Force Coriolis Satellite and he was a co-investigator on the Flare Genesis balloon mission sponsored by NASA, the National Science Foundation, and the Air Force which flew in Antarctica. Dr. Keil is a 1969 graduate of the University of California, Berkeley, with a major in physics and a commission in the Army Corps of Engineers. He received his A.M. (1971) and Ph.D. (1975) from Boston University in Physics and Astronomy. He held several fellowships, including 18 months at the University of Sydney in Australia and a National Research Council Fellowship at Sacramento Peak, before joining the Air Force's Solar Research Branch as a Captain, USAF, in 1980. He was Chief of the Branch from 1983-1996. Dr. Keil has over 80 publications in the scientific literature.

Hamid Djodeiri Khodashenas

Observing Solar Eclipse in Space: a dream that is coming true

Hamid Djodeiri Khodashenas was born in 1963 in Tehran, Iran. He is a lawyer, and has been an active eclipse chaser since 1999. His deep passion

for observing eclipses of the sun led him to found the first Iranian eclipse chasing institute called Sayeh. Sayeh, shadow in Farsi, is set to be a place to promote interest in solar eclipse observation and other astronomical activities among Iranian amateur astronomers. His institute aims to research solar eclipse effects on the earth and its creatures.



He observed and documented the 1999 totality from the remote lake of Gahar in Iran, the 2001 totality from Zimbabwe, the 2003 totality from Antarctica, the 2004 transit of Venus from Iran, the 2005 hybrid in the Pacific Ocean near the Galapagos islands, the 2006 totality from Niger, the 2008 totality from the Arctic, the 2009 totality from Fiji and Kiribati, the 2010 annular solar eclipse from Myanmar (Burma) and the 2013 hybrid from Kenya.

Going on these trips and experiencing nature in different parts of the world has made him an avid nature photographer. His photos have been shown in several exhibitions in Iran. He has taken over 40,000 solar eclipse and nature photos in his expeditions to all the seven continents around the world.

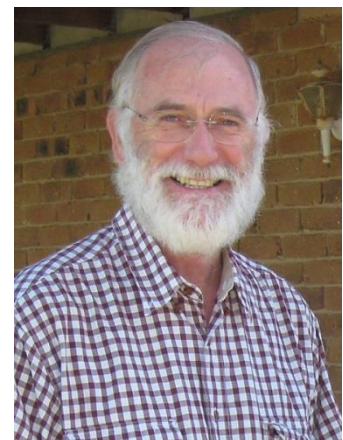
Sayeh research institute is now planning on its first observatory which is going to be located on the top of a mountain in north of Iran in 3000m altitudes.

Also, he was the only foreigner who lectured in The Astronomical League of 2005 in Kansas City, USA. Tai Chi and playing the harp have assisted him to materialize his deep affection, which is bringing science and art together. Additional information may be found at: <http://www.mreclipse.ir/> and <http://www.shadow-chasers.net/> Email: hkhodashenas@gmail.com

Terry Cuttle

Outcomes of TSE 2012 in Australia and thoughts for 2017

As the resident umbraphile, Terry was responsible for much of the planning and preparation for the 2012 Total Solar Eclipse in North Queensland. He assisted the Queensland Government to develop and issue a safe eclipse viewing message; he coordinated and developed much of the school education program



material focused on the eclipse; he was a member of the Cairns Eclipse Task force assisting Local Authorities and Emergency Service plan for the eclipse; undertook eclipse media briefings and numerous radio and TV interviews as well as providing local advice to eclipse travelers, tour groups and the general public.

A retired engineer, Terry is a keen amateur astronomer and astrophotographer and is the current President of the Astronomical Association of Queensland. He is a keen umbraphile with a passion for travel to and observing eclipses and undertook the 2012 eclipse preparations as a way of repaying the many others whose advice and assistance he has relied on when travelling to and observing previous eclipses.

Nick James

Techniques used and results of high resolution video obtained at the 2010 and 2012 TSEs

B.Sc., MIET, C.Eng

I have been interested in astronomy for as long as I can remember, certainly since the age of 8. I have been a member of the British Astronomical Association since I was 12 and now serve as its papers secretary. I am also an Assistant Director of the BAA's Comet section and Assistant Editor of The Astronomer Magazine. I have written many articles for magazines and books, and co-authored Observing Comets which was published in 2003 as part of Sir Patrick Moore's Practical Astronomy series.



Professionally, I am an engineer in the space industry, leading a team responsible for implementing highly sensitive and accurate systems for receiving and processing signals from deep-space spacecraft. This keeps me pretty busy but it provides sufficient funding to allow me to indulge in regular eclipse chasing expeditions.

So far I have been under the umbra or antumbra 14 times (3 annular, 11 total, only two of which, including the UK eclipse in Cornwall, were totally clouded out) and has used video to document the events. This started with simple analogue video cameras but more recently I have been using DSLRs in HD video mode attached to a telescope. During the 2010 Total Eclipse from Hao I was one of the first people to obtain an HD video of shadow bands projected onto thin clouds.

Serge Koutchmy

Measurements of the solar edge and of the diameter of the Sun using total eclipses



Dr d'Etat es science (1972). Position now: Directeur de recherches emeritus at Institut d'Astrophysique de Paris, UMR 7095, CNRS (Section 14) & UPMC. Address: Institut d'astrophysique de Paris 98 Bis Bd Arago; F- 75014 Paris. Tel. 33144328056; email: koutchmy@iap.fr

1 Main positions

1967 Assistant, Paris Observatory

1968 Research fellowship, Centre National de la Recherche Scientifique

1978 Permanent position in CNRS (tenure/charge de recherche)

1992: Directeur de Recherche (DR) in CNRS(France)

2006- now : Directeur de recherche émérite CNRS

Fellowship/Awards: AFGL/Sacramento Peak Observatory-NM(USA) 1976-78

Senior Research Associate at NSO/SacPeak Observatory 1986-88; NAOJ-Mitaka in 1995.

2. Main contributions to research:

- * Successfully observed 20 Total Solar Eclipses at ground, over ground and oceans, using aircrafts (including the Supersonic Concorde 001) and in space; models of F-corona and of coronal structures, including the finest structure; spectra; polarization; tangential magnetic discontinuities; 3D streamers and sheets; active regions linear threads; emission line profiles, velocity/ temperature structure, coronal mass eruptions; prominences.

- * Developed several solar IR experiments at Pic du Midi Observatory; 1st absolute measurements of solar intensities at 18 to 24 microns- 1968; 1st sunspot photometry at 3.75 microns;

- * Developed IR photometry at Sacramento-Peak Obs. VTT (1977); umbral dots; faculae; network magnetic elements;

- * Developed a prominence magnetograph on the largest existing coronagraph- 53 cm aperture- of the USSR Kislovodsk High Altitude Observatory (1980-82); V- Stokes magnetic field measurements and Doppler- Fizeau effects in prominences;

- * P.I. of the space borne experiment 'Night Sky Imaging' and co-I of PIRAMIG for the flight of the Saliout 7 (1982) ST of the 1st French Spationaute; 1st observation of the inner zodiacal light; Earth atmospheric effects including twilight effects and mirages.

- * Developed the 1st mirror coronagraph at NSO/SP (1987); 1st optical coronal emission line image ever made with a mirror coronagraph;
- * Co-I of the C2/Lasco coronagraph of SoHO (1988); design of the SWATH space borne mirror coronagraph (NASA);
- * P.I. of the CFHT-91 eclipse coronal experiment on Mauna-Kea to point the largest optical telescope ever used toward the Sun; best resolution ever achieved of an image of the W-L corona; movie and dynamics of a 2 arcsec diameter coronal plasmoid;
- * Performed 1st observations of SXR polar jetlets using the SXT of Yohkoh-96 at ISAS-Japan; more observations with the XRT of Hinode, TRACE, AIA of SDO and IRIS mission.
- * Performed 1st measurement of the solar prolateness at NSO/Sacramento-Peak Observatory (1997-98) using VTT (DST) images and spectra.
- * co-I Solar Probe exp-t of NASA (2000), Lyot- SMESE and ASPIICS proposal of CNES & ESA (2004-6).
- * P.I. of several cooperative projects (2000-2015) in astrophysics and solar energy, including facilities in Egypt, Iran and Angola.
- * 1st analysis of chromospheric spicule coherent components including waves using the SOT of Hinode (Japan). Spectra at eclipses (2010-14).
- * Main adviser (directeur de these) of more than 12 PhDs (1974- to now) and of more than 20 Master thesis.

3. International Audience

Medal of the USSR Space Agency (1982) and the French Space Agency CNES (1983); Medal Janssen, French Academy of Sciences (1993); Price Janssen of the French Astronomical Society (1998); elected member of the Marquis "Who's Who in the World", 20th edition (2003) for "outstanding achievements in his field".

4. Most significant publications

More than 450 scientific papers selected from 1967 to now in NASA Astrophysics Data System, half in refereed journals; more general public papers and many eclipse images published.

Books: "Total Eclipses", 1998, Masson Ed. 300p (in French); re-edited and translated in English at Springer-Praxis Series in Astron. (1999), etc. Participation as invited contributor and/or chairman in the writing of 8 books, starting with the Illustrated Solar Glossary- Riedel Pub. (1978), part "solar corona".

Five selected papers over 45 years: "Morphological Particularities of the Solar Corona" (1969) in Astrophys. Letters, 3, 215-220; "Study of the June 30, 1973 trans-polar coronal hole" (1975) in Solar Phys. 51, 399-410 ; "Short Periods coronal oscillations: observations and interpretation"(1983) in

Astron. Astrophys. 120, 185-191 ; "Space-borne Coronagraphy" (1988) in Space Science Review, 47, 95-143 ; "Coronal Streamers" (2000), in "The Encycl. of Astron. Astrophys." 5 vol., Institute of Physics Pub., England.

Ray Brooks

Saros Maths

Ray is a retired nuclear engineer who has been interested in eclipses since age 8.



He lives in Arizona Sky Village at 4600' in dark skies.

He has spent most of his time in the last few years studying the physics of Earth's atmosphere which he intends to publish in 2014.

Tom Murphy

Lunar eclipse dust accumulations

Tom Murphy cut his teeth as an amateur astronomer in Tennessee, twice traveling to the Texas Star Party and later to Mexico for the July 1991 total solar eclipse. With undergraduate and graduate degrees in physics at Georgia Tech and Caltech, respectively, Murphy traded his 10-inch telescope for 200-inch and 10-meter instruments, building an integral field spectrograph operating in the infrared at the Palomar 200-inch telescope to study colliding galaxies. After graduate school, Murphy went to the University of Washington in Seattle to begin a project to subject General Relativity to the most stringent tests yet via the technique of lunar laser ranging (LLR). In 2003, Murphy carried this project to UCSD where he is now an associate professor of physics. The Apache Point Observatory Lunar Laser-ranging Operation (APOLLO), operating on the 3.5-meter telescope near Sunspot, NM, now routinely achieves one-millimeter range precision between the Earth and Moon.



Shadia Habbal

Unique science with total solar eclipses

Shadia Rifai Habbal is currently a professor at the Institute for Astronomy of the University of Hawaii. She has led eclipse expeditions since 1995. She is also a scientific editor for the Astrophysical Journal. Her expertise is in the modelling the solar wind and analysis of coronal observations.



Victor Fainshtein

White-Light observations and polarimetric analysis of the solar corona during the eclipse of 1 August 2008

Fainshtein Victor Grigoryevich, Leading Researcher of the Institute of Solar - Terrestrial Physics of the Siberian Branch of the Russian Academy of Sciences (ISTP SB RAS). I was born in Irkutsk (Russia) on January 31, 1946. In 1969, I graduated from the Department of Physics of Novosibirsk State University. I have been working in ISTP SB RAS since December 1971. Until 1986, I was engaged in research of the phenomena in laboratory plasma which can play a role in space plasma. My Ph.D. thesis was devoted to the study of expansion of collisionless plasma in vacuum. Since 1986, I have been engaged in the analysis of data in the field of solar and solar-terrestrial physics. In 1999, I defended thesis for a Doctor's degree on the topic "The solar wind: some regularities of formation near the Sun, propagation in interplanetary space and interactions with the Earth magnetosphere". My scientific interests now are the solar corona, coronal mass ejections, and solar and interplanetary sources of geomagnetic storms. I am the author of more than 200 publications.



Glenn Schneider

UMBGRAPHILLIC ESOTERICA: A Retrospective Beyond Science and Technology

Dr. Glenn Schneider is an Astronomer at University of Arizona's Department of Astronomy and Steward Observatory where, since 1994, he has served as the Project Instrument Scientist for the Hubble Space Telescope's Near Infra-red Camera and Multi-Object Spectrometer. He is the Principal Investigator for the EXoplanetary



Circumstellar and Disk Explorer (EXCEDE), a proposed EX class explorer mission selected by NASA for, and undergoing, technology development and maturation. His research and instrumental interests are primarily centered on the formation, evolution, and characterization of extrasolar planetary systems, and high contrast space-based (coronagraphic) imaging systems. His studies have focused on the direct detection of sub-stellar and planetary mass companions to young and near-by stars and the circumstellar environments from which such systems may arise and interact. In concert with his scientific investigations of circumstellar dust and debris disks and co-orbital bodies they may harbor, he has played a leading role in the development of very high contrast space-based coronagraphic and near-infrared imaging systems and techniques with HST, leading to spatially resolved scattered light images the birthplaces of planetary systems. Dr. Schneider is a member of the International Astronomical Union's Working Group on Solar Eclipses with expertise in the high-precision numerical calculation of eclipse circumstances and the application of those computations in planning and carrying out observations of total solar eclipses. For more than four decades, Dr. Schneider has lead expeditionary groups and conducted such observations on land, sea and air of thirty-one total solar eclipses occurring since 7 March 1970 from remote locations across the globe conducting direct, polarimetric, and spectrophotometric imaging programs. Additionally, he has executed five, and planned many more, high-altitude eclipse intercepts with jet aircraft and is now preparing for his next stratospheric eclipse flight, for TSE 2015, over the Norwegian Sea. Additional information on his background and research interests may be found at : <http://nicmosis.as.arizona.edu:8000>

David Dunham, US

Plans of the International Occultation Timing Association (IOTA) for 2017 (report from the Columbia Workshop) and Other "Eclipse" Opportunities

Dr. Dunham obtained his BA degree at the University of California, Berkeley in 1964 and a PhD at Yale University, Astronomy Department in 1971. He now works part-time on spacecraft trajectory design with KinetX Aerospace, Inc. His research has included the fields of celestial mechanics, astronautics, solar eclipse prediction, observation and analysis, and lunar and asteroidal occultations. After writing the first computer programs for lunar grazing occultations, David established the worldwide network of observers for grazes starting in 1962. This was formalized in 1975 with the



founding of the International Occultation Timing Association (IOTA), of which he was president from 1975 to 2013. David coordinated and video recorded the first confirmed lunar meteor impacts during the Leonid storm that hit the Moon on November 18, 1999.

Jay M. Pasachoff

Science at Recent Annular
and Total Eclipses

Williams College and Chair, IAU
Working Group on Eclipses

Jay M. Pasachoff is Field Memorial
Professor of Astronomy at Williams

College, where he teaches the astronomy survey courses as well as advanced seminars and works with undergraduate students on a variety of astronomical research projects, including one studying the atmosphere of Pluto. He is also Director of the Hopkins Observatory and Chair of the Astronomy Department there. Pasachoff received the 2003 Education Prize of the American Astronomical Society and the 2012 Janssen Prize of the Société Astronomique de France. He is an honorary member of the Royal Astronomical Society of Canada.



Pasachoff has observed 59 solar eclipses. He is Chair of the Working Group on Eclipses of the International Astronomical Union. His research is currently sponsored by the National Science Foundation, NASA, and the National Geographic Society. His studies of the sun include ground-based and space-based observations of the solar corona and chromosphere. In addition, he is collaborating with colleagues to observe occultations of stars by Pluto, Charon, and other objects in the outer parts of the solar system. With Glenn Schneider, he is studying transits of Venus and Mercury. Further, he works in radio astronomy of the interstellar medium, concentrating on deuterium and its cosmological consequences.

At the time of the fateful General Assembly of the International Astronomical Union at which Pluto was placed in a new category called dwarf planet, he was president of its Commission on Education and Development. He is coeditor of *Teaching and Learning Astronomy : Effective Strategies for Educators Worldwide* (2005).

Pasachoff is coauthor of *The Cosmos : Astronomy in the New Millennium*, 4th Edition (2014), and author of the *Peterson Field Guide to the Stars and*

Planets, 4th edition (2015 printing with expanded 2017 coverage including maps from Fred Espenak, Michael Zeiler, and Jay Anderson, in press, 2015), as well as author of *Astronomy : From the Earth to the Universe*, 6th edition (2002). His books about the sun include *Nearest Star : The Exciting Science of Our Sun*, 2nd edition (2014) and *The Solar Corona*, 2nd edition (2010, both with Leon Golub as coauthor; and *The Complete Idiot's Guide to the Sun*. See <http://www.solarcorona.com/>. Pasachoff and Jay Anderson are coauthors, with John Day, for the forthcoming *Peterson Field Guide to Weather* (2015). With the 2013 eclipse in Gabon, he completed an exeligmos.

Vojtech Rušin

Do we need scientific observations during total solar eclipses?

Astronomical Institute, Slovak Academy of Sciences,
059 60 Tatranská Lomnica, Slovak Republic



I was born in Spisske Hanusovce, Slovakia, on January 7, 1942. Since 1959 I have been working at the Astronomical Institute of the Slovak Academy of Sciences (AI SAS) in Tatranska Lomnica, Skalnaté Pleso and Lomnický štít observatories. I graduated from the Comenius University, Faculty Mathematics and Physics, specialization Astronomy, Bratislava in 1970, In 1975 I obtained an RNDr. degree from the Charles University in Prague, in 1978 a PhD. degree and in 1994 a DrSc. one, both from the Slovak Academy of Sciences.

I have been actively engaged in the solar research for most of my scientific life, specializing in the solar corona structures and dynamics, dynamics of prominences, and solar-terrestrial research. Observations of the emission coronal lines 530.3 and 637.4 nm and prominences were performed at the Lomnický štít coronal station with a 20-cm lens coronagraph. Starting in 1973, I have participated in 20 expeditions to observe total solar eclipses in many countries around the world (Niger, India - 2, Indonesia, Russia-2, Mexico, Chile, Mongolia, Venezuela, Turkey, Zambia, South Africa and Pacific Ocean-Galapagos Legend, Marshall Islands, French Polynesia, Australia and Gabon). The main scientific achievements were presented in 220 scientific papers (mostly published in internationally-recognized journals), 80 talks and 6 books (in Slovak). The papers are almost exclusively based on my own observations, made at the Lomnický štít coronal station and/or during solar eclipses. I have given more than 1300 lectures for the public and written many popular papers.

During the period 1995-2005 I was a member of the Presidium of the Slovak Academy of Sciences. I am also a member of the IAU, the Czech Astronomical Society-honorary (2013), the European Astronomical Society, and AGU. I was a vice-director of the AI SAS from 1993 to 1997.

The most important awards: the Governmental Pribina Cross of the second rank (2008), an SAS award for science (1989) as a team member of 3 co-workers, and an SAS award for popularization of science (1982 and 2005), a Gold prize of the Slovak Astronomical Society (1984), and asteroid 26390 is honored with name RUSIN.

Bill Kramer

Automation of Eclipse Contact Timing Modifications Using Digital Lunar Profiles

Bill has been keenly interested in solar eclipses since 1970 when he watched a partial eclipse during a swim meet (and almost missed his favorite event) from Ohio in the USA. On board the TSS Olympia in 1972 he watched his first total solar eclipse and marveled at the precision of the prediction. That began an interest in to how eclipses were predicted that coupled well with his studies in computer science.



Bill has seen fifteen total solar eclipses (from the sea, in the air, and on land). He is a member of the IAU Working Group on Solar Eclipses and currently runs the www.eclipse-chasers.com web site where eclipse chasers can log their experiences, share images, and calculate circumstances for up coming eclipses.

In 1985 Bill started a computer consulting business specializing in CAD/CAM/CAE. For 20 years he was a regular author for CADENCE and then CADALYST magazines and wrote half a dozen books about computer programming for engineers. Bill retired from his business and now splits his time between Ohio and Jamaica where he still enjoys programming computers and observing. He is a member of the Astronomical Association of Jamaica and past president of the Columbus Astronomical Society in Columbus Ohio.

Forrest M. Mims III

The Old and the New: Thomas Jefferson's solar eclipse, photographing eclipses through a pinhole and eclipse-induced waves in the ozone layer

Forrest Mims, an amateur scientist whose research has appeared in leading scientific journals, detected waves in the ozone layer during the solar eclipses of July 11, 1991, and May 10, 1994. He used a pinhole camera to photograph the annular eclipse of May 20, 2012. Mims is the most widely read electronics author in the world. His 50+ books have sold over 7.5 million copies. Mims is a Rolex Award recipient, and he was named one of the "50 Best Brains in Science" by Discover Magazine. His science is featured at www.forrestmims.org



Nelson Quan

CHASING SHADOWS

Director Nelson Quan is a Chinese-American filmmaker based in Beijing, China and Honolulu, Hawaii, USA. His passion for solar eclipse chasing began back in 2008 when he saw his first total solar eclipse in Weinan, China. Then again in 2009 in Wuhan, China. Most recently, astronomer, Geoff Sims, invited him to help document the 2013 total solar eclipse in southern Ethiopia.

Nelson's most recent work was at visual effects company, Pixomondo, working as the lead editor on a documentary/web-series project with Volkswagen called *The People's Car Project*, which won the Golden Lion award at the 2013 Cannes film festival for branded content. He got his start working as a production intern on Bryan Singer's *Superman Returns* movie in 2005. Later he edited a Chinese remake of Hollywood's *What Women Want* starring two of China's biggest stars: Andy Lau and Gong Li. He has also directed *Humble Beginnings* and produced the feature film, *The Criminally Inept* which were official selections at the Hawaii International Film Festival 2004 and 2006 respectively.



*Pixomondo is winner of the 84th Academy Award ® for Best Visual Effects 2011 for Hugo; also the 64th Primetime Emmy Awards ® for Outstanding Special Visual Effects 2012 for Game of Thrones.

John Tilley

More Morsels

John's earliest astronomical memories are of the launch of Sputnik and watching the partial phases of the 1961 solar eclipse from the UK.

After graduating from Cambridge with a degree in Mechanical Sciences, he spent the next 15 months working in Japan, studying the oriental board game "Go" and then helped invent the "gap year", travelling in the far east and Himalaya, before joining IBM UK, where he spent some 34 years, in a variety of software technical positions. Prior to taking early retirement in 2005 he was EMEA Technical Sales Manager for IBM's Data Management products.



His interest in solar eclipses was rekindled by the 1999 total eclipse, so he bought two of Jean Meeus's books and given his interest in maps, recreational mathematics and technical challenges in general, he started to write a program to look at both eclipse maps and Mathematical Astronomical Morsels.

John presented at SEC2004, with Luca Quaglia, showing an early version of "Solar Eclipse Explorer" and an extended saros-inex panorama for a period of 26000 years. In 2005 John produced the first kml files for a solar eclipse < the 2005 October annular> for use with the very first version of Google Earth. He had a paper accepted for SEC2007 on "Eclipse Mapping, On and Off the Web", which became a joint presentation with Xavier Jubier, but unfortunately he was unable to travel due to family illness. When preparing a slide for SEC2007, showing the track of the 2008 total eclipse, using four different sets of data and different ephemeris, he noticed that the centre line track using the NASA data was some 200 metres away from the other three. John worked with Luca Quaglia and helped resolve this problem.

John has always suffered from having too many hobbies and interests, as a result his eclipse programs all seem to be permanently stuck at "90% complete"; however the long lead time into SEC2014 has focused him on

getting something that does much of what he wants and allows him to present some more solar eclipse "Mathematical Morsels".

John's favourite astronomical memories include watching the 2004 Transit of Venus on the beaches of D-Day with his father, the shadow bands at Jalu in Libya and the spectacular storm that followed the 2009 eclipse in China, the clouds having co-operated for exactly the right six minutes.

Charles N. Fulco

Developing STEM lesson plans integrating Common Core standards in conjunction with the 2017 total solar eclipse

Director of Space & Environmental Sciences, Port Chester Public Schools, Port Chester, NY



Section Leader, International Dark-Sky Assoc. (Westchester County, NY)

Charles Fulco is a science teacher and planetarium director ([FB: Port Chester Planetarium](#)) at Port Chester, NY Public Schools, an adjunct professor of English at Westchester County Community College, and a local chapter leader in the International Dark-Sky Association (<http://www.darksky.org/>)

Charles first became interested with solar eclipses in March 1970, when the NY area was immersed in a 96% partial eclipse, but didn't get to see his first TSE until "The Big One" at Tuxpan, Mexico, in 1991. Since then, he's seen three more on three other continents, most recently the 2010 TSE over Patagonia.

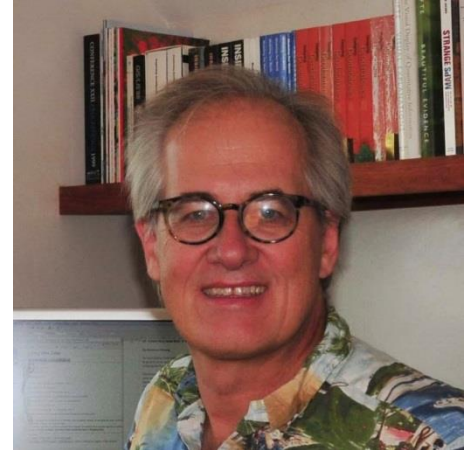
Observing the 1994 eclipse with passengers onboard a cruise ship led (somehow) directly into both a teaching career and a love of introducing the public to the sky via the planetarium, local NY media and outdoor sky shows.

During the 2014-15 school year, he will be on sabbatical to visit districts around the country to explore ways to best integrate authentic and experiential (*read: get the class outdoors!*) science teaching within common core standards, with an emphasis on generating interest and excitement in both teachers and students, all the while raising awareness of the 2017 TSE ([FB: Totality2017](#)) as an instructional focal point.

Michael Zeiler

New frontiers in eclipse cartography

I, Michael Zeiler, am a GIS professional who enjoys combining my twin passions for maps and solar eclipses. Eclipse maps are amazing artifacts of our civilization that combine geography, science, exploration, history, wonder, artistry, and imagination. They also have great value in inspiring youth in science education and invite us all to witness the greatest spectacle in nature, a total eclipse of the sun.



In 2009, I was preparing for my fourth total solar eclipse on board the Costa Classica. I was interested in using my GPS receiver to locate where we would see the eclipse but existing eclipse maps lacked a graticule (grid of latitude and longitude values) for navigation at sea. So I decided to make my own eclipse maps. First I used path data from Fred Espenak's NASA web site. A fortuitous email exchange with Bill Kramer led to a collaboration on some detailed eclipse maps utilizing GIS surface modelling techniques that I had recently written a book on. I received many encouragements to continue eclipse mapping after I published this map, <http://bit.ly/1fUhgPv>

After the 2009 eclipse, Bill Kramer and I continued to refine our technique. After the JAXA/Kaguya laser altimeter data from the Moon became available, Bill quickly made adjustments to his calculations that I adopted to make the first eclipse maps with eclipse durations and contact times corrected for the precise lunar limb. As my collection of historic eclipse maps was growing and I was making more eclipse maps, I launched <http://eclipse-maps.com> in January 2011 as a repository of old and new eclipse maps.

Since 2012, I've been working with Xavier Jubier on further refinements of eclipse maps and volume production. Xavier built a customized eclipse calculator which allows me to more efficiently compute eclipse circumstances and add further corrections such as atmospheric refraction, important at the sunrise and sunset lines of central eclipses.

At the Solar Eclipse Conference in Cloudcroft, I will talk about the history of eclipse mapping from 1654 on and how I am using state-of-the-art GIS technology for eclipse maps and animations. I will also present a new digital

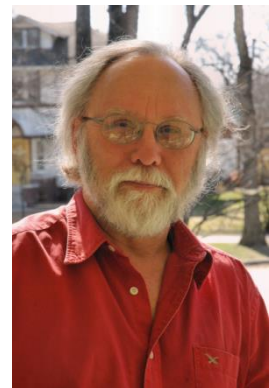
atlas of solar and lunar eclipses that I have been working on with Xavier with newly computed Besselian elements by Fred Espenak.

I was born in 1956 in Germany and immigrated to the United States when I was very young. I earned a B.A. in Physics from the University of California, Berkeley. I've been a professional geographer and cartographer since 1984 and have been employed as a technical writer at www.esri.com since 1995. I've written 7 books on geographic information systems (GIS) technology and data modelling. I sit on the IAU Working Group for Solar Eclipses and live in Santa Fe, New Mexico. My wife, Polly White, is also an eclipse enthusiast and will attend the conference with me.

Jay Anderson

Three Years of Eclipses: Where to Go?

Jay Anderson is a retired Canadian meteorologist who has been providing climate summaries and weather tips for eclipse tracks for over 35 years, beginning in 1979. He has been to many of those eclipses, and usually scouts the eclipse sites several years ahead as a part of the TravelQuest International eclipse team.



Scott McIntosh

The Eclipse Megamovie Project

Scott is a Research Section Head at the High Altitude Observatory of the National Center for Atmospheric Research in Boulder, CO. His primary responsibility lies in understanding the processes which drive solar transients and space weather. He is an author of more than 100 peer-reviewed articles in his research area with a particular focus on the formation of the solar corona and solar wind. He is the Principal Investigator of the Eclipse Megamovie Project - a project to engage the public about the Sun-Earth Connection.



Xavier Jubier

The Ultimate Chase Into the Stratosphere

Member of IAU Working Group on Solar Eclipses

Xavier Jubier is an engineer and currently works as an IT Manager in a multinational French company outside of Paris. He started to get involved with solar eclipses in the early 90's and now tries to combine three of his passions : solar eclipses, travel and photography.

He maintains a website related to eclipses and has been directly involved in a few world premieres notably in Antarctica or high above the Western Atlantic Ocean on the edge of the Bermuda triangle.

In early 2007, he released the Five Millennium Canon of Solar Eclipses (5MCSE) web tool to allow the exploration of 11,898 solar eclipses. A simplified version of this tool was later adapted for NASA's website and the same tool was later released for the corresponding 12,064 lunar eclipses (5MCLE) but also for the Mercury and Venus solar transits (6MCST). The year after he released Solar Eclipse Maestro a new software to automatize the photography of solar eclipses and much more, then soon after Lunar Eclipse Maestro for lunar eclipses and Mercury Venus Transit Maestro for Mercury and Venus Transits.



All these tools are widely used by the eclipse chasing community and outside as well.

2015 will see him involved in new adventures in the lower stratosphere high above the Northern Atlantic Ocean or at the North Pole...

Posters

Under the Shadow: eclipse public education

Melissa Hulbert^{1,2} and Toner Stevenson^{1,3}

1. Sydney Observatory, Museum Applied Arts and Sciences, Sydney, Australia;
2. Swinburne Astronomy Online, Centre for Astrophysics and Supercomputing, Swinburne University, Melbourne, Australia;
3. Museum Studies, Faculty of Arts, The University of Sydney, Australia

For over 140 years Sydney Observatory has been travelling to observe solar eclipses.

From 1861 Sydney Observatory has been at the forefront of communicating eclipses with the Australian public through the media, eclipse expeditions and photographic recounts. The past +140 years have seen great change in technology which has impacted on the quality and quantity of information communicated with the public as well as the audience reach. Now we make extensive use of social media, live streaming of eclipses and conduct eclipse tours rather than expeditions.

This paper/poster will focus on Sydney Observatory's eclipse observations from 1861 until the present day and future plans to continue public education and include historic and recent photographs.

Bio: While completing a BSc. (Hons) in Physics at the University of Western Sydney, Melissa worked as a night guide/lecturer at [Sydney Observatory](#) (part of the Powerhouse Museum) where she now works full-time as an Astronomy Educator. In between, she contributed a column to Lab News Magazine and then later spent some time as Assistant Editor on both *Lab News* and *Today's Life Sciences* Magazines. In 2000 she was part of the 'Science in the Pub' team that won an Australian Eureka Award for Science Promotion.



Melissa is an instructor with [Swinburne University's](#) online astronomy courses and also teaches astronomy courses at WEA, Sydney. She has been an active member of Sutherland Astronomical Society for over 20 years with her main interest in astroimaging. In 2004 she initiated the formation of the astroimaging group which she coordinated for 10 years.

Melissa's main interests have always been eclipses and comets, but if it's up there and not beyond the range of the equipment she's using then she's happy to snap its portrait. Her images have featured in magazines, newspapers and online media and she is a media spokesperson for Sydney Observatory on a range of astronomical topics.

Melissa has organised and led three solar eclipse tours for Sydney Observatory, the most recent in 2012 where she saw her sixth totality. In 2013 she was just outside Tennant Creek, Australia where she saw her first annular eclipse.

She is now planning future eclipse travels and eagerly looking forward to her seventh totality.

Solar Eclipse Journeys 2008-2013

Jan Sladeczek, Czech Republic, Prague, email: sladeclipse@seznam.cz

This poster includes pictures of Solar Eclipse Journeys from 2008 to 2013. The photos are from expeditions to: Mongolia 2008, China 2009, French Polynesia 2010, Australia 2012 and Uganda 2013. We try to take the photos of Solar Corona for later processing. This poster includes also composite pictures by Miloslav Druckmuller, Thomas Bader and Petr Horalek.



Timing of the internal contacts of the 2013 November 03 total solar eclipse by flash spectrum analysis

Luca Quaglia and Constantinos Emmanouilidis

The internal contact times of the 2013/11/03 total solar eclipse were measured by recording and analysing the eclipse flash spectrum. The main goal of these measurements was twofold: to provide data to validate the algorithms used to precisely compute local circumstances and to gauge if the method could be easily used to measure the solar radius. The idea of using the flash spectrum for precise timing of contact times is not new: for example, it was used by H. Kristenson during the 1954 total solar eclipse, by Y. Kubo in the '70 and '80 and more recently by S. Koutchmy. Nevertheless, it seems that there has been very little activity in precisely measuring internal contact times in the last quarter of century by the eclipse chasing community, despite the advances in the accurate computation of local circumstances and in recording equipment. Two sets of flash spectrum data were collected: a low resolution accurately timestamped analogue video and a time lapse of high resolution digital images. This poster will present the experimental data collected, a comparison between experimental and theoretical contact times, a discussion of some of the learnings gathered (i.e. the importance of the contribution of the solar mesosphere) and a proposal for improving the experimental set-ups.

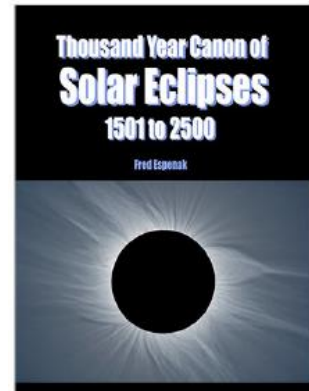
Eclipse Canons

Fred Espenak

Two New Eclipse Canons Published

Fred Espenak has just published two new eclipse canons:

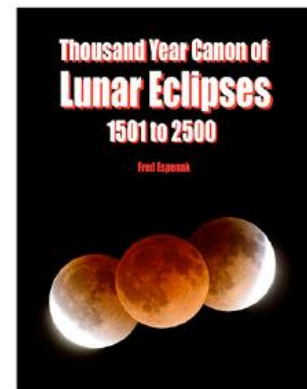
- 1) Thousand Year Canon of Solar Eclipses 1501 to 2500
(<http://astropixels.com/pubs/ap001.html>)
- 2) Thousand Year Canon of Lunar Eclipses 1501 to 2500
(<http://astropixels.com/pubs/ap002.html>)



The "Thousand Year Canon of Solar Eclipses 1501 to 2500" contains maps and data for each of the 2,389 solar eclipses occurring over the ten-century period centered on the present era. The eclipse predictions are based on the Jet Propulsion Lab's DE406 - a computer ephemeris used for calculating high precision coordinates of the Sun and Moon for thousands of years into the past and future.

The 2,389 solar eclipse maps are arranged twelve to a page and include the eclipse type, calendar date and time of greatest eclipse, Saros series number, lunar node, Delta T, gamma, Sun's altitude, and central eclipse duration or eclipse magnitude.

The "Thousand Year Canon of Lunar Eclipses 1501 to 2500" contains diagrams, maps and data for each of the 2,424 lunar eclipses occurring over the same period. As with the solar eclipse canon, the maps/diagrams for each eclipse are arranged twelve to a page and include the eclipse type, calendar date and time of greatest eclipse, Saros series number, lunar node, Delta T, gamma, eclipse magnitudes, and phase durations.



Each of these books are also available in color editions:

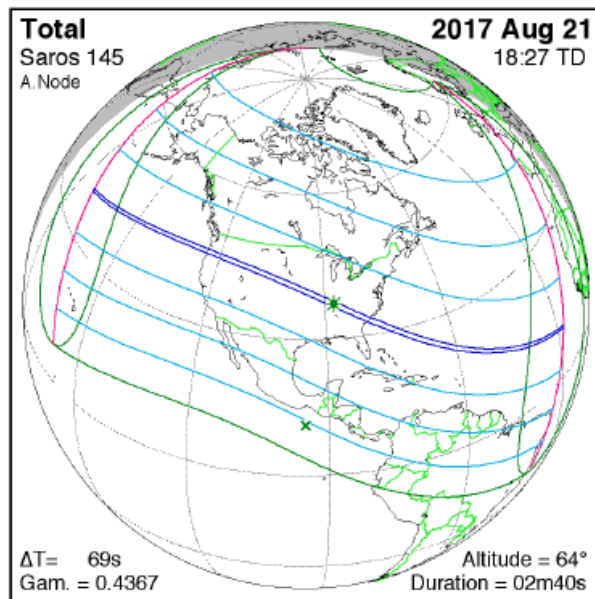
- 3) Thousand Year Canon of Solar Eclipses 1501 to 2500 - Color Edition
(<http://astropixels.com/pubs/ap003.html>)

4) Thousand Year Canon of Lunar Eclipses 1501 to 2500 - Color Edition
(<http://astropixels.com/pubs/ap004.html>)

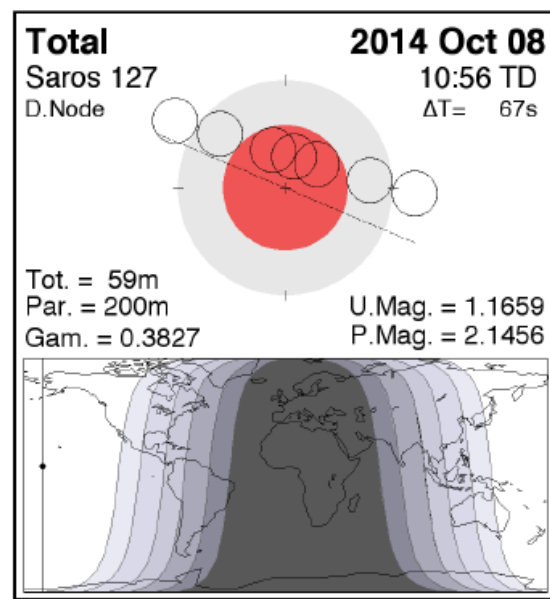
You can download sample pages of the maps at:

5) Solar Eclipses:
<http://astropixels.com/pubs/images/TYCSE-sample1ce.pdf>

6) Lunar Eclipses:
<http://astropixels.com/pubs/images/TYCLE-sample1ce.pdf>



Thousand Year Canon of Solar Eclipses
©2014 by Fred Espenak



Thousand Year Canon of Lunar Eclipses
©2014 by Fred Espenak

The figures above are taken from each of the two new eclipse canons.

The EUV photosphere- corona interface from eclipses to study the origin of low- FIP elements and the basis of the chromosphere

Bazin Cyrille, Serge Koutchmy, and Ehsan Tavabi, Institutions : Institut d'Astrophysique de Paris UMR 7095, CNRS & UPMC ; Payame Noor University -Tehran and Zanjan (IR of Iran)

We use the full occultation of the Sun by the Moon to study the upper solar atmosphere with flash spectra free of any parasitic light from the disc as provided by eclipse condition. A radial resolution of 40 km is obtained from unique images in many emission lines seen as crescents of the low atmosphere. The natural motion of the lunar limb probes the photosphere – corona interface where the solar magnetic field emerges. High cadence CCD

slitless flash spectra obtained before and after the eclipse totality (in 2008, 2009, 2010, 2012, and 2013) show that the over-abundance of the low First Ionisation Potential elements (low FIP) like FeII, TiII, BaII, etc. comes from the interface layers close to the temperature minimum. For the 1st time, the solar edge is defined by considering the “true” continuum analysed outside of faint emission lines at heights ranging from 0.2 to 0.6 Mm.

We also measure the helium shells of He I 4713Å and of He II 4686Å (Paschen alpha, optically thin high FIP lines), starting at the height of 0.8 Mm. Enhancements of the high FIP lines (H beta, He I and He II) are found at altitudes lower than 0.8 Mm above the limb from new 2013 spectra.

We also demonstrate some density gradient analogies between the photosphere- corona and the prominence-corona interface using the Ti II lines as a marker. The effect of the magnetic field emergence for supplying mass to the corona through low FIP elements is discussed. A simultaneously obtained 193 SDO/AIA processed image was used to discuss what the coronal extensions are.

Interpretation of High Resolution Eclipse Corona Images

Serge Koutchmy, Jean- Marc Leclaire, Jean Mouette, Ehsan Tavabi and Olivier Urtado, *Institutions* : Institut d'Astrophysique de Paris UMR 7095, CNRS & UPMC ; Payame Noor University -Tehran and Zanjan (IR of Iran)

During a Total Solar Eclipse a lot of photons are made available for coronal imaging. Accordingly, very high signal/noise ratio images makes possible a lot of processing for reaching the best possible resolution. Even a short time sequence is possible for studying dynamical phenomena. Unfortunately, the line of sight effects are an important limitation when the interpretation of the imaged structures is needed. It makes rather disputable the interpretation of details of each eclipse snapshot, including the most prominent features like polar plumes, coronal enhancements made of loops and/or shells, or the well-known more extended helmet streamers that are probably not made like a helmet but more probably, are confined with threaded and folded sheets inside. Even the so- called cusp of streamers is a controversial feature; however tangential discontinuities of magnetic origin are rather well evidenced. We address these questions using selected parts of eclipse processed images. Finally an attempt is made for making a stereo view of

eclipse images, making the assumption of the rigid rotation of magnetically dominated structures and neglecting the non radial dynamical effects.

Observations from Australia in 2012 of the Transit of Venus and Total Solar Eclipse

Nick and Andrea Turner

Our poster presents some images of the transit showing comparisons between visual and photographic observations including detection of the Lomonosov arc. Eclipse images, taken at second and third contacts, show the progression of the lunar limb across the chromosphere and the evolution of Baily's beads.

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2015



Svalbard Arctic Total Solar Eclipse

MARCH 17-23, 2015

Join us at the top of the Earth for an eclipse adventure on the frozen barrens of a remote Norwegian archipelago.



Faroe Islands & Iceland Total Solar Eclipse

MARCH 17-27, 2015

Visit Iceland and the Faroe Islands, two lands of stunning natural beauty. Enjoy a perfect Faroe Islands vantage point for the total eclipse and try for an aurora sighting in Iceland.

Flight to Totality



MARCH 20, 2015

Experience totality above the clouds.

2016

Bali New Year and Total Solar Eclipse

MARCH 2-11, 2016

Experience Balinese rituals that few outsiders get to see, and witness 2 minutes and 45 seconds of totality from a specially selected island.

Indonesia and Borneo Cruise to Totality

MARCH 4-15, 2015

Sail among the beautiful islands of the Indonesian archipelago and witness totality from onboard our ship in the Molucca Sea.

AUGUST 2017 Totality in the USA

Details available in 2015.

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Transit of Venus 2012



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Hand Held Solar Viewer 2002

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physicists, mathematicians, geologists, engineers, and others whose research and educational interests lie within the broad spectrum of subjects comprising contemporary astronomy. The mission of the AAS is to enhance and share humanity's scientific understanding of the universe.

See <http://aas.org/>

AMATEUR ASTRONOMERS GROUP ALAMOGORDO

The Amateur Astronomers Group is located in Alamogordo, New Mexico. The majority of our members are from South Central New Mexico. We are comprised of amateur astronomers with a variety of backgrounds and experience levels. Our group primarily supports Oliver Lee State Park with their astronomy events and other local outreach opportunities. The membership ranges from beginners to highly advanced individuals conducting scientific research. We welcome everyone, especially families and youngsters. Telescopes NOT required. Best of all membership is FREE!



CELESTRON

<http://www.celestron.com/>

Skyris USB 3.0 Solar System Imagers



The Universe is your studio. Create your masterpiece. Achieve stunning lunar, solar, and planetary images with Celestron's new USB 3.0 camera: Skyris. This intuitive camera features fast frame rates and shutter speeds, allowing you to capture planets during brief moments of stable air. Then, using the included iCap and stacking software, you can stack your best images to create vibrant color or monochrome images of Saturn, solar prominences, lunar craters, and so much more. Celestron has joined forces with The Imaging Source to design this cutting-edge camera from the



ground up. It's available with a variety of popular Sony imaging sensors, so there's a Skyris to meet any imager's needs.

Donations

Some people we would like to list for a big thank you helping in one way or another with the organisation of SEC2014, so far - in alphabetical order:

Jay Anderson, Derryl Barr, Celestron, Ralph Chou, Fred Espenak, Michael Gill, Shadia Habbal, Bill Kramer, Bill Livingston, Barbara Moore, Jay Pasachoff, Glenn Schneider, Joerg Schoppmeyer, TravelQuest and Michael Zeiler.

Donations received from (in alphabetical order):

Ricardo Alcoser, Bengt Alfredsson, Amateur Astronomers Group (Alamogordo), Jay Anderson, Audie Barnette, Derryl Barr, John Beattie, Stephen Bedingfield, Fred Bruenjes, Jens Buus, Greg Buchwald, Keiko Chaki, Ralph Chou, Terry Cuttle, Kris Delcourte, Jackie Diehl, David Dunham, Joan Dunham, Letitia Ferrer, Rick Fienberg (AAS), Lloyd Franklin, Jay Friedland, Michael Gill, Thomas Goodey, Joel Harris, Jan Hellemans, Steve Keil, Hamid Khodashenas, David Larson, Mark Littmann, Robert Lucas, Mark Margolis (Rainbow Symphony), Robert Minor, Joel Moskowitz, Richard Nugent, Derald Nye, Jay Pasachoff, Luca Quaglia, Robert Ray, Torsten Rothenwaldt, Eckehard Schmidt, Larry Stevens, John Tilley, TravelQuest, Nick Turner, Sheridan Williams, Jen Winter, Michael Zeiler.

And of course the teams of the facilities at Sacramento Peak Observatory , the New Mexico Museum of Space History, The Lodge Resort, and TravelQuest's sponsoring the openings reception at the NM Museum of Space History. Last but not least thank you to all speakers who have willingly accepted or proposed to cooperate at SEC2014.

Without you all no SEC2014 would be possible!

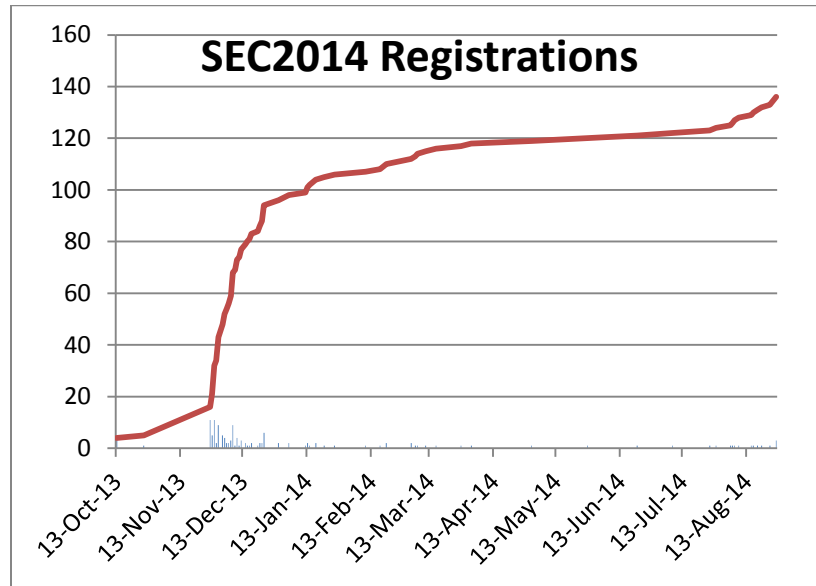
Delegates

Final status of registrations: total 137

Thursday 23 October Conference Sacramento Peak Observatory	102
Friday 24 October Conference Sacramento Peak Observatory	97

Friday 24 October Reception NM Museum Space History	126
Saturday 25 October Conference The Lodge Resort	115
Saturday 25 Oct Dinner The Lodge Resort	125
Sunday 26 Oct Conference The Lodge Resort	112

Below the registrations by day.



Thanks to Bill Kramer to keep the SEC2014 webpages up to date all time!
 See <http://www.eclipse-chasers.com/article/SEC2014.html>

Eclipse Chasers

CHASERS LOG FUTURE ECLIPSES PAST ECLIPSES IMAGE GALLERIES PHOTOGRAPHY REFERENCES COOL STUFF

Solar Eclipse Conference 2014

Announcement

The next Solar Eclipse Conference is scheduled to take place at The Lodge Resort, Cloudcroft, New Mexico, USA the 25th (Saturday) and 26th (Sunday) of October 2014 with a welcome reception at the New Mexico Museum of Space History the evening of the 24th (Friday).

Cloudcroft NM is located to the northeast of El Paso TX, near the famous White Sands rocket development and testing area, and the National Solar Observatory (Sunspot).

A two day pre-conference option with advanced topics, partial solar eclipse observations, and BBQ at Sacramento Peak Observatory will also take place. Due to space limitations the optional pre-conference will only be available to a limited number of people.

[Sign up now for SEC2014!](#)

[Latest News Letter](#)

Update March 2014:

- Preliminary Program
- Speaker list update
- Transportation between venues will have to be arranged by each delegate. Bus or coach services will not be available.
- The Lodge Resort still offers accommodation for speakers and delegates with very attractive discounts.
- Tours and trips for non-delegates are being investigated.

A Crossroad on Physics & Eclipses of the Sun

- from Patrick Palumbo

Over the last few decades, there have been dramatic changes in solar eclipse traveling. Solar Eclipse specialists meet most of the time in the shadow of the Moon. Solar Eclipse meetings out of totality are rare, or are nearly focused on solar physics. The Solar Eclipse Mailing List and before the Solar Eclipse News-letter has been successful as a vehicle in bringing together solar eclipse enthusiast, professionals and amateurs alike. Because there was no central eclipse in 2000 we had been presented with a perfect opportunity for an International Solar Eclipse Conference.

We had had this project in mind for some time, but mainly due to planning eclipse travels it has been put on hold. The aim of the

Joerg Schoppmeyer is so friendly to offer his company beamer for the presentations. Performance (2000 lumen) as the Viewsonic, but far better resolution: 1920x1080.

There will be a microphone for those speakers and presenters who do not have a strong voice.

Of the 137 registries, we do have delegates out of 19 different countries. See below the distribution.

Australia	4
Belgium	2
Canada	8
China	1
Czech Republic	1
France	3
French Polynesia	1
Germany	6
India	1
Iran	2
Jamaica	1
Japan	1
Mexico	1
Romania	1
Russia	1
Slovak Republic	1
Sweden	1
UK	13
USA	88

The list below indicates for which event the delegates have registered. In case of speaker or presenter, at which event the speaker/presenter is programmed. Also it indicates if the delegate has enrolled for a diet, or poster/trade. Shaded areas are those sharing the morning/afternoon sessions (as per program). Please contact us immediately if you think there are discrepancies with your thoughts.

SEC2014	137	19	102	97	126	115	125	112	9	9	31
First name	Second name	Country	Th SPO	Fr SPO	Rec NM	Sa TLR	Din TLR	Su TLR	Di et	Post er	Spea ker
Ricardo	Alcocer	USA	X	X	X	X	X	X			
Bengt	Alfredsson	Sweden	X	X	X	X	X	X			

Jay	Anderson	Canada	X	X	X	X	X	X	X	X
Lynn	Anderson	USA	X	X	X	X	X	X	X	
Audie	Barnette	USA			X	X	X	X		
Margie	Barnette	USA			X		X			
Derryl	Barr	USA	X	X	X	X	X	X		X
Pam	Barr	USA	X	X	X		X			
Jean-Pierre	Barriot	French Polynesia	X	X	X	X	X	X	X	X
John	Beattie	USA		X	X	X	X	X		
Stephen	Bedingfield	Canada	X	X	X	X	X	X		
Lynn	Bedingfield	Canada	X	X	X	X	X	X		
John W.	Briggs	USA	X	X	X	X	X	X		X
Dori	Brooks	USA			X					
Ray	Brooks	USA			X	X	X			X
Daniel	Brookshier	USA		X	X	X	X	X		
Sue	Brown	UK	X		X	X	X	X	X	
Aaron	Brown	USA	X	X	X	X	X	X	X	
Fred	Bruenjes	USA	X	X	X	X	X	X		
Greg	Buchwald	USA	X	X	X	X	X	X		
Vicki	Buchwald	USA	X	X	X		X			
Jens	Buus	UK	X	X	X	X	X	X		
Keiko	Chaki	Japan	X	X	X	X	X	X		
Ralph	Chou	Canada	X	X	X	X	X	X		X
Johnny	Cox	USA	X	X	X	X	X	X		
Tony	Crocker	USA	X		X	X	X	X		
Terry	Cuttle	Australia	X	X	X	X	X	X		X
Kris	Delcourte	Belgium	X	X	X	X	X	X		X
Jackie	Diehl	USA			X		X			
Jean Luc	Dighaye	Germany	X	X	X	X	X	X		
Hamid	Djodeiri Khodashenas	Iran	X	X	X	X	X	X		X
Frances	Donovan	UK	X	X	X	X	X	X		
David	Dunham	USA	X	X	X	X	X	X		X
Joan	Dunham	USA	X	X	X	X	X	X		
Paula	Eisenhart	USA	X	X	X	X	X	X		
Fred	Espenak	USA	X	X	X	X	X	X	X	X
Patricia	Espenak	USA	X	X	X	X	X	X		
Victor	Fainshtein	Russia	X	X	X	X	X	X		X
Leticia	Ferrer	USA		X	X	X	X	X		
Lloyd	Franklin	USA	X	X	X	X	X	X		
Susan	Franklin	USA	X	X	X	X	X	X		
Jay	Friedland	USA	X	X	X	X	X	X		
Benno	Friedland	USA	X	X	X	X	X	X	X	
Allan	Fromm	USA	X	X	X	X	X	X		

Charles	Fulco	USA	X	X	X	X	X	X	X				X
Michael	Gill	UK	X	X	X	X	X	X	X				
Monika	Glowe	USA	X	X	X			X	X				
Donald	Glowe	USA	X	X	X			X	X				
Thomas	Goodey	Romania	X	X	X	X	X	X	X				
Shadia	Habbal	USA	X	X	X	X	X	X	X	X			X
Joel	Harris	USA			X	X	X	X	X				
Jan	Hellemans	Belgium	X	X	X	X	X	X	X				
Khati	Hendry	Canada	X		X	X	X	X					
Nicole	Hollenbeck	Germany	X		X			X					
Melissa	Hulbert	Australia	X	X	X	X	X	X	X	X	X		
Kari	Hull TQ	USA			X	X	X	X				X	
Nick	James	UK	X		X	X	X	X	X				X
Xavier	Jubier	France		X	X	X	X	X	X				X
Aram	Kaprielian	USA			X	X	X	X				X	
Stephen	Keil	USA	X	X	X								X
Roger	Kennedy	USA	X										X
Linda	Kennedy	USA	X										
Sally	Kilburg	Canada	X	X	X	X	X	X	X				
David	Kodama	USA	X	X	X	X	X	X	X				
Jean	Kodama	USA	X	X	X			X					
Serge	Koutchmy	France		X	X	X	X	X			X		X
Bill	Kramer	Jamaica	X	X	X	X	X	X	X				X
Denise	Kramer	USA			X			X					
David	Larson	USA	X	X	X	X	X	X	X				
Eleonor	Larson	USA	X	X	X	X	X	X	X				
Burns	Larson	USA	X	X	X	X	X	X	X				
Mark	Littmann	USA	X	X	X	X	X	X	X				
Robert	Lucas	Australia	X	X	X	X	X	X	X	X			
Angela	Malcolm	USA			X	X	X	X	X				
Soheil	Malekzadeh	USA	X	X	X	X	X	X	X				
Mark	Margolis	USA	X	X	X	X	X	X	X				
Douglas	McCarty	USA	X	X	X	X	X	X	X				
Dan	McGlaun	USA	X	X	X	X	X	X	X				
Scott	McIntosh	USA				X			X				X
Klaus	Meissn	Germany	X	X	X	X	X	X	X				
Minnie	Mims	USA							X				
Forrest	Mims	USA							X				
M.	Mims III	USA							X				X
Robert	Minor	USA	X	X	X	X	X	X	X				
Norma	Minor	USA	X	X	X	X	X	X	X				
Mike	Molitor	USA	X	X	X	X	X	X	X				
Joel	Moskowitz	USA			X	X	X	X	X				
Tom	Murphy	USA				X							X

Richard	Nugent	USA							Cancelled			
Derald	Nye	USA	X	X	X	X	X	X	X			
Liz	O'Mara	USA	X		X	X	X	X	X			
Amir	Pakrooh	USA/Iran	X	X	X	X	X	X	X			
Jay	Pasachoff	USA	X	X	X	X	X	X	X	X		X
Naomi	Pasachoff	USA	X		X		X			X		
Gillian	Perry	UK	X	X	X	X	X	X	X			
Roger	Perry	UK	X	X	X	X	X	X	X			
Joanne	Poitevin	UK	X	X	X	X	X	X	X			
Patrick	Poitevin	UK	X	X	X	X	X	X	X			
Matthew	Poulton	France		X	X	X	X	X	X			
Nelson	Quan	China	X	X	X	X	X	X	X			X
Robert	Ray	USA	X	X	X	X	X	X				
Barbara	Ray	USA	X				X					
Mike	Reynolds	USA		X	X	X	X	X	X			
Helen	Robinson	Australia	X		X		X					
Torsten	Rothenwaldt	Germany	X	X	X	X	X	X	X			
Ruben	Ruiz	Mexico							Cancelled			
Stan	Runge	Canada	X		X	X	X	X	X			
Vojtech	Rusin	Slovak Republic			X	X	X	X	X			X
George	Scheitinger	USA				X		X		X		
Eckehard	Schmidt	Germany	X	X	X	X	X	X	X			
Glenn	Schneider	USA			X	X	X	X	X			X
Joerg	Schoppmeyer	Germany	X		X	X	X	X	X			X
Austin	Shea	USA	X	X	X	X	X	X	X			
Kent	Silliman	USA	X	X	X	X	X	X	X			
Carol	Silliman	USA	X	X	X		X					
Mike	Simmons	USA			X	X	X	X	X		X	
Jan	Sladeczek	Czech Republic	X	X	X	X	X	X	X	X	X	X
Craig	Small	USA	X	X	X	X		X				
Robert	Stephens	USA			X	X	X	X	X			
Larry	Stevens	USA	X	X	X	X	X	X	X			
Paul	Sunde	USA	X	X	X	X	X	X	X			
Barbara	Sunde	USA	X	X	X	X	X	X	X			
Jordan	Sutton	USA			X	X	X	X				
Aywar	Talwar	India							Cancelled			
John	Tilley	UK		X	X	X	X	X	X			X
Gene	Torncello	USA	X	X	X	X	X	X	X			
Janet	Torncello	USA	X	X	X	X	X	X	X			
Nicolas	Turner	UK	X	X	X	X	X	X	X		X	
Andrea	Turner	UK	X	X	X	X	X	X	X			
Rene	Verreault	Canada							Cancelled			
John	Westfall	USA			X	X	X	X				

Elizabeth	Westfall	USA			X		X		
Polly	White	USA	X	X	X	X	X	X	X
Sheridan	Williams	UK	X	X	X	X	X	X	X
Jim	Windlinger	USA	X	X	X	X	X	X	X
Jen	Winter	USA	X	X	X	X	X	X	X
Alson	Wong	USA			X	X	X	X	X
Michael	Zeiler	USA	X	X	X	X	X	X	X
Evan	Zucker	USA	X	X	X	X	X	X	X

Sacramento Peak Observatory



www.nso.edu



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The National Solar Observatory / Sacramento Peak is located in southern New Mexico at the height of 9200 feet (2800 meters) in the Sacramento Mountains.

This site, chosen in 1947, overlooks White Sands Missile Range in the Tularosa Basin. The dry air of the southwest, isolation from any major source of air pollution, and plenty of sunshine make this an excellent site for observing the Sun.

Your interest in the National Solar Observatory is appreciated. We hope that your visit is informative and enjoyable.

The Staff presently consists of research scientists, engineers, technicians, and support staff. In addition, scientists from other observatories and universities around the world come to the National Solar Observatory / Sacramento Peak to pursue research, along with many students in astronomy who work here during the summer months.



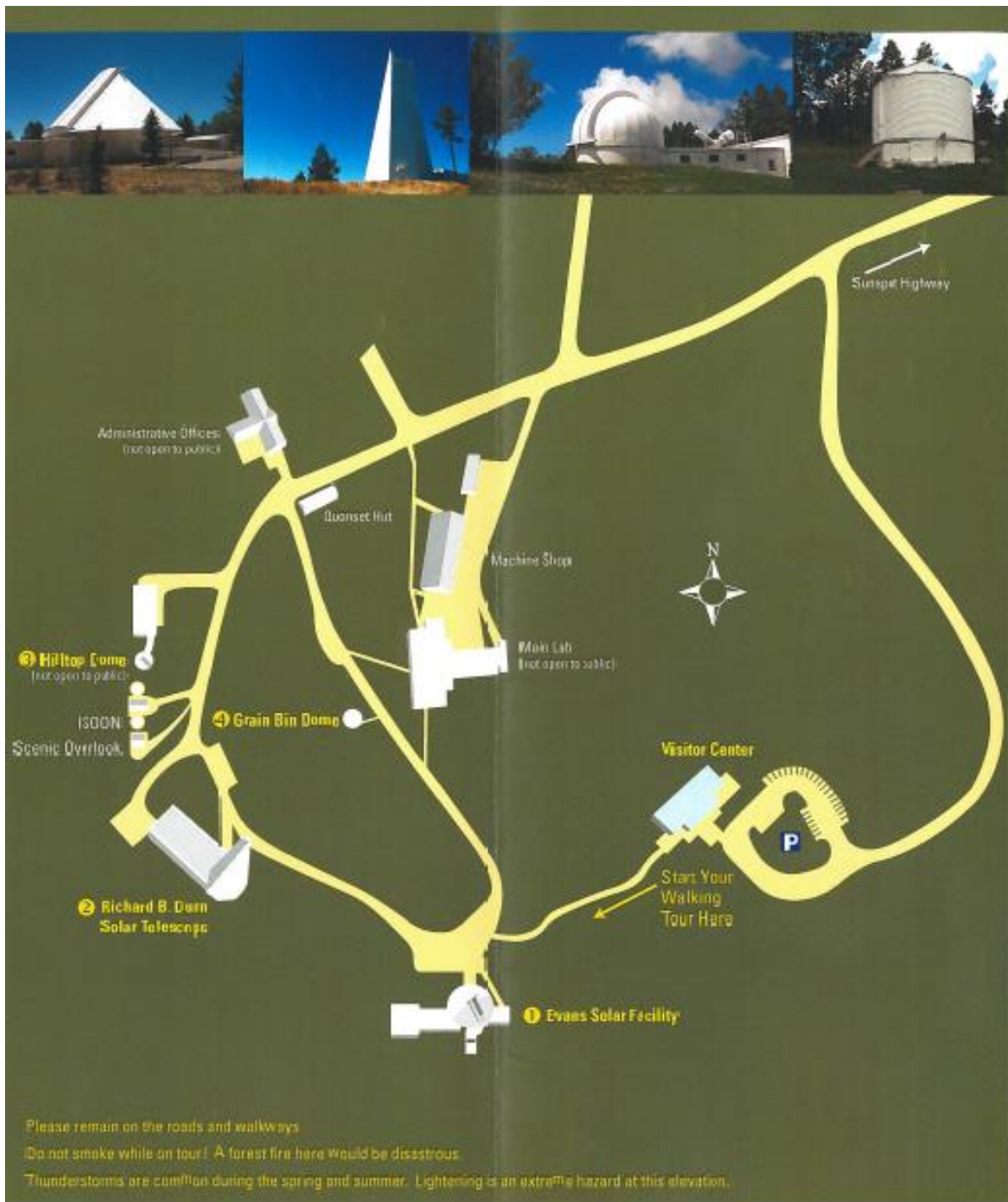
Hours of Operation
Visitor Center Open Daily
9am until 5pm
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www.nso.edu

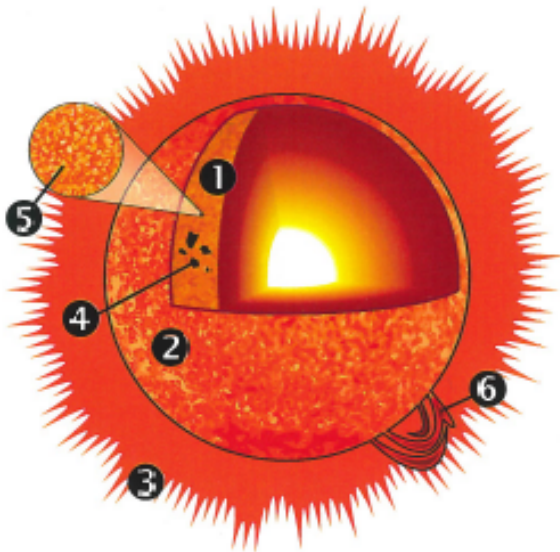
WALKING TOUR MAP



NATIONAL SOLAR OBSERVATORY
SACRAMENTO PEAK
SUNSPOT, NEW MEXICO







Our Solar Furnace

For the past 4.5 billion years, the Sun has been bathing our Earth with life-sustaining heat and light. Yet, as the closest star to the Earth, it is 145 million km distant (this distance is called an Astronomical Unit). You could fit 109 Earths across the Sun's 864,000 mile face.

The core of the Sun is a solar furnace: its heat is an incredible 27 million degrees F (15 million degrees C). The surface temperature of the Sun is about 10,000 degrees F (5,700 C). About three quarters of the weight of the Sun is hydrogen, almost one quarter is helium and less than 1% is made up of other elements. Sunlight generated in the core takes millions of years to reach the surface.

By examining the solar spectrum, it is possible to determine the Sun's chemical composition, its temperature, the motions of its surface gases, and the strength of the magnetic field.

1 The Photosphere (visible surface)

The photosphere is the visible surface of the Sun. It is a layer of gas several hundred miles thick where huge, cooler sunspots are seen. These dark, splotchy sunspots appear where magnetic field lines burst through the surface.

2 The Chromosphere

In the chromosphere, below the corona, fountain-like jets of gas, called spicules, rise thousands of miles high. Slender spicules of flaming gas reach heights of 6,000 miles or more. Loop prominences are formed when fiery material raining down from the corona is caught by arch-shaped magnetic field lines

3 The Corona (outer atmosphere)

The Sun's thin outer atmosphere is called the corona. Recent studies have revealed that there are openings in the corona where the density and temperature are unusually low. These "coronal holes" allow solar material to escape more easily. This material gives rise to high-speed solar wind streams which interact with Earth's magnetic field and cause geomagnetic storms.

4 Sunspots

Sunspots are places where a very strong magnetic field sticks through the surface of the Sun. Sunspots vary greatly in diameter, from about 1,500 miles for the smallest ones (which are called pores) to 30,000 miles or more for the largest ones. The magnetic field in sunspots can be up to 5,000 times stronger than the magnetic field of the Earth. Sunspots can last about a month or so (if they are big). Sunspots do not affect the weather or anything else on Earth.

5 Granulation

Understanding the Sun can also be gained by looking at the area where there are no sunspots. This spot-free area is known as the "quiet" sun. The fine mottled background of the quiet sun is called granulation. Granulation is the irregular pattern of bright spots (granules) surrounded by dark lanes that covers most of the visible surface of the Sun. Granules have a diameter of about 600 miles (about the size of the state of Texas), a temperature of about 10,000 degrees F, and last for about 8 minutes. Granules are places where hot material comes to the surface of the Sun from below, like hot bubbles in boiling water. When the material has cooled off, it turns darker and goes down the lanes.

Faculae

Faculae are places smaller than sunspots or pores where a magnetic field sticks through the surface of the Sun. The magnetic field in faculae is not as strong as that in sunspots. Faculae are hard to see in ordinary pictures of the Sun, but they appear bright in pictures taken with appropriate filters in front of the camera.

6 Solar Flares

Flares are explosive eruptions of material from the Sun into space. Solar flares occur sometimes when a strong magnetic field becomes very twisted. The energy stored in the twisted field is released, heats the material to temperatures of millions of degrees, and shoots part of it into space. Eruptive phenomena such as flares can eject particles which can reach the Earth. This can result in the Aurora Borealis, or Northern Lights, seen frequently at higher latitudes and it can also lead to the disruption of some radio communications. However, solar flares have no influence on the lives of most people.

1 Evans Solar Facility

The Evans Solar Facility is housed in the Big Dome, which was completed in 1952. There are two main telescopes in this facility: a 16" coronagraph and a 12" coelostat. Each of these telescopes can be used to feed one of several instruments. This means that two observing programs can be run simultaneously.

The facility is mainly used to look at the corona: the faint outermost layer of the Sun. Because the visible disk of the Sun is so bright, one cannot usually see the corona. The main telescope in the Big Dome is a coronagraph. It has a disk inside that blocks off the bright disk of the Sun simulating an eclipse, so the scientists can study the faint corona.

Scientists use this facility to investigate solar flares, a magnetic field high above the visible surface of the Sun, and filaments (which are called prominences when they are seen sticking beyond the bright disk of the Sun).

The Evans Solar Facility has no fixed observing program. Scientists are able to point the telescopes wherever they want on the Sun and to use whatever filters or other special equipment they need to complete their research.

2 Dunn Solar Telescope

This structure contains an entrance window and two mirrors that guide the light of the Sun down the tower in an evacuated tube from which the air has been removed. The tower is an impressive 136 feet (41m) tall, but the building has 228 more feet (72m) below ground, so most of the building is in fact not visible. After the light has hit the two mirrors at the top, it goes straight down the tube at the center of the telescope until it hits the primary mirror, 188 feet (57m) below the ground. The primary mirror is 54 inches (163 cm) in diameter. It focuses the light and sends it back up to ground level, where it exits the vacuum tube and can be guided into the scientists' experiments on optical benches.

The rotating part of the telescope weighs more than 200 tons. It is suspended at the top from a ring-shaped container holding 10 tons of mercury. The central tube is hanging: it does not sit on anything. Because mercury has very low friction, it is easy to rotate the 200 tons of tube and instruments.

The kinds of things on the Sun that scientists investigate using this telescope include granulation, sunspots, faculae, weak magnetic field, filaments, and solar flares.

3 Hilltop Dome

The Hilltop Dome was completed in 1963. As with the Evans Solar Facility, the roof of the building (with the doors in it) can rotate around to allow the telescope to see the Sun anywhere in the sky. This telescope is used for taking patrol images of the whole Sun. These images are used to discover when something interesting is happening on the Sun, such as a solar flare, and have a record of what the Sun looks like every day.

The Hilltop Dome contains several telescopes that have one task only: to look at the whole Sun all the time that the Sun is visible. Pictures are regularly taken through these telescopes; at the rate of one picture per minute, but more if it is likely that something interesting will happen. The Hilltop Dome telescope takes two kinds of pictures: ones that show what the Sun looks like to the human eye, and others at a particular color (with a wavelength of 6563 Angstroms) that is affected by hydrogen atoms in the Sun. It allows scientists to see the largest possible number of interesting things on the Sun (such as solar flares), even if the other telescopes at the observatory are looking at other parts of the Sun. If a solar flare is seen, then we can go back to the archive and check if something happened earlier that can help us predict when the next one will come.

4 Grain Bin Dome

In 1950, the Grain Bin Dome was the first telescope dome built in Sunspot. The Observatory ordered the grain bin from a Sears catalog and modified it for use as a telescope dome. A 6-inch prominence telescope was mounted on a 10-foot spar inside for observing the limb (edge) of the Sun. The modifications included a slit in the roof and the ability to rotate so that the telescope could track the Sun. From March 1951 through 1963 daily flare patrol images were taken from the Grain Bin. Additional or newer telescopes were installed in 1952, 1955, and 1957. In 1963 the solar patrol duties of the Grain Bin were transferred to the newly built Hilltop Dome.

The Grain Bin Dome was not used after 1963, until a nighttime telescope was installed in 1995. Sunspot residents can now use that telescope to look at the night sky. Over the years that the Grain Bin Dome was not in use, the trees around the Dome have grown, limiting the amount of observable sky.



New Mexico Museum of Space History



www.nmspacemuseum.org

EXPERIENCE SPACE



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STAPP AIR & SPACE PARK
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**New Mexico Museum of
SPACE HISTORY**
Celebrating the Spirit of Exploration!
Alamogordo New Mexico



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New Mexico Museum of Space History

Experience space where it all began! The Tularosa Basin is the birthplace of modern rocketry and the NM Museum of Space History brings the story of man's race to space alive. The Museum features four floors of space related exhibits including an interactive space shuttle simulator, a Moon rock brought back on Apollo 17 by New Mexico Astronaut Harrison Schmitt, and special tributes to Dr. John Paul Stapp and Dr. Robert Goddard.

GIANT SCREEN DOME THEATER

Experience the thrill! The theater's wraparound domed screen and surround sound will take you on a trip that's out of this world!

EDUCATION PROGRAMS

Launch young imaginations into the universe with our exciting hands on science programs! On-site and off-site activities for schools and groups. Ask about our summer science camps – a fun filled week of learning excitement!

Open 7 days a week.

Call or visit our website for hours.

575-437-2840 or toll free 877-333-6589

www.nmspacemuseum.org

New Mexico Museum of Space History

Top of Hwy 2001
(3198 State Hwy 2001)
Alamogordo, NM 88310

Driving Directions:

From Hwy 54/70, turn east on to Indian Wells Road. Continue to Scenic Drive and turn left. Turn right on Hwy 2001.
RV & bus parking available.



New Mexico Museum of SPACE HISTORY
Celebrating the Spirit of Exploration!
Alamogordo New Mexico



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The Lodge Resort

The Lodge was founded in 1899 and the present building was built in 1911. On the walls of the hallways you will see many exhibits of the history of the Lodge, Cloudcroft, and famous visitors.

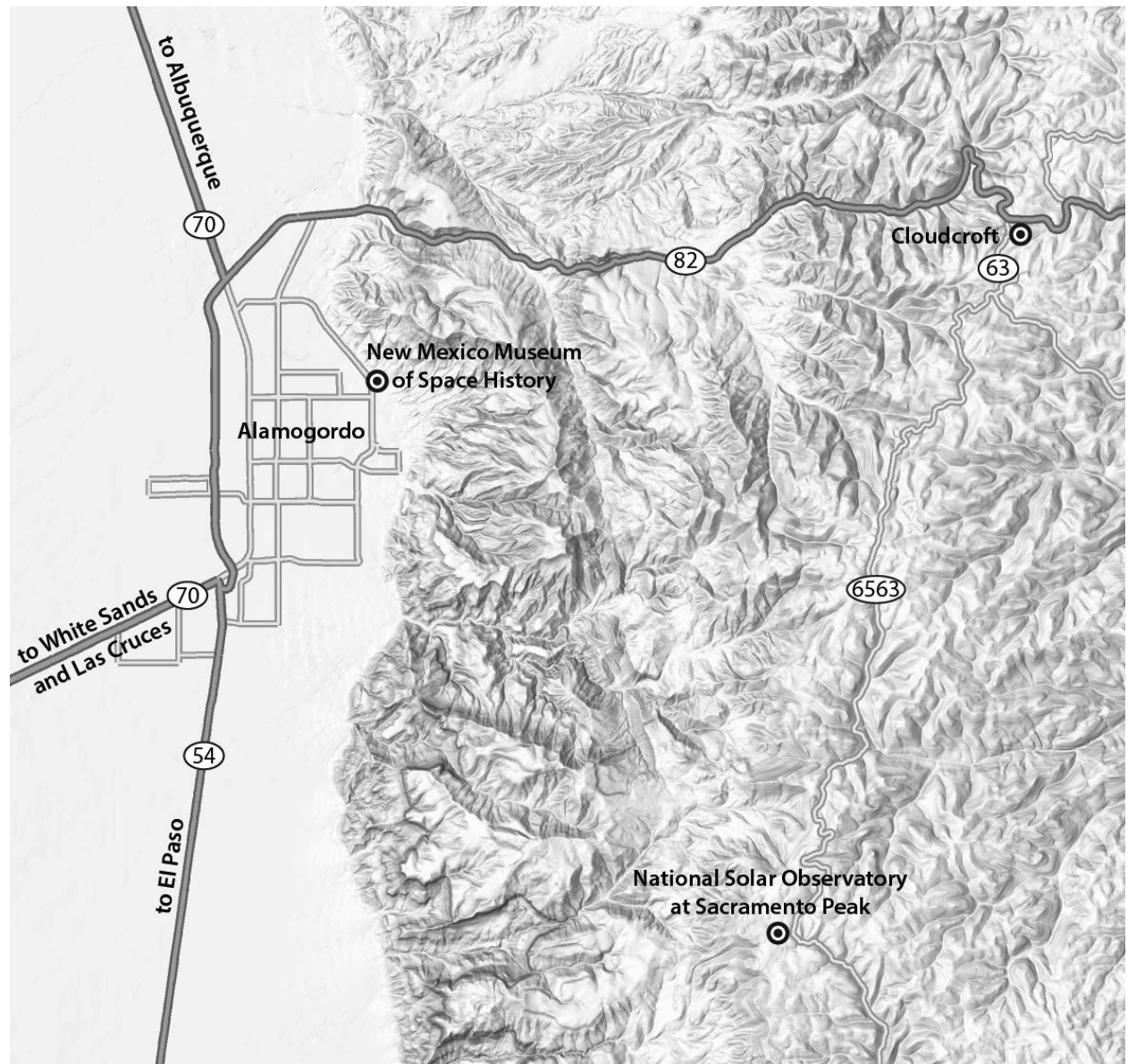
There is a lot of wildlife in the Cloudcroft area. Bears are common but not considered dangerous if not provoked. Other wildlife is deer, elk, red fox, coyote, mountain lion, bobcat, raccoon, and porcupines. Mountain lions are potentially dangerous but are very rarely seen and avoid people.

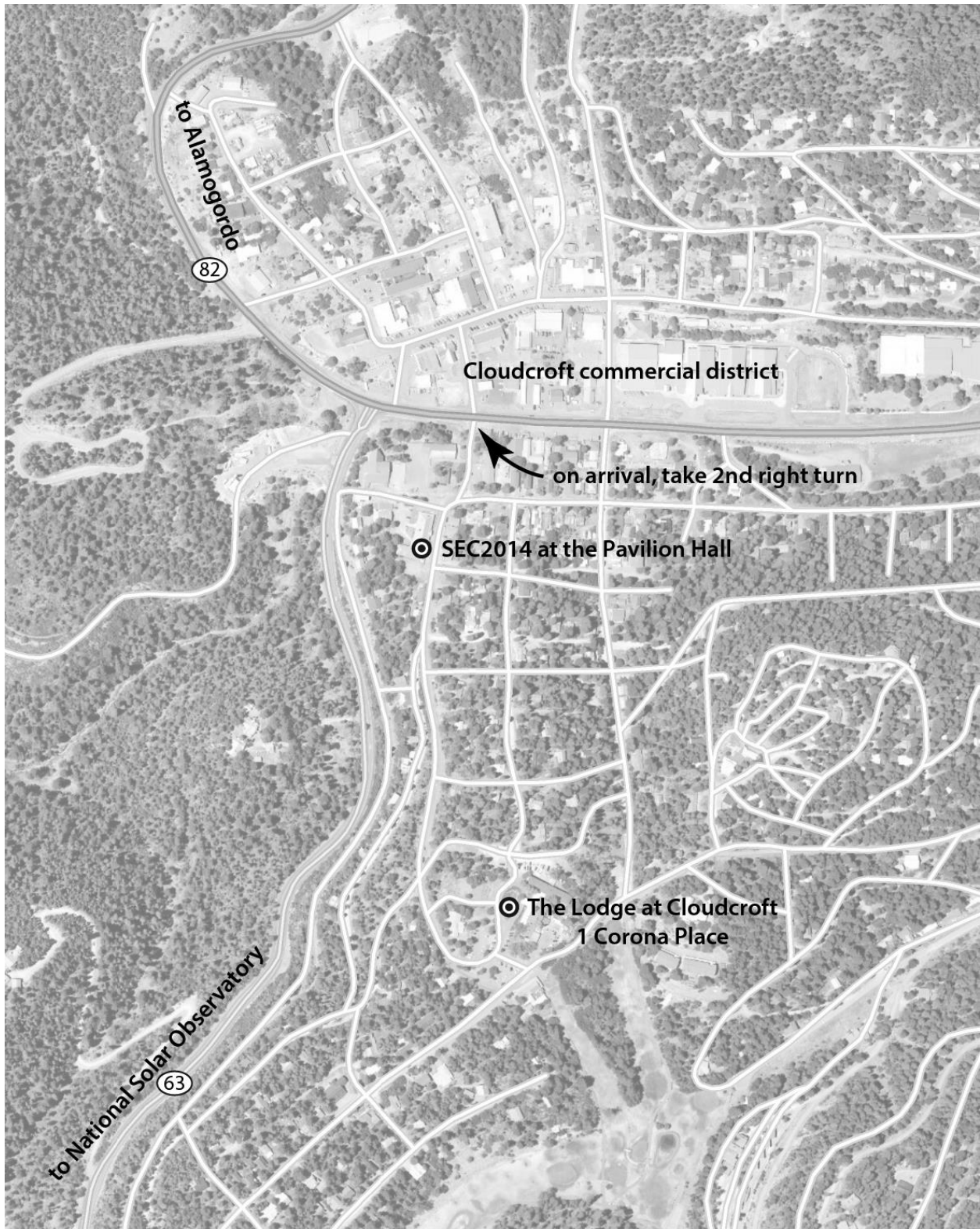
Many types of birds are seen in Cloudcroft. See photo for varieties seen. Many bird watchers come to Cloudcroft and a special bird walk tour can be arranged.

The Lodge Resort is constructed on the highest point in the vicinity of Cloudcroft. While the forest mostly obstructs direct views of the valley below, from the very top of the Lodge tower you can clearly see White Sands and the valley.



http://www.thelodgeresort.com/index.cfm?src=ppc_yahoobing_brand_72rate





Maps kindly provided by Michael Zeiler

Everyone coming to the conference will notice a very dramatic shift in scenery. You will drive through an arid desert region with mesquite bushes and scrub. If you come from Albuquerque, you will drive through a very fresh lava field (about 1000 years old). If you come from El Paso, you will drive by White Sands.

When you start driving up the road from the north side of Alamogordo to Cloudcroft, the vegetation will change with elevation. On top, Cloudcroft is a forested and verdant area in great contrast to the landscape below. The drive from Cloudcroft to the observatories is very beautiful with green valleys, forests, and occasional vistas of the valley below (called the Tularosa Basin) and White Sands.

An interesting feature of the drive is a scale model of the Solar System. Signs along the road announce the relative position of the planets so you can judge how close you are to the observatory as the outer planets are far apart and the inner planets are close together.

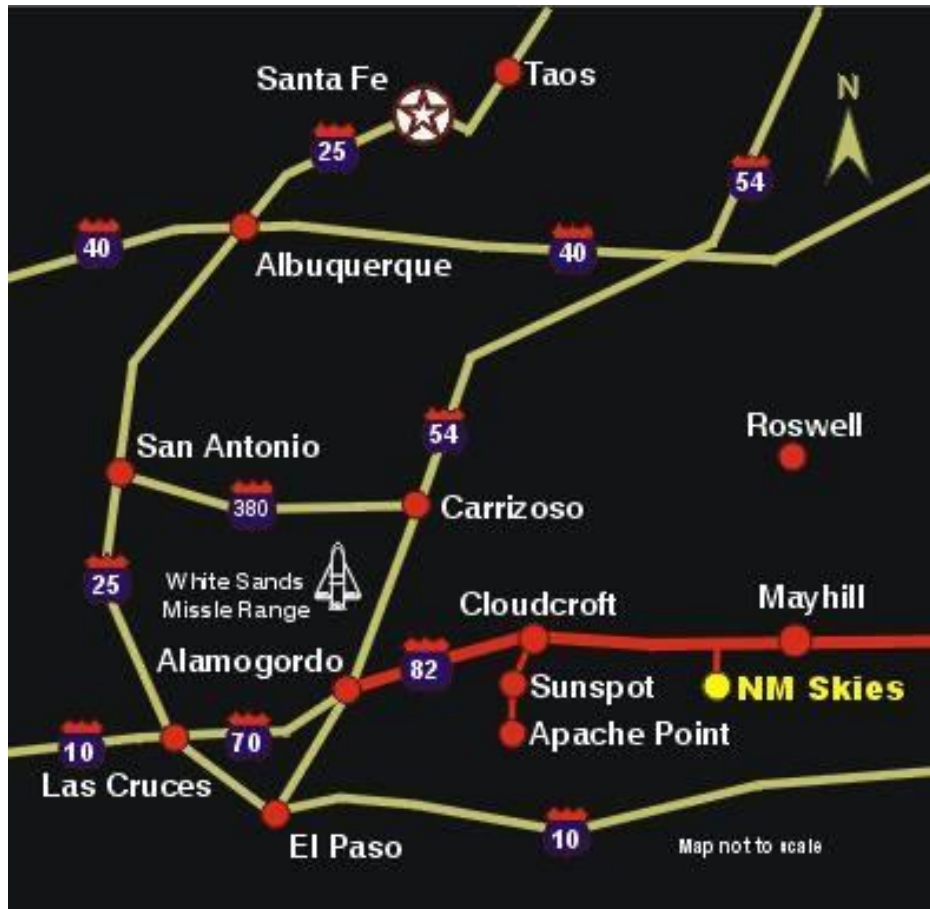
You'll see many road signs with astronomical names. The Lodge is (fortuitously) at 1 Corona Place. The local population is very aware of the astronomical significance of the area and many notable amateur astronomers live in this area for its dark skies due to remote location, southern latitude, and low humidity.

The town of Cloudcroft has a distinctly western cowboy feel and is a popular location for weekend visitors from southern New Mexico and Texas. The appeal of Cloudcroft is that it is at a high elevation and thus much cooler than the surrounding areas in the summer. Also, Cloudcroft has a small ski area which is the southernmost ski area in North America.

Late October will likely be mild and comfortable, but a snow storm is not impossible. Everyone should bring jackets for the evenings and if unseasonably cold weather arrives. October is a generally clear time of year with low humidity and deep blue skies (see photos of observatory above).

Cloudcroft is at 8800 feet (2600 meters)
Observatories are at 9200 feet (2800 meters)
Alamogordo is at 3800 feet (1150 meters)

Two nearby places of interest are White Sands National Monument and the Three Rivers Petroglyph State Park (see photos). Everyone should try to at least visit White Sands as it's not far and very scenic. The Space Shuttle landed there once on the dry lake bed.



- From Cloudcroft to the Space Museum is 18 miles and will take 25 minutes of driving
- From Cloudcroft to the Solar Observatory is 17 miles and will take 30 minutes of driving
- From the Solar Observatory to the Space Museum is 38 miles and will take 55 minutes of driving

With a good map, it will not be complicated to find your way around. For people with smartphones, they simply need to enter the address "1 Corona Place, Cloudcroft NM" to be guided by their phone map or car GPS.

Jay Pasachoff reports that the road between Cloudcroft and Sunspot is New Mexico Highway 6563, with "6563" being the wavelength in angstroms of the red spectral line of hydrogen that is so basic to solar observations. A couple of years ago he discovered that Google Maps listed it as "65/63" and he was able to get them to acknowledge their error and to correct the listing to "route 6563" in at least one place on the map (though more remains to be fixed).





Those who need transport from the airport to Alamogordo, there is a shuttle. From the webpages: from El Paso to Alamogordo: <http://nsosp.nso.edu/shuttle>

In Alamogordo, the shuttle office is in the lobby of the Best Western Desert Aire Hotel. In El Paso, look for the sign saying "Ground Transportation" to the right just before you get to Baggage Claim, near the monitor and telephone bank by the Business Center. You will meet the Alamo/El Paso Shuttle driver here; he will have your arrival information and will be looking for you.

Alamo/El Paso Shuttle
 1021 S. White Sands Blvd., Suite #A
 Alamogordo, New Mexico 88310
 Phone: (575) 437-1472 or (800) 872-2701
 Fax: (575) 434-2689

El Paso to Alamogordo:			Alamogordo to El Paso:		
	Depart El Paso	Arrive Alamogordo		Depart Alamogordo	Arrive El Paso
Trip B	8:45 a.m.	10:15 a.m.	Trip A	5:00 a.m.	6:30 a.m.
Trip 01	11:00 a.m.	12:45 p.m.	Trip 1	7:15 a.m.	9:00 a.m.
Trip 02	2:00 p.m.	3:30 p.m.	Trip 2	10:00 a.m.	11:45 a.m.
Trip 03	5:15 p.m.	7:00 p.m.	Trip 3	1:45 p.m.	3:30 p.m.

Submitted by wwwnso on Tue, 02/28/2012 - 13:49

Alamo-el Paso Shuttle Service - Limos & Shuttles

1021 S White Sands Blvd, #A, Alamogordo, NM 88310
Cross Streets: Between Mercury Ave and White Sands Community

Tel. (575) 437-1472

General Information

List of the places/activities Denise Kramer has found in the Cloudcroft area that might be considered fun things to do for the spouses/partners.

Savories Cooking Classes in Ruidoso

<http://www.newmexico.org/listing/?lid=1486>

Willmon Vineyards in Ruidoso

<http://www.newmexico.org/listing/?lid=20638>

Noisy Water Winery in Ruidoso

<http://www.newmexico.org/listing/?lid=20650>

Arena Blanca Tasting Room in Alamogordo

<http://www.newmexico.org/listing/?lid=20658>

<http://www.pistachioland.com/>

Tularosa Vineyards in Tularosa

<http://www.tularosavineyards.com/>

Dos Viejos Wines in Tularosa

<http://www.dosviejoswines.com/DosViejosWines/default.aspx>

New Mexico Wine Tours

<http://www.newmexicowinetour.com/>

<http://www.newmexicowinetour.com/private-group-tours.html>

Sunspot Solar Observatory Visitor Center

<http://www.fs.usda.gov/recarea/lincoln/null/recarea/?recid=34236&actid=120>

Trestle Recreation Area (Day Use/Trails)

<http://www.fs.usda.gov/recarea/lincoln/recarea/?recid=34242>

Old Apple Barn

<http://oldapplebarn.com/directions.html>

<http://oldapplebarn.com/aboutcontact.html>

Beverly & Bill Niffenegger

Three Rivers Petroglyph Site (North of Tularosa)

NM Map <http://www.newmexico.org/map/>

Patrick & Joanne Poitevin
September 30, 2014