

37545 days 2 hours Until the 2117 Transit of Venus



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2012 June 5-6 Witness the spectacle!

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What is a transit of Venus?

When Venus passes directly between earth and the sun, we see the distant planet as a small dot gliding slowly across the face of the sun. Historically, this rare alignment is how we measured the size of our solar system. The view is like a front row seat to the transit method, by which we find planets around distant stars.

When is it?

The last transit of Venus occurred June 5-6, 2012. The next pair of Sun-Venus-Earth alignments will be December 2117 and 2125. Look for a transit of Mercury in 2016.

What happened in 2012?

People across the globe witnessed and celebrated science in action. Observing parties, public outreach, live webcasts, art exhibits, historic displays, music, and more set the 2012 transit of Venus apart as a collective science experience.



See A Community Celebrates for a summary of the 2012 Transit of Venus from Michiana.



Transit of Venus Story

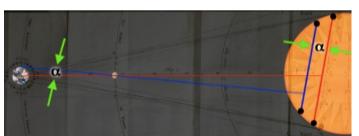
Rare Alignment



A transit of Venus occurs when Venus passes directly between the sun and earth. This alignment is rare, coming in pairs that are eight years apart but separated by over a century. The most recent transits of Venus were a thrilling sight in June 2004 and 2012, with the next transit of Venus pair occurring in December 2117 and 2125.

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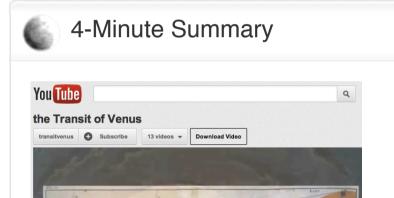
Global Expeditions



Observers from two locations on earth see two distinct paths (red and blue) of Venus across the sun. The slight difference in times Venus takes, moving from edge to edge, can mathematically unlock the distance from earth to the sun, and thus the size of our solar system. For 17th & 18th century transits, intrepid explorers set out to answer a leading question of mankind. Not all of them made the voyage back home.

Read More History

Mystery of "Black Drop"



Animation and visual effects by Patrick McPike.

More Videos



Get Your Gear



Three designs of **T-shirts at reduced price** from supporters of Transit of Venus outreach efforts.

Midwest Treasure: TROVE



Art exhibits, family activities, a bus tour, historic artifacts, lectures, webcasts, telescope viewing, and





Protect your eyes. There are several safe ways to observe the sun.

- Solar filtered telescope
- Disposable "eclipse shades"
- Rear projection screen
 (Build a Sun Funnel, above)
- Live webcast
- More

Read More







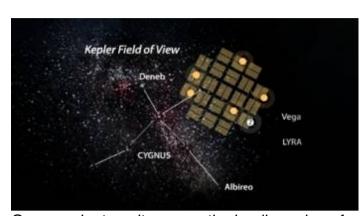




Just before or after the circular black dot of Venus seems to touch the edge of the sun, a peculiar "black drop effect" sometimes occurs between the contact points. A ligament of darkness smears the juncture of Venus and the sun. You can see a similar anomaly if you almost pinch your thumb and forefinger together. Just before you sense contact, a black feature spans your two digits.

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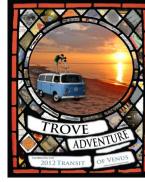
Transits Lead the Hunt



Once again, transits are on the leading edge of new discoveries. The NASA Kepler mission and others are using the transit method to find habitable planets around distant stars. The Kepler spacecraft monitors over 150,000 stars, looking for periodic dips in their light curves which reveal the presence of companion planets. You, too, can join this quest for new worlds.

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more complemented the visual spectacle near the Michigan-Indiana border. This hub of 2012 transit of Venus activity in Michiana celebrated the math, science, history, and art of the celestial phenomenon.



Read More TROVE



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Closure for Transit of Venus



With the sealing of the Transit of Venus Time Keg, the bulk of my public outreach for this celestial alignment comes to a close. Members of the Great Lakes Planetarium Association (GLPA) added the final messages to future observers before I caulked and bolted the cover and side plug into place. The hospitality suite at the GLPA 2012 Annual Conference was a fitting site for marking the end of a long but enjoyable effort.



Earlier in the conference I presented my concluding paper and prezi, A Commmunity Celebrates the Transit of Venus. I invite you to peruse the prezi in depth to get a sense of how one community embraced the opportunity to promote math and science. An audio recording of that talk is online.

This transitofvenus.org website still needs material on the aftermath of June 5, including images of the 2012 transit of Venus itself and results of scientific inquiries. I hope to add valuable content here in the future, but at a leisurely pace.

In the interim, I will be casually building the website www.nightwise.org, a portal to my other interests and to astronomy in my community.

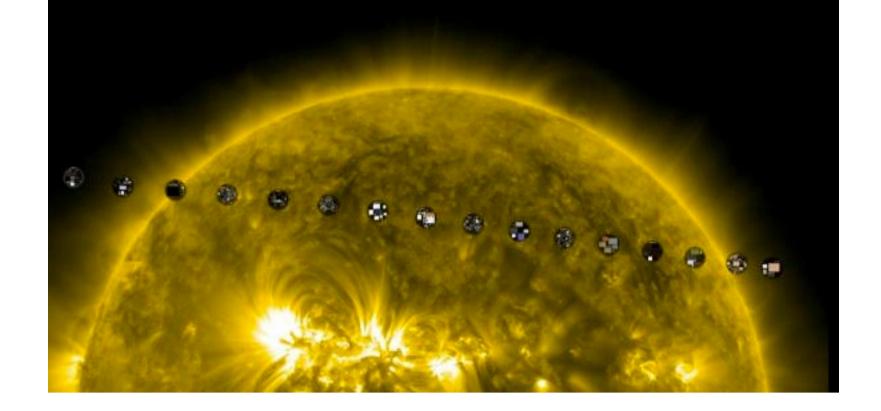
I thank the many supporters who have encouraged and supported Transit of Venus education and public outreach. In particular I thank my wife Mary, my kids Eric and Sarah, Steven van Roode, Patrick Rumley, and the many parties seen in the prezi. That was fun.



Community Celebrates

OCTOBER_SHORT 29 | 09:19

Chuck



Reprinted with permission from

Proceedings of the Great Lakes Planetarium Association 48th Annual Conference

Dale Smith, Editor

Abstract:

Astronomy educators and enthusiasts near the Michigan-Indiana border embraced the 2012 Transit of Venus as a community celebration. Among the diverse components were a planetarium program, a treasure hunt, a lecture series, a symphony performance, a newsletter, a motor coach tour, original videos, art exhibits, historical displays, public outreach events, Sun Funnel workshops, social media initiatives, related products by small businesses, multiple observing opportunities, and a time capsule. This talk parallels the interactive prezi *Transit of Venus Across the Sun* at http://prezi.com/3tgyibho9g-w/transit-of-venus-across-the-sun/.

Text:

For the 2012 transit of Venus, a community of astronomy educators and enthusiasts near the Michigan-Indiana border (dubbed Michiana) embraced the 2012 Transit of Venus as a community celebration. Outreach efforts were diverse, extending into schools, businesses, institutions, and informal education venues. An interactive presentation *Transit of Venus Across the Sun* at http://prezi.com/3tgyibho9g-w/transit-of-venus-across-the-sun/ has sixteen circles laden with images and embedded videos that suggest the extent of the community effort. Highlights of each black pearl on the string--each a talk unto itself--are summarized below. An audio file of the talk, delivered in the paper session at the Buhl Planetarium, is at http://www.transitofvenus.org/docs/2012GLPA-Pittsburgh2.mp3.



Planning

Diverse partners stepped up to plan and execute events before and during the transit of Venus. Among them were staff from planetariums, a math center, University of Notre Dame, a microbrewery, art galleries, astronomy clubs, NASA, and small businesses.

Talks, Papers & Workshops

Prior to June 2012, I presented papers and posters at the National Science Teacher's Association (NSTA) National Conference in Indianapolis; the Great Lakes Planetarium Association (GLPA) in Urbana, IL; the Astronomical Society of the Pacific (ASP) in Baltimore, MD; the American Astronomical Society (AAS) in Austin, TX; and the Michiana STEM Forum IV in South Bend, Indiana. Additional talks were at astronomy clubs, Rotary Clubs, and public venues in Ohio, Michigan, Illinois, Wisconsin, and Indiana. A sample is at http://youtu.be/4bufgnyXw7c. Publications included *Planetarian*, *Journal of the International Planetarium Society*; *Universe in the Classroom*; *The Classroom Astronomer*, and regular newsletters for the PHM Digital Video Theater.

Stump Speech

After the 1639 transit of Venus, Jeremiah Horrocks complained about two things. First, he didn't have enough time to warn others about the impending alignment. Second, he had to compete with sports. Of his friends, Horrocks wrote, "Most of them care little for trifles of this kind, preferring rather their hawks and their hounds."

Today science educators are still competing with the equivalent of hawks and hounds. If we as a nation want to prosper through math and science, then we need to celebrate math and science in action. Embrace it with the same zeal as sports and other popular culture. The transit of Venus is that opportunity to celebrate.

Outreach

The Michiana community stepped up to prepare students and the public alike for the transit of Venus. Venues included libraries, planetariums, a community math center, and parks. Activities occurred at Science Alive, a family event at the main library in South Bend; Prairie Vista University, a five-session after-school program at an elementary school; AstroFest, a school district event that was duplicated at South Bend Union Station; AstroCamp, a week-long summer camp for kids; and the Michiana Star Party.

To broaden our reach into the community and to involve individual business, the Riverbend Community Math Center coordinated a regional treasure hunt for families, called TROVE Adventure. About two dozen small businesses and institutions each exhibited a historical artifact with signage describing the respective item. Families who picked up ten Keywords from among the sites received free solar shades as a reward.

Read more: Community Celebrates

Poster: Transit of Venus Time Keg

Reprinted with permission from

Proceedings of the Great Lakes Planetarium Association 48th Annual Conference

Dale Smith, Editor

Abstract:

In past centuries, observers of transits of Venus have written messages for future witnesses of the celestial phenomenon. During and after the 2012 transit of Venus, spectators reflected on and shared their experience for their 22nd century counterparts. The written personal records and other transit of Venus artifacts from 2004 and 2012 will be sealed in the Transit of Venus Time Keg, a stainless steel time capsule made from a beer keg. Great Lakes Planetarium Association (GLPA) members can contribute their messages at the GLPA 2012 Annual Conference in Pittsburgh, PA, where the Transit of Venus Time Keg will be sealed, bringing closure, literally, to this popular and historically significant solar system alignment. A commemorative plaque celebrates nature's celestial spectacles, and invites people to open the Time Keg after 100 years as the 2117 and 2125 transits of Venus approach.

Poster Text:

The Transit of Venus Time Keg is a time capsule containing artifacts and personal reflections from the 2012 transit of Venus. It is intended to capture elements of the celestial phenomenon in the 21st century and to inspire observers in 100 years when the 2117 and 2125 transits of Venus approach.

Read more: Poster: Transit of Venus Time Keg

Vision For Future

In late September 2012 I wrote some elected officials and candidates for office, including President Barack Obama and Governor Mitt Romney, seeking their personal contribution to the Transit of Venus Time Keg. I asked them for their vision of the future, where they expect America to be in a century, and the roles science and the observation of nature (e.g., the transit of Venus) serve in our national interests.

Awaiting their responses, I invite all candidates of political office--people who aspire to lead--to submit their long-range vision, as outlined below:

Dear Candidate for Leadership,

I write to invite you to support education outreach in science, technology, engineering, and mathematics (STEM) by sharing your vision of the future.

Sun Earth Day 2012: Shadows of the Sun Milestones

• Largest NASA Event Ever
• All NASA Internet Stats –
Broken

http://venustransit.nasa.gov

According to NASA figures, the nation's space agency experienced "the largest NASA event ever" during the June 5 transit of Venus (Source: NASA GSFC, June 2012). For the last time in our lives, the planet Venus was readily visible during the day as it passed directly in front of the sun.

While both political parties profess to support STEM education, no political candidates led the nation in 2012 by personally witnessing the celestial spectacle that captivated the rest of the world. Similar lackluster leadership occurred with the 2004 transit of Venus, which Google deemed the #1 Popular Event in the world for an entire month (Google Zeitgeist, June 2004). Is it any wonder some people think today's politicians are out of touch with constituents? I ask if you will challenge such prevailing cynicism and look ahead not just four years but, rather, 104 years, literally.

The Transit of Venus Time Keg (www.transitofvenus.org/misc/360-transit-of-venus-time-keg) is a time capsule to be opened by and to motivate future generations as they prepare for the December 2117 transit of Venus. Will you please write a letter of your vision of America for the people of that era? In your view, where are we now, and where do you expect us to be in a century when the next pair of Venus transits occur? What role does science and the observation of nature (e.g., the transit of Venus) serve?

Much of the national and global outreach for the transit of Venus originated in the Midwest, where we celebrated with an educational focus (e.g., http://transitofvenus.org/trove). Hence, the Time Keg will be sealed at the Great Lakes Planetarium Association (GLPA) Annual Conference, October 23-26, 2012, in Pittsburgh, PA.

Please write your personal statement preferably with permanent marker (e.g., Ultra Thin Point Sharpie[®]) on acid-free paper and mail it to the address below by October 19, 2012. If necessary to make the deadline, you may email a digital version, though longevity of printer ink is less assured. Include instructions as to whether I may publicly air your letter in 2012 or whether you want it to remain sealed and unread until the time capsule is opened. Your call. I prefer the latter if it means your written contribution to the Transit of Venus Time Keg would have more candor and less political correctness. That is, I'd rather have the people of 2117 judge the content of your letter than the people of 2012, the latter of whom might read it through the skewed filter of election year bias.

Thank you for your timely consideration,

Chuck Bueter Granger, IN

Submit Your Transit of Venus Time Keg Message

TRANSIT OF VENUS TIME KEG MAY OBSERVERS OF CELESTIAL PHENOMENA FIND VALUE AND JOY IN NATURE'S ELEGANT SPECTACLES. FROM WITNESSES OF THE 2012 TRANSIT OF VENUS. OPEN AFTER 100 YEARS AS THE 2117 AND 2125 TRANSITS OF VENUS APPROACH.

Viewing Great, Timing Difficult

JUNE SHORT 18 | 00:00

Reprinted from blog at Transit of Venus Project, courtesy of Steven van Roode

Chuck

A Recap of the Transit of Venus on June 5, 2012

I've never surfed a big ocean wave before, but I imagine it's something like the transit of Venus. You prepare, you see it coming, you paddle franticly to catch the right spot. Then, for a fleeting moment you stand up, ride a mass of towering energy, delight in a surreal moment in a tunnel, then feel the watery bulk flow underneath you as you emerge on the wave's backside, thankfully intact. For the last couple of weeks I've been floating on the backside of that transit of Venus wave, and it's been quietly exhilarating.

Eight years of anticipation peaked with a gorgeous June 5 in northern Indiana. The day got underway early with site preparations, as a tent was raised and brought to life with with electricity, cable, internet, and sound. Of course, the phone was ringing as last minute seekers of solar shades and interviews dialed in to the day's events. There was nothing left to do with the website, as that ship had set sail. I reset the Countdown Clock for the 2117 transit of Venus, some 38,000+ days in the future, and walked away from the computer. Our Transit of Venus (TROVE) celebration was underway.



Shortly after noon a group of descendants of Irvin Stanley arrived, having come from Michigan, Indiana, Illinois, and California. Irvin Stanley was the Assistant Photographer for the US Naval Observatory (USNO) expeditions to Kerguelen Island (1874) and Patagonia (1882), and USNO Librarian Sally Bosken had generously provided many artifacts from the expedition archives. A highlight of the transit of Venus experience has been learning about and following this one person, Irvin Stanley, through the travails of exploration in a previous century. Now his family was touring regional transit of Venus highlights, with more than just the celestial sight on tap.

First up was an exhibit of transit of Venus art by high school students. Then I presented a talk centered on Irvin Stanley and the greater quest to find the Astronomical Unit from timed observations and photographs of the event from widely separated (hence, remote) locations. I wish I had had more time to peruse the family photo album that someone brought, but the family was ushered onto the motor coach and was off to the next stop—the Harris Branch Library, site of a transit of Venus display of artifacts and an art exhibit in pastel.

June 5 was the last day of school for the Penn-Harris-Madison (PHM) school district, and Art Klinger's astronomy class students began setting up telescopes and viewing devices in the field near the tent. Over an hour before first contact, spectators were showing up as we secured solar filters to telescopes with bright orange duct tape. I gave one last frenzied lecture in the theater before returning to the scopes outside A bustle of activity ensued until suddenly hundreds of people had gathered and there was talk of the transit beginning imminently. Scott Potosky quieted the music and piped in a WWV time signal for anyone at a scope who wanted to capture the moments of contact by that audible method. Everybody had taken their first look at the sun with solar shades, which in itself yielded a lot of oohs and ahhs, before Venus even took the stage.

Venus entered near the one o'clock position on the sun, the planet not easily discernible to the naked eye as it worked its way across the limb. People waited patiently in lines to view through telescopes, a sight complemented by two significant bands of sunspot groups. I occasionally glanced in a telescope, but was strangely removed as I emceed the event for a growing audience. As second contact approached, I cut to the front of a line and planted myself. I felt like the narrator in Oliver Wendell Holmes, Sr.'s, The Flaneur. There I was, face to face with Venus, having a conversation with her at internal contact.

My overriding impression of the moment was, "Damn, determining the time of contact is not easy." I tried to imagine all of our predecessors trying to discern an exact moment when they felt convinced Venus was edge-to-edge with the sun. I understand Crabtree not recording the transit in writing. I understand Rittenhouse becoming overcome with emotion. I understand Cook's time not being in synch with his shipmates' times. I understand the expedition preparations that insist on total concentration and absence of distractions leading up to the transit, conditions that were lacking at the public event.

While the sight through a telescope was enthralling, I experienced an undeniable uncertainty and lack of confidence in my timing. Despite my familiarity with what to expect and my having witnessed the 2004 transit of Venus, I could easily have been off by 30 seconds. The sun was at about 30 degrees of altitude with no clouds obstructing the view, but Venus seemed to linger on the solar edge. I looked for the planet to separate clearly from the sun, but when that didn't happen I tried to see if the horns of the sun had reconnected. Was that a minimalistic black drop effect I witnessed that suspended time? How did so many of those earlier explorers seemingly fare better? I wasn't at the eyepiece long enough to look for other phenomena, like the aureole effect.

Four monitors in the tent showed other perspectives. Feeds were coming in from NASA's webcast in Hawaii, news channels, and websites like Steven van Roode's transitofvenus.nl and my own transitofvenus.org. David Wyatt tracked Venus through a video camera that was hooked into a telescope and broadcast on a monitor. Another person projected a vast image of the transit onto a screen. Some people saw the transit through white light filters and a hydrogen-alpha telescope provided by AstroCamp of YMCA Camp Eberhart in Three Rivers, MI. Of course, a couple of telescopes were equipped with Sun Funnels, which yielded a projected image of the sunspots and of Venus in silhouette.



A few clouds moved in, thankfully after first and second contact, so during breaks in the action I demonstrated with a paper plate why transits come in 8-year pairs separated by over a century. I solicited and answered questions, pleased by the inquiries while realizing what I had previously left unsaid while narrating the event. The best memories are from the quiet moments when I shut up.

For example, after one extended cloud was ready to give the sun back to us, everyone realized when the sun was about to emerge from the well defined edge. I watched the crowd as they lifted their heads in unison and donned solar shades just as the sun brightened their faces.

During the whole event, a few local businesses that were supportive of science hawked their wares. Victorian Pantry served its Black Drop Effect Coffee, a smooth dark roast that was packaged with a design borrowed from the stained glass windows of St. Michael's Church in Hoole, England. Pizza Transit (yes, its pre-existing name) had both a Transit of Venus pizza and a Black Drop Effect pizza for sale. Taylor Design sold commemorative t-shirts, one of which has Worlds on Tour printed on the backside with the dates of past and future transits of Venus. Rock on.

People had been coming and going from the PHM site for the duration of the transit, and I joined the early departures. My heart was set on watching the transit underway at sunset from Warren Dunes State Park in Sawyer, Michigan, overlooking Lake Michigan. I had to see the Nitzschke-like view, what I consider an iconic transit image.

While I was driving to that lakeside destination, I realized other local observing sites with telescopes were drawing large crowds–New Carlisle Public Library (160 people), Andrews University (500 people), LaSalle Intermediate Academy (400 people), University of Notre Dame (~2,000 people). Each was staffed by dedicated transit of Venus enthusiasts.

We had distributed about 6,000 pairs of solar shades to people ranging from church pastors to juveniles at the detention center, so hopefully the shades were pressed into service. Venus was readily apparent naked eye to most people when it got away from the edge of the sun, albeit just a small dot on the sun.

As we arrived at Warren Dunes, a chilly breeze kept a red warning flag blowing stiffly. The Kalamazoo Astronomical Society had stationed itself on a large concrete pad overlooking the beach and lake, with a fabulous assortment of telescopes and observing devices, from grand to humble. Over a thousand people had gotten a glimpse of the transit through their gear that day, and sunset was approaching. I can't emphasize enough how beautiful the sunset was, with only the slightest of wispy clouds near the horizon that added character to the spectacle rather than obscured it. Seen in filtered telescopes, Venus contorted into a variety of shapes as her blackness or absence of light flickered through the thickest atmosphere.



The time came to abandon telescopes and solar shades. With the orange-ish sun plunging into the water, Venus was visible to the naked eye. I saw Venus at times appear to be nearly square, like four pixels on a monitor, and then it would momentarily disappear completely before re-emerging as an obvious spot on the sun. At one point the black blemish was above and right of a thin cloud line across the sun; soon it was below the thin line. Eventually Venus was gone, set below the horizon. The spectators watched the remainder of the sunset and cheered, sending well wishes to Venus for the next 105.5 years.

From there a modest crowd and the bus tour went to The Livery microbrewery in Benton Harbor, MI, where musician Venitia Sekema was performing an excellent musical set. We propped up the Transit of Venus Time Keg for people to write any last comments to denizens of the 22nd century. Shortly after 11:00 p.m. EDT we broadcast live via Slooh, showing some more transit of Venus art on display at the microbrewery. And, of course, we quaffed some Venusian ale, which had been crafted specifically for the celestial phenomenon. To see the half hour of our live broadcast, watch from about 0:52 to 1:23 of the Slooh Space Camera Transit of Venus Part 3.

Shortly before midnight, everybody inside the pub went out to the back patio and watched the International Space Station pass nearly overhead at magnitude -3.3. Onboard the ISS, astronaut Don Pettit would have been between the second and third contacts, though we were in the dark below. Again we cheered, wishing Don well in his photographing of the transit from the ISS cupola.

Everyone was clearly getting tired from a long day. While I had intended to seal the Time Keg for its long storage, we opted not to do so that evening. I figured there may be a couple of items to add before we hastily closed the lid for good. If you have any contents that you wish to include, email me (timekeg@transitofvenus.orgtimekeg@transitofvenus.org) to see if there is room and time. I'd like to wrap it up soon.

The week after the transit of Venus has been a time to decompress and re-connect with family and friends. From my perspective, much more has passed by than just 6+ hours of Venus on the sun. It's been a long, fun ride, and I'm grateful to many people for their respective roles in this adventure. There is still much more to do, of course, but on a different level of urgency. Thanks for being a part of the 20th century transit of Venus experience, especially to everyone who contributed to the outreach effort

What a sight. What a day. Surf was definitely up.

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 TROVE Adventure
 Can I Use Welding Glass to View the Sun?
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Google's *Zeitgeist* feature rated the 2004 Transit of Venus as the world's **#1 Most Popular Event** for all of June 2004! The 2012 transit of Venus is the last one in the 21st century--not seen again until 2117. You don't want to miss this rare dance of the planets!

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