

**Minutes of the Meeting of the  
Astronomy and Astrophysics Advisory Committee  
24 February 2017  
National Science Foundation, Arlington, VA**

**Members attending:**

Dieter Hartmann	Shane Larson
Rachel Bean	Rachel Mandelbaum (Vice Chair)
Kelsey Johnson	William Smith
Buell Jannuzi (Chair)	Jean Turner
Shane Larson	Martin White
Lisa Kaltenegger	
Brian Keating	

**Agency personnel:**

Chris Davis, NSF-AST	Hashima Hasan, NASA
Elizabeth Pentecost, NSF-AST	Kartik Sheth, NASA
Edward Ajhar, NSF-AST	Kathy Turner, DOE
Joseph Pesce, NSF-AST	Eric Linder, DOE
Vladimir Papatashvili, NSF-Polar	
Andrea Razzaghi, NASA	

**Others:**

Karl Stapelfeldt, JPL	Sara Barber
Eric Mamajek, Univ. of Rochester	Jason Kalirai, STScI
Tricia Crumley, UTexas	

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**MEETING CONVENED 12:00 PM EST, FEBRUARY 24, 2017**

The Chair called the meeting to order. Participants identified themselves.

The Agencies had no program updates since the January 26-27, 2017 meeting.

Kartik Sheth, Program Scientist, NASA's Astrophysics Division, presented a science highlight recently reported in the news and published in *Nature*, the discovery of the TRAPPIST-1 system of seven (7) planets. The Spitzer Space Telescope was pivotal in making the discovery. The TRAPPIST-1 optical telescope in Chile looked at the planet system. The first transit measurements of the star (ultra-cool dwarf) about 40 light years away showed a signature which was interpreted as possibly a two-planet or three-planet system. Since then, a number of ground-based telescopes were used including the VLT, SAO, and Liverpool telescope (robotic telescope in Marrakesh, Morocco). It was not until the planet system was observed for about 500 hours that scientists were able to figure out what was going on and the conclusions are that after the analysis done by the team concluded that there are seven planets; two of the planets were already known and Spitzer identified five new planets, one of which has only one transit and is the least characterized. Scientists believe that the seven planets are Earth-like sized planets, and three are believed to be in the habitable zone, i.e., receiving enough solar energy that there could be liquid water on the surface of planets; under the right conditions all seven planets could have liquid water on them. Having a system this nearby with this many Earth-sized rocky planets gives scientists an incredible laboratory which can be followed up using Hubble and JWST to try and understand their atmospheres. Additional data is being obtained using Spitzer and Hubble. The mass estimates for the six inner planets suggests rocky compositions; not sure about the seventh planet but assume it falls within this range as well. The system will be observed for an additional 250 hours using the Spitzer telescope; Kepler will also look at the planet system and their orbits. Spitzer has measured the transit timing very accurately. Not only is it the first system with this many habitable zone planets, this many Earth-like planets, but it is

also a near perfect resonant chain. The implication is that the planets should have a volatile rich composition with lower densities than Earth.

The remainder of the meeting was dedicated entirely to discussion of the Committee's draft annual report due 15 March 2017. The Committee discussed the report's structure and possible recommendations. The Chair and Vice Chair will collate the changes and create a final draft for Committee approval.

Liz Pentecost will provide the Chair with the names and addresses of report recipients.

**MEETING ADJOURNED AT 2:30 PM, 24 FEBRUARY 2017**