

**DENVER MUSEUM OF NATURE AND SCIENCE
VENUS WINDS PROJECT
MINUTES OF MEETING**

Date/Time/Location: 19 November 2015 6:00 PM ADM 1 (Basement)

ATTENDING

Art	Ashley	Christian	Cristy	Dave	Drew	Dylan
Elizabeth	Emilie	John	Kevin	Mark	Marta	Michael D.
Michael L.	Rachel	Terran	Yvonne			

Guests: Dave Wolf

The meeting opened at 6:00 PM in Admin 1. Those **attending** are listed above.

OLD BUSINESS

Selecting images for stacking September 2015 dataset Yvonne

Yvonne selected five sets of 10 good images from the Sept 25, 2015 data. She discussed how she went about this and what criteria she used for selecting the images. She co-registered (centered) the 10 images of the first set, which are shown below.



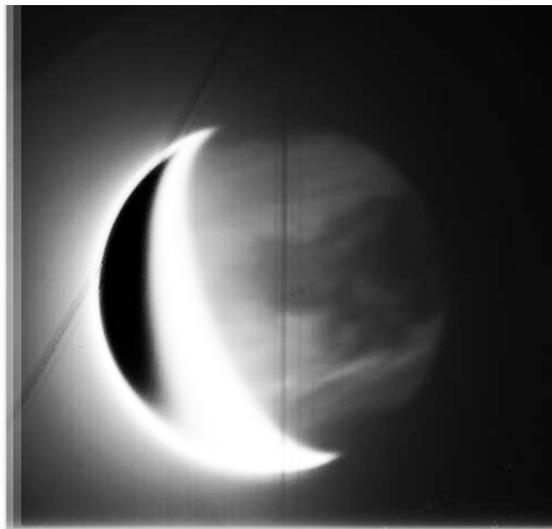
Stacking images Mark

Mark took Yvonne's 10 images above and 'stacked' them. Mathematically, this is just adding all 10 images together. This improves the contrast and signal to noise of the images. The result is shown below. Mark suggested that the fuzziness might be due to some of the images not being completely centered, but it turns out that the fuzziness was probably an artifact due to the fact that he first converted them to JPG format. This is a not a good idea – when you zoom in on this image (below), you can see that it is full of compression artifacts. Mark will redo this using an uncompressed format for next time. Also, it is probably a good idea to remove the vertical slit and the diagonal line (an imperfection in the chip) before centering and stacking the images. Although Mark used a scientific programming language to do the stacking, we will investigate using the free software DS9 for doing the stacking in the future.

NEW BUSINESS

Using FITS Liberator Art

Art discovered that FITS Liberator, the free program for opening FITS images on any computer platform, has some very useful features for us. In particular, scaling the pixels can be adjusted to greatly improve the contrast. This is essential for being able to see the limb of the night side of Venus, which is necessary for accurate centering of the images. Use the 'Stretch Function' pull-down menu to set the scaling. The default setting is linear, but by selecting ArcSinh(x) or Log(x), the contrast is enhanced. Furthermore, by clicking the 'Freeze Settings' box, all subsequent images will be opened with this scaling. When you click 'Save', the fits image is converted to a TIFF image with the improved contrast, ready for centering (see image below).



Spreadsheet for velocity calculations of July 2004 images Mark

Postponed until next meeting.

Hypothetical structure of the Universe All

Mark began a discussion about a news article that appeared in the November 19, 2015 issue of *Nature* magazine. Cowen, R., *Space, Time, Entanglement*, *Nature* **527**, 290-293, (2015). This article reports on a brand-new idea in cosmology – that space and time are actually constructed by quantum entanglement. Therefore, the answer to the 'spooky action at a distance', whereby 2 particles appear to communicate at faster than light speed is because they are connected by a wormhole! Marta invited Dimitri K. from Space Sciences at the museum to join the discussion. The article has been distributed to the group.

The next meeting on 3 December will be in ADM 1 at 6 PM.

Submitted by Arthur C. Tarr, Venus Winds Project Coordinator