Starscan

Johnson Space Center Astronomical Society

JSCAS is an association of amateur astronomers dedicated to the study and enjoyment of astronomy. Membership is open to anyone wishing to learn about astronomy.

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Canadian Space Telescope

Eight years ago this month, astronomers reached a major milestone - the first confirmed discovery of a planet orbiting another star like our sun. That star is named 51 Pegasi and you can see I it from your own backyard on the next clear night. It's part of the autumn constellation of Pegasus, which looks like a giant square. These days you can find Pegasus in the eastern sky right after sunset, when it appears to be standing on one corner.

The star 51 Pegasi (just 51 Peg for short), is just above the upper right side of the square. It's faint but in a dark sky it is visible to the naked eye. If you use binoculars you can find it easily, even in city skies. Since evidence for the planet around 51 Pegasi was first reported over 100 other stars have been identified as having planets. But astronomers haven't forgotten about 51 Peg.

In fact a group of researchers is hoping to learn more about the planet there by using Canada's first ever space telescope. The telescope is called "MOST" (for Microvariability and Oscillations of Stars). MOST rocketed into space last June from a launch pad in northern Russia. MOST wasn't actually the reason for the launch. It's so small -- about the size of a suitcase -- it just piggybacked up on another satellite. Since then astronomers at the University of British Columbia have been putting MOST through its paces and making sure its systems are working as planned.

The idea behind MOST is both exciting and elegant. Technically, it's more of a light meter than a telescope. It can measure subtle variations in the brightness of stars down to one part in one million. This is a remarkable feat. This is the kind of precision you need to see the reflected light from a star orbiting a distant sun. How can MOST possibly do this? Normally planets of other stars, or "exoplanets" are far too faint and distant to be distinguished from the stars they orbit. This is certainly true of the planet around 51 Pegasi. But as it moves through its orbit it will pass through phases, rather like the moon. The change in the planet's light due to these phases ends up looking like a subtle but regular variation in the total light coming from the star itself. MOST is easily sensitive enough to spot this variation, which means the MOST team could be the first in history to detect reflected light from a planet outside our solar system. Depending on the precise signature of that reflected light MOST should be able to tell us whether the planet has clouds, haze, or is completely clear. Until MOST came along no one expected to get this kind of information for years or even decades.

The catch is it will take weeks of continuous staring at 51 Peg to tease out the signature of the planet's light. This would not be possible on the ground where the rising sun is constantly putting an end to a few hours worth of observing. The obvious answer is to put a telescope in

space where it can stare at just about anything for as long as necessary. It's a job the Hubble Space Telescope could do, but the Hubble's time is too expensive to dedicate to one target for very long.

That's where MOST comes in. This Canadian satellite is so small and inexpensive it's been nicknamed the "humble" space telescope. And it's about to corner the market in star staring. MOST has already obtained its first data from 51 Peg. For now the star have moved out of the satellite's "continuous viewing zone" which means it's too close to the sun for the satellite to look at it safely. But it will be back in view next spring. MOST is expected to finish the job then.

Meanwhile, MOST has lots of other targets to keep it occupied. Aside from planets, MOST can help determine the ages of individual stars based on the way their light fluctuates. That in turn will help determine a more precise age for the Milky Way galaxy and for the universe as a whole. Not bad for a machine that's built simply to stare off into space!

For more information check out the MOST website: http://www.astro.ubc.ca/MOST/

Occultation Opportunity

Paul Maley

New information has been received on the upcoming Christmas Eve day occultation by the asteroid Circe that will pass south of San Antonio and Houston and over a 70-mile path from Corpus Christi to Victoria, eclipsing an 11.8 magnitude star. The prediction error is a mere 0.25 path widths, which in real terms makes it the most accurate prediction for the Texas area of 2003. I am especially requesting observers with an 8-inch scope or larger from the Corpus and Kingsville area to cover the vital south limit and observers from San Antonio and Houston to consider making the drive south to get the north side of the path.

This path is slightly south of the favorable Dynamene path shown on November 16. Please check out the Houston Events web page:

http://www.eclipsetours.com/events

Since this event occurs on a Wednesday morning just before a major holiday, there is a lot of time for planning. Please let me know if you think you can try this.

FOR SALE

Celestron Ultima 8 with electronic drive, accessories, heavy-duty tripod, carrying case and Minolta camera with adapter. Cost new $3550. Sell for $1299 (firm).

Contact Mary Lou Carpenter (281-559-1657) for details and description of accessories.

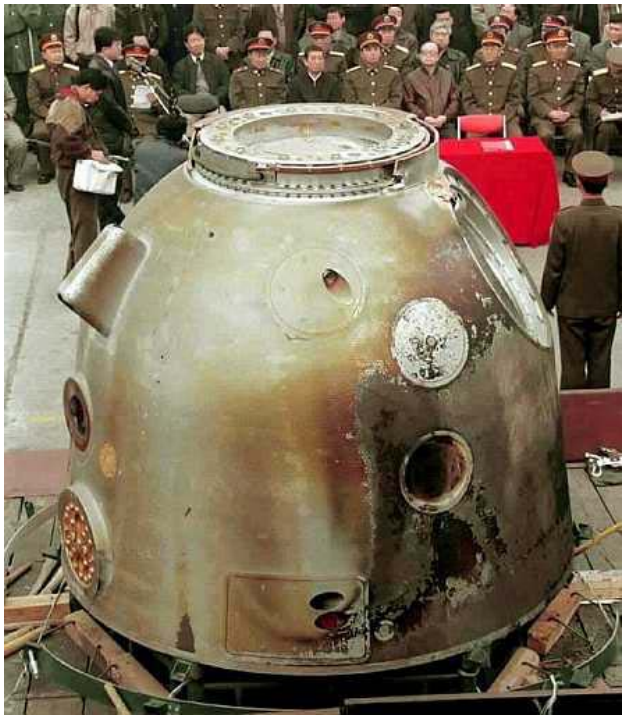
Paul Maley

A historic event took place this month (October 15) when China's Lt. Col. Yang Liwei joined Yuri Gagarin and John Glenn as the first person in space from his country. The 22- hour 14-orbit flight of the Shenzhou 5 spacecraft was to be visible over the US in three regions. The first would be over the Boston/New York area during orbit 6; the Midwest on orbit 7; and above the west coast on orbit 8. I made plans to attempt to find a location where it might be possible to view the sunlit spacecraft and hopefully its rocket carrier in a clear sky. My intent was to secure some video with the system I normally use for asteroid occultation recording—a Watec CCD camera, Collins image intensifier and (in this case) a 50 mm Nikkormat lens as the objective.

The planned liftoff time was badly timed for 8pm CDT October 14 which was after nearly all flights had departed from Houston airports to anywhere. Realizing that unless there was a very specific launch delay that might move the orbit for advantageous viewing in Houston, I had to plan to fly either to New York, Kansas City, Denver or San Francisco. The orbital inclination of 42.4 degrees meant that these parts of the US would likely be favored. The key questions then became: 1) would the Shenzhou 5 launch on time or be delayed? 2) would skies be clear where I landed?

I had installed digital cable from Time Warner some time ago and I was informed that Chinese television CCTV 9 appears on channel 223. News media had indicated that the launch would be televised live. But the military apparently squashed this plan and because there was no real track record of launch delays, it became speculative at best as to whether or not it was worthwhile to risk flying somewhere in advance only to find out that the launch had slipped by hours or even days. A lot of money potentially spent for nothing. This was a historic opportunity. I was not able to see either Gagarin's launch or John Glenn's. But I could not pass up this chance to see something amazing and historic. Isn't that what amateur astronomy is supposed to be about?

I decided that it was best to wait till liftoff. Ted Molczan, a friend and an amateur satellite orbit computer living in Canada, had calculated a possible orbital element set from which it was possible to plan an intercept. Jim Oberg was keeping me up to date on the launch news. My first choice became Kansas City. But then I realized that unless I left at 4:20pm (nearly 4 hours before launch) I could not reach that location in time. As the clocked ticked down I found only one viable option. Southwest Airlines operated a flight to Dallas at 10pm. If I could reach Dallas, I could rent a car and drive north and get as close to the orbit as I could. It really wasn't necessary to be directly underneath it. In fact I calculated that this same orbit was visible technically from Houston on the same orbit. The Shenzhou would reach a maximum elevation of only 8 degrees above the north-northwest horizon. In our skies that was unacceptable.



I then decided that this would become became the plan. Weather from Houston to Kansas was forecasted to be perfect, Southwest Airlines had plenty of seats and if I could stay awake, I could get close enough to the orbit to put it about 25 or 30 degrees above my horizon.

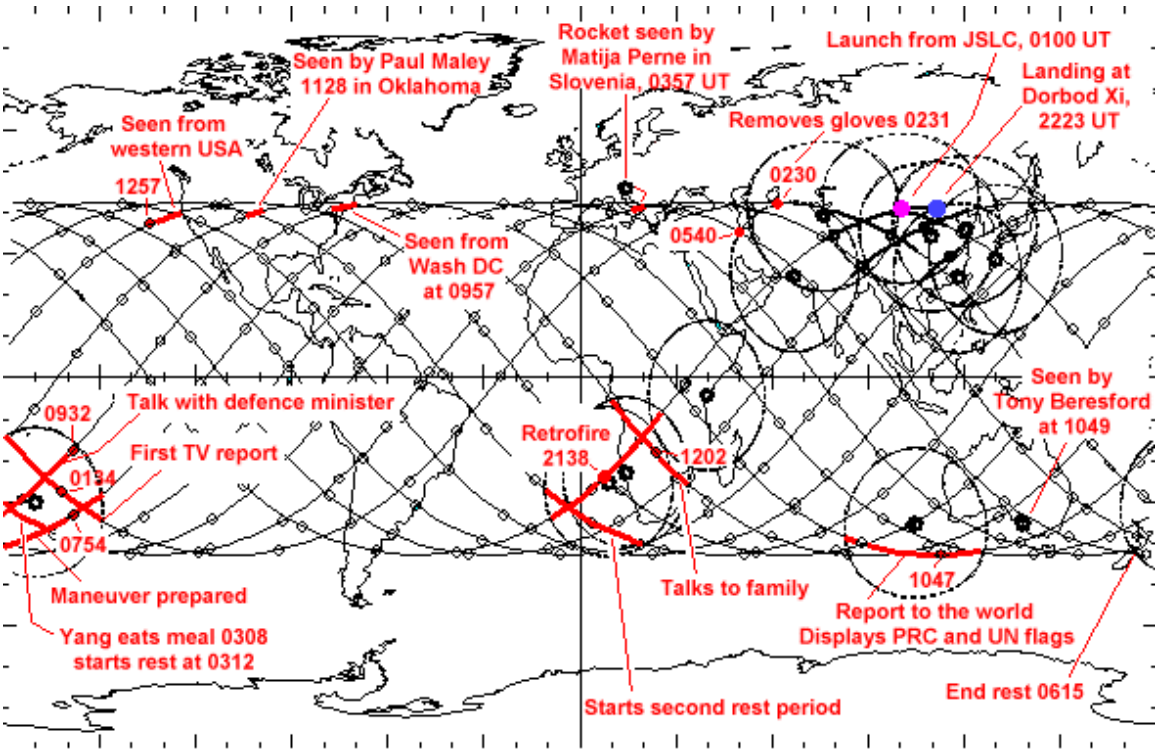
The plan was in motion and I had to be fast and lucky to pull it off. Launch could perhaps not be delayed more than 30 minutes. Of course, if that had happened, the lighting would change and the plan would not have enough time to be reevaluated. So, essentially the delay really could only have been a matter of a few minutes! At precisely 8:06pm CCTV9 indicated that the launch had occurred on time at 8:00pm. I left the house en route to Hobby Airport only to encounter an accident on Clear Lake City Blvd blocking it completely. First time ever! I had to turn around and navigate along through Pinebrook to El Dorado and from there to Hobby. I was able to hop on the 9pm flight to Love Field arriving 50 minutes later. At 10:08 pm, as I was getting my rent car from Avis, Yang was reported to have begun eating his first space meal. Clearly he had eaten better than I had on Southwest! Can you imagine a 14-orbit space meal consisting only of peanuts because the space agency was trying to cut back on costs?

By 12:30am Oct. 15 I had reached Ardmore, Oklahoma. Shenzhou V was now in its 3rd orbit around the earth. Even though it had only been two hours, I was too tired to drive further and stopped at the Holiday Inn. I was able to sleep from about 1 to 4am and by 4:30am I began loading my equipment into the car. As I walked out the door, I realized the temperature had dropped to the 50s and I was only dressed for Houston weather (t-shirt). I drove up the highway and arbitrarily cut off when the horizon looked good and the Ardmore lights disappeared in the rear view mirror. The pass time was scheduled to be 6:25am for the rocket and the Shenzhou 5 was to appear just 3 minutes later. At 5:00am Ted called on my cell phone and updated me on the look angles. It turned out the launch had occurred on time and his original element set was only 9 seconds off! The look angles were nearly the same as I had calculated two days earlier. This is an example of talented amateurs being able to still have an impact on space events. By 5:30am I had found a spot in the small town of Gene Autrey, Oklahoma 11 miles north of my hotel. It was in front of an oil well with flat horizon and dark sky. Although the 3rd quarter moon was behind me and lit up part of the sky, the fact that the rocket would emerge from the earth's shadow only 18 degrees elevation above the northern horizon meant I had to have good skies in order to distinguish it.

At 6:25am the rocket appeared in my field of view and I began to manually track it. It was only 140 miles high and moving briskly. In the 40+ seconds of time I decided to devote to following it, the rocket's brightness peaked at 10.3-second intervals, smooth and periodic over four cycles. I next moved the optics to the spot in the sky just above the oil well where the Chinese capsule was supposed to appear. About 10 seconds before it was due an object appeared moving slowly through the field. It was bright and easy to track. But something seemed slightly

wrong about its movement. Not wanting to be fooled by a cosmic interloper I reluctantly went back a few degrees and as I did so, the real Shenzhou 5 appeared. The two satellites essentially crossed within a degree or so of one another in the sky. Ted later identified this first object as Kosmos 1675 rocket (some 1040 miles away). The faster moving Shenzhou was 212 miles high and about 440 miles away. I could track it nearly 2.5 minutes as it moved eastward toward a predawn sky. Minor suspected periodic variations were noted in its appearance. As I began to repack the car, the eastern sky was beginning to get light. If the launch had been delayed more than 15 minutes, it was unlikely I would have been able to get decent video because of the sky brightness.

On the way back from the site I encountered a fog bank. Though I slowed, I unluckily managed to collide with a coyote on the roadway. I could not see it but I am reasonably sure it survived.



Here is a timeline showing reported observations of Shenzhou (courtesy of Sven Grahn)

The previous day I had arranged to provide a copy of the video to CNN in Dallas if I had been successful and by 1030am I arrived at their office in central Dallas. It took me longer to find a parking spot than it did to find an observation site. I was hopeful that they might use the footage but that never happened. In addition, I had taken a time exposure on ASA 400 film which I realized would probably not yield much. When I returned to Houston, the photo was developed at my lowest priority developing store (Eckerd's) and after pestering the processing folks to change their print settings, the two crossing tracks appeared very dimly in the field--too dimly to scan and put on my web site. However, where the video is concerned, I was able to extract a few frames which are now posted at my web site showing the rocket and the module with the first Chinese astronaut in a dark Oklahoma sky.

As a postscript, Yang Liwei reported that although he passed over China and had clear views below his capsule, he could definitely NOT see the Great Wall.

Johnson Space Center Astronomical Society

Agenda for November14, 2003

Center for Advanced Space Studies
Lunar and Planetary Institute

7:30 Meeting Start and Welcome

7:40 Presentation: Don Petit – Science Officer for ISS Expedition 6

8:30 Break

8:45 Calendar Review, Announcements, Awards and SIG Reports

- **Deep Sky, Challenge Object – Chris Randall**
- **Star Party News - Lisa Lester**
- **Hernan's Astronomical Oddities-Hernan Contreras**
- **Elections for Officer Positions**
- **Tales from Ft McKavett**

9:30 Charlie's Challenge - Charles Hudson

10:00 Door Prizes and Adjourn

The Latest Shape of the Earth

Bob Taylor

At a couple of our most recent meetings we've learned that there have been, and still are, some who have questionable ideas as to the true shape of our planet. Hernan Contreras has enlightened us on the Flat Earth Society as well as the Hollow Earth Society (complete with tour

in July 2005). The following is just to clear the air, hopefully. Not that a trip on an icebreaker into the center of the earth wouldn't be a hoot!!!

Today it is well known that the Earth is a sphere, or very close to one (its equator bulges out a bit because of the Earth's rotation). When Christopher Columbus proposed to reach India by sailing west from Spain, he too knew that the Earth was round. India was the source of precious spices and other rare goods, but reaching it by sailing east was difficult, because Africa blocked the way. On a round globe, however, it should also be possible to reach India by sailing west, and this Columbus proposed to do (he wasn't the first one to suggest this--see below). Sometimes the claim is made that those who opposed Columbus thought the Earth was flat, but that wasn't the case at all. Even in ancient times sailors knew that the Earth was round and scientists not only suspected it was a sphere, but even estimated its size.

If you stand on the seashore and watch a ship sailing away, it will gradually disappear from view. But the reason cannot be the distance: if a hill or tower are nearby, and you climb to the top after the ship has completely disappeared, it becomes visible again. Furthermore, if on the shore you watch carefully the way the ship disappears from view, you will notice that the hull vanishes first, while the masts and sails (or the bridge and smokestack) disappear last. It is as if the ship was dropping behind a hill, which in a way is exactly the case, the "hill" being the curve of the Earth's surface. To find out how the distance to the horizon is calculated, click here Eratosthenes, Posidonius and El Mamun The Greek philosopher Aristotle (384-322 BC) argued in his writings that the Earth was spherical, because of the circular shadow it cast on the Moon, during a lunar eclipse. Another reason was that some stars visible from Egypt are not seen further north the full quotation can be found here. The Alexandria philosopher Eratosthenes went one step further and actually estimated how large the Earth was. He was told that on midsummer day (June 21) in the town of Syene in southern Egypt (today Aswan, near a huge dam on the river Nile) the noontime Sun was reflected in a deep well, meaning that it was right overhead, at zenith. Eratosthenes himself lived in Alexandria, near the river's mouth, north of Syene, about 5000 stadia north of Syene (the stadium, the size of a sports arena, was a unit of distance used by the Greeks). In Alexandria the Sun on the corresponding date did not quite reach zenith, and vertical objects still threw a short shadow. Eratosthenes established that the direction of the noon Sun differed from the zenith by an angle that was 1/50 of the circle, that is, 7. 2 degrees, and from that he estimated the circumference of the Earth to be 250,000 stadia.

Other estimates of the size of the Earth followed. Some writers reported that the Greek Posidonius used the greatest height of the bright star Canopus above the horizon, as seen from Egypt and from the island of Rhodes further north (near the southwestern tip of Turkey). He obtained a similar value, a bit smaller. The Arab Khalif El Ma'mun, who ruled in Baghdad from 813 to 833, sent out two teams of surveyors to measure a north-south baseline and from it also obtained the radius of the Earth. Compared to the value known today, those estimates were pretty close to the mark. The idea of sailing westward to India dates back to the early Romans. According to Dr. Irene Fischer, who studied this subject, the Roman writer Strabo, not long after Erathosthenes and Posidonius, reported their results and noted: "if of the more recent measurements of the Earth, the one which makes the Earth smallest in circumference be introduced--I mean that of Posidonius who estimates its circumference at about 180,000 stadia, then. . . "and he continues: "Posidonius suspects that the length of the inhabited world, about 70,000 stadia, is half the entire circle on which it had been taken, so that if you sail from the west in a straight course, you will reach India within 70,000 stadia. " Notice that Strabo--for unclear reasons--reduced the 250,000 Stadia of Eratosthenes to 180,000, and then stated that

half of that distance came to just 70,000 stadia. Handling his numbers in that loose fashion, he could argue that India was not far to the west. All these results were known to the panel of experts, which King Ferdinand appointed to examine the proposal made by Columbus. They turned Columbus down, because using the original value by Eratosthenes, they calculated how far India was to the west of Spain, and concluded that the distance was far too great.

Maybe the jury is still out?

Star Party Schedule

November 8 - Moody Gardens- Lunar Eclipse Observing & Star Party
November 11 - Hyde Elementary
November 14 - JSCAS Meeting
November 15 - Haak Winery
November 23 - New Moon @ 16:59 CST

December 06 - Moody Gardens
December 12 - JSCAS Meeting
December 23 - New Moon @ 03:43 CST

Attention JSC recipients of the Starscan

Unfortunately, this may be your last copy of the Starscan received via NASA mail.

Due to closing of the Bldg 1 satellite printing facility, we (JSCAS) may be going to an all-electronic, distribution of the Starscan.

The Starscan file is too large to send out via email.

If you are interested in receiving a monthly email notifying you when the Starscan is available for viewing on the JSCAS website, send an email to me, Randy Moore at randall.c.moore@nasa.gov.

In your email, if other than the address in your email FROM field, provide me the email address to which you want notification sent.

Folks who receive the Starscan via US Mail (~20 of you) will continue to do so until further notice.

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STARSCAN Information
(Upcoming Input Deadline: Nov 25th at 6:00 PM)

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