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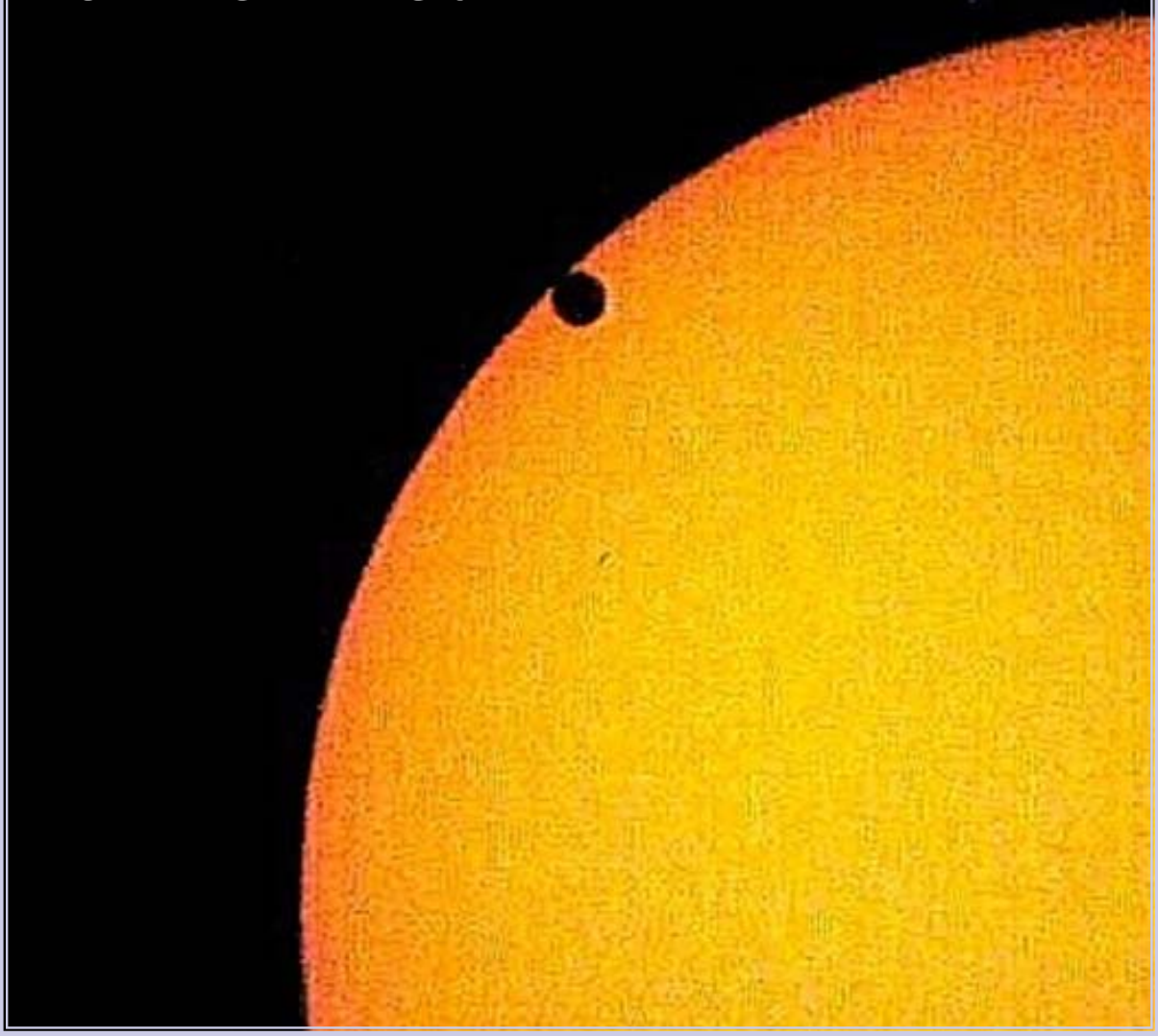
Special Supplement:

TRANSIT OF VENUS — EXPEDITION TO MAURITIUS



THE GREAT TRANSIT OF VENUS — EXPEDITION TO MAURITIUS JUNE 8, 2004

BY PAUL D. MALEY

A RING OF FIRE EXPEDITIONS tradition is to fly the Texas flag. Here it waves above the Hilton Hotel, at Flic-en-flaq, Mauritius under clear skies for the Transit of Venus! Note my C5 on a chair and Meade ETX90 on long aluminum legs in foreground. Lynn Palmer photo.

This is the beautiful view of the beach available to us daily. Courtesy Belle Mare Plage Hotel.

The RING OF FIRE EXPEDITIONS team at the Mauritius Radio Telescope. Left to right: Mike Batchelor, David Callender, Anne Reuter, George Byron, Gloria Leach, Joe Sitter, guest Dr. Danielle Briot (Paris Observatory), Byron Braswell, Judy Anderson, Sid Leach, Lynn Palmer, Paul Maley.

The RING OF FIRE EXPEDITIONS adventure to the Indian Ocean June 4-12 was a resounding success. We watched in awe as the first passage since 1882 of the planet Venus across the sun's disc occurred from our remote corner of the universe. When you read this account, do not miss our impressions of Mauritius hospitality at the end of this text.

On June 6, the anniversary day of the transit of Venus in 1761 and that of the next transit in 2012, we arrived at Plaisance Airport (not far from the German transit site of 1874) after two days of travel. There are no remains from this expedition and so I did not make an attempt to survey the site. We then moved to our base --- the Belle Mare Plage Hotel in Flacq. The group received upgraded rooms and 8 of us occupied two walled villas with private pool. The food was quite good and the beach sandy-white and inviting. Hospitality by everyone on the island was unprecedented for friendliness, and this was not an exaggeration. Much appreciation goes to Phil Carta of New Adventures for setting up the initial overall tour arrangements.

Night skies were very dark compared to our later site on Reunion Island, but the busy schedule, sporadic clouds, and presence of the moon which rose mid evening made observing problematic.

The day before the transit we were invited to visit the only astronomical installation on the island, the Mauritius Radio Telescope (MRT) located 20 minutes from our hotel.

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Compare the picture of the Ring of Fire Expedition team with the Dutch transit expedition of 1874 to Reunion in the following image. They were not nearly as happy a lot as were we.

Another transit team 120 years ago.

On June 7 the RING OF FIRE EXPEDITIONS group was invited to a champagne reception and presented First Day postal covers in honor of the transit of Venus; this was the site of the plaque unveiling at the Caudan waterfront.

I was privileged to be invited to meet with the Prime Minister of Mauritius, a time honored tradition which was accorded British expeditions in 1874 who observed the transit at that time. NASA prepared a special plaque containing a Mauritius flag flown in space and also a print of the best Space Shuttle photo of the island. I presented it to the 'people of Mauritius' to commemorate the JSC Astronomical Society expedition of 2004 for the historic Venus transit. A secondary plaque was presented earlier in the day to the radio telescope team headed by Dr. Dinesh Somanah of the University of Mauritius MRT in recognition of their education and research excellence. Dinesh was most active in organizing the transit conference the week prior to the event and provided our group with insight into the workings of the MRT site.

The NASA JSCAS plaque.
Lynn Palmer photo.

Paul Maley presents a plaque approved by NASA to Prime Minister Paul Berenger (left) on June 7 in the capital of Port Louis. Two weeks earlier PM Berenger had been in Washington meeting with President George Bush.

On Transit Day the skies dawned with only a few puffy clouds on the horizon. In order to maximize the likelihood of success, I deployed observers to the four locations shown on the following map. The better weather had been in the north and west parts of the island and on June 8, there was perfect weather across nearly the whole region. The only place reporting some minor clouds was at the 1874 British site of Lord Lindsay at Belmont. All four of the ROFE sites had spectacular viewing witnessing all contacts. Thanks to the incredible arrangements of the local transit organizing committee (especially the remarkable efforts by Marie-Josee Martial Craig), we had transportation hosted for us and a complimentary hotel room available at the Hilton, Labourdonnais and Legends Hotels

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on Transit Day for the three deployed teams.

Meanwhile, at the center of public activity, some 15,000 persons gathered at Belmont, the 1874 site of the expedition funded by Lord Lindsay (Earl of Crawford) and led by Sir David Gill. Members of the Mauritius Astronomical Society set up 3 telescopes to accommodate the crowds. The great-great grandson of Lord Lindsay (Alex Lindsay) was in attendance, an amateur astronomer and film maker whose most recent accolades include a production on the recovery of the Titanic. The site had been accidentally found by the administrator of Belmont, Roland Rambert, some years earlier when he noticed columns sticking up from the soil. Work since that time has enabled the government to establish the site as a historic monument. Remains of key features have been located. Jacques Pougnet kindly provided initial survey diagrams to me which were useful in understanding the orientation of the various instruments before we arrived in Mauritius.

Distribution of the 11 observers across Mauritius. Correction: Mike, Joe and Byron were actually on the north east coast facing Ile d'Ambre to the east of where the arrow shows them.

Site diagram of Belmont showing the heliometer room (A), photo room (B), transit room (C), double image micrometer location (D), 4-inch telescope room (E), alt-azimuth room (P), stone pillar with heliotrope (F), and 3-inch telescope location (Y), and miscellaneous stone pillars (Z). Lynn Palmer photo.

Left, Alex Lindsay with the Belmont transit site of 1874 in the background. Courtesy P. la Hausse de Lalouviere.

Right, the Minister of Tourism, Anil Gayan gets his view at Belmont. Note the long queue in the background. Courtesy P. la Hausse de Lalouviere.

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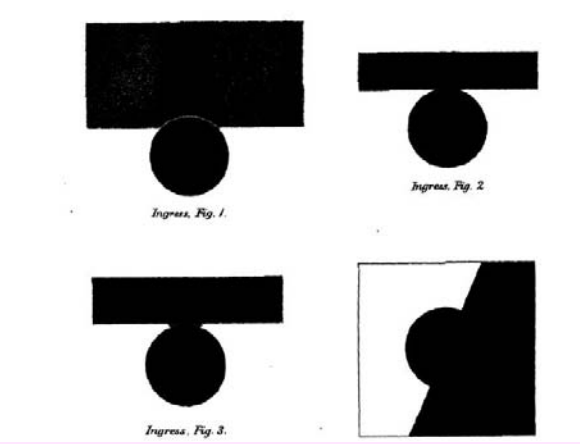
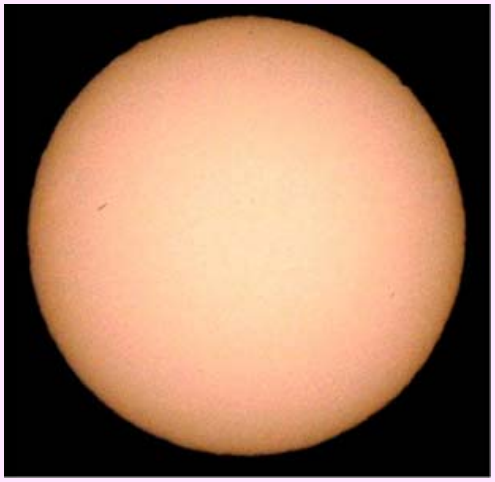
We made no attempt to go to the Botanic Gardens at Pamplemousses, the 1874 site of Royal Alfred Observatory which was badly damaged decades later in a hurricane. This old observatory was demolished around 1964 in order to make space for a new national hospital. This site was located midway between Legends and Port Louis. During that transit, Charles Meldrum was able to obtain complete two sets of distance measures and also saw third contact. There are no remains of this site to be seen.

First sign of Venus on solar disc was documented in my Meade ETX90 at prime focus with a Nikon D100, ASA 1250, at 1/1250 sec. The predicted first contact was 9:14:48 am but I didn't spot Venus until 9:16:29. My goal was to attempt to confirm phenomena observed at nearby Rodrigues Island by Lt. Hoggan, who used a 4-inch refractor at 120x and 160x. This comparison was achieved with a C5 and Meade clickstop eyepiece. I did not see any bright spots on the edge or surface of Venus but I thought at one time I could see a faint ring. The closest phenomenon was that shown in the following figure.



I observed only the features in figures 2 and 3 at second contact which were drawn by Lt. Hoggan in 1874.

Texas and Mauritius flags fly together at Flic-en-flaq. Lynn Palmer photo.



9:19:35am Meade ETX90. The transit begins as Venus' image appears in the upper right portion of the photo as a mouse-bite taken out of the sun. The small diagonal line is dust. P.Maley photo.

9:36:07am Meade ETX90. Second contact was predicted at 9:35:29. P. Maley photo.

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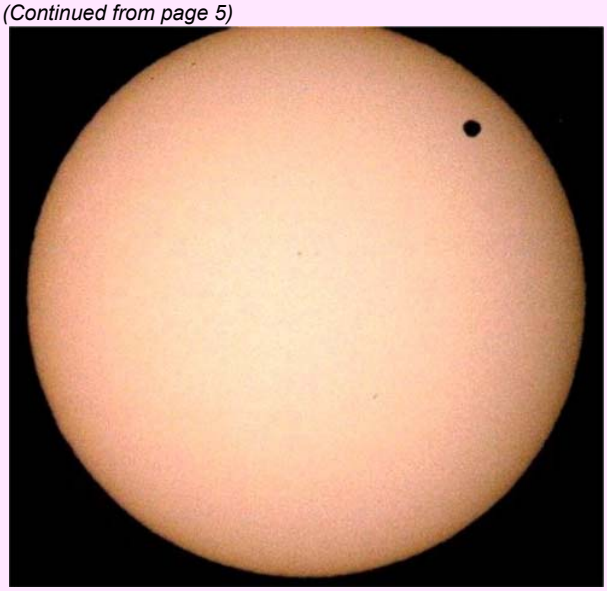
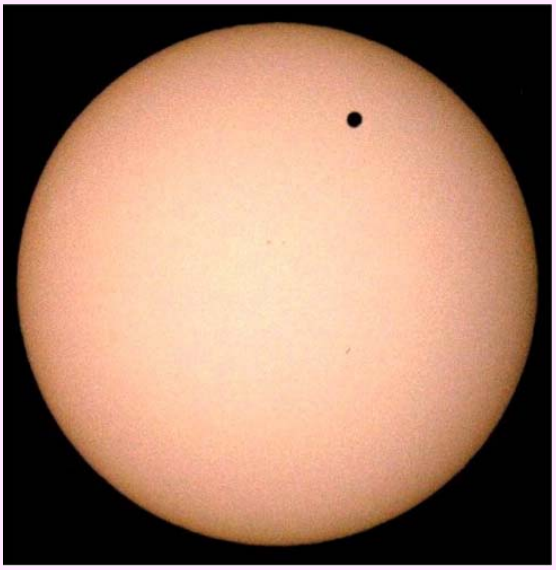
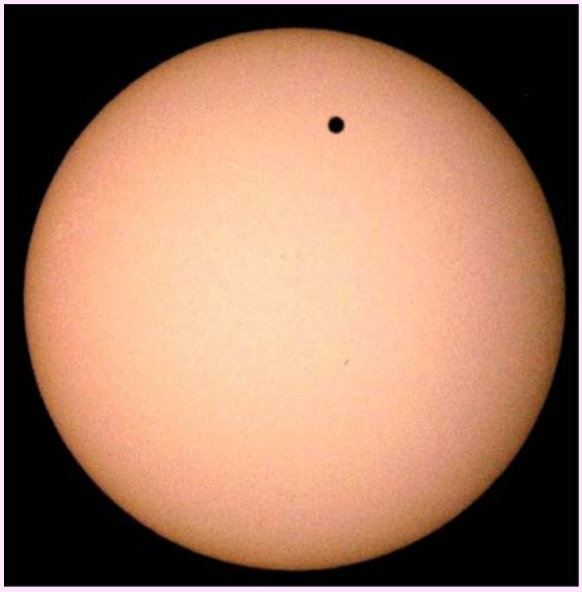


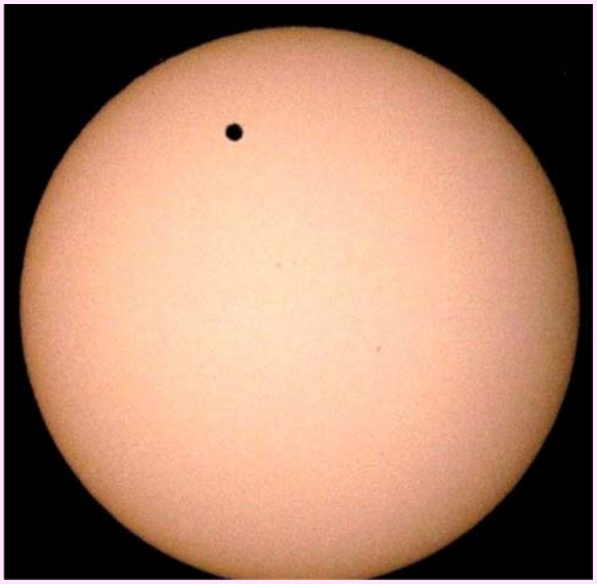
10:14:57am Meade ETX90. P. Maley photo.



11:22:16am Meade ETX90. P. Maley photo.



11:49:44am Meade ETX90. P. Maley photo.



12:56:09pm Meade ETX90. P. Maley photo.

Break time! We needed a time out after non-stop viewing. At the beach, the Hilton bar had a video camera with ND5 filter in front and had a small exhibition on the Transit along with a TV set up so people could watch it without any effort. Several times we glanced over to see patrons reading the exhibit info and watching the event on the tube.

Lynn captured (via a photo) one of the many exotic birds near the beach, including the endangered pink pigeon.

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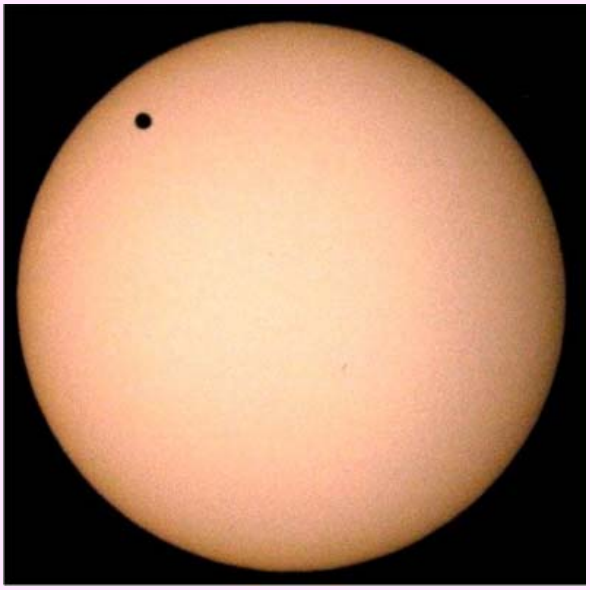
Lynn and Paul enjoying a pizza on the beach at the Mauritius Hilton. We wore our JSC Astronomical Society T-shirts.

Lynn commemorates the 'Transit of Venus' with a run on the beach at the Hilton

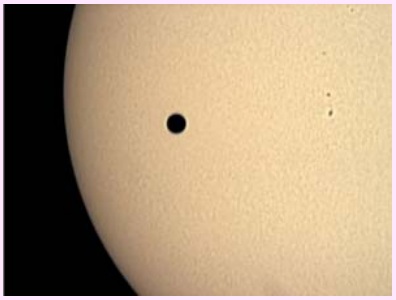


The transit continues at 2:23:12pm Meade ETX90. P. Maley photo.

Sid and Gloria were located on the roof of the Labourdonnais Hotel in central Port Louis. Catering to a steady parade of hotel workers, Sid reports that the hotel chef was kind enough to provide a free lunch. When Sid's 12V power supply failed, two White Sand Tour drivers ripped the batteries out of their respective vehicles and hauled them up to the roof providing a new prime and backup system. Sid used a Takahashi FS-78 refractor at prime focus. The 78mm objective has a focal length of 630mm. A ToUcam with shutter speed of 1/500 sec captured video at 30 frames/ sec. The best of 600 frames were stacked to produced the two images below.

Image #2 shows the ring of light surrounding the planet. However, it may be an artifact of computer processing and is shown here to illustrate a phenomenon that I partly observed during the transit and had been seen in 1874.

Additional images may be found on Sid's web site:
http://members.cox.net/sidleach/venus_transit_black_drop.htm



Sid's Venus composite image #1 (left). Note the 4 small sunspots that were rather hard to spot visually. Photo by Sid Leach.

Webcam image #2 (right).
Sid Leach photo.

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Mike, Byron and Joe, reporting from Legends Hotel at Grande Gaube, watched on the lawn outside room #6045 with 11x, 12x and 15x binoculars and photo equipment. First contact there was not confirmed until 9:19:30. Second contact was estimated at 9:34:45. At 3:06:45, Venus' image appeared balloon-like before the real third contact that was estimated at 3:08:53pm. Fourth contact time by Joe was 3:25:22 and by Byron at 3:25:32. They showed the transit to about 200 tourists and employees during their stay at the hotel.

The Legends Team preparing for the transit.
Courtesy Joe Sitter.

The Legends Team's tropical site.
Courtesy Joe Sitter.

At the Belle Mare Plage Hotel, within sight of their room, Judy and George observed the whole transit independently, with twin Coronado Solar Max 40 refractors in Hydrogen Alpha light. Though neither could see Venus when it was off the solar disc, they both confirmed that at one point in the transit process the surface of Venus took on a cloudy appearance. Both Judy and George made local headlines after being interviewed by the Mauritius press.

Celebrating success
Courtesy Joe Sitter.

George(2nd from left) and Judy (right) behind their hotel room ready for the transit.
Courtesy Byron Braswell.

During the transit, those with one-power eclipse glasses commented on how easy it was to see Venus on the sun's disc; unlike the 1/3 failure rate when we conducted a JSCAS simulation in Houston.

Anne had made a great decision to transport the Sunspotter, which proved to be most effective in diffusing the trickle of hotel employees at the Hilton and visitors so that they would not disturb us during our work. Crisp images were the result. I must admit that had I not had to hand carry tele-

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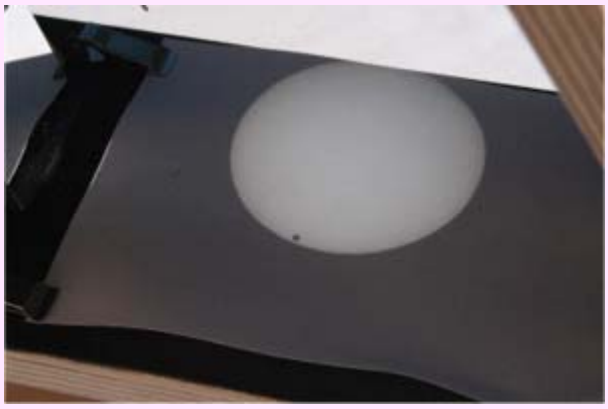
scopes, viewing through the Sunspotter would have been much easier.



A clear image of Venus with Anne's Sunspotter.
Lynn Palmer photo.

Corine George, who provided outstanding service to the team from White Sand Tours, stayed with me the whole time and coordinated logistics with the other sites by phone. It was Corine who pulled everything together on the ground, taking care of minute details at the hotel, transport, and airport, including the optional tours that each person wanted to exercise. The Hilton was kind enough to let us set up on the patio of their meeting building and put up ropes to constrain onlookers and others.

Even though I used Thousand Oaks Type II solar filters there was still a minor reflection due to scattered light in the C5. The hood made it possible to focus through the C5 eyepiece and also through the Nikon camera. A steady wind which gusted to 30 miles/hr meant fast shutter speeds and a cable release had to be used for each exposure. Special aluminum extender legs were tried for the first time to elevate the Meade EXT high enough to where I could use a chair to comfortably sit. An inclinometer and compass were effectively used to align to the South Pole in daylight.

Paul uses a hood to enable focusing in daylight.
Lynn Palmer photo.

David Callendar's setup
Lynn Palmer photo.

As I watched for the black drop at 3rd contact there was something between the planet and sun's limb, but no black drop was ever seen. It is important to note that of all the various phenomena described including ligaments and other such features, the one that matches most closely my view at 3rd contact was that in the diagrams on the next page (marked as "fig. 23").

As the planet touched the limb, a tiny wedge began to form as shown in the next image.

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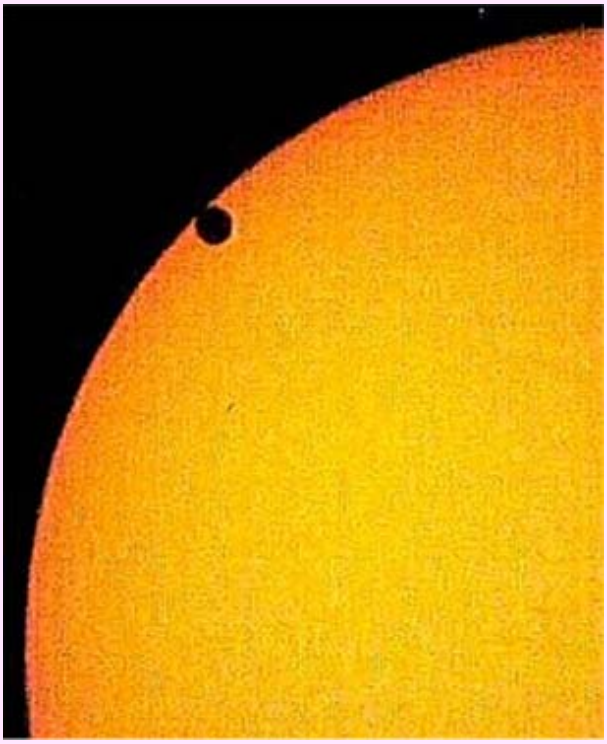
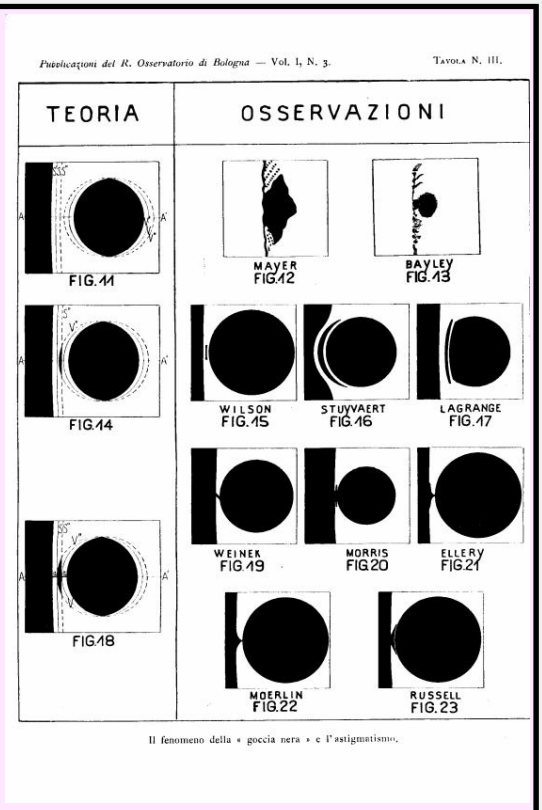


At 3rd contact a small wedge (enhanced from the original photo) was seen in this Celestron 5 image through a 25mm eyepiece. The white spots are processing artifacts. P. Maley photo.



The 'something' that I saw between Venus and the solar edge at 3rd contact is represented most closely by the drawing at the bottom of this figure by Russell

Above left, Anne Reuter watches the transit progress. Lynn Palmer photo.

Left, Anne observing through David's equipment. Lynn Palmer photo.

Above, Paul views contact 2 with the Meade clickstop eyepiece. Note tape recorder, sketch pad, table top mount, and manual slow motion control knobs on the Orion portable mount. WWV time signal receiver lies on balcony ledge behind. One lesson learned earlier: if you are going to observe for a long time, get comfortable. Lynn Palmer photo.

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At 5:15pm we completed our drive to Belmont in order to place the plastic container with a CD, NASA patch and information on all JSCAS participants into a 5 foot hole. A team of workers buried it in Portland cement and a plaque is to be put on the site later commemorating our presence through the courtesy of Roland Rambert.

Preparing to bury the NASA JSCAS time capsule at Belmont. Lynn Palmer photo.

On June 9 we flew to Rodrigues where A.-G. Pingre observed the Transit of 1761 and a British expedition watched in 1874 under the command of Lt. Neate. They had much better weather on Rodrigues in 1874 than on Mauritius. The site at Pt. Coton was marked with an iron bar which we searched for without result. Earlier inhabitants of Rodrigues used to cut sections of rock for building material and the location in the next photo may have been unrelated to any transit activity.

Surveying the 1874 site at Point Coton on Rodrigues Island. Lynn Palmer photo.

Ricaud Auckbur, local amateur astronomer and president of the Mauritius Astronomical Society, models the Transit T-shirt. Lynn Palmer photo.

My principal contact in Mauritius, Marie-Josee Martial Craig, was invaluable in organizing all the logistics for the ROFE expedition related to the transit, including the inaugural ceremonies, welcome lunch, contacts with the astronomical society, ground transport and cell phones. She also provided important insight into the historical information being gathered to support the transit project. The group owes her a tremendous amount of thanks for her excellent work. She flew with us to Rodrigues. Mgr. Amadee Nagapen, a retired Catholic priest with a strong interest in history, met us on Rodrigues and accompanied Lynn and me the entire day. He wrote a book in French entitled "Le Transit De Venus" describing the expeditions of the 18th and 19th centuries to the area. His book was a big seller in the airport bookshops. He also pointed out two glaring errors

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in the bust of A.-G. Pingre (which is not Pingre at all) and the monument to the Port Mathurin transit observation (has the wrong year!). Both of these individuals earned our utmost praise, appreciation and admiration.

Marie-Josee Martial Craig (2nd from left) and Mgr. Amadee Nagapen (2nd from right).

Lynn's birthday occurred on June 10. We decided to take a small boat to a wildlife sanctuary not far from the airport. We stopped at a small French restaurant and picked up a large lunch including plates, wine glasses, etc. Due to running late we had to carry all this to the boat, but pouring rain and restrictions on bringing food to the island forced us to eat this formal lunch in the back seat of a taxi! Afterwards we took a small boat to Isle Aux Aigrettes where we saw giant tortoises. The indigenous ones on Mauritius are as extinct as the famous bird of the island--the Dodo--which used to inhabit only this island and was hunted to extinction 300 years ago.

Only one, mostly intact, skeleton of a Dodo has ever been found. This is a metal replica on exhibit at Isle Aux Aigrettes which is to scale. P.Maley photo.

Our guide shows us two Aldabran tortoises on Isle aux Aigrates. Although some rare bird species are successfully being bred on this small island, one has an 80% mortality rate due to effects of inbreeding. Lynn Palmer photo.

Morning view of Piton de Neiges from Commerson crater on Reunion Island. Lynn Palmer photo.

Lynn, David and I flew to Reunion Island June 11 and ascended to the summit of the 2631m high Bory Crater. Remnants of eruptions in September 2003 and May 2004 were seen and the 4-hour roundtrip hike originating from Pas de Bellecombe was made under wonderfully clear skies. Following that we conducted a survey of the Dutch camp of 1874. That expedition had less luck than on the other two islands owing to the presence of a cyclone in the area. Though there was some

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confusing historical data I had received on this site, I was able to recognize two landmarks from the old accounts and measure new positions.

MAURITIUS HOSPITALITY --- BELIEVE IT

I could go on and on about how incredible we found Mauritius hospitality. My organization was assured through a couple of hundred email transactions with Marie-Josee Martial Craig, a volunteer for the transit committee. In most countries one sees advertisements extolling how friendly people are, but in Mauritius it could not be more true. Lynn lost her wallet with credit cards and drivers license. We thought it impossible to recover. However, I searched parts of the hotel notifying various people and within 24 hours, it was located and returned. This would have been impossible in any other country. On another occasion Lynn left her snorkel mask in a locked dive shop after we left the country. The only person with the key lived in a remote part of the island and would not return until after our flight left. Corine George looked into the matter, tracked it down and returned it to us as we briefly touched down in Mauritius on our way from Reunion to Paris on June 12.

Sid's experiences transcend most (see also his account at the Labourdonnais Hotel). However, when he rented a car and got lost, a stranger saw him negotiating a street the wrong way, ran in front of him directing other cars out of the way and then ran in front of his car through neighborhood until he got to a key roundabout and on his way. Other Mauritian people he met invited him to their home on a future trip after showing them the transit. Sid asked someone at the Belle Mare Plage to borrow an extension cord. This showed up that night in our villa instead of his. When he could not find it they found him a second one, so in the end he had two. Ricaud Auckbur found a particular type of adapter for Sid and offered to get one for him.

At the Labourdonnais hotel, the hotel arranged a free room for Sid on the wrong side of the hotel for transit viewing. After he explained what he needed, the hotel took him to the roof to get a better site and the head of maintenance assured him that power would be available for him during the transit (it happened!). Sid had more equipment than could be accommodated in his car. Due to Marie-Josee Marital Craig's organizing transport we had two extra vans and one followed Sid with all his excess equipment. Sid forgot his compass and the head of maintenance got him one so he could align to the south celestial pole. Hotel room service supplied Sid a steady stream of Coca-Cola all day. One driver took Gloria shopping at one point during the long transit. The other driver took film to a one hour photo developing store so Sid could see how his exposures were working. The quick processing allowed Sid to adjust his exposure times properly before the transit was over. The MRT gave Sid permission to use their facility for night time observing Satish Jadhav, the systems engineer who set up my presentation activity, offered to meet Sid in the middle of the night to help him out. Similar experiences were reported by others in our group. Mauritius--what a country!

Finally, as I had presented in Mauritius, there were 3 orbits during which ground observers could potentially spot the International Space Station crossing the sun during the six-hour transit window. The photo below depicts how one such ISS combo transit looked during the Venus event as taken from Slovakia.

ISS transits the sun in this webcam exposure set. T. Maruska photo.

Our next adventure is to the nearly total solar eclipse on April 8, 2005 in Panama.

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July Meeting Agenda

July 9th. Center for Advanced Space Studies/Lunar Planetary Institute, 3600 Bay Area Blvd. (at Middlebrook Drive).

7:30	Meeting start and welcome
7:40	Presentation—
8:30	Break
8:45	Calendar review, presentations, and awards
8:50	Star Party Announcements, Lisa Lester
9:10	Deep Sky Observing, Chris Randall
9:30	Astronomical Oddities, Hernan Contreras
9:40	Charlies Challenge, Charles Hudson
9:50	Door Prizes

Starscan Submission Procedures

Original articles of astronomical interest will be accepted up to 6 P.M. July 25th.

The most convenient way to submit articles or a Calendar of Events is by electronic mail, however computer diskettes or CDs will also be accepted. All articles should include author's name and phone number. Also include any picture credits. The recommended format is Microsoft Word. Text files will also be accepted.

Submitter bears all responsibility for the publishing of any e-mail addresses in the article on the World Wide Web.

Editor's electronic address is: lesteke@swbell.net. Be sure to include the word Starscan in the subject line for proper routing of your message.

Starscan Staff

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	Ken Steele

Cover Image by Paul Maley

Venus Transits, 3rd Contact

Third contact as seen in this small, enhanced portion of the original image taken through a Celestron 5 with a 25mm eyepiece. The white spots are processing artifacts.