

ABOVE THE FOG

• BULLETIN OF THE SAN FRANCISCO AMATEUR ASTRONOMERS •

VOL. 49, No. 10 – October 2001

Speaker, General Meeting, October 17

Robert Naeye
The Great Pluto Debate

Robert Naeye is the editor of Mercury magazine, which is published in San Francisco by the Astronomical Society of the Pacific. Robert previously worked as an editor for Astronomy magazine for more than 5 years. He has also worked on the editorial staffs of Sky & Telescope and Discover magazines. He is the author of two books. His first book, Through the Eyes of Hubble: The Birth, Life, and Violent Death of Stars was published in 1997. He will be sticking around after his talk to sign copies of his second book, Signals from Space: The Chandra X-ray Observatory, which was published in 2000.

Speaker, City Star Party, October 27

Jay Withgott
Panspermia

Not long ago, the idea of "panspermia" — that our planet's life may have originated in outer space — was deemed outlandish. But recently, astrobiologists are studying this possibility anew, as they learn more about how materials are transferred between planets and how some microbes can withstand amazingly harsh conditions. When comets or asteroids impact a planet, they may send tons of debris into space, some of which may eventually travel to another planet (think of Martian meteorite ALH 84001 that garnered headlines in 1996). If hardy microbes could survive the trip inside such a meteorite, then Earth could have seeded Mars with life — or vice versa. Today many labs are experimentally testing just how much abuse microbes can stand, to determine how likely it is that such interplanetary panspermia has taken place. Jay Withgott is a San Francisco-based freelance science writer. His feature article on panspermia appears in the Spring 2001 issue of California Wild, and a further astrobiological piece should appear in the Fall issue.

PLEASE NOTE: THE SEPTMEBER 19 GENERAL MEETING MAY BE MOVED DUE TO THE RECENT FIRE – PLEASE CHECK THE HOTLINE OR THE WEBSITE BULLETIN BOARD TO VERIFY THE LOCATION!!!!!!

San Francisco
Amateur Astronomers

Web Page:
www.sfaa-astronomy.org



Sharing the Wonders
of the Universe

Information Hotline
(415) 566-2357

2001 Club Officers & Contacts

<i>President</i>	Al Stern (415) 929-7035	<i>City Star Party Coordinator</i>	Toney Burkhart
<i>Vice President</i>	Bill Stepka (415) 928-2367	<i>Membership & Subscriptions</i>	Chelle Owens (415) 479-5313
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<i>Treasurer</i>	Chelle Owens (415) 479-5313	<i>Telescope Loans</i>	Pete Goldie (415) 206-9867
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<i>Alt. Board Members</i>	Randy Taylor	Jim Webster	

Club Telescopes

The SFAA owns 3 club loaner telescopes, Dobsonian/Newtownian reflectors: 6" f/10, 8" f/7, and 10" f/8. These are available for extended periods (30 days or more) to SFAA members. These are generally very fine scopes, easy to use and well-suited for deep sky, planets, and star parties. The loaner custodians are Pete Goldie & Sarah Szczechowicz, located in San Francisco. If you are interested in borrowing a scope, or if you have items you can donate for the loaner program (eyepieces, star maps/books, collimator, etc.) please contact them via email (pg@lbin.com) or phone (415-206-9867). Email communication is preferred and strongly recommended for a quick and accurate reply.

Important Dates

Board Meeting – October 10 - 7:00 p.m.
Western Addition Library, Scott & Geary Sts., SF

SFAA General Meeting – October 17
Morrison Planetarium, Golden Gate Park
Refreshments at 7:00 p.m.
Speakers begin at 7:30 p.m.

Mt. Tam Star Party
September 22 at 8:00 p.m.
October 20 at 7:30 p.m.

City Star Party
September 29 at 7:30 p.m.
October 27 at 7:00 p.m.

Above the Fog is the official bulletin of the San Francisco Amateur Astronomers. It is the forum in which club members may share their experiences, ideas, and observations. We encourage you to participate by submitting your articles, announcements, letters, photos, and drawings. We would also like to hear from our new members. Tell us about yourself – what you have done in the past and what other clubs you have joined. **The deadline for the next issue is the seventh day of the month.** Send your articles to Lorrie Boen at 765 Geary Street #302, San Francisco, CA 94109 or at LorrenLee@aol.com

From the President

August was a very good month for SFAA and your club president. Rita and I visited my son, Thomas, in Maine and then went on to Stellafane where again I helped coordinate the pre convention acting as the site foreman for that week. Convention itself was a wonderful event as usual. Both Rita and I had great fun meeting new people and people from before. John Dobson, was also present and was greeting with much appreciation by those present.

The following weekend saw us at Yosemite for the SFAA weekend. My daughter, Michelle, joined us there and helped out during the weekend. We were surrounded by smoke on Friday night from the Yosemite fires, which were pretty far off in the distance, and got a heavy dose of smoke until about midnight on Saturday night. The presentations were well attended, the impromptu potluck dinner on Saturday was a great success, and we all had a real good easy going time except for Ron Rossano who climbed half dome from Glacier point all in one long 12 hour day!!!

The Davis star party was a big success as well and was well attended by SFAA members. Our City star party the same night as the Yosemite star party and the Davis Star party went off well also. What a busy time and thanks to all the members who participated in each event representing our club.

We just returned from a fun SFAA picnic at Stern Grove. The solar observing provided by Art and Chelle Owens and Bob Berta showed us some really interesting and exciting solar flare activity.

The month of September will be quiet by comparison; or will it really!!! John Dobson will be our guest speaker at the September meeting; bring your questions for John. We hope to hold it at the usual place. HOWEVER, an electrical fire has destroyed the Academy of Science Gift shop, the Solar System display, and the Foucault pendulum just outside the Morrison planetarium. Lynette Cook's art work and mural were spared from all but some repairable 'smoke' damage, and the planetarium itself was left with smoke fumes and no electricity for an extended period of time. Please check the SFAA information hotline (415) 566-2357 for the location of the meeting if you plan to attend.

The Month of October will have Bob Naeye as our guest speaker. He will talk about the "Pluto as a planet" controversy, which should be very interesting. He had prepared a nice summary in this Bulletin.

Bob Berta's CCD group is moving along, watch for more info in future Bulletins.

Al

SFAA SPEAKERS CALENDAR 2001

November 14, 2001 **Joe Jordan, of NASA Ames Research Center, will present "Atmospheric Wonders: Light and Color, Fire and Ice in the Sky". See and understand physics in the environment about such aerial phenomena as rainbows, haloes, sundogs and the green flash.**

THIS IS THE SECOND WEDNESDAY OF THE MONTH TO AVOID THANKSGIVING EVE

December 19, 2001 **Members' night. SFAA members talk about their astronomical experiences.**

Abstract of General Meeting Talk
By Robert Naeye

For a cold little planet on the outskirts of the solar system, Pluto raises a firestorm of controversy. Neither a rocky terrestrial planet nor a gas giant, Pluto was unable to find comfortable niche in the grand scheme of the solar system. But since 1992, astronomers have found more than 400 similar bodies orbiting the Sun beyond Neptune in the so-called Kuiper Belt. Some of the newly discovered worlds have diameters half that of Pluto. Given these new discoveries, should Pluto still be called a "major planet," or is it simply the largest known Kuiper Belt object? Robert's talk will present both sides of the Pluto debate in a fair and balanced manner, and it will also present some of the latest findings of planets outside the solar system (which have sparked another debate about the upper end of the planet scale). Robert hopes that a spirited discussion among SFAA members will follow his talk.

ANNUAL ELECTION - CANDIDATES

The SFAA elections will be coming up in December and we have officer and board member vacancies to be filled. Please participate more in the club by being on the Board or by being a Club Officer. The extra commitment is small and the personal returns are many. Please consider helping make your astronomy club more like you would want it to be. Contact any club officer or board member to get your name on the ballot. We need to have the information in October to have the ballot ready for the November Bulletin. Thanks.

Al Stern SFAA President.

Mt. Tamalpais State Park
Star Programs

September 22 - 8:00 p.m.

"Life's Expansion Beyond its Planet of Origin"

Dr. Rocco Mancinelli, NASA-Ames Research Center

Is there potential for survival, adaptation, and biological evolution of life beyond the home planet?

October 20 - 7:30 p.m.

"Saving the World with Sky-Power"

Dr. Joe Jordan, Space and Atmospheric Researcher, SETI Institute

Scientists are searching for a solution to our energy crisis and projected climate changes
with renewable energy systems.

Dinners with the speakers: at Lau's China Bistro, Tam Junction, 252 Almonte Boulevard, Mill Valley, 2 1/2 hours before the scheduled talk. To participate, call the restaurant at (415) 389-8868, and add your name to the "Mt Tam Party." The no-host dinners run between \$10 and \$15, including tax and tip.

Information: **Telephone: (415) 455-5370, (415) 388-2070 Same day Hotlines: (415) 566-2357, (415) 455-5370 (messages after 4:00 pm)** Mailing Address: **MTIA/Astronomy Programs, P.O. Box 3318, San Rafael, CA 94912**

“IN THE COSMOS WHAT YOU SEE IS REALLY WHAT YOU GET”

By David J. Frey

Conventional wisdom suggests that the scientific process will eventually lead to a complete understanding of the basic laws of the cosmos. As scientific knowledge progresses we should get closer and closer to a complete understanding of the mechanisms that makes it all work. It seems, though, that the universe may have a built in limit as to what we can understand. The recently proposed cosmological effect that is causing the universe to expand at an accelerating rate may lead us to conclude that our ability to understand the universe is limited by the epoch within which we view the universe.

In the very distant future, when this expansion causes the velocities (redshifts) of all of the galaxies not gravitationally tied to our own to reach the speed of light, distant galaxies will begin to wink out and disappear from our universe. Eventually we will appear to be floating in a finite universe consisting of, at best, several hundred galaxies.¹ These will all be observable and understood to within the limits of our telescopes.

If the human race is still around to witness the winking out of the last galaxy, and we have kept very good records, we will understand that the universe is much larger than what we are actually observing.²

Imagine, then, that we are able to travel forward in time to when our universe is finite as described above. And then imagine that we bring all of our current observational data with us to discuss with some future civilization that is just reaching our same level of observational ability. After cordial (hopefully) introductions and successfully convincing our new found friends that we are who we claim to be (from the past) we would compare our observational data.

Three possible outcomes of this comparison of observations are as follows:

1. They see it our way: accept our information on faith and start a new religion based upon our observations.
2. They would chuckle, thank us politely for the pretty pictures and our hard work, and print our findings in their version of the tabloid press.
3. We would both come to the conclusion that the very fabric of the universe has changed. Not only did the galaxies that we have pictures of disappear but they have completely disappeared from their universe. In the future civilization's view the galaxies we have pictures of did not just disappear - *they never existed within their universe.*

Conclusion One is subjective and would result in a lively discussion that is too broad in scope for the amount of space available in most publications.

Conclusion Two is a real possibility and hopefully would eventually lead their scientific community to conclusion Three.

How can two technically similar civilizations, from what would appear to be the same universe, come to the conclusion that the universe is both infinite³ and finite just because they look at it during different times?

Because our understanding of the cosmos is based only on what we can observe, a civilization's understanding of the cosmos is fundamentally based upon the time in which a civilization observes it. Reality appears to change over time on a cosmic time scale. Consequently, our reliance on observational data may be insufficient to describe the cosmos.^{4,5}

This suggests that observations and the flow of time, as well as the laws of physics, all conspire to determine the fundamental state of the cosmos – not just the physical laws by themselves. Sort of like a Heisenberg uncertainty principle on a cosmic scale. Therefore, any theory or equation that attempts to describe the universe would also need to include a variable that corrects for the reality described by the theory or equation relative to the date in which the theory or equation is developed.

Our understanding of this delta in cosmic reality could be described by developing an equation for this variable, or Universe Epoch Factor (UEF) based on the following parameters:

1. Actual age of the universe in which the civilization studies the problem and to what extent the universe has expanded and what the red shift of the surrounding galaxies are (whether or not they have “winked out”).
2. Length of time the civilization studies the problem- Instantaneous / Extensive.
3. Observed change in the universe - Extensive vs nearly steady.
4. Point in time at which the universe is observed.
5. Point in space at which the universe is observed.

This factor could then be applied to cosmic theories in such a manner that the reality of the cosmos will change over time.

Or perhaps, the flow of time itself creates many universes that are fundamentally unrelated and cannot be described as a continuation or subset of each other and no amount of fiddling with our theories and equations can reconnect them.

Personally I like this conclusion the best.

Notes:

1. As these gravitationally tied clumps of galaxies loose communication with each other they will all become distinct and separate universes unto themselves.
2. However, it might become more and more difficult to convince future generations to rely on historical records rather than their then observational data that would seem to indicate otherwise.
3. For purposes of this discussion the term infinite is used *only* to make a distinction between what we currently see and what the post redshift finite universe would see.
4. Our universe may be fully understandable to us up to and until the time that the last galaxy disappears from view. The instant in which that last galaxy disappears will cause a quantum change in reality. The universe will change from an infinite one to a finite one. The people from the finite universe will likely develop different theories as to the origin of the universe, and it’s ultimate fate, than us lucky enough to live in the infinite universe. Thereby showing that the laws of physics are malleable rather than absolute.
5. It would be interesting to see how the finite group would deal with the cosmic microwave background radiation issue as it relates to the Big Bang theory. Developing alternate theories of physics and the cosmos to fit within the finite universe might be an interesting check and balance approach to our own theories about cosmos. This may result in a cosmology that can account for the quantum reality shift described above.

AANC Leonids page is up!
Jane Houston Jones

Our AANC Leonid page is already up thanks to Alan Gould, and more information will be added as events and facts materialize. We have an excellent chance to see the Leonid Shower and possible storm from the Bay Area this year.

And many of our clubs and science centers have already started planning programs around the Leonids, and I'd like to ask each of you to let me know your own club or regional activities so I can list them on the website. While over at Chabot Space and Science Center on Thursday, I picked up a copy of Dr. Mike Reynold's new meteor book, Falling Stars. You might want to get a copy yourself! Chabot is one of our AANC members, and Dr. Mike was our AANC Professional Astronomer of the year this year 2001!

Here is where to go for the new Leonids Page: <http://www.aanc-astronomy.org/>

Morrison Planetarium's
Benjamin Dean Lecture Series
presents

September 18

MOVED TO THE AUDITORIUM AT THE ASIAN ART MUSEUM

Pr. Michael S. Turner

University of Chicago & Fermilab

The Dark Side of the Universe

What is the dark matter that makes up most of our Universe and what is the dark energy that repulses gravity and is causing the expansion of the Universe to accelerate?

October 16

Dr. Mario Livio

Hubble Space Telescope Institute

Beauty and the Accelerating Universe

If the expansion of the Universe is indeed accelerating, this finding challenges the assumption that any fundamental theory of the Universe must be "beautiful."

November 20

Pr. Neta A. Bahcall

Princeton University

Will the Universe Expand Forever?

What is the ultimate fate of the Universe? Will it expand forever, or will it eventually collapse in a Big Crunch?

December 11

Dr. Gia Dvali

New York University

The Universe's Unseen Dimensions

Could the visible world lie on a membrane floating within a higher-dimensional space? The extra dimensions would help understand the inexplicable weakness of gravity and help us unify the forces of nature.

January 29

Dr. Alexander Vilenkin

Tufts University

Eternal Inflation

The eternal nature of inflation – an epoch of accelerated expansion driven by the repulsive energy of a "false vacuum" – has profound implications for understanding the Universe.

All programs begin at 7:30 p.m. in the Planetarium - Tickets are \$3.00 each
DEAN LECTURE INFORMATION LINE at (415) 750-7141



Solar Astronomy from San Francisco by Jim Uber

I enjoy it most when someone stops and asks, "What are you doing?" My reply, "Looking at the sun, the sunspots" catches their attention, and a quick follow-up "Wanna look?" does the rest. Although I occasionally run into a "hmmm, interesting" and they're gone response, the usual reaction is amazement, and a handful of questions I do my best to answer. And if instead of my white light filter I have changed to the hydrogen alpha one, my guests become really excited -- now we have not only spots, but prominences and flares!

I have been observing the sun, and doing sunspot drawings, for almost three years now. I added the flares two years ago when I got my hydrogen alpha filter. I set up on the sidewalk in front of my house to make my observations. The drawbacks -- heat rising from the street and buildings (turbulence), passing cars and trucks (vibrations) -- are more than offset by the convenience and potential to meet and introduce new people, however briefly, to a bit of astronomy. In fact, one of the people who first stopped told me about the SFAA and an upcoming city star party -- we went and soon joined. I am usually out for an hour or so. There are days when no one stops, and others when I talk to more than a dozen -- neighbors, tourists, people going from one end of town to the other. Some stop regularly when they see me out; some come back the next week with their children or visiting parents or friends.

Sunspots are caused by the sun's magnetic forces. They are areas which are relatively cooler than what surrounds them, and as they are cooler, they are less bright, therefore appearing dark. Flares and prominences are explosions of energy from the sun's disk. These can increase the intensity of the solar wind, a constant stream of charged particles the sun

expels into space. We are near the peak of solar maximum, the point in the approximately 11 year solar cycle when sunspot numbers are at their highest. The total sunspot count is arrived at using the formula $R = 10G + S$, where R is the total number of sunspots, G is the number of sunspot groups, and S is the number of spots actually seen. Accompanying the increased number of sunspots is an increase in the number of solar prominences and flares. Particularly large outbursts (coronal mass ejections), when earth directed, can cause geomagnetic disturbances in the atmosphere such as auroras, and can have an adverse effect on satellites and radio communications. Extremely large outbursts can disrupt power grids, leading to electrical blackouts -- the last solar maximum in 1989 saw the power grid in Quebec Province, Canada, overwhelmed and the entire province lost power. There have been several minor satellite, radio and power problems this cycle peak.

My brief records show that solar maximum peaked in April, 2000, with an average daily sunspot count of 240. As the professional count is done, I add my daily numbers for the month and divide by the number of days of viewing. My viewing days are affected by weather (and fog) and whether I am home during the day. My records show a nice progression up to the high and down since, with the numbers still going strong -- the June, 2001, average count being 190. The one obvious aberration is February, 1999, when I was only able to get out once that month on a particularly high sunspot count day.

As well as looking for solar phenomena, there is also sometimes a solar system occurrence to be seen: the November 15, 1999, transit of Mercury across the sun's disk, the December 25, 2000, partial solar eclipse, and the July 17, 2001, lunar occultation of Venus. I have shared all these with passersby and hope to continue doing so on fog free days.

The Count to June 2001

							Aug-98				Dec-98
							109	98	59	69	84
Jan-99											Dec-99
53	188	49	61	95	113	153	94	78	174	197	127
Jan-00											Dec-00
129	165	199	240	162	131	206	146	148	119	155	130
Jan-01					Jun-01						
144	115	130	166	120	190						

Stacy's Stargazing Getaways

Lassen Volcanic National Park (Or a place with really, really dark skies)

Fellow astronomers, it is with great pleasure that I write this edition of Stacy's Stargazing Getaways. Humbly written, you will find a truly spectacular location that my fingers are twittering and all a flutter just to write about it. Oh, the anticipation of being able to tell you about Lassen Volcanic National Park. So sit back, feast upon the words and enjoy.

Literally, star date July 17, 2001. A truly deserved vacation from work was beginning. 6 days and 5 nights of viewing in a new and totally different place was the destination. As part of a larger astronomy group, it was planned to meet up at Lassen Volcanic National Park, 40 miles east of Redding on highway 44. Leaving San Francisco the night before at 9 PM, a decision made entirely by my companion, we drove, nay flew, up Interstate 5 making various stops for food, more food, ice and gas. While on the way up and gazing out the window of the van, a fortuitous portent graced the nighttime sky – a green fire ball, last about 10 seconds as it lit up the alfalfa and mustard fields on either side of the highway. It was a good thing that we were between towns and highway intersections with gasoline stations' lights blurring out the sky.

At last, our turn-off through Redding...it was nice to be able to slow down somewhat and get away from the numerous trucks making their way between metropolitan areas. It is at the point the excitement overwhelmed me and I fell asleep – but then too, it was about 1.30 AM. Luckily for me, my companion is adept at driving at night so I slipped into a slumber worthy of a baby. It was about 45 minutes later that my body perceived the slowing of the van and then a stop. Ah, we were here – Lassen. But of course, it was nighttime and not much to see except the pine trees surrounding the parking lot at Manzanita Lake. So it was decided that rather than drive to the campground and disturb everyone with our arrival, we'd napped in the van at the lake and dawn, drive down the campground. My friend soon found out that sleeping across a telescope case and tripod case can be downright uncomfortable. I on the other hand was snugly ensconced in the seat that reclined. (Please note that I did offer the prime seat to my companion as he is quite a bit bigger than me and it would afford him more room. However, he declined, twice.)

So it was at dawn a wonderful thing to make our way to the group campground, to join others of our ilk and set up camp, albeit quietly as it was 6.30 AM and no doubt those who had arrived the previous day would have done some observing that night. However, it was amazing to see some of our colleagues up and about. Not that they were very conscience at this point, but they were moving and able to go through the motions in making coffee.

The first night was an eye opening experience. Having eaten a scrumptious dinner of chicken Italian sausage, marinated tomato slices and a lovely pinot noir, we headed up to Devastated Parking lot – 6 miles from the group camp. Devastated is so named because when Lassen last erupted in 1914, a large area NE of the peak was completely wiped out. It is only now that the forest is returning to its lower slopes with a considerable coverage. As I was sitting up and the sky was darkening, Mars made a grand appearance. Quite red and large. It just seemed more vibrant up here at 6200 feet. Soon Antares made its debut for the evening and it was a fine start. As the evening pasted into nighttime and my eyes kept getting more dark-adapted, I started seeing incredible detail that I had not seen since the previous summer. Out came the binoculars and my jaw proceeded to drop to the ground for the next 6 hours.

How does one describe the beauty of the cosmos with accurate words that will convey the sense of oneness, smallness, gratitude and excitement all rolled up? Quite simply, one cannot. However, let me describe what I saw. First off, it was dark. Really dark. I mean, really, really dark. You could make out Triangulum and M33 nekked eye. At one point, even the red light off my observing flashlight was too much and I had it turned down to almost nothing. The Milky Way looked like electrified sugar that had been strewn across the sky. Nary a breeze was blowing so the seeing was steady, the clarity brought stars' light to pin points. For the better part of my viewing session that night, I used my two best instruments – my two eyes. Next, I went for the 7x50 and 9x63 binoculars depending upon what had caught my eye as I gazed up. I did use my 120mm refractor, but needless to say, the eyes and the binoculars would have been enough that first night.

I must inform you dear reader that it was with this first night, that I officially started pursuing my Messier certificate. And, I was able to get off to a good start with the incredibly dark skies, good transparency and steady seeing. That's what you get at Lassen...some of the best stargazing conditions in California. For the remaining 5 nights, the conditions pretty much stayed as close to perfect. One night the seeing was a little soft and dewy, so it was an early turn-in.

So did I mention that this place was dark? Really dark? If I was remiss in stating that fact, let me re-iterate. Lassen Volcanic National Park is REALLY DARK.

This is one of the more spectacular parks in the National Park system that does not get over crowded...while it's good to call ahead and make a reservation at one of the campgrounds, there are areas that are first come, first serve...which aren't taken up by Wednesday or Thursday afternoon. Getting there is quite an easy drive and the park does have amenities near the entrance not to mention a very good museum about the history of the park and area. Daytime activities range from a moderate hike up to the peak of Lassen, to multiple hikes, fishing, good photography possibilities and scenic areas.

All in all, I have to rate Lassen Volcanic National Park at stunning 9 stars! But Stacy, it's a 4-6 hour drive! But it's a very easy drive – piece o' cake! So that's my story and I'm sticking to it. Good seeing!

Dark sky factor	10 stars (this place is really dark)
Ease of access	7 stars
Clarity of skies	10 stars
Seeing	8 stars
Good place to set up telescope	10 stars

Carbon Stars – Fall & Winter

This list was compiled by Linda Mahan, a SFAA member, from information contained in the two volumes of “The Night Sky Observers Guide”, and “Stars”. Her interest began after observing Hind’s Crimson Star in Lepus.

Carbon stars are highly evolved cool red giants. Their deep crimson color is the result of the abundance of carbon molecules in their atmospheres, which are efficient absorbers of blue light. Carbon stars have strong spectral lines of such carbon molecules such as C2, CN and CO; TiO is absent. N type stars differ from spectral class M with a reversed carbon- to-oxygen ratio. R type stars are warmer and carbon rich, corresponding in temperature to classes K and G. Type S stars are intermediate in carbon composition between M and N, and has its TiO replaced by ZrO. In M type stars, neutral metals, CH and CN are strong. TiO appears and become stronger toward late M stars.

The Night Sky Observer’s Guide, Kepple and Sanner Volume 1, Autumn & Winter
Carbon, and other select Red Stars, by constellation

Andromeda

VX And. C4.5 carbon variable. 00h19.9m +44 43
R And. red giant.carbon variable. S3-S8(M7) 00h24.0m +38 35
Grb(Groomsbridge) 34, double star. M2, red binary.
00h17.9m +44 00

Aries

V Ari. R4 deep orange carbon star. 02h14.9m +12 15

Auriga

UV Aur variable, burnt orange carbon star. C6-C8 with blue companion star. 05h21.8m +32 31

Camelopardalis

S Cam C7 carbon variable. 05h41.0m +68 48
R Cam S2-S8 carbon variable. 14h17.8m +83 50

Cancer

X Cnc C5,4 carbon variable. 08h55.4 +17 14
T Cnc C3,8-C5,5 carbon variable. 08h 56.7m +19 51
V Cnc S0-S7 carbon variable. 08h21.7m +17 17

Canis Major

W Cma C6 carbon variable. 07h08.1m -11 55
VY Cma M5 variable star. 07h23.0m -25 46

Canis Minor

R Cmi C7 carbon variable. 07h08.7 +10 01
S Cmi M6-M8 variable star. 07h32.7m +08 19

Cassiopeia

V Cas M5-M8 variable star. 23h11.7 +59 42

Cepheus

S Cep C7(N8) carbon variable. 21h35.2m +78 37
T Cep M5-M8 variable star. 21h09.5m +68 29
Mu Cep Herschel's Garnet star, M2
21h43.5m +58 47 second largest red giant star.
VV Cep largest red giant in Milky Way.
21h56.57m +63 37 eclipsing double star.
Krueger 60 M2 & M5, red pair, 13 ly. distant.
22h28.1m +57 42

Cetus

W Cet S6-S9 carbon variable. 00h02.1m -14 41
Omicron Cet "Mira" type, M5-M9 variable. 02h19.3m -02 59

Fornax

R For Ce carbon variable. 02h29.3 -26 06

Lepus

R Lep C6 "Hind's Crimson Star", variable. 04h59.6 -14 48

Pisces

TX Psc N0 (C6) fine red color variable. 23h46.4 +03 29
Z Psc C7,3 reddish variable. 01h16.6 +25 46

Cosmology at the Academy of Sciences

John Dobson will be giving a course on Cosmology at the California Academy of Sciences. The class will be held on Monday nights from 7:00 to 9:00 according to the following schedule: 10/22, 10/29, 11/5, 11/12, 11/19. For more information, go to <http://www.calacademy.org> under Education. Note: the Fall schedule isn't on the website last I checked, but it will be up soon.

Founded in September 1952, the San Francisco Amateur Astronomers (SFAA) is an association of people who share a common interest in astronomy and other related sciences. Our membership consists of people from all walks of life, educational backgrounds and ages. Many SFAA members own their own telescopes; some have been made by hand in local telescope-making classes and vary in size from 6 to 25 inches.

Treasurer, SFAA, 13 Mabry Way, San Rafael, CA 94903

make checks payable to **San Francisco Amateur Astronomers** and mail to:

- \$ 8 enclosed, youth membership (under 18)
- \$30 enclosed, institutional membership
- \$30 enclosed, family membership
- \$30 enclosed, foreign membership
- \$25 enclosed, individual membership

Select one category:

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Name: Telephone:

San Francisco Amateur Astronomers Membership Application

San Francisco Amateur Astronomers

c/o Morrison Planetarium
California Academy of Sciences
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