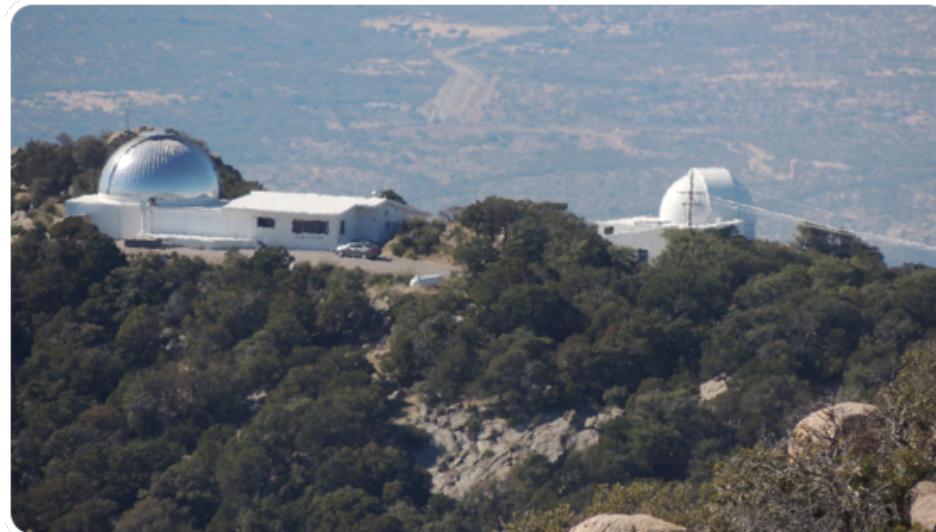


Service and Remote Observing at the MDM Observatory

R. Mark Wagner

LBT Observatory and The Ohio State University



MDM Observatory on the SW Ridge of KPNO

- Current partners
 - Dartmouth College
 - University of Michigan
 - The Ohio State State University
 - Columbia University
 - Ohio University
- Two telescopes
 - 2.4 m Hiltner telescope
 - 1.3 m McGraw Hill telescope
- Excellent instrument suite from the visible to the near-infrared
- Experienced observers and astronomer-driven



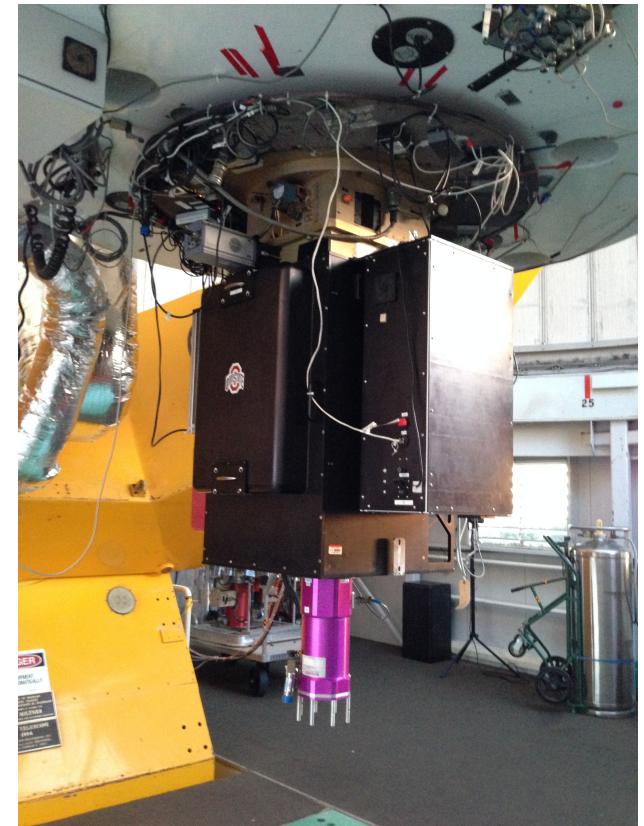
Hiltner 2.4 m



McGraw Hill 1.3 m

Instrumentation

- Most instruments can be shared
- OSMOS (Ohio State Multi-Object Spectrograph)
 - 2.4 m use only
 - Wide field imager and multi-object spectrograph
 - Unvignetted 18×18 arcmin FoV; 0.273 arcsec/pixel
 - Selection of long-slits and custom multi-slit masks
 - Blue and red VPH grisms ($R = 1700, 310-1000$ nm)
 - Triple prism ($R=100-400, 360-1000$ nm)
- Blue and red optimized 4k x 4k detectors for OSMOS and direct imaging at either telescope
- RETROCAM (Retractable Optical Camera on 2.4 m side port, 5×3.3 arcmin)
- Several direct imaging CCD choices for the 1.3 m



OSMOS with B4K

Use and Scheduling

- Both telescopes are scheduled classically by partner shares and dark-bright balance.
- Both telescopes are remote-capable.
- 2.4 m scheduling includes ~6-10 nights per month of service mode using OSMOS+B4K. Service observer employed part-time. Not used remotely.
- 1.3 m is used remotely for direct imaging from partner campuses for research and instruction almost exclusively.
- Partners have strong programs involving monitoring programs, targets of opportunity, and spectroscopic classifications such as ASAS-SN, reverberation mapping, lensing, explosive transients, and cataclysmic variables for example.

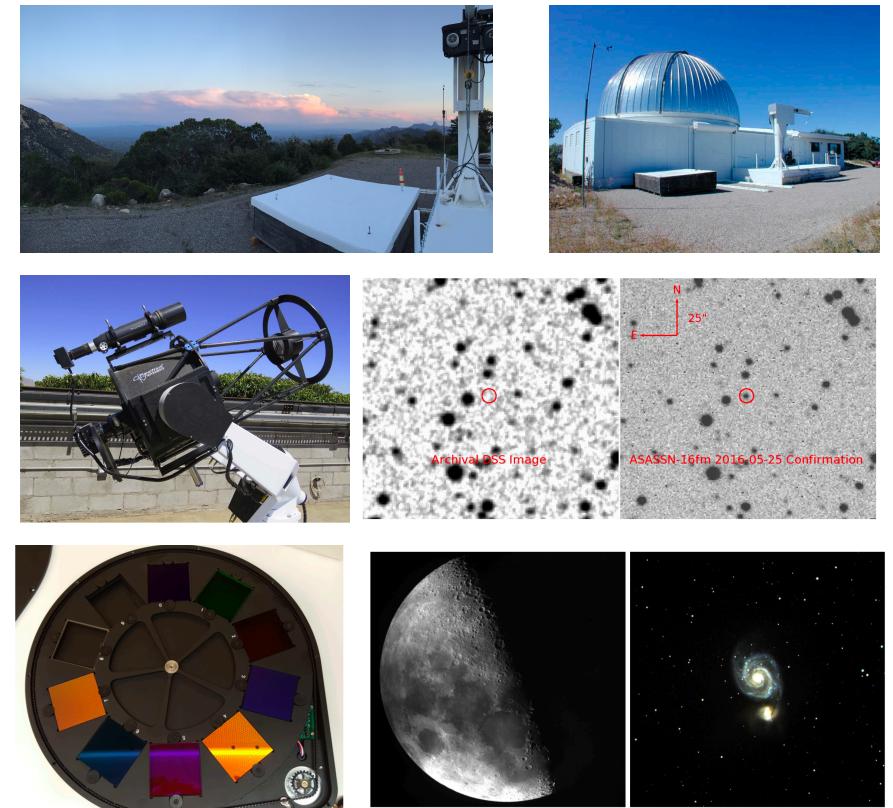
MDM OBSERVATORY CONSORTIUM TELESCOPE SCHEDULE					
2017 DECEMBER					
DAY/MOON	McGRAW-HILL 1.3m		HILTNER 2.4m		
Fri 1 br 97					
Sat 2 br full					
Sun 3 br 99					
Mon 4 br 96	Templeton	Gallo	OSMOS/B	Proxy Queue	
Tue 5 br 89			OSMOS/R	Proxy Queue	
Wed 6 br 81			OSMOS/B	Proxy Queue	
Thu 7 br 71			OSMOS/B	Proxy Queue	
Fri 8 br 60			OSMOS/R	Proxy Queue	
Sat 9 br 52			OSMOS/R	Proxy Queue	
Sun 10 dk 39			OSMOS/R	Runnce	
Mon 11 dk 30	Templeton	Gallo	OSMOS/R		Runnce
Tue 12 dk 21	Templeton	Gallo	OSMOS/R		Runnce
Wed 13 dk 12	Templeton	Halpern	OSMOS/R		Runnce
Thu 14 dk 08	Templeton	Halpern	OSMOS/R		Runnce
Fri 15 dk 04	Templeton	Halpern	OSMOS/R	Douglas	
Sat 16 dk 01	Templeton	Thorstensen	OSMOS/R	Douglas	
Sun 17 dk new	Templeton	Thorstensen	OSMOS/R	Douglas	
Mon 18 dk 01	Templeton	Gallo	OSMOS/B	Fesen	
Tue 19 dk 03			OSMOS/B	Fesen	
Wed 20 dk 08	Templeton	Halpern	OSMOS/B	Fesen	
Thu 21 dk 13	Templeton	Gallo	OSMOS/B	Fesen	
Fri 22 dk 20	Templeton	Gallo	OSMOS/B	Fesen	
Sat 23 dk 29			OSMOS/B	Fesen	
Sun 24 dk 38			OSMOS/B	Fesen	
Mon 25* dk PQ					
Tue 26**br 59					
Wed 27**br 69					
Thu 28**br 79					
Fri 29**br 88					
Sat 30 br 95					
Sun 31 br 99					

* CHRISTMAS DAY HOLIDAY					
** MICHIGAN SEASON DAYS					
MDM OBSERVATORY CONSORTIUM TELESCOPE SCHEDULE					
2018 JANUARY					
DAY/MOON	McGRAW-HILL 1.3m		HILTNER 2.4m		
Mon 1* br full					
Tue 2 br 98			OSMOS/B	Proxy Queue	
Wed 3 br 95	Templeton	Gallo	OSMOS/B	Proxy Queue	
Thu 4 br 92	Templeton	Gallo	OSMOS/B	Proxy Queue	
Fri 5 br 76			OSMOS/B	Proxy Queue	
Sat 6 br 66			OSMOS/B	Proxy Queue	
Sun 7 br 56			OSMOS/B	Proxy Queue	
Mon 8 dk LQ	Templeton	Gallo	OSMOS/R	Douglas	
Tue 9 dk 36	Templeton	Halpern	OSMOS/R	Douglas	
Wed 10 dk 27	Templeton	Halpern	OSMOS/R	Douglas	
Thu 11 dk 19	Templeton	Halpern	OSMOS/R	Douglas	
Fri 12 dk 12	Templeton	Halpern	OSMOS/R	Douglas	
Sat 13 dk 07	Templeton	Halpern	OSMOS/R	Douglas	
Sun 14 dk 03	Templeton	Gallo	OSMOS/R	Douglas	
Mon 15**dk 01	Templeton	Gallo	OSMOS/R	Douglas	
Tue 16 dk 04	Andor	Bakowska	OSMOS/R	Douglas	
Wed 17 dk 01	Andor	Bakowska	OSMOS/R	Douglas	
Thu 18 dk 04	Andor	Bakowska	OSMOS/R	Douglas	
Fri 19 dk 09	Andor	Bakowska	OSMOS/R	Douglas	
Sat 20 dk 15	Andor	Bakowska	OSMOS/R	Douglas	
Sun 21 dk 23	Andor	Bakowska	OSMOS/R	Douglas	
Mon 22 dk 32	Templeton	Gallo	OSMOS/R	Douglas	
Tue 23 dk 42	Templeton	Gallo	OSMOS/R	Douglas	
Wed 24 br PQ			OSMOS/R	Douglas	
Thu 25 br 64			OSMOS/R	Douglas	
Fri 26 br 75	Templeton	Gallo	OSMOS/R	Douglas	
Sat 27 br 84			OSMOS/R	Douglas	
Sun 28 br 92			OSMOS/R	Douglas	
Mon 29 br 98	Templeton	Gallo			
Tue 30 br full					
Wed 31 br 99					

* NEW YEAR'S DAY HOLIDAY					
** MARTIN LUTHER KING, JR. BIRTHDAY (OBSERVED) HOLIDAY					

MDM Robotic Transient stellar object Facility (MRTF)

- Current capabilities are still classically scheduled and will not meet future demands.
- Robotic telescope with imaging and spectroscopic capabilities required to address, exoplanet follow-up, frequent ASAS-SN confirmations, monitoring, microlensing, precise time series photometry, and transients.
- Install a 27" (0.7 m) PlaneWave CDK700 robotic telescope in an Astro Haven 7-12' clamshell enclosure adjacent to the 2.4 m. Optical imager with 2k x 2k CCD with large FoV and 10 filter choices. IFU fed optical spectrograph with fixed dispersion and spectral coverage to come later.
- Use all control and observation software developed for the OSU CDK20 telescope (**DEMONEXT**) installed at Winer Obs in Sonoita (Villanueva+ 2018, PASP, 130, 015001).



Conclusions

- MDM 2.4 m monthly service mode and 1.3 m remote operation have improved and broadened the existing capabilities.
- Service mode requests are easy, straightforward, and fast.
- Remote observing with the 1.3 m allows wider participation by faculty and students directly from the campuses.
- Use of OSMOS for service mode provides both imaging and spectroscopy in the same instrument and is ideal for monitoring and interventions. Lower operational costs are realized by fewer instrument changes.
- Existing and future demands will require a dedicated robotic telescope with both imaging and spectroscopic capabilities.
- Currently evaluating the science cases for the installation of a 0.7 m robotic telescope on the MDM site to provide rapid ToO response, monitoring, and time series photometry.