

Some cold clear nights have re-invigorated our imagers.

Solar system: John Kozimbo's friend Dave Bobowicz took a photo while a *meteor fell over Tinton Falls* NJ, on December 18 at approximately 4:45 pm EST. His photo was enhanced by Clif Ashcraft to show four meteor pieces in the trail.

Clif continued to image Mars as it recedes from us.

On December 11 Tony Sharfman took a video of Comet 46P Wirtanen showing a tiny fuzzy dot moving vertically against the starry background over an hour. He used a 135 mm camera lens with ten second exposures without a telescope.

Jim Nordhausen observed comet 45P Wirtanen with his 10" Dobsonian telescope without filters, but with averted vision on December 18. That morning he had also observed Venus, Jupiter, and Mercury before dawn.

Stars: Jack Cleeve wrote a report on the preliminary analysis of his summer project on the roAp variable stars. Steve Lowe continues to take spectra of interesting stars and also nebulae.

Nebulae: Tolga Gumusayak imaged the chocolate clouds of *NGC 1555* which is sometimes known as Hind's Variable Nebula. It is illuminated by the star T Tauri near Aldebaran in the Milky Way's anti-center direction. This young star varies from 9th to 14th magnitude over many years and is the prototype of a class of erratic variable stars interacting with their surrounding dusty accretion disks, possibly hiding nascent planets. They are pre-Main Sequence stars roughly like our sun but with some emission lines as well as absorption lines in their spectra. More information can be found at https://www.aavso.org/vsots_ttau

Helder Jacinto imaged *M76, The Little Dumbbell*, a faint planetary nebula in Perseus with 3 minute subs in H alpha and OIII filters for about two hours. This is a more magnified view than his image in 2015. M76 was first recognized as a planetary nebula in 1918 by Heber Doust Curtis.

Other: Clif began a discussion of biology's use of cheap abundant elements for metabolism. He pointed out that if you leave out



helium and neon (which do not form compounds) 96% of our bodies are made up of the most abundant things in the universe. Hydrogen, oxygen, carbon, and nitrogen are 74%, 1%, .5%, and .1% of the mass of the universe. It would be interesting to see what biochemistry looks like several more star generations from now when heavier metals become more abundant. Perhaps some critter will, in fact, have a metabolic enzyme where bismuth is used.

Aaron Zuckerman pointed out that it has been 50 years since the iconic photo of *Earthrise* was shot. In December 1968, Apollo 8 crew members Frank Borman, James Lovell, and William (Bill) Anders became the first humans to leave Earth and travel to another body in space. While orbiting the Moon and photographing the lunar surface on December 24th, the astronauts suddenly spotted the Earth rising beyond the Moon.

Here's how the conversation unfolded:

Anders: Oh my God! Look at that picture over there!

There's the Earth coming up. Wow, that's pretty.

Borman: Hey, don't take that, it's not scheduled. (joking)

Anders: (laughs) You got a color film, Jim? Hand me that roll of color quick, would you...

Lovell: Oh man, that's great!



This image energized the environmental movement, showing how isolated in space our home planet is.

Respectfully submitted, Mary Lou West, Research Chair