



SJAA EPHEMERIS

SJAA Activities Calendar

Jim Van Nuland

(late) August

- 22 Dark Sky weekend. Sunset 7:50 p.m., 11% moon sets 8:58 p.m. Henry Coe Park's "Astronomy" lot has been reserved.
- 28 Hough Park star party. Sunset 7:42 p.m., 68% moon sets 1:53 a.m. Star party hours: 8:45 until 11:45.

September

- 5 **General Meeting at 8 p.m.** Slide and Equipment night. Latest images, latest equipment, being made by our members.
- 11 Astronomy Class at Hough Park. 7:30 p.m. Topic is TBA
- 11 Hough Park star party. Sunset 7:21 p.m., 48% moon rises 11:39 p.m. Star party hours: 8:15 until 11:15.
- 12 Dark Sky weekend. Sunset 7:19 p.m., 36% moon rises 12:44 a.m.
- 19 Dark Sky weekend. Sunset 7:09 p.m., 2% moon sets 7:25 p.m. Henry Coe Park's "Astronomy" lot has been reserved.
- 22 Autumn begins at 2:19 p.m. PDT.
- 25 Hough Park star party. Sunset 7:00 p.m., 49% moon sets 11:40 p.m. Star party hours: 8:00 until 11:00 p.m.

October

- 3 General Meeting at 8 p.m. Our speaker is Dr. Bradford Holden of Lick Observatory, on The Physical Evolution of Massive Galaxies
- 9 Astronomy Class at Hough Park. 7:30 p.m. Topic is TBA
- 9 Hough Park star party. Sunset 6:39 p.m., 62% moon rises 10:37 p.m. Star party hours: 7:30 until 10:30.
- 10 Dark Sky weekend. Sunset 6:37 p.m., 51% moon rises 11:56 p.m.
- 17 Dark Sky weekend. Sunset 6:28 p.m., 0% moon rises 7:57 a.m. Henry Coe Park's "Astronomy" lot has been reserved.
- 23 Hough Park star party. Sunset 6:20 p.m., 33% moon sets 10:26 p.m. Star party hours: 7:15 until 10:15 p.m.

The Board of Directors meets before each general meeting at 6:30 p.m. All are welcome to attend.

24 hour news and information hotline:

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<http://www.sjaa.net>

It's Our Choice, Really

Wayne Hale

In my new role I get to travel around the country and talk to a lot of people. These days I am frequently asked the same question: can we afford the luxury of having a space program? In these days where the nation is fighting two wars, there is a crisis in health care, the national debt is reaching astronomical levels, and we are in an economic recession, indeed fighting hard to prevent another great depression; can The United States Of America afford a space program.

It does little to point out that NASA receives 0.6% of the federal budget and if all space activities were terminated that drop in the federal bucket would not solve any of the problems facing the nation.

I believe that a strong business case can be made that the space program leads to economic growth through the invention of new products which stimulate new businesses and indeed whole new industries. But I am not going to make that case today; indeed I believe you are more familiar with it than I am.

A case can be made that space exploration excites our young people to study science, mathematics, and engineering areas, which the nation is desperately short of new college graduates. But I am not going to make that case today.

A case can be made that by looking back on the earth and studying other planets we can best understand what is happening to our climate and perhaps how to control it. But I am not going to make that case today.

There is an even stronger case that space activities help protect our nation militarily. But I am not going to make that case today.

I am here today to talk about the long term consequences of space exploration, or of not having space exploration.

I am mindful today that we chose our own destiny. We are founded by pioneers who saw opportunity and who had the courage and energy to take a chance.

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History tells us that there are no guarantees. It is not a given that the United States will always be great. Today we are the world's only super power and what we do in space contributes to that position. Without continued courage and sweat, we could find ourselves no longer the leader of the world.

Everyone knows the quotation from the historian George Santayana: those who do not learn from the past are doomed to repeat it. And so, today, I have a little history lesson for you to think about in the days to come.

Five hundred years ago there was only one superpower in the world: China.

The Ming Empire ruled a people more numerous than the ancient roman empire at its height, larger in territory than modern Russia, vastly more powerful and richer than all the petty fiefdoms of contemporary Christian Europe put together.

The Ming Empire was fabulously wealthy. The emperor wanted a new capitol: they built the city we know as Beijing from empty grazing land.

The emperor needed to feed the people in his new city: they build the Grand Canal, an engineering feat not rivaled until the Suez and Panama Canals.

The emperor wanted a navy, so he appointed an admiral to build a fleet of 1,500 ships.

The largest of these ships rival the size of WWII's support aircraft carriers; they were the largest wooden ships ever built, the largest sailing ships ever built.

It was not until the age of steam and steel four hundred years later that larger ships built. There were over 30,000 sailors in this navy. China was so inconceivably rich in those days

that the cost of this vast navy was an inconsequential fraction of the resources available to the emperor.

The Chinese admirals set out on many voyages of discovery and commerce to the Philippines, Malaysia, India, and as far as the east coast of Africa. For over 40 years the Ming navy made many voyages which resulted in Chinese hegemony: total political control over half the world. Not half the known world as those ignorant Europeans might guess, but half the total world.

From the Cape of Good Hope through India to the Bering Strait, from Australia and New Zealand to the west coast of the Americas, trade and tribute poured into China. All of these accomplishments are well documented and well known to historians.

"...they concluded there was nothing out there for China - a conclusion that sounded logical but was far from true."

In a recent book, a retired British royal navy sea captain, Gavin Menzies, provides evidence that the Chinese navy circumnavigated the world in 1421, discovering Antarctica in the south and coming within two hundred miles of the North Pole in the other direction.

Captain Menzies has evidence that the Chinese set up colonies not just on the orient facing east coast of Africa, but on the west coast as well, Chinese colonies in the Caribbean, near present day Providence Rhode Island, and on Greenland. Wow.

How did the Europeans get an accurate map of the world 75 years before Columbus and a century before Magellan? From China!

So the Chinese were the world's greatest superpower and controlled half the world and explored the entire globe in 1415. The tiny principality of Portugal put everything on the line. Portugal was insolvent, its prince in debt and his

court threadbare. After a huge debate, the Portuguese borrowed just enough money to finance a few ships and their crews.

With less than two dozen ships - none of them large by even the miserable European standard of the day the Portuguese fought a successful sea battle in the Mediterranean and captured the port of Ceuta on the North African coast. This opened up, ever so slightly, trade with the orient, especially increased trade in the highly desired spices from that region.

The scrappy Portuguese decided to go forward, learning the lesson that taking risks was worthwhile, and losses could be accepted. They invented a new type of ship suited for the stormy Atlantic, the caravel, the first really new ship design since ancient times.

The caravel became only the first in a series of continually improving and innovative ship designs that have continued even to the Present.

The Portuguese earned the admiration and envy of all the European states, and every country tried to emulate them. Thus started the age of wooden ships and iron men.

Over the next centuries, the European countries repeatedly decided to go forward, by fits and by starts, for good reasons and for bad ones, always with endless debate, generally teetering on the edge of financial insolvency. But the west Europeans made the decision to go forward into the world for trade, treasure, discovery, and glory. They immersed the west in new ideas, new technologies, and new innovations.

Back in China, after a generation of astounding voyages, the great Ming admiral died at sea. The emperor also died, and the new emperor came under different influences.

These voices counseled the young emperor to turn inward. Surely China had enough problems to solve in China,

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Home, Home on Lagrange

Akkana Peck

Jupiter is back! The giant planet is up all night through September, rising a bit before sunset and transiting before midnight.

Jupiter's been in the news a lot lately. I'm sure you've seen the stories about the Black Smudge — the result of an impact of a comet or meteor, discovered in Jupiter's south polar region by an Australian amateur astronomer. Unfortunately, a few weeks after it was discovered the spot spread out and became very difficult to see, and by now you probably won't be able to see it at all.

But of course there are plenty of other things to see on Jupiter. I was intrigued by a note in the RASC Observer's Handbook: Jupiter with no Galilean satellites at 9:43 pm on the night of September 2. But all the Jupiter simulators I've checked say that Europa will be transiting then, while Ganymede and Callisto will still be visible slightly off the limb. Still, take a look and see if the simulators are wrong and the RASC is right. It'll be a lovely view anyway, with Ganymede hanging right off Jupiter's limb and gradually moving into the limb, very closely followed by its shadow, while Callisto moves further from the planet.

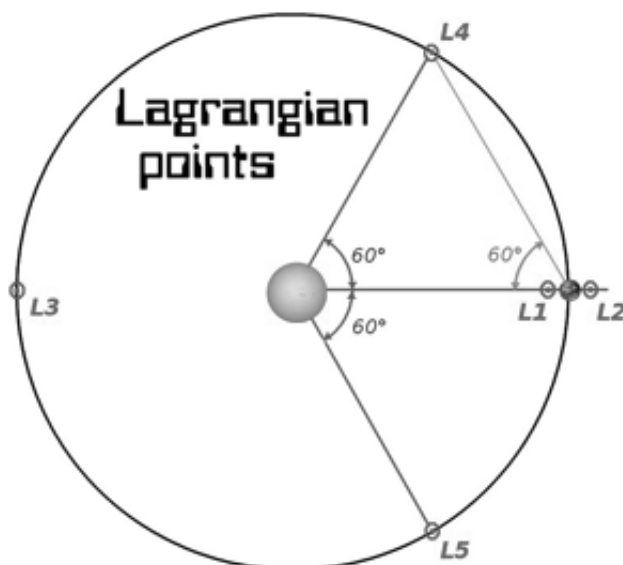
Neptune spends September just a few degrees to the east of Jupiter, while Uranus, at opposition on the 17th, trails about an hour and a half behind. Pluto transits around nightfall and sets a bit after midnight, so it's findable but you'll have to work at it. Venus and Mars are in the morning sky, while Saturn is hiding behind the sun.

There's some manmade satellite action in the shallow sky this month, too. Cassini continues to impress: last month it sent back images of narrow towers above the ring plane, held in place by one of Saturn's seemingly endless fleet of tiny moonlets. Check it out if you

haven't already seen the image.

And the LCROSS mission is on its way to impact the moon, where it will crash into the moon on October 9. I'll talk about that more in next month's column.

Meanwhile, the NASA spacecraft STEREO A makes its closest pass to L4 on September 10, while its partner STEREO B passes by L5 on October 26. A and B, it turns out, stand for "Ahead" and "Behind" — since the L4 Lagrangian point precedes Earth by 60° while L5 follows it by the same amount (see diagram).



I described the Lagrangian points back in June — stable points in Earth's orbit, and a nice place to park spacecraft. But we amateur astronomers are observers. I wondered, where are the Lagrangian points in the sky? Where would you look if you had a big enough telescope to see one of these satellites?

Of course, the first three are no-brainers. For L1 and L3, look directly toward the sun. There are several spacecraft at L1 — SOHO, for example, which has discovered lots of new comets as well as its main mission of observing the sun.

For L2, look the other way, toward the antisolar point. There are several spacecraft there, like WMAP, which has been studying the cosmic microwave background radiation for years now. There's also a new spacecraft there on a similar mission: Planck, "the coolest thing in space". Its sensitive detectors need to be kept very cold, so they're refrigerated to cool the detectors down to -272.9°C, only a tenth of a degree above absolute zero.

Okay, the first three Lagrangian points are easy. How do you find L4 and L5?

Well, obviously they're in the plane of the ecliptic, so that narrows it down. But where on the ecliptic? If you look at the diagram, you'll notice that 60° angle centered on the Sun that defines L4 and L5 also defines an equilateral triangle. Draw a line from Earth to either of those points, and you find it's also 60° away from the Sun. So all you have to do is sweep from the Sun's position forward or backward along the ecliptic 60 degrees.

What if you want the actual coordinates? There's a way of doing that too. Most astronomy programs let you enter new solar system objects by specifying their "orbital elements". If you've ever tried that — perhaps with a new comet — you know it can be a bit tricky, since orbital elements don't follow any standard and there are lots of different systems in use. But for the Lagrangian points you can use shortcuts.

For a quick approximation, pretend the Earth's orbit is circular: semi-major axis 1.0AU, eccentricity 0, inclination 0.

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If a plane crashes in the woods and nobody hears it, does it make a sound? Never mind contemplating this scenario as a philosophical riddle. This can be a real life or death question. And the answer most of the time is that, even if no people are nearby, something is indeed listening high above. That something is a network of satellites orbiting about 450 miles overhead. The “sound” they hear isn’t the crash itself, but a distress signal from a radio beacon carried by many modern ships, aircraft, and even individual people venturing into remote wildernesses. In the last 25 years, more than 25,000 lives have been saved using the satellite response system called Search and Rescue Satellite-aided Tracking (SARSAT). So what are these life-saving superhero satellites? Why they are mild-mannered weather satellites. “These satellites do double duty,” says Mickey Fitzmaurice, a National Oceanic and Atmospheric Administration (NOAA) systems engineer for SARSAT. “Their primary purpose is to gather continuous weather data, of course. But while they’re up there, they might as well be listening for distress signals too.” In February, NASA launched the newest of these Polar-orbiting Operational Environmental Satellites (or POES) into orbit. This new satellite, called N-Prime at launch and now dubbed NOAA-19, prevents a gap in this satellite network as another, aging NOAA satellite reached the end of its operational life. “The launch of N-Prime was a big deal for us,” Fitzmaurice says. With N-Prime/NOAA-19 in place, there are now six satellites in this network. Amongst them, they pass over every place on Earth, on average, about once an hour. To pinpoint the location of an injured explorer, a sinking ship, or a downed plane, POES use the same Doppler effect that causes a car horn to sound higher-pitched when the car is moving toward you than it sounds after it passes by.

In a similar way, POES “hear” a higher frequency when they’re moving toward the source of the distress signal, and a lower frequency when they’ve already passed overhead. It takes only three distress-signal bursts — each about 50 seconds apart — to determine the source’s location. Complementing the POES are the Geostationary Operational Environmental Satellites (GOES), which, besides providing weather data, continuously monitor the Western Hemisphere for distress signals. Since their geostationary orbit leaves them motionless with respect to Earth below, there is no Doppler effect to pinpoint location. However, they do provide near instantaneous notification of distress signals.

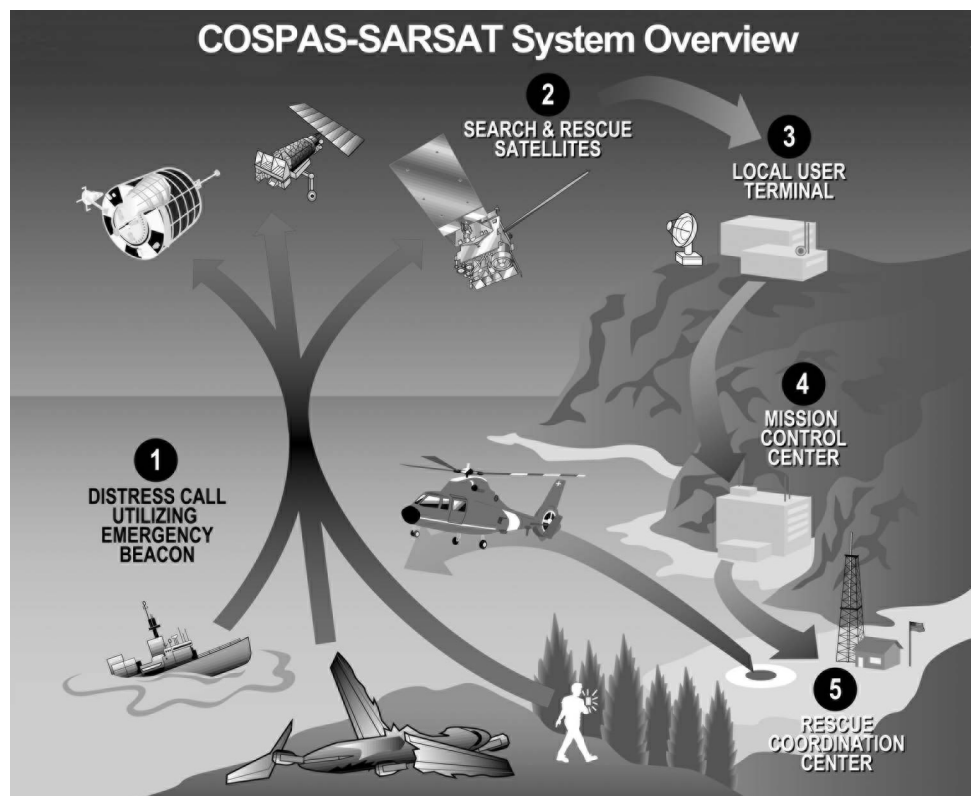
In the future, the network will be expanded by putting receivers on

new Global Positioning System (GPS) satellites, Fitzmaurice says. “We want to be able to locate you after just one burst.” With GPS, GOES will also be able to provide the location of the transmitter.

Philosophers beware: SARSAT is making “silent crashes” a thing of the past.

Download a two-page summary of NOAA-19 at http://www.osd.noaa.gov/POES/NOAA-NP_Fact_Sheet.pdf. The Space Place gives kids a chance to rescue stranded skiers using their emergency rescue beacons. The Wild Weather Adventure game awaits them at <http://spaceplace.nasa.gov/en/kids/goes/www>.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



NOAA's polar-orbiting and geostationary satellites, along with Russia's Cospas spacecraft, are part of the sophisticated, international Search and Rescue Satellite-Aided Tracking System.

The Shallow Sky
Continued from page 3

The next two, ascending node and “argument of periapsis” or similar name (everyone seems to name that one differently), specify where the orbit rises above the ecliptic and where perihelion is. For a circular orbit on the ecliptic plane, neither of these matter, so set them to 0.

That leaves you with two elements that specify where the object (or in this case, the region of space) is at any given time. Some systems call this “Mean anomaly at epoch”. “Epoch” just means the time when you know the object’s position. “Mean anomaly” is a little harder: it’s the object’s position along its orbit if you assume the orbit is circular. That may sound silly — most planetary orbits aren’t actually circular — but orbits are a lot easier to calculate if you start with the mean anomaly and then make all the extra corrections later.

Aieee! That sounds complicated! But here’s all you really need to know: Earth’s mean anomaly is 180° at the time of the vernal equinox each year. If you were specifying Earth’s position, you could specify a mean anomaly of 180 and an epoch date of the most recent vernal equinox: 3/20/2009 11:44 UT.

Wait — why 180 and not 0? Isn’t zero defined by the vernal equinox?

It is — but zero is the Sun’s position from the Earth at the vernal equinox. In this case, you want the Earth’s position from the Sun.

Now you know how to specify the Earth. For L4 and L4, use that same vernal equinox date — but specify mean anomalies of 120 and -120 degrees. (They’re 120 rather than 60 for the same reason Earth is 180 rather than 0.)

Plug that into your astronomy program and you’ll find that L5 sets just past 10pm. L4 rises at 2am; it’s about 10° east of Mars.

Of course, this is all an approximation since it began by assuming a circular orbit. It also ignores factors like perturbations from other planets. But it should get you close enough that you can point your hypothetical super-telescope and start sweeping around ...and it’s certainly close enough if you just want to gaze in the right direction and wonder what STEREO is seeing now!

ASTRONOMY Renewal

Jim Van Nuland

It’s time to renew our group subscription to Astronomy magazine. The rate for 2010 is still \$34, or \$60 for two years. Please send a check payable to Jim Van Nuland, 3509 Calico Ave., San Jose CA 95124.

Subscribers: if I have your e-mail address (from the SJAA roster), you should have gotten a note with particulars of your subscription. If not, write me, e-mail address below.

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If you do not subscribe and wish to do so, send the \$34/60 and your subscription will begin with the January 2010 issue.

I will hold your checks until late September, when the renewal package must be sent in. So don’t worry that your check doesn’t clear promptly.

Any questions? Call me at 408.371.1307, from 11 a.m. to 11 p.m., or e-mail to <jvn@svpal.org>.

PLEASE NOTE: this applies to Astronomy magazine, not Sky & Telescope! The latter subscription is paid to the treasurer as part of your SJAA dues.

Good Reading!

Fall “Astronomy for Poets” Classes at Foothill College

Andrew Fraknoi

2009 is the International Year of Astronomy! It’s a perfect time to treat yourself to an astronomy class at Foothill College, in Los Altos, just off freeway 280 between San Francisco and San Jose. As a community college, Foothill welcomes students from ages 16 to 80+. Some students take classes as part of a degree program, but many come just to take one or two classes for fun and self-improvement. Fall classes start Sept. 21.

This fall we offer:

Astronomy 10B — Stars, Galaxies, and the Universe

A first course in “astronomy for poets”, this class introduces some of the most exciting objects and discoveries in the universe, and traces the history of your atoms from the Big Bang to their place in your body today. Offered during the day (at noon) and in the evening (Tues and Thur night.) An optional hands-on lab is offered with each, and no math background is required or assumed.

Astronomy 36 —

This one unit course accompanies the Silicon Valley Astronomy Lecture Series. Just attend each of the six lectures in 2009-2010 (you may watch one on the Web) and write a short paper.

The instructor for these classes was named California Professor of the Year in 2007, in recognition of his ability to explain scientific concepts in everyday language and with a sense of humor.

For more information, see: <http://www.foothill.edu/ast>

The Last Month In Astronomy

AUG-07-2009 **Kepler finds atmosphere** The Kepler spacecraft has just started the scientific phase of its 4 year mission but it has already detected the atmosphere around a previously detected exoplanet. The planet is called HAT-P-7 and it transits a star that is 1000 light years away. This detection shows that the Kepler instruments are working well. <http://www.astronomy.com/asy/default.aspx?c=a&id=8524>

AUG-03-2009 **New Martian Meteorite** The Martian rover Opportunity has discovered a new meteorite. The new discovered iron-nickel meteorite, dubbed Block Island, is not the first meteorite found on Mars by the rovers but it is the largest. <http://www.scientificamerican.com/blog/60-second-science/post.cfm?id=opportunity-rover-finds-possible-me-2009-08-03>

JUL-29-2009 **NEOs on the web** NASA/JPL has started a new website that gives frequent updates on NEOs - Near Earth Objects. <http://www.jpl.nasa.gov/asteroidwatch/>

JUL-22-2009 **Ammonia = Water?** The Cassini spacecraft has detected ammonia during flybys of Enceladus. This doesn't mean Enceladus does windows but it may indicate the presence of liquid water. How? Ammonia is essentially an antifreeze. It can reduce the freezing point of water down to -143 Fahrenheit and temperatures measured along fractures on Enceladus are at least -136° F. <http://jpl.nasa.gov/news/features.cfm?feature=2238>

JUL-17-2009 **Info on OCO failure** Last February, an attempt to launch the Orbiting Carbon Observatory from Vandenberg failed. The failure has been definitely tied to the spacecraft fairing (satellite covering) not separating. The specific reason why cannot be determined but at least one likely cause is an ordnance failure. <http://jpl.nasa.gov/news/news.cfm?release=2009-109>

*It's Our Choice, Really
Continued from page 2*

why waste time and energy exploring? These advisors told the emperor that there was nothing in the world to match Chinese culture - true. They told the emperor there were no goods in the world to rival Chinese goods - true. In short, they concluded, there was nothing out there for China - a conclusion that sounded logical but was far from true.

They advised that China should protect what they had from the foreigners. Foreigners who wanted what the Chinese had. The emperor followed this advice. He completed the great wall to keep foreigners out. He built a new capital, a forbidden city to keep the citizens of his own country out.

The emperor ordered that the fleet be burned. The sailors were disbanded. It became a capital offense to build a sailing ship with more than two masts. The emperor even ordered that all the records of all the voyages be burned. China turned inward.

When the Portuguese explorers Bernardo Dias and Vasco de Gama

rounded the Cape of Good Hope from the west to the east, they found legends of white ghost ships that had come two generations earlier. Africans all along the east coast were wearing Chinese style hats and clothes.

When Magellan crossed the Pacific Ocean and claimed the Philippine islands for King Charles of Spain he found silk and porcelain, all imported from China years before, but the traders that brought them had vanished.

All throughout the Indies, Europeans found remnants of a culture that had been of great influence but which had disappeared completely from the scene: Chinese culture.

The Chinese course led inexorably to stagnation, then dissolution, then decay, and finally to destruction. For there came a day when the Portuguese and the other Europeans carved up the pitifully weak remnants of China for their own colonial use.

Five hundred years later, the great 20th Chinese historian Wei Pu concluded the choice of direction was critical. The Chinese turned inward, the Europeans

went forward. That Chinese historian observed: the history of the world for the last 500 years has been the history of the west.

Choices matter. There are consequences, some unseen at the time. But one constant has held through human history; taking risks to find new knowledge, new lands, new ways of doing things, new cultures, and new ideas has always paid off. Staying home is the short road to failure.

So are we, today, to be the Chinese or the Portuguese? Which direction will our country choose? There are no guarantees, only rewards for those who are willing to seize opportunity, take risks, work hard, and show courage. The Chinese have learned this lesson from history, will we?

Wayne Hale was the manager of the Space Shuttle Program from 2005 until 2008. This article is taken from a speech that he gave and subsequently posted on his blog on June 16, 2009. You can view his blog at <http://blogs.nasa.gov/cm/blog/waynehalesblog>. The editors received specific permission from Mr. Hale to print this article.

It Must Be Astronomical ...

Loaners

The loaner program offers members a means to try scopes of various sizes and technologies before you buy. It is one of the real jewels of being a member of the club. Scopes are available for all experience levels. The inventory is constantly changing. The following list is a sample. For more information please see the loaner program web page: <http://www.sjaa.net/loaners>

Hot Dates

September 12 - 16 - ASP Annual Meeting in Millbrae, California.

September 17-19 - CalStar, see <http://www.observers.org/CalStar/>

September 21 - Fall classes start at Foothill College including "Astronomy for Poets". See <http://www.foothill.edu/ast> for more information.

October 30 - Nov.1 - Advanced Imaging Conference in San Jose

Q: How many galaxies are closer to the Milky Way Galaxy than Andromeda?

A: Assuming that all galaxies 2.2 million light years or closer to the Milky Way must be closer then there are a total of 14 galaxies closer than Andromeda. (RASC 2009, pg. 331)

Astro Blogs

<http://blogs.discovermagazine.com/badastronomy/> - Phil Plait covers bad astronomy including myths, urban legends, and the horrendous scientific errors made by Hollywood.

<http://cs.astronomy.com/asycs/blogs/astronomy/default.aspx> - The astronomy blog for Astronomy magazine. Most articles are by Bill Andrews.

<http://www.starstryder.com/> - This is the blog for noted astronomer, Pamela Gay. She also has some astronomical podcast. Many of the blog posting involve her travels.

<http://blogs.jpl.nasa.gov/> - The JPL blog is written by Jane Houston Jones and about two dozen other contributors.

"It is worthy of notice that the brighter variables have the longer period." – Henrietta Swan Leavitt, one of the Harvard Observatory's "computers".

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