

May 2003 – Astronomy Abroad: American Southwest Itinerary

May 1 – Thursday

Class Day

1:00pm – 3:50pm

Hand out new syllabus

Talk about Cosmos reading – sign up sheet (make copies when filled in)

Talk about Final Project

Lecture:

Right Ascension and Declination

Local Sidereal Time

Magnitude Scale

Go over star charts show RA, Dec, Magnitude and type of objects.

8:00pm Observing from campus, learn about telescope.

Hand out Tyson Scientific Method article for discussion May 2nd at dinner.

Bring flashlights tomorrow.

May 2 – Friday

Pick up 15-person Van

4:00pm Meet Duke Hall for drive to dinner at my house.

Discuss Tyson article on scientific method.

Stargazing in Angelus Oaks.

Assignment for Sunday: Cosmos 1

May 3 – Saturday

11:00am Meet at Duke Hall.

Check equipment.

Check room in van.

4 – Sunday

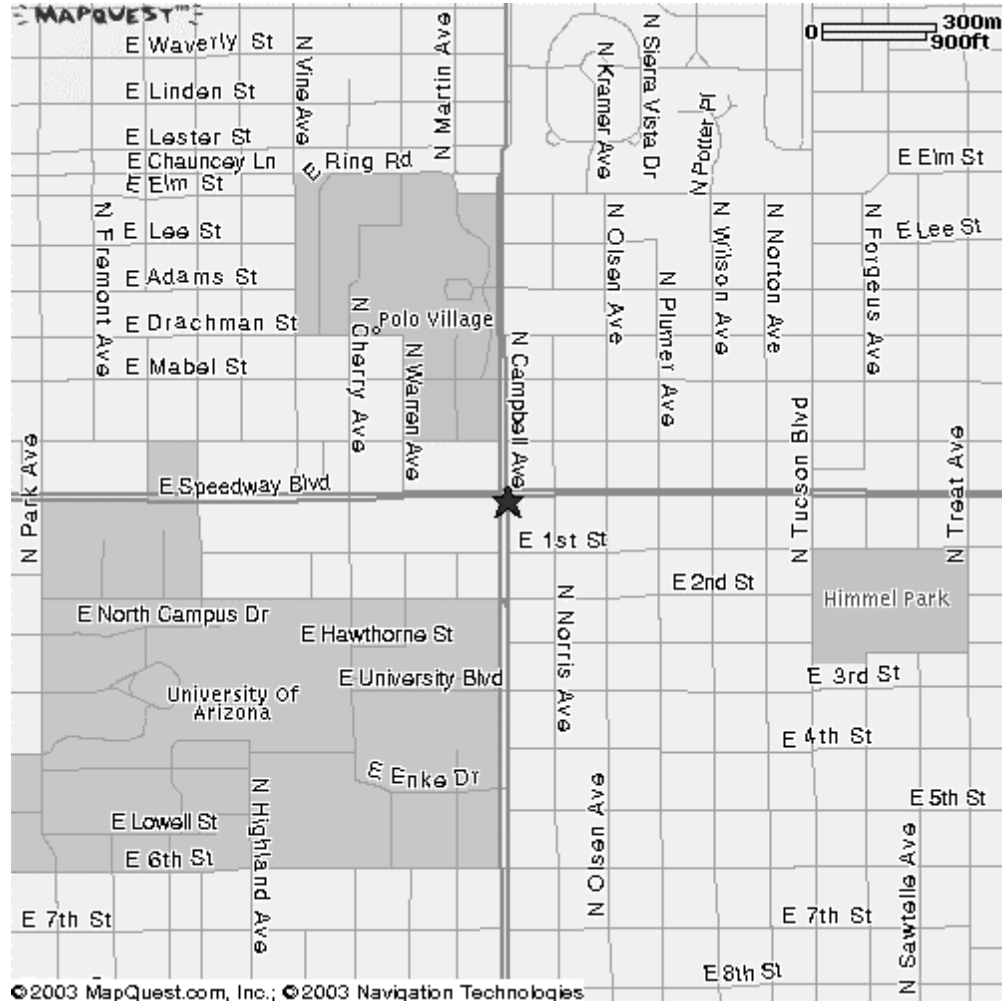
9:00am - Meet at Duke Hall

Drive to Tucson: ~7 hours

Discuss Cosmos 1 – Assign Cosmos 2 for Wednesday

Lodging Tucson: **Four Points Sheraton** (1900 E. Speedway, 520-327-7341)

Location:



May 5 – Monday

9:00am Leave for KPNO (get lunch on way to KPNO). Arrive Visitor Center by 11:00am

Contact: NOAO E/PO Officer Robert Wilson

(phone en route: 520-318-8726 or 8732, office 8440; email: rwilson@noao.edu)

Tour McMath-Pierce Solar Observatory:

Contact: Claude Plymate (phone: 520-318-8168, email: plymate@noao.edu)

I have arranged for your group to eat dinner in the cafeteria; the cost will be \$10.00 per person. There are places along the way where you could pick up lunch or just buy it in town before leaving. A noon tour of the 4-meter should be possible. The only real question about that telescope is whether we can get on the floor. I am working on that but can't promise anything. But even if we don't get on the floor, they can still see the telescope. I would say arrive about 11:00. We can go straight to the 4-m, have a leisurely lunch, see the 2.1-m, do some solar observing on the 16-inch (weather permitting), visit the McMath-Pierce (by 2:30), and have dinner at 4:30. We could use the time between dinner and WIYN to get your equipment set up. Does this sound reasonable given your schedule?

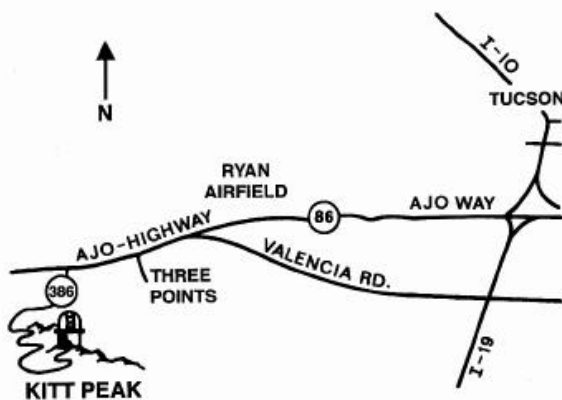
6:00 Set up at WIYN/0.9m parking lot.

6:30 Tour WIYN Observatory

Contact: Liese van Zee (email: vanzee@astro.indiana.edu)

7:07pm - Sunset at WIYN. Stargazing from WIYN/0.9m parking lot.

Driving Directions: Kitt Peak is 56 miles southwest of Tucson via State Route 86 on the Tohono O'Odham Reservation. Allow 90 minutes of drive time from Tucson. Take I-10 to I-19 South (*see note below*). Less than 1 mile is Ajo Way/Hwy 86 (Exit 99). Take this exit West (right). Proceed past Ryan Airfield and Three Points. Continue until Junction 386 (Kitt Peak turnoff). Turn left onto 386. The Kitt Peak Visitor Center is located at the summit (12 miles).



Note: I-10/I-19 construction -- It looks like you can take Campbell to 22nd Street, turn west on 22nd street, cross under I10, whereup 22nd Street becomes Starr Pass Blvd. Then you can either turn left onto Mission Road or the next major left onto La Cholla Blvd. Both of these intersect the Ajo Highway (Route 86).

Assigned Reading for Tuesday: Sun and thermal radiation

Sun and Moon Data for 5 May 2003, Tucson AZ

The following information is provided for Tucson, Pima County, Arizona (longitude W110.9, latitude N32.2):

SUN

Begin civil twilight	5:08 a.m.
Sunrise	5:34 a.m.
Sun transit	12:20 p.m.
Sunset	7:07 p.m.
End civil twilight	7:34 p.m.

MOON

Moonset	10:20 p.m. on preceding day
Moonrise	8:19 a.m.
Moon transit	3:46 p.m.
Moonset	11:14 p.m.
Moonrise	9:10 a.m. on following day

Phase of the Moon on 5 May: waxing crescent with 16% of the Moon's visible disk illuminated.

Sunrise and set position

Mountain Standard Time		
	Altitude	Azimuth
		(E of N)
h m		o
05:34	rise	70.5
19:07	set	290.0

Moonrise and set position

Mountain Standard Time		
	Altitude	Azimuth
		(E of N)
h m		o
08:19	rise	59.0
23:14	set	301.0

Magnetic Declination (MD) for Tucson = 11 degrees (East)

Magnetic Direction = True Direction - MD

May 6 – Tuesday

The Sun and GONG

10:30 am - 12:00 noon GONG presentation (Sudol)

DMAC Conference Room

(lunch break)

01:00 pm - 02:00 pm ATST presentation (Hill)

Science Conference Room

02:00 pm - 04:00 pm field trip to GONG shelter, solar observing with Tyler's telescope at the GONG farm

Mercury transit?

Assigned Reading for Thursday: Impact hazards and Io

May 7 – Wednesday

Saguaro National Monument (West)

10:00 am - Day hike at Saguaro. Bring lunch and dinner.

Discuss Cosmos 2 – Assign Cosmos 6 for Thursday

6:00 pm – Set up at Sus Picnic Area on Bajada Loop Drive.

Have dinner. Loop closes at sunset (no gate), but we will need to drive van out and park at entrance to loop.

Carry equipment out to van when done.

Assigned Reading for Friday: Galaxies and electromagnetic spectrum

Sun and Moon Data for 7 May 2003 Tucson AZ

Mountain Standard Time

SUN

Begin civil twilight	5:06 a.m.
Sunrise	5:32 a.m.
Sun transit	12:20 p.m.
Sunset	7:09 p.m.
End civil twilight	7:35 p.m.

MOON

Moonrise	9:10 a.m. on preceding day
Moonset	12:06 a.m.
Moonrise	10:07 a.m.
Moon transit	5:32 p.m.
Moonset	12:52 a.m. on following day

Phase of the Moon on 7 May: waxing crescent with 33% of the Moon's visible disk illuminated.

Sunrise and set position

Mountain Standard Time		
	Altitude	Azimuth (E of N)
	h m	o
rise	05:32	69.2
set	19:09	290.9

Moonrise and set position

Mountain Standard Time		
	Altitude	Azimuth (E of N)
	h m	o
rise	10:07	59.0
set	24:52	301.0

Magnetic Declination (MD) for Tucson = 11 degrees (East)

Magnetic Direction = True Direction - MD

May 8 – Thursday

Planetary Day

10:00am Jay Melosh

Impact Cratering

Gould/Simpson Building – Geology.

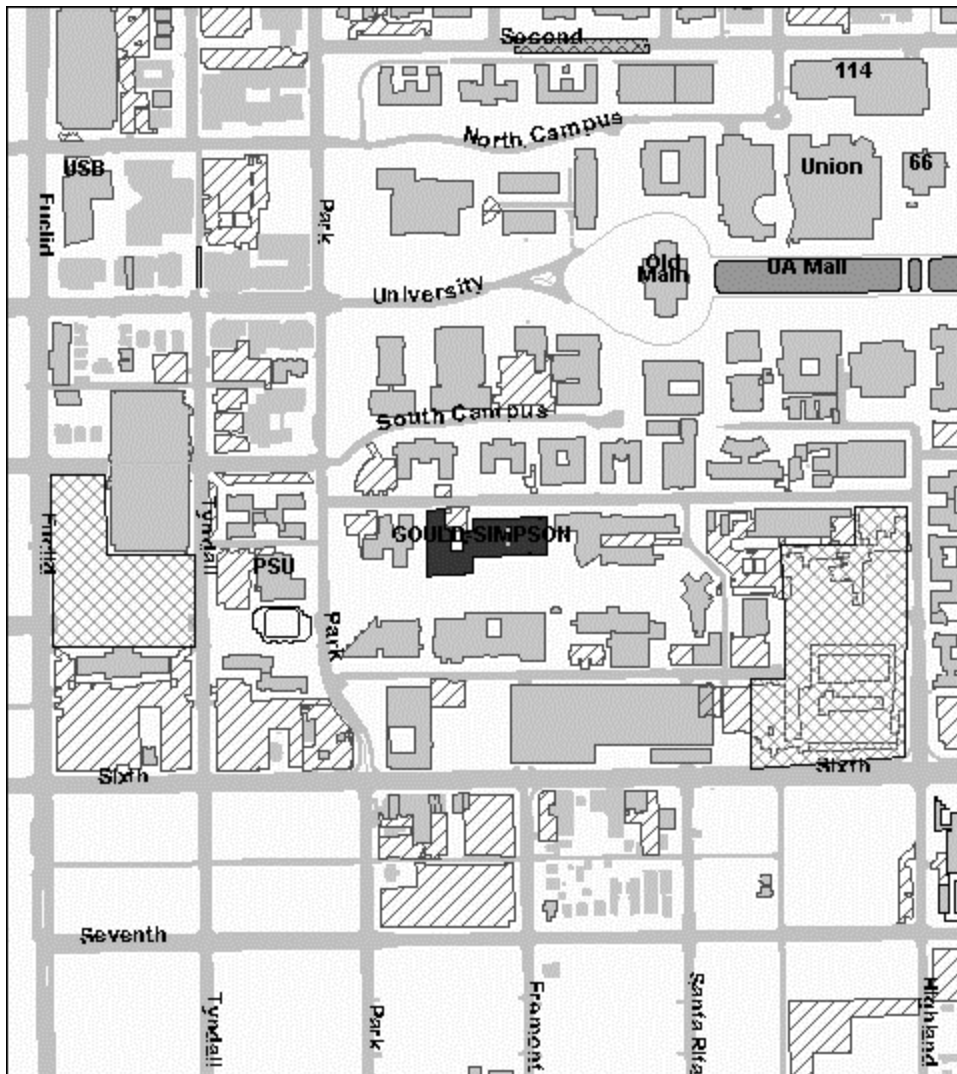
Conference room on the ninth floor of the Gould/Simpson building, just down the hall from my office.

Lunch

12:45 Jani Radebaugh (LPL) – Geology (same room as morning)

Io Volcanism

Discuss Cosmos 6 – Assign Cosmos 3 for Sunday



May 9 – Friday

Galaxy Day

Contact: JD Smith, Steward Obs.

Noon lunch.

Steward Observatory Room 450 1:00 – 3:00pm

1:00pm J.D. Smith – SIRTf galaxies

2:00pm Betsy Barton Gillespie – Colliding galaxies

Free Night

May 10 – Saturday

Free Day.

May 11 – Sunday

Mother's Day – call mother

12:00pm Leave Tucson for Kartchner Caverns

Kartchner Caverns (520-586-2283)

Arrive by 2:30 pm

Tour 3:40 pm

Directions

The park is located nine miles south
of I-10 exit 302, off State Hwy 90.

Lodging Benson: **Super 8 Motel** (855 N Ocatillo Rd, I-10 exit 304, just north, 520-586-1530)

Do Laundry (Sat night or Sun morning)

Discuss Cosmos 3 – Assign Cosmos 4 for Monday

May 12 – Monday

9:00 am Leave Benson, AZ for Socorro, NM ~5 hours (+Lose 1 hour)

Lodging in Socorro: **Econo Lodge** (713 California Ave, I-25 exit 150, 1 mile south, 505-835-1500) staying May 12- May 14.

Driving: I-10E to Demming NM, Hwy 26 NE to Hatch, I-25 N to Socorro
Discuss Cosmos 4 – Assign Cosmos 7 for Wednesday

In Socorro: AJ recommends “El Sombrero”

May 13 – Tuesday

VLA Contact: Robyn Harrison

Go to VLA HQ in morning.

Talk by somebody about latest results.

Minerological Museum

Tour of array in afternoon.

Sun and Moon Data for Tuesday 13 May 2003 MDT

The following information is provided for Magdalena, Socorro County, New Mexico (longitude W107.2, latitude N34.1):

SUN

Begin civil twilight	5:41 a.m.
Sunrise	6:09 a.m.
Sun transit	1:05 p.m.
Sunset	8:02 p.m.
End civil twilight	8:30 p.m.

MOON

Moonrise	4:15 p.m. on preceding day
Moonset	4:37 a.m.
Moonrise	5:26 p.m.
Moon transit	11:22 p.m.
Moonset	5:10 a.m. on following day

Phase of the Moon on 13 May: waxing gibbous with 91% of the Moon's disk lit.

Sunrise and set position

Mountain Daylight Time		
	Altitude	Azimuth
		(E of N)
h m		o
06:09	rise	67.2
20:02	set	293.7

Moonrise and set position

Mountain Daylight Time		
	Altitude	Azimuth
		(E of N)
h m		o
17:26	rise	96.7
05:10 fd	set	267.0

Magnetic Declination (MD) for Socorro = 10 degrees (East)

Magnetic Direction = True Direction - MD

May 14 – Wednesday

9:00 am Leave Socorro, NM for Chaco Culture National Monument (arrive by 5:00pm).

Albuquerque for lunch and camping supplies and food.

Lunch: AJ recommends “Cervantes” on corner of Gibson and San Pedro.

Discuss Cosmos 7 – Assign Cosmos 9 for Friday

Popular Outdoor Outfitters

4900 Cutler Ave NE #D, ABQ NM 87110



Assigned reading for Thursday: Chapter on Celestial Orientation

Chaco Canyon

Chaco park staff: 505-786-7014 x 221

DIRECTIONS	DISTANCE
1: Start out going West on ABEYTA AVE toward I-25 BL N/N CALIFORNIA ST/US-60 E.	0.05 miles
2: Turn RIGHT onto I-25 BL N/N CALIFORNIA ST/US-60 E.	1.05 miles
3: Merge onto I-25 N.	91.94 miles
4: Take the NM-44 W/NM-165 E exit- exit number 242- toward RIO RANCHO/PLACITAS.	0.24 miles
5: Take the ramp toward BERNALILLO/RIO RANCHO/FARMINGTON.	0.04 miles
6: Turn LEFT onto NM-44 W.	115.82 miles
Total Estimated Time: 4 hours, 16 minutes	Total Distance: 209.15 miles

May 15 – Thursday

Free hike

Be back at campsite for 4:30pm dinner. Leave for ruins 6:30pm. Bring snacks.

Lunar eclipse

May 16 – Friday

Get new campsite.

Hike to Penasco Blanco pictograph – *Discuss Cosmos 9 – Assign Cosmos 8 for Sunday*

Sun and Moon Data for Wednesday 14 May 2003, ~Chaco Canyon

Mountain Daylight Time

SUN

Begin civil twilight	5:37 a.m.
Sunrise	6:06 a.m.
Sun transit	1:09 p.m.
Sunset	8:12 p.m.
End civil twilight	8:41 p.m.

MOON

Moonrise	5:31 p.m. on preceding day
Moonset	5:11 a.m.
Moonrise	6:46 p.m.
Moon transit	12:20 a.m. on following day
Moonset	5:46 a.m. on following day

Phase of the Moon on 14 May: waxing gibbous with 97% of the Moon's visible disk illuminated.

Sunrise and set position

Mountain Daylight Time		
Altitude	Azimuth	
	(E of N)	
h m	o	
06:06	rise	65.7
20:12	set	294.0

Moonrise and set position

Mountain Daylight Time		
Altitude	Azimuth	
	(E of N)	
h m	o	
18:46	rise	105.3
05:46 nd	set	250.9

Magnetic Declination (MD) for Chaco = 13 degrees (East)

Magnetic Direction = True Direction - MD

Sun and Moon Data for Thurs. 15 May 2003, Chaco Canyon

Mountain Daylight Time

SUN

Begin civil twilight	5:37 a.m.
Sunrise	6:05 a.m.
Sun transit	1:09 p.m.
Sunset	8:13 p.m.
End civil twilight	8:42 p.m.

Sunrise and set position

Mountain Daylight Time

		Altitude	Azimuth
		(E of N)	
h	m	o	
06:05	rise	65.5	
20:13	set	295.0	

Total Lunar Eclipse: Lunar Position

		Azimuth		Altitude
		h	m	o
Moonrise	2003 May 15	20:04	113.2	----
Moon enters totality	2003 May 15	21:13.7	124.1	10.9
Middle of eclipse	2003 May 15	21:40.1	128.7	14.9
Moon leaves totality	2003 May 15	22:06.4	133.6	18.7
Moon leaves umbra	2003 May 15	23:17.4	148.7	27.1
Moon leaves penumbra	2003 May 16	00:14.8	162.9	31.5
Moonset	2003 May 16	06:25	244.1	----

Magnetic Declination (MD) for Chaco = 13 degrees (East)

Magnetic Direction = True Direction - MD

Lenses, field of view, and size of moon disk

Film	Lens	f.o.v.	Moon D. 4x6	Moon D. 8x10	Moon D. 10x16
35mm	28mm	46 x 65 deg.	1mm	2mm	2.5mm
30	50	30 x 40	1.7	3.4	5.4
120mm	35mm	62 x 76	1	1.7	2.5
120	80	29 x 40	2.2	3.7	5.5
120	105	23 x 29	3	5	7
120	210	11 x 15	5.4	9	13
120	420	6 x 7.5	11	18	27

Sun and Moon Data for Friday 16 May 2003, Chaco Canyon

Mountain Daylight Time

SUN

Begin civil twilight	5:36 a.m.
Sunrise	6:05 a.m.
Sun transit	1:09 p.m.
Sunset	8:14 p.m.
End civil twilight	8:43 p.m.

MOON

Moonrise	8:04 p.m. on preceding day
Moon transit	1:18 a.m.
Moonset	6:25 a.m.
Moonrise	9:21 p.m.
Moonset	7:12 a.m. on following day

Phase of the Moon on 16 May: waning gibbous with 99% of the Moon's visible disk illuminated.

Sunrise and set position

Mountain Daylight Time		
	Altitude	Azimuth
		(E of N)
	h m	o
06:05	rise	65.3
20:14	set	295.1

Moonrise and set position

Mountain Daylight Time		
	Altitude	Azimuth
		(E of N)
	h m	o
06:25	set	244.0
21:21	rise	118.9

Magnetic Declination (MD) for Chaco = 13 degrees (East)

Magnetic Direction = True Direction - MD

May 17 – Saturday

9:00am Leave Chaco for Monument Valley (must arrive by 7:00pm)

Lodging: Mitten View Campground (435-727-5870)

Reservation: Nordgren

Assigned reading for Monday: the Outer Solar System (Pluto and Comets)

DIRECTIONS	DISTANCE
1: Start out going North on US-550 N/NM-44 N toward CR-7600.	35.95 miles
2: Turn LEFT onto US-64/W BROADWAY AVE. Continue to follow US-64 W.	11.21 miles
3: Turn SLIGHT RIGHT onto E BROADWAY/US-64 BR W. Continue to follow US-64 BR W.	0.91 miles
4: US-64 BR W becomes US-64 N.	29.71 miles
5: Turn RIGHT onto US-64/NM-504.	26.07 miles
6: US-64/NM-504 becomes US-160.	28.22 miles
7: Turn RIGHT onto US-191.	26.44 miles
8: Turn LEFT onto US-163/UT-163.	41.03 miles
9: Turn RIGHT onto OLJETO RD.	0.85 miles
Total Estimated Time: 5 hours, 42 minutes	Total Distance: 200.39 miles

Sun and Moon Data for Friday 17 May 2003, Monument Valley

Mountain Daylight Time

SUN

Begin civil twilight	5:43 a.m.
Sunrise	6:12 a.m.
Sun transit	1:17 p.m.
Sunset	8:23 p.m.
End civil twilight	8:52 p.m.

MOON

Moonrise	9:30 p.m. on preceding day
Moon transit	2:28 a.m.
Moonset	7:21 a.m.
Moonrise	10:44 p.m.
Moonset	8:16 a.m. on following day

Phase of the Moon on 17 May: waning gibbous with 96% of the Moon's visible disk illuminated.

Sunrise and set position

Mountain Daylight Time		Altitude	Azimuth
			(E of N)
h	m	o	
06:12	rise	64.6	
20:23	set	295.5	

Moonrise and set position

Mountain Daylight Time		Altitude	Azimuth
			(E of N)
h	m	o	
07:21	set	239.0	
22:44	rise	123.0	

Magnetic Declination (MD) for Monument Valley = 12 degrees (East)
Magnetic Direction = True Direction - MD

May 18 – Sunday

9:00am Drive Monument Valley loop drive.

12:00noon Leave Monument Valley for Flagstaff AZ (gain hour off Navajo reservation)
~5 hours driving time

Lodging: **Du Beau Hostel** (1-800-398-7112, 19 West Phoenix Street)

May 18 – May 29

Discuss Cosmos 8 – Assign Cosmos 5 for Tuesday

Assigned reading for Tuesday: Mars

May 19 – Monday

Lowell Observatory

10:00am Slipper Room, Topic: Pluto – KBOs and the outer solar system

Contact: Will Grundy at Lowell

May 20 – Tuesday

USGS

10:00am Mars and Martian Glaciers

Contact: Jeff Kargel

Discuss Cosmos 5 – Assign Cosmos 10 for Friday

Assigned reading for Wednesday: Stars

Present idea of final project (proposed object) – discuss over dinner

May 21 – Wednesday

10:00am Tour of NPOI

2:00 pm Talk by Tyler Nordgren at NOFS

May 22 – Thursday

Lowell Observatory

Deidre Hunter – Galaxies

May 23 – Friday

Final Projects due at 9:00am

9:00am Leave for Grand Canyon

Discuss Cosmos 10 – Assign Cosmos 11-12 for Sunday, Monday or Tuesday nights

Watch sunset

Stargaze from south rim or closer back to Flagstaff

Sun and Moon Data for 23 May 2003 Flagstaff AZ ~Grand Canyon

Mountain Standard Time

SUN

Begin civil twilight	4:49 a.m.
Sunrise	5:17 a.m.
Sun transit	12:23 p.m.
Sunset	7:30 p.m.
End civil twilight	7:58 p.m.

MOON

Moonset	11:46 a.m. on preceding day
Moonrise	1:45 a.m.
Moon transit	7:13 a.m.
Moonset	12:47 p.m.
Moonrise	2:12 a.m. on following day

Phase of the Moon on 23 May: waning crescent with 42% of the Moon's visible disk illuminated.

Sunrise and set position

Mountain Standard Time

	Altitude	Azimuth (E of N)
h m		o
05:17	rise	63.6
19:30	set	296.3

Moonrise and set position

Mountain Standard Time

	Altitude	Azimuth (E of N)
h m		o
12:47	set	255.5
2:12 fd	rise	101.0

Magnetic Declination (MD) for Flagstaff = 12 degrees (East)

Magnetic Direction = True Direction – MD

May 24 – Saturday

11:00am Leave for Meteor Crater

Saturday night Free night

May 25 – Sunday

Free day

Observing Night 1

Discuss Cosmos 11-12 – Assign Cosmos 13 Wednesday

May 26 – Monday

Free day

Observing Night 2

Discuss Cosmos 11-12 – Assign Cosmos 13 Wednesday

May 27 – Tuesday

Free day

Observing Night 3

Discuss Cosmos 11-12 – Assign Cosmos 13 Wednesday

May 28 – Wednesday

11:00 am Leave Flagstaff for University of Redlands (~7 hours)

Discuss Cosmos 13