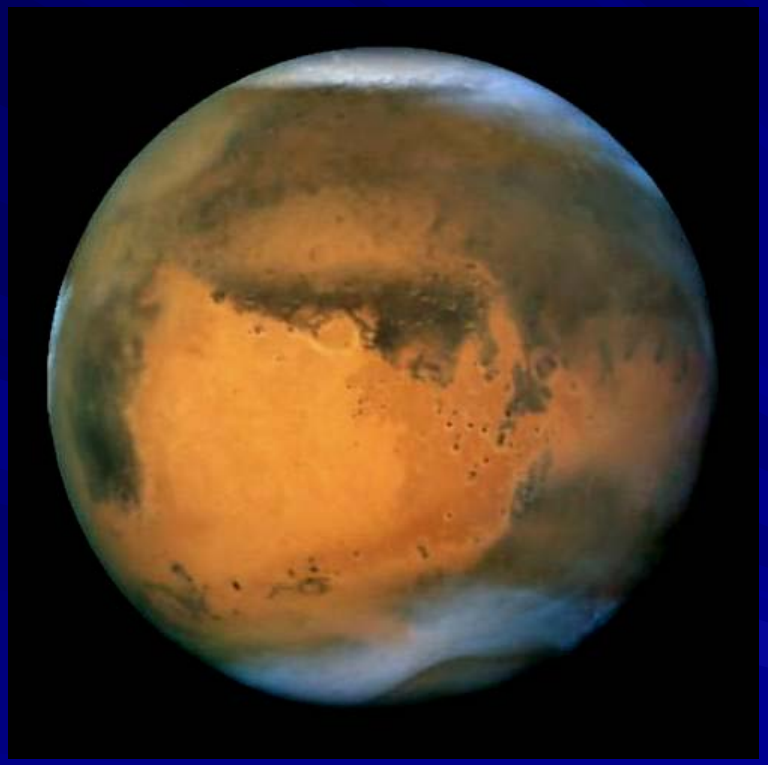
OBSERVING MARS 2018

Mars (god of war)

Nirgal (star of death)



Angakara (burning coal)

Huoxing (fire star)

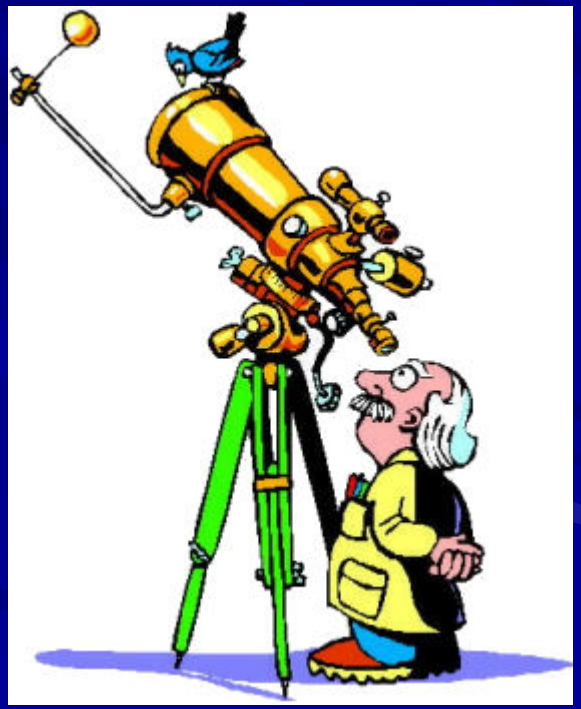
A DROP OF CURDLED BLOOD IN THE NIGHT SKY

Liability Warning

Be careful Observing Mars!

Beware the ire of Mars, astrologers say

“*Expect heated aggression, flashes of road rage and fiery embraces of passion*”, warn astrologers, “*as Mars moves closer to the Earth*….”



MARS WEBSITES

Mars Profiler (orientation of Mars 2018): http://wwwcdn.skyandtelescope.com/wp-content/plugins/observing-tools/mars_profiler/mars.html

Mars 2018 Opposition (details): http://www.alpo-astronomy.org/jbeish/2018_MARS.htm

Current Photos of Mars: http://alpo-j.asahikawa-med.ac.jp/Latest/Mars.htm

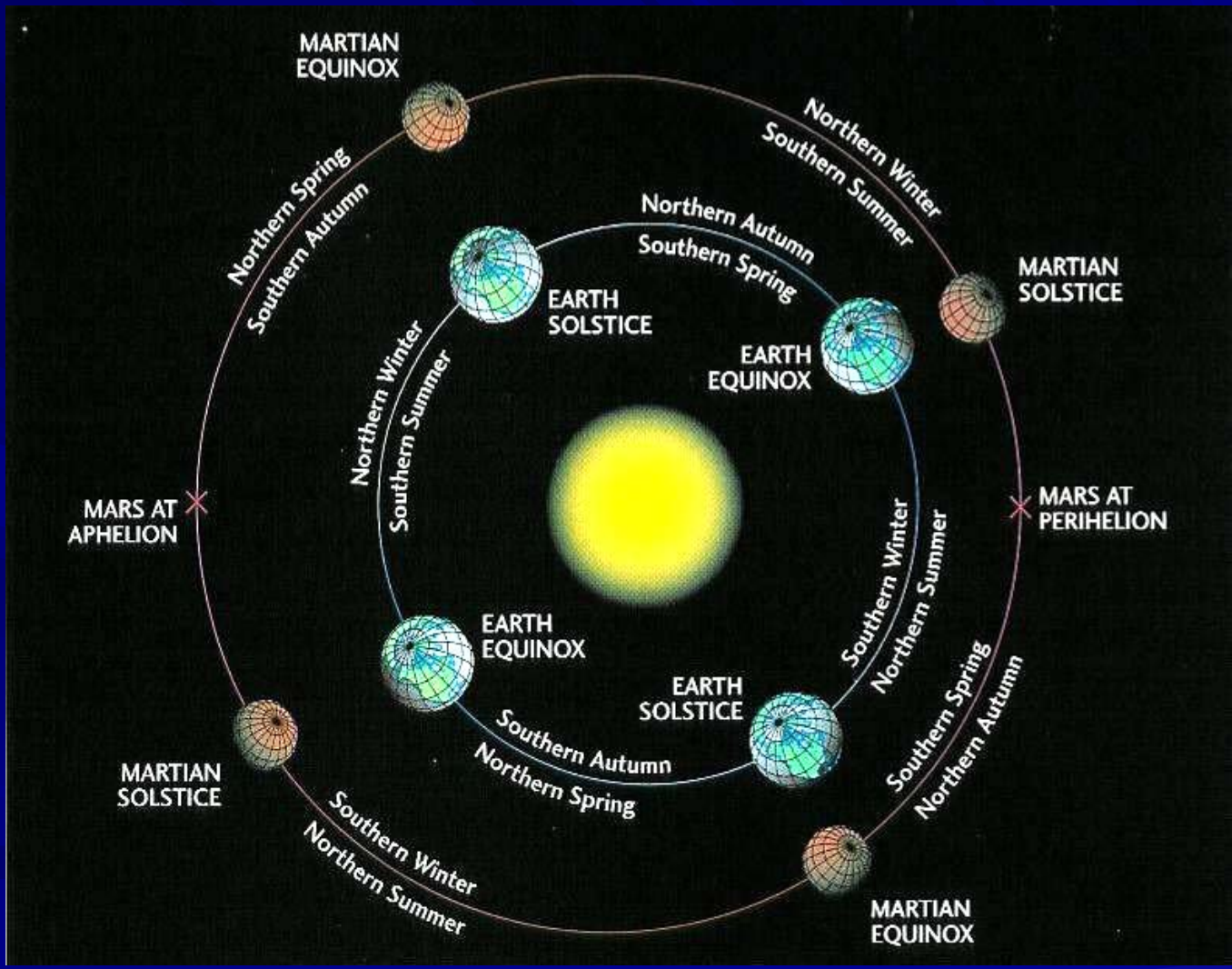
Richard Orr's Mars drawings: http://www.orrastrodrawing.com/Mars.html

Not all Mars Oppositions are Equal

20% closer to the sun during perihelion (SP cap faces the sun) than at aphelion (NP cap faces the sun)

Southern Summers are 52 days shorter but 64 F warmer (45% more sun) than Summers in the north

From Earth 50% brighter when closest (wheat colored) than furthest (blood red)

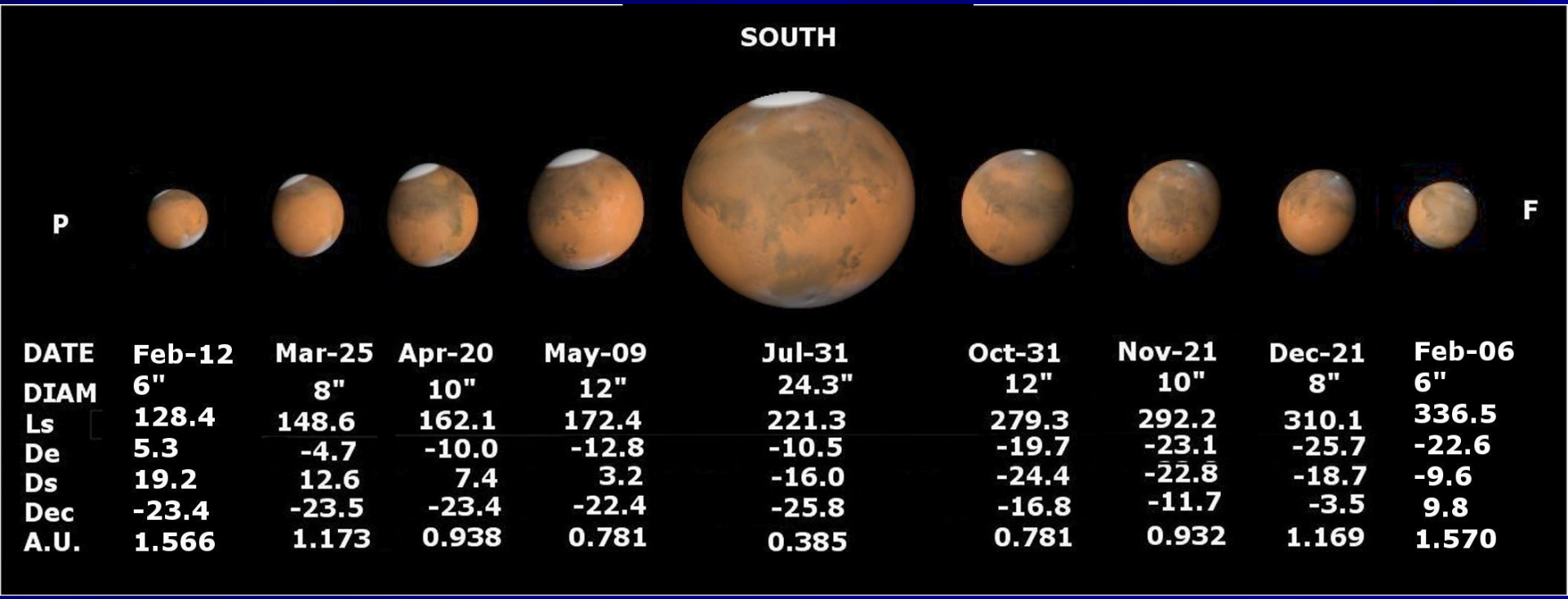


The GOOD, the BAD, the UGLY

- **The Good for 2018:**
  - You can see clouds, dark markings, the south polar cap and surface detail.
  - Mars gets just about as large as it ever gets exceeding 24” in size between July 23rd and August 9th (this is 97 percent of the maximum of 25.13”). It will not appear this large again for 17 years.
  - You can observe Mars when the moon is bright and/or transparency is poor. The stability of the atmosphere during our Summer months is often the best we get here in Maryland.
- **The Bad for 2018:**
  - Mars is placed low in the sky much more so than in most oppositions – but 4.4 degrees higher than the last opposition (2016)
  - Mars is going to be small, very bright, with its surface markings subtle. It will not appear like the enhanced highly processed photos or even detailed drawings that you have seen.
- **The Ugly for 2018:**
  - Viewing Mars will be like trying to see details within a medium-sized lunar crater at full moon while the moon is near the horizon -- and the crater is covered in a thick Los Angeles like-smog

Mars 2018

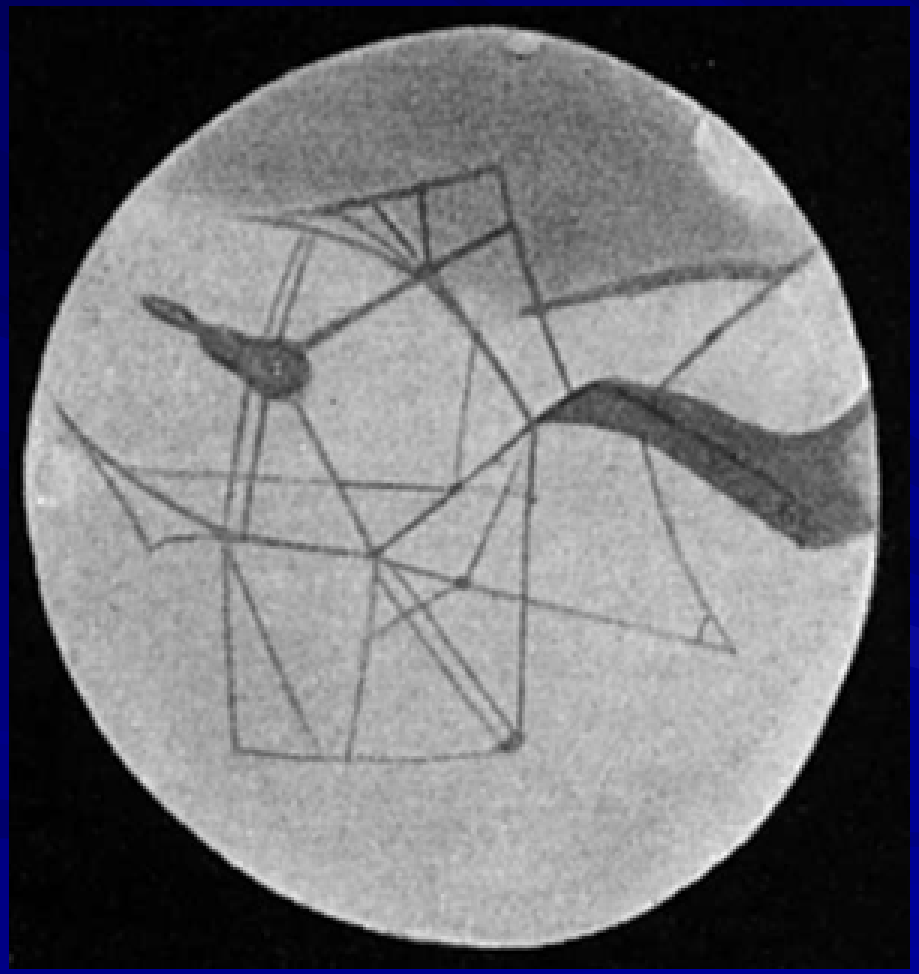
- Mars will reach opposition on July 22nd . At that time it will reach 24.3 arcseconds.
- Mars will be closest to Earth on July 31st . It will still be 24.3 arcseconds in size.
- Start of Mars autumn (northern) and spring (southern) on May 22nd
- Start of Mars winter (northern) and summer (southern) on October 16th



DATE	Feb-12	Mar-25	Apr-20	May-09	Jul-31	Oct-31	Nov-21	Dec-21	Feb-06
DIAM	6"	8"	10"	12"	24.3"	12"	10"	8"	6"
Ls	128.4	148.6	162.1	172.4	221.3	279.3	292.2	310.1	336.5
De	5.3	-4.7	-10.0	-12.8	-10.5	-19.7	-23.1	-25.7	-22.6
Ds	19.2	12.6	7.4	3.2	-16.0	-24.4	-22.8	-18.7	-9.6
Dec	-23.4	-23.5	-23.4	-22.4	-25.8	-16.8	-11.7	-3.5	9.8
A.U.	1.566	1.173	0.938	0.781	0.385	0.781	0.932	1.169	1.570

A simulated view of the appearance of Mars during opposition at 0507 UT on July 27, 2018 (218.9° Ls, CM 143.9°)

“Nothing is ever seen perfectly, but only by fragments, and under various conditions of obscurity” – John Ruskin

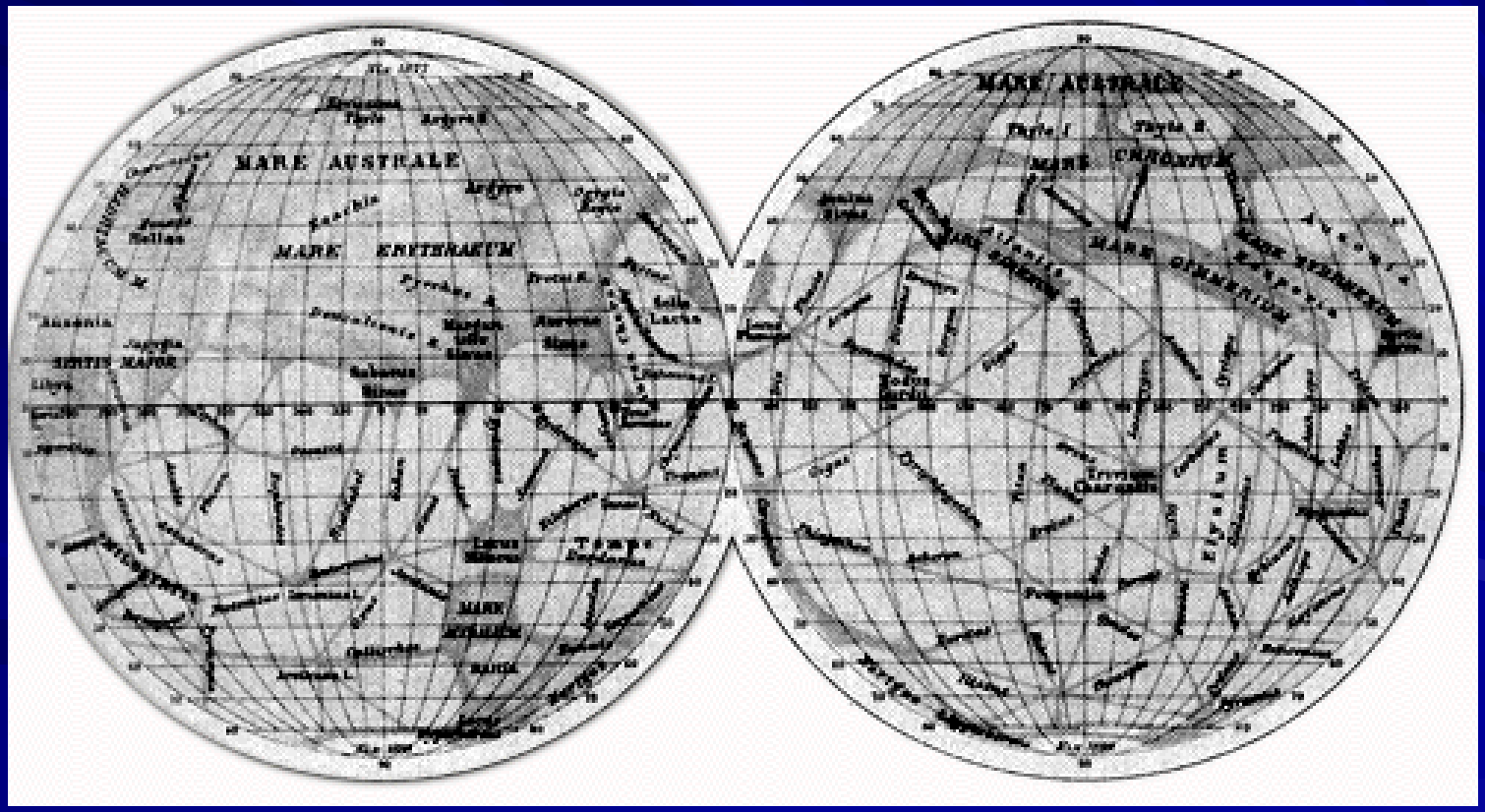


“History has shown that [Mars] has revealed itself only to those who care. We do not expect first-time observers to come away from the eyepiece with a complete understanding of what he or she has seen. Nor do we expect novice observers to see much.”

W. Sheehan & S.J. O’Meara (The Lure of the Red Planet)

“We may hope that, because the world of Mars is older than ours, humankind there will be more advance and wiser” – Flammarion

“Yet across an immense ethereal gulf, minds that are to our minds as ours are to the beasts in the jungle, intellects vast and cool and unsympathetic regarded this earth with envious eyes and slowly and surely drew their plans against us” – War of the Worlds



To See Mars at its Best

(small bright with subtle markings)

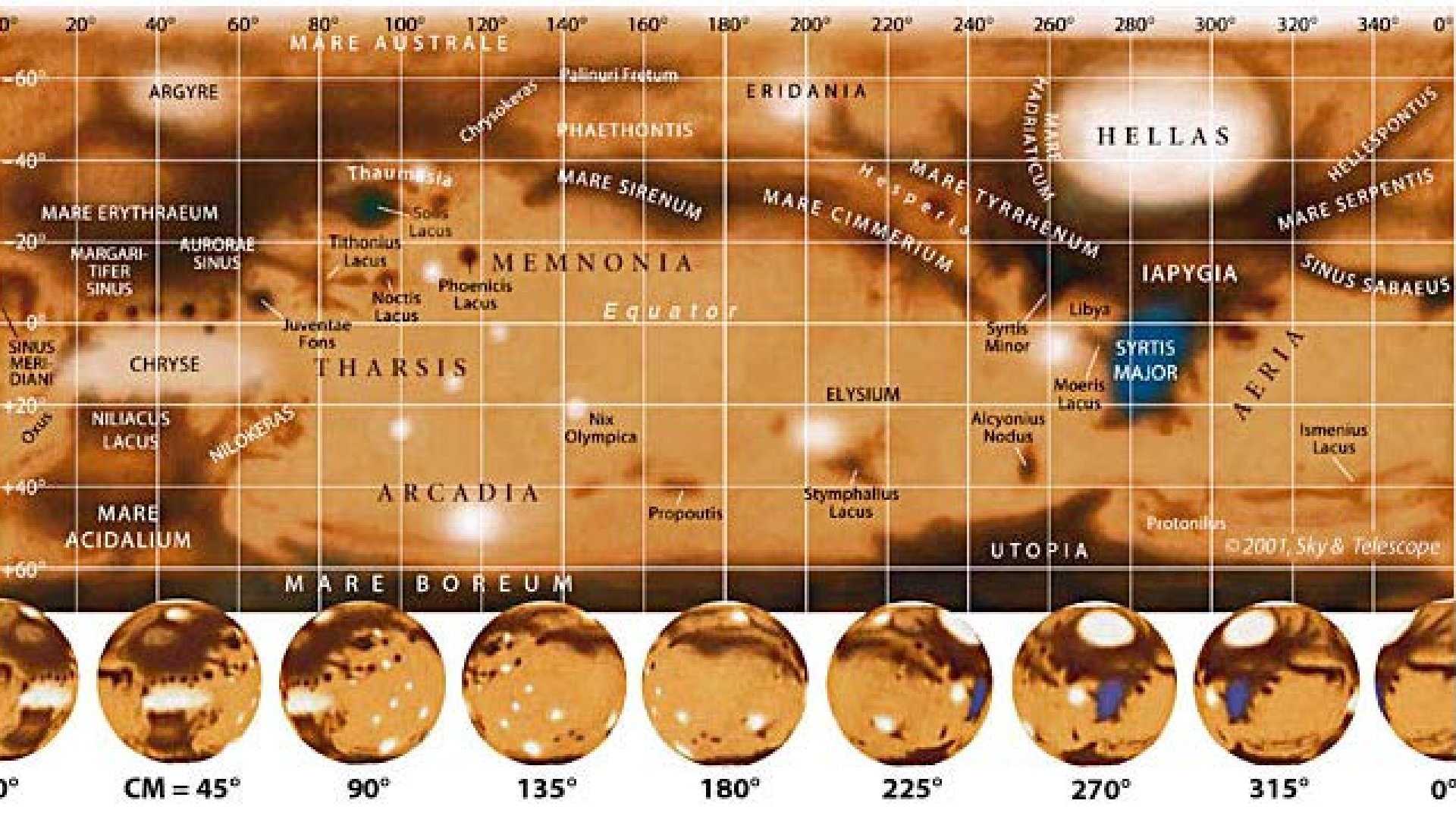
- **Telescope (quality, size) Your goal is to maximize contrast and resolution**
  - **Resolution (Dawes limit) vs. contrast**
  - **Dobsonians – collimation is the key**
  - **MAK & SCT – watch for tube currents**
  - **Trust your telescope – expect to be disappointed in your initial image of Mars**
- **Location of Telescope**
- **High Power (60-75x/inch on 8” or less; on 12” or more 500x) – eyepiece/barlow quality – filter (Mars is too bright)**
- **Mount (high quality drive) and Chair**
- **Patience and Practice**
- **Familiarity with the gross surface markings -- know what to look for on Mars**

MAP OF MARS

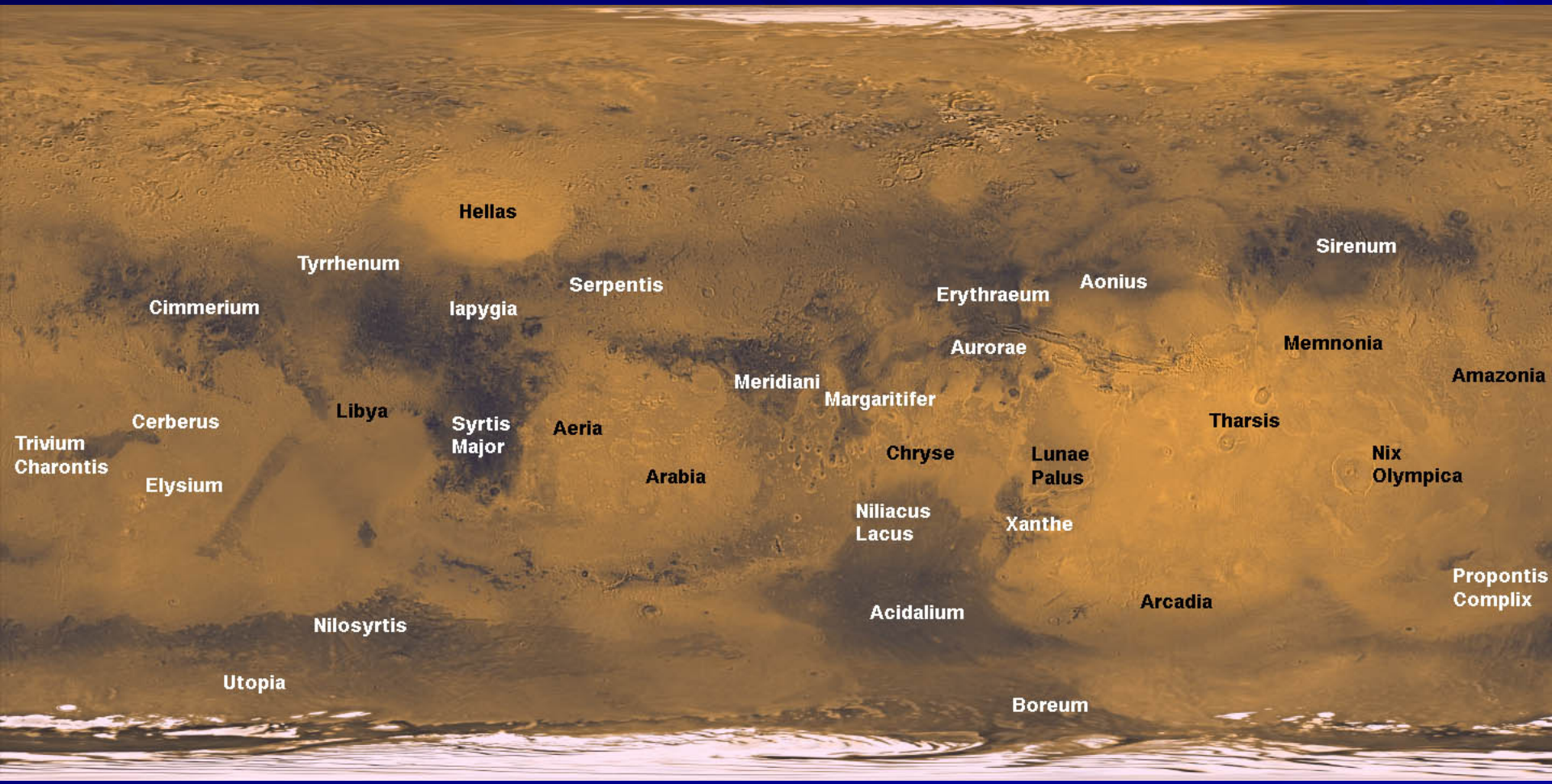
Dark Brown/red Areas = mixed dust sizes or exposed rock

Light Red Areas = lots of fine-grained dust

White Areas = clouds, frost, ice, fog



Getting familiar with Mars



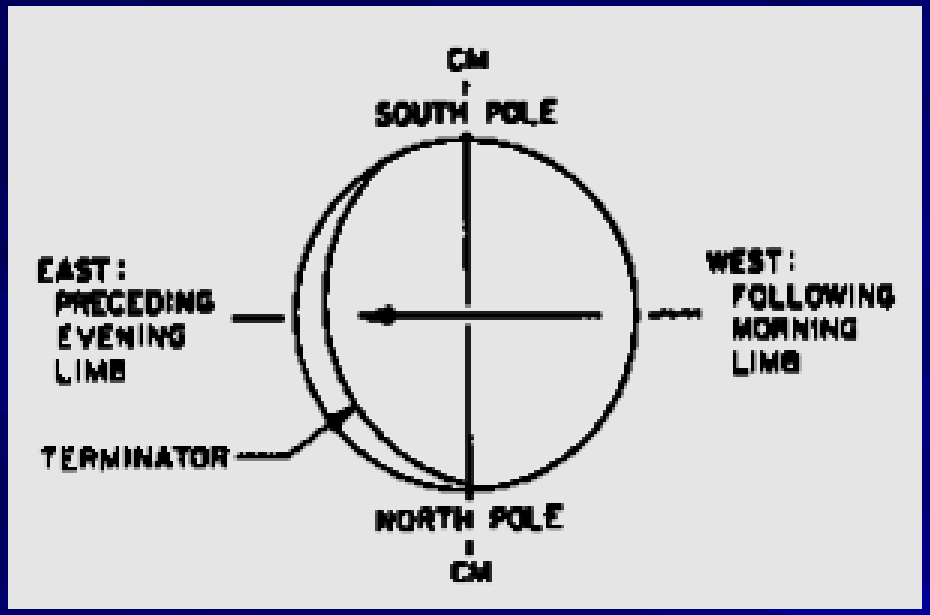
Getting familiar with Mars

1) Syrtis Major[1]
2) Hellas[2]
3) Sinus Sabaeus
4) Sinus Meridiani[3]
5) Utopia
6) Sinus Sirenum[5]
7) Sinus Cimmerium[5]
8) Sinus Tryrrhenum[5]
9) Proponitis Complex
10) Solis Lacus[4]
11) Mare Erythraeum
12) Mare Acidalium

KEY:

1 = means Mediterranean Sea (old names Hourglass Sea, Blue Scorpion, Frasier Sea)
2 = means Greece (largest impact basin in the Solar System)
3 = Dawes' Forked Bay (zero longitude)
4 = Eye of Mars (Schiaparelli's "Land of Wonder")
5 = Schiaparelli's "Great Diaphragm"

MARS ORIENTATION



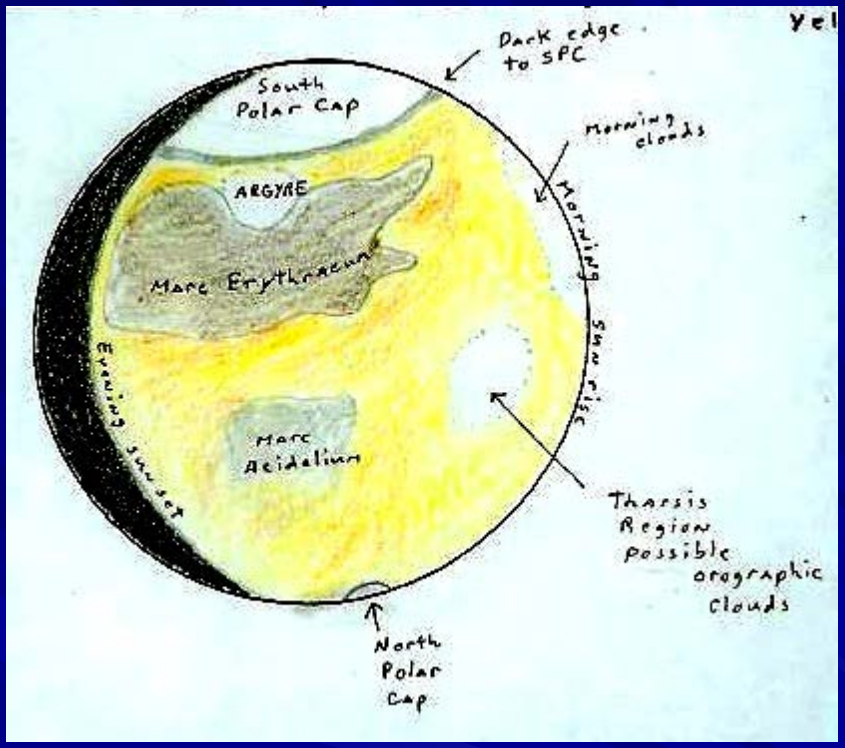


Figure out before observing the orientation of Mars & Rotation (sunrise/sunset) for your telescope

Day on Mars = 24 hours, 37 minutes – therefore if you observe the same time night after night the surface features appears to back up (anti-rotational) about 9 degrees every night causing an illusory retrograde rotation of about 36 days.

Polar caps will be offset from the apparent up and down in your eyepiece.

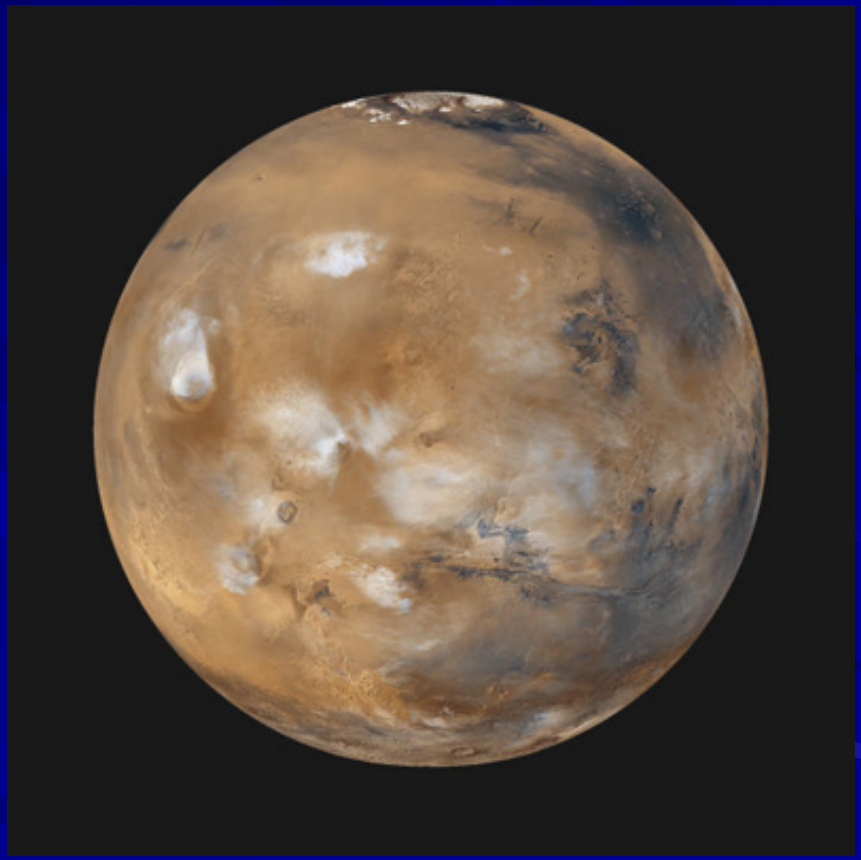
USE OF COLOR FILTERS
(a necessity not a choice; even so – improvements are going to be subtle)

Enhances dark surface markings	Red (W25) for 6” or more Yellow (W15) for 5” or less
Atmospheric clouds, limb hazes, polar caps & hoods	Blue (W80A)
Surface frosts and fog	Green (W58)
No filter	Color of disk and its markings
Specialized Interference filter(s)	General overall views

(Note -- Buy 1-1/4” not 2” since you will be changing filters more than changing eyepieces) -- Filter Wheel recommended – but must be of high quality if you are going to use interference filter(s).

MARTIAN METEOROLOGY

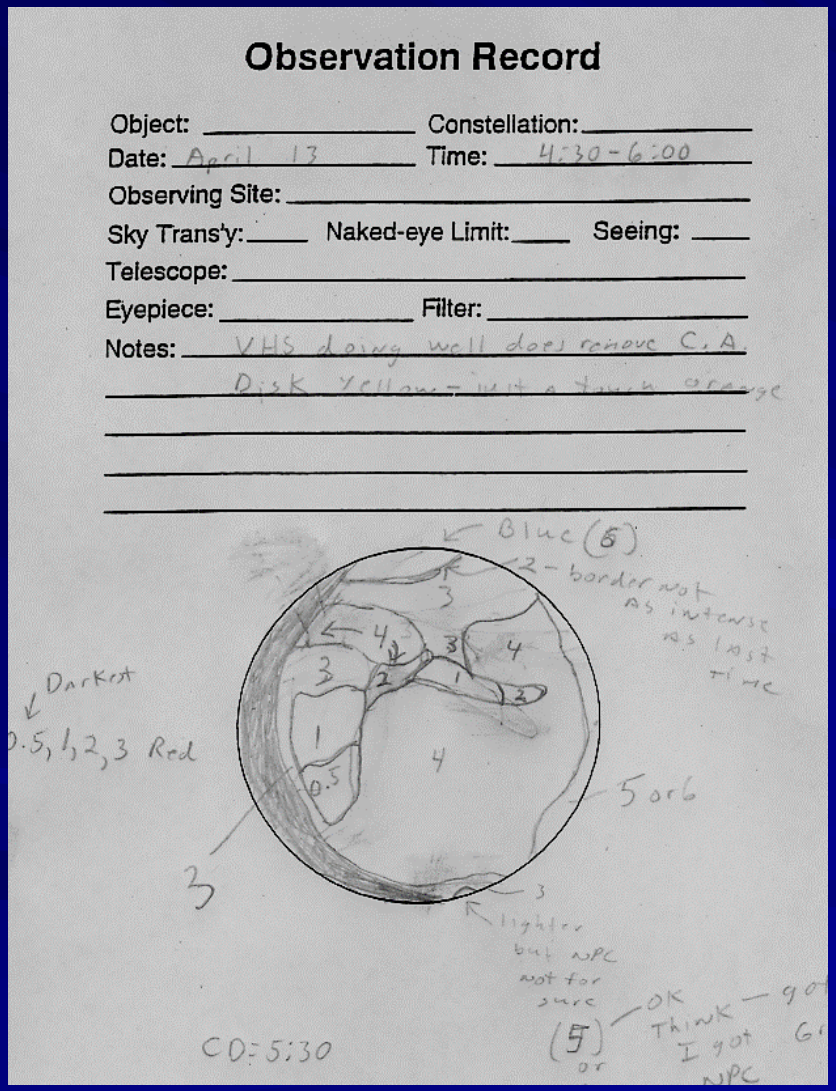
- **Discrete Atmospheric Clouds**
  - Orographic (Bright in Blue; Faint in Green and Orange) -- best seen about two hours before sunset
  - Localized – e.g. Syrtis Blue Cloud (Best in Blue)
- **Morning & Evening Clouds** (Best in Blue) -- Evening Clouds can be as bright as the polar caps
- **Limb Brightening**
  - Scattering of Dust (Best in Red)
  - Scattering of Dry Ice Particles (Best in Blue)
- **Surface Frosts** (Green best -- has sharp edges)
- **Low level fog or Clouds** (Green best --has hazy edges)
- **Dust Storms** (Bright in Red; Faint in Yellow)




3
ORION®
Multiple Filter Wheel
PORTUGAL
SIRIUS OPTICS
VARIABLE FILTER SYSTEM
VFS-1.25

Make a Drawing

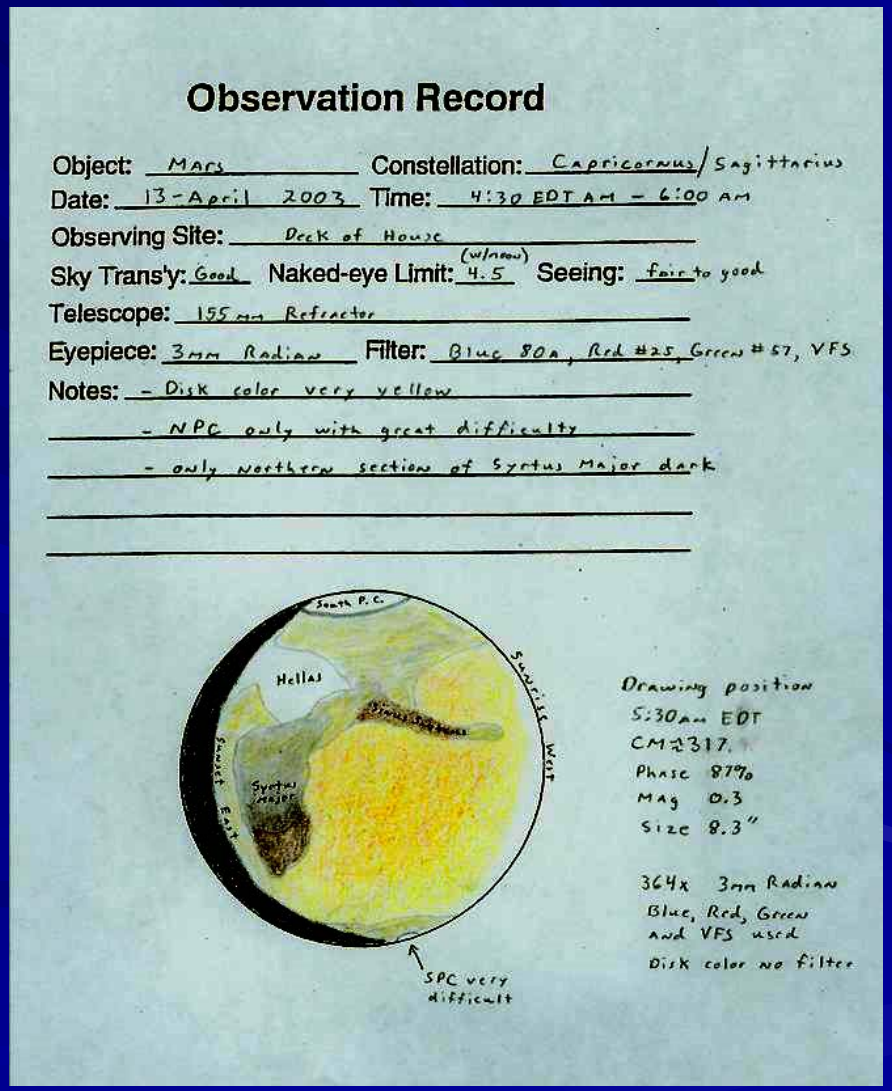
You will see more detail



Observation Record

Object: _____ Constellation: _____
Date: April 13 Time: 4:30 - 6:00
Observing Site: _____
Sky Trans'y: ____ Naked-eye Limit: ____ Seeing: ____
Telescope: _____
Eyepiece: _____ Filter: _____
Notes: VHS doing well does remove C.A.
Disk Yellow - with a touch orange

Blue (6) - border not as intense as last time
Darkest 0.5, 1, 2, 3 Red
5 or 6
3
lighter but NPC not for sure
(5) OK Think — got I got G NPC
CD: 5:30



Observation Record

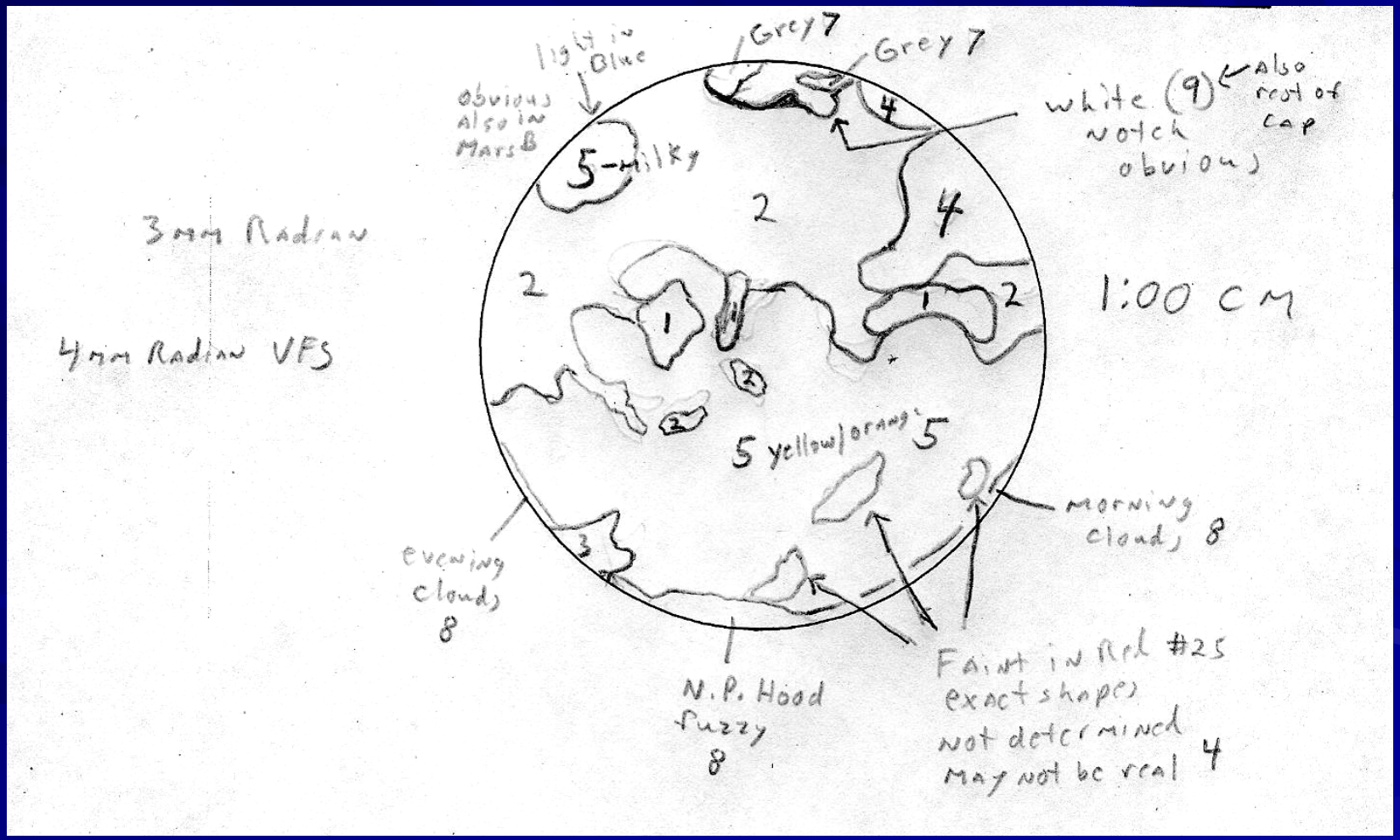
Object: Mars Constellation: Capricornus / Sagittarius
Date: 13-April 2003 Time: 4:30 EDT AM - 6:00 AM
Observing Site: Deck of House
Sky Trans'y: Good Naked-eye Limit: (w/naw) 4.5 Seeing: fair to good
Telescope: 155 mm Refractor
Eyepiece: 3mm Radian Filter: Blue 80A, Red #25, Green #57, VFS
Notes: - Disk color very yellow
- NPC only with great difficulty
- only Northern section of Syrtus Major dark

South P.C.
Hellas
Sunrise West
Sunset East
Syrtus Major
SPC very difficult

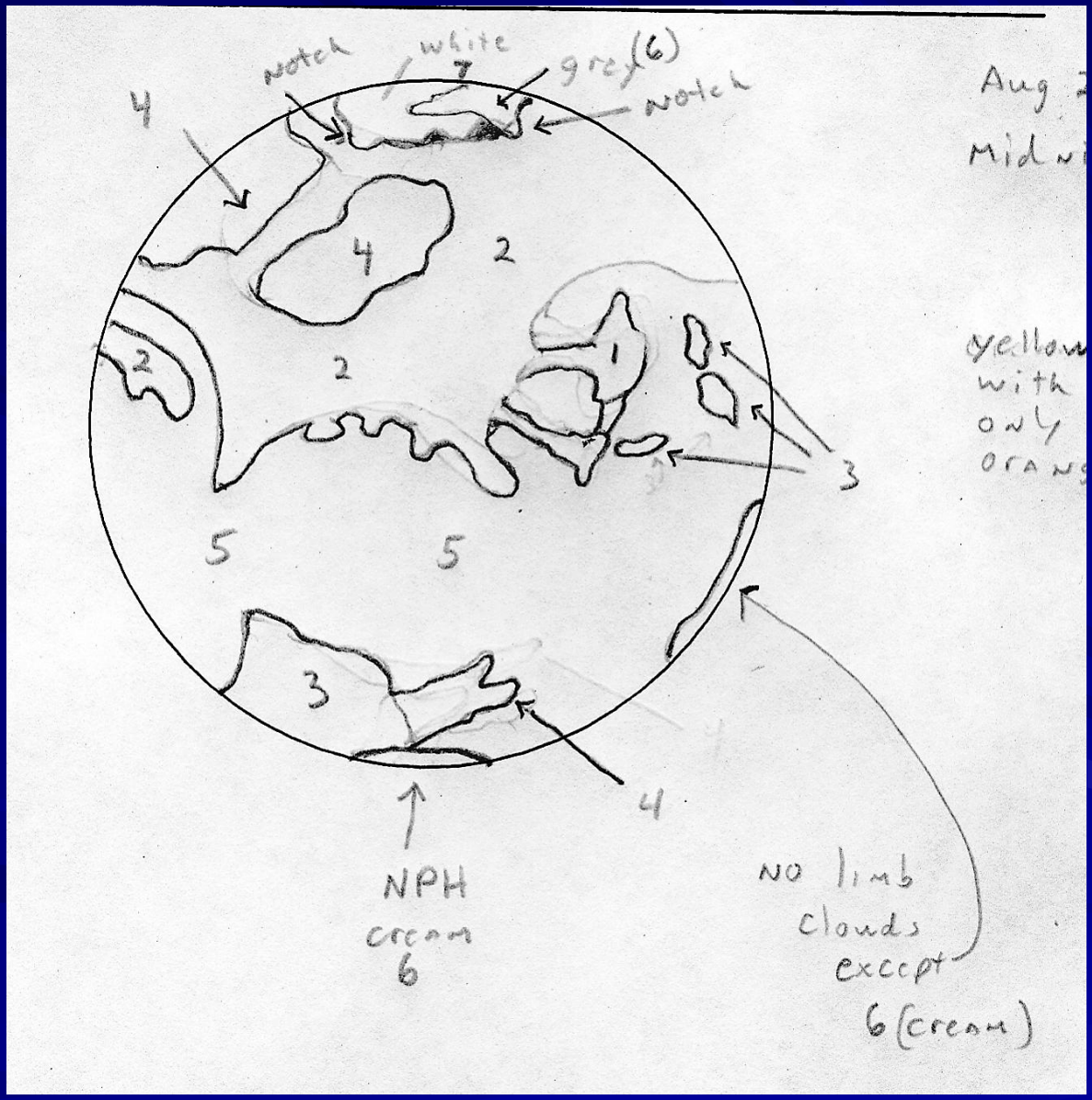
Drawing position
5:30 AM EDT
CM = 317.
Phase 87%
Mag 0.3
Size 8.3"

364x 3mm Radian
Blue, Red, Green and VFS used
Disk color no filter

August 21, 2003 Size = 24.9”, 155mm Refractor 619x



August 26, 2003 Size = 25.07”, 155mm Refractor (619x)



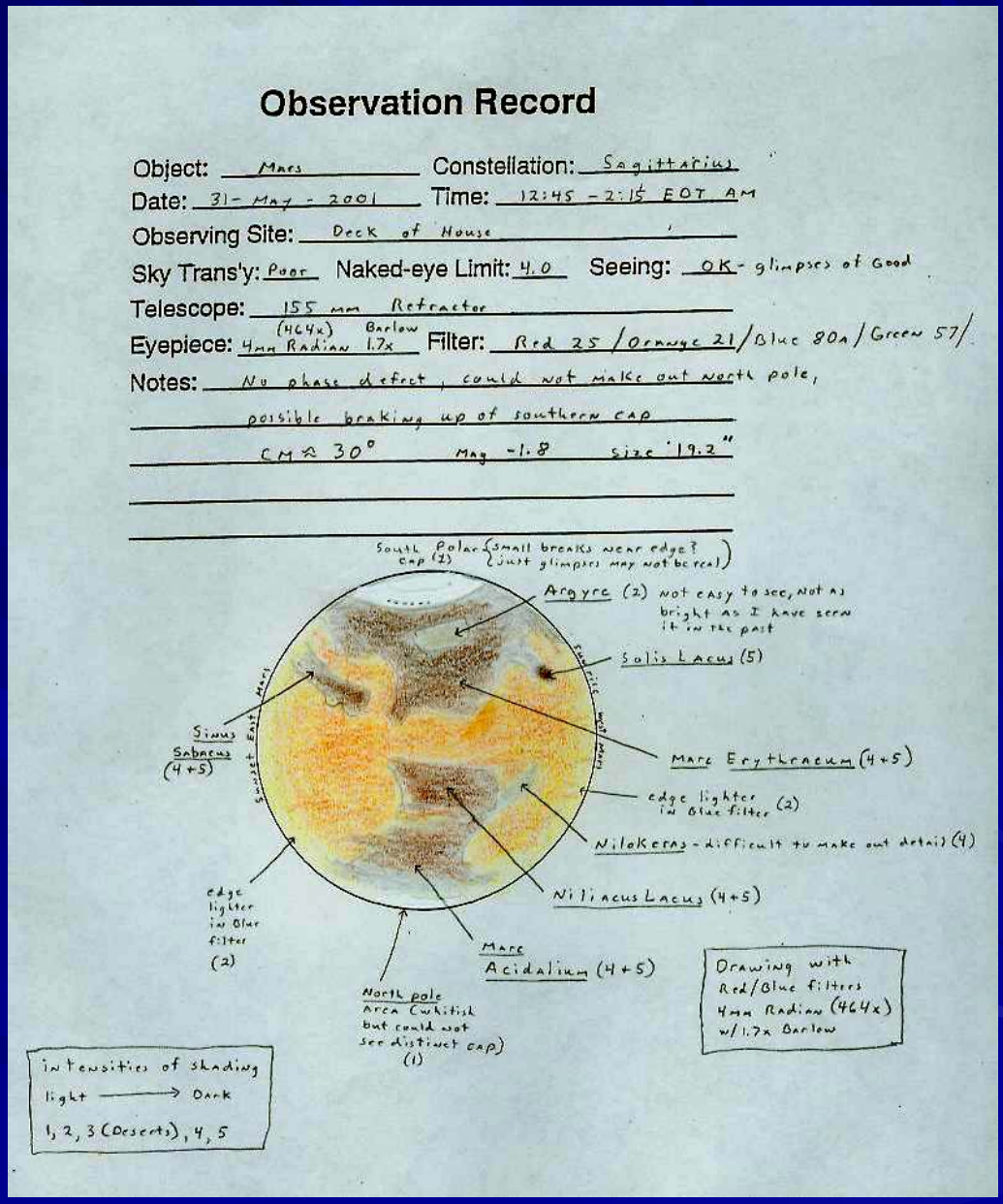
MAKE A DRAWING

1) Observe a while before starting the drawing -- don't rush to draw
2) ALPO = 42mm disk

   BAA = 50mm disk

   I use = 72mm disk

   Best = 3mm/arcsecond



MAKE A DRAWING

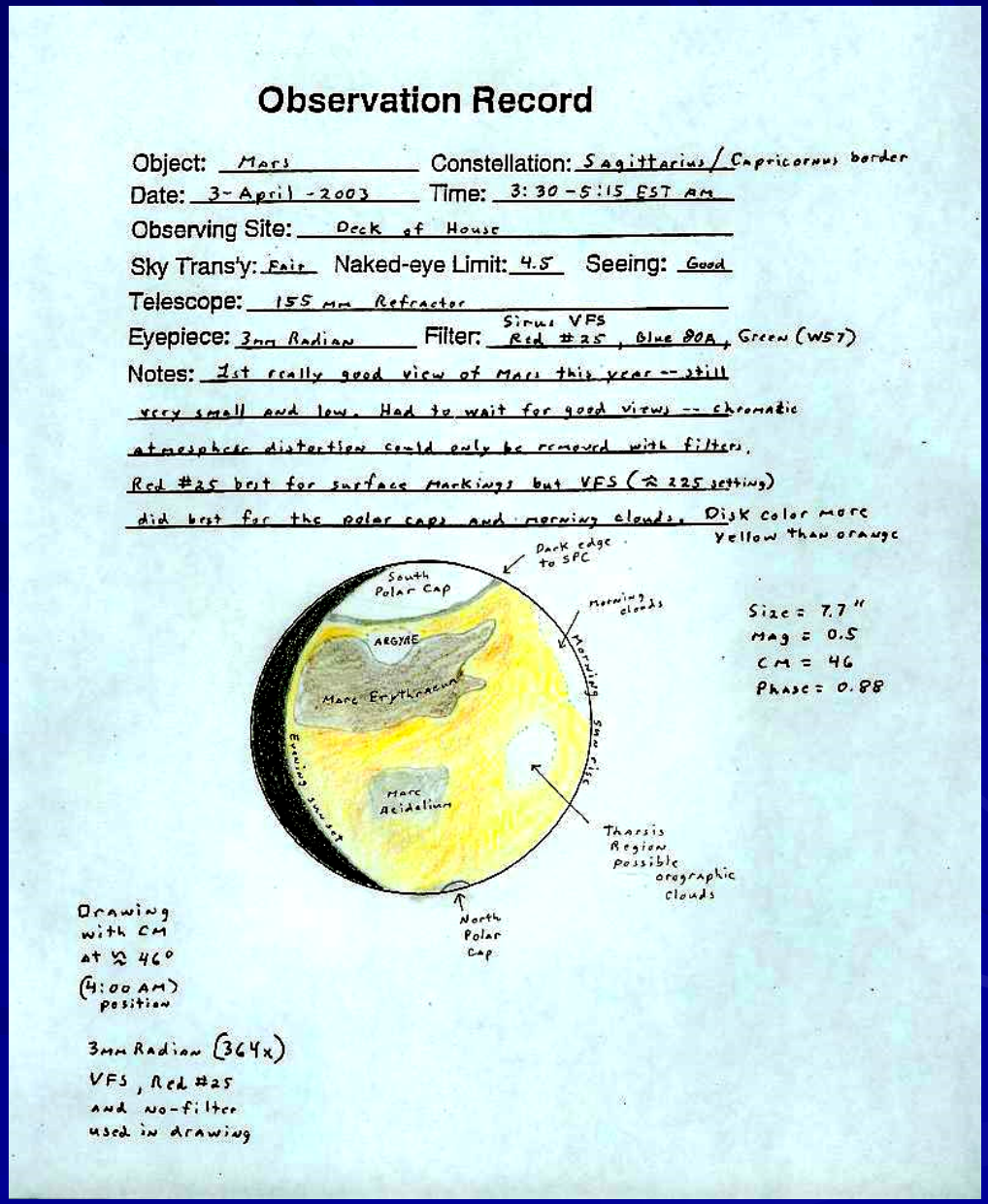
1) Observe a while before starting the drawing -- don't rush to draw
2) ALPO = 42mm disk

   BAA = 50mm disk

   I use = 72mm disk

   Best = 3mm/arcsecond

3) Draw in Phase and PC – take notes
4) Next draw in darker areas (use a Red/Orange filter) – take notes



Observation Record

Object: Mars Constellation: Sagittarius / Capricornus border
Date: 3-April-2003 Time: 3:30-5:15 EST AM
Observing Site: Deck of House
Sky Trans'y: Fair Naked-eye Limit: 4.5 Seeing: Good
Telescope: 155 mm Refractor
Eyepiece: 3mm Radian Filter: Sirius VFS Red #25, Blue 80A, Green (W57)
Notes: 1st really good view of Mars this year -- still very small and low. Had to wait for good views -- chromatic atmospheric distortion could only be removed with filters. Red #25 best for surface markings but VFS (≈ 225 setting) did best for the polar caps and morning clouds. Disk color more yellow than orange

Size = 7.7"
Mag = 0.5
CM = 46
Phase = 0.88

Drawing with CM at ≈ 46° (4:00 AM) position

3mm Radian (364x)
VFS, Red #25 and no-filter used in drawing

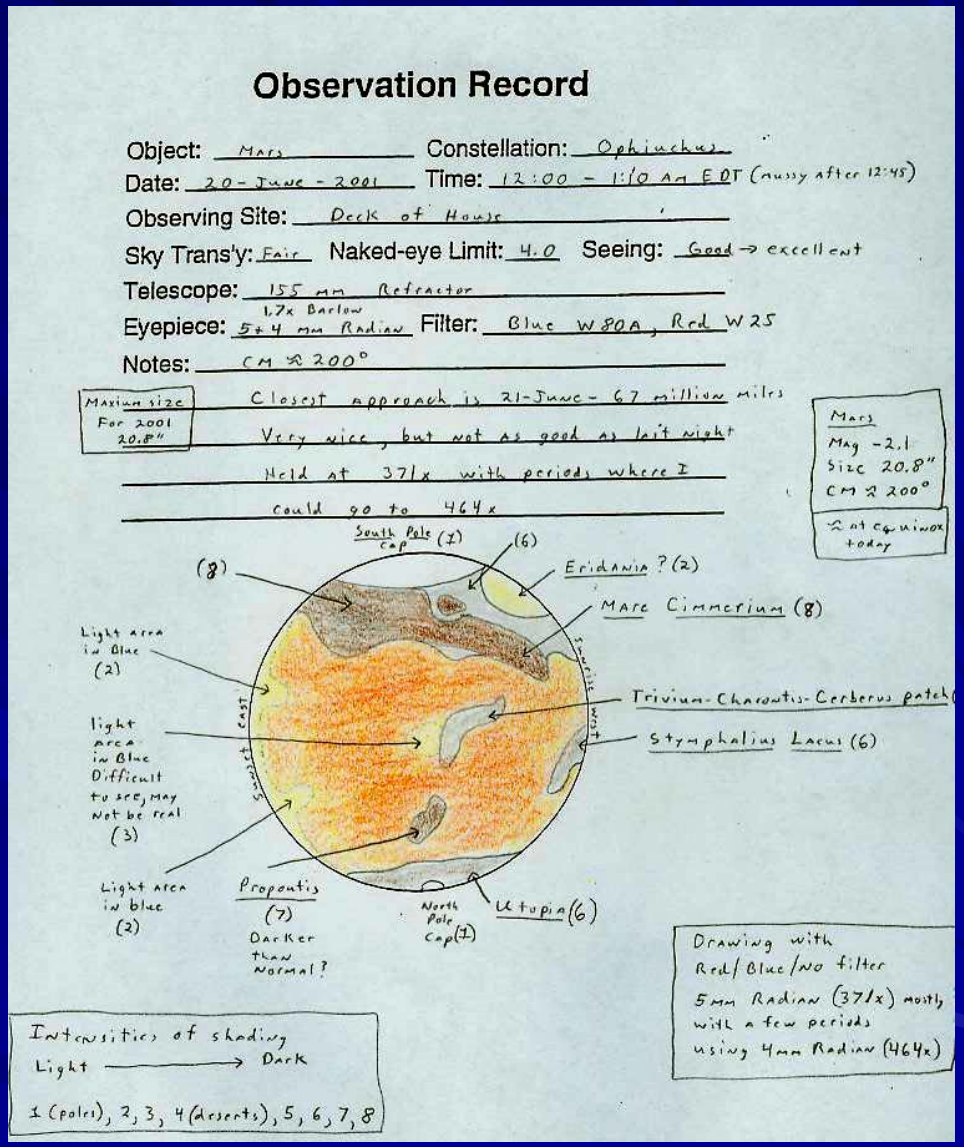
MAKE A DRAWING

1) Observe a while before starting the drawing -- don't rush to draw
2) ALPO = 42mm disk

   BAA = 50mm disk

   I use = 72mm disk

   Best = 3mm/arcsecond
3) Draw in PD and PC – take notes
4) Next draw in darker areas – take notes (use a Red/Orange filter)
5) Examine with (no filter) the red, green, blue filters make changes to drawing – take notes



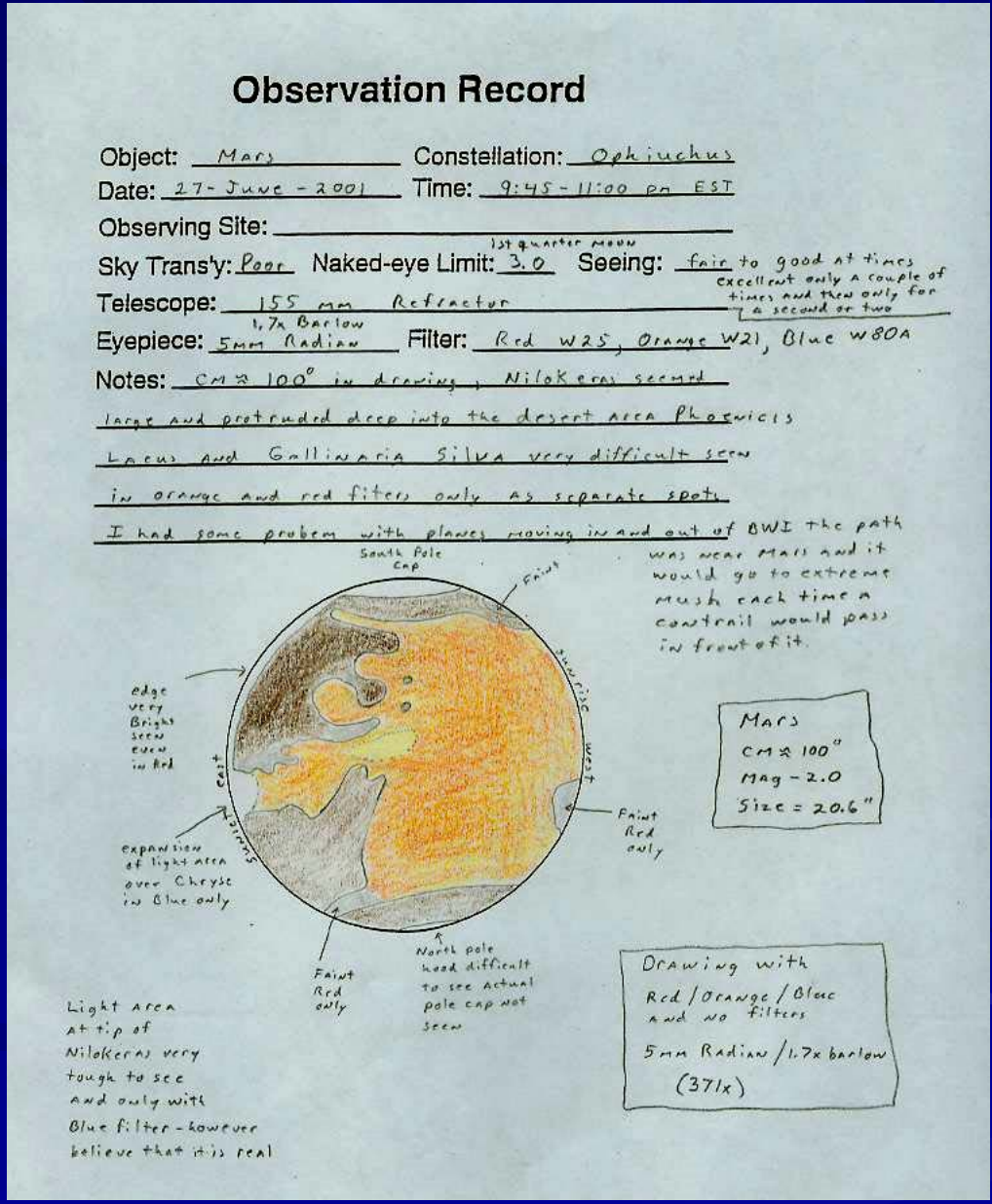
MAKE A DRAWING

1) Observe a while before starting the drawing -- don't rush to draw
2) ALPO = 42mm disk

   BAA = 50mm disk

   I use = 72mm disk

   Best = 3mm/arcsecond
3) Draw in PD and PC – take notes
4) Next draw in darker areas – take notes (use a Red/Orange filter)
5) Examine with (no filter) then red, green, blue filters make changes to drawing – take notes
6) Re-draw your observations using color as soon after observing as possible



Observation Record

Object: Mars Constellation: Ophiuchus
Date: 27-June-2001 Time: 9:45-11:00 pm EST
Observing Site: _____
Sky Trans'y: Poor Naked-eye Limit: 3.0 (1st quarter moon) Seeing: fair to good at times excellent only a couple of times and then only for a second or two
Telescope: 155 mm Refractor
Eyepiece: 5mm Radian (1.7x Barlow) Filter: Red W25, Orange W21, Blue W80A
Notes: CM ≈ 100° in drawing, Nilokeras seemed large and protruded deep into the desert area Phoenicis Lacus and Gallinaria Silva very difficult seen in orange and red filters only as separate spots. I had some probem with planes moving in and out of DWI the path was near Mars and it would go to extreme mush each time a contrail would pass in front of it.

South Pole Cap
Faint
sunrise
west
edge very Bright seen even in Red
east
sunset
expansion of light area over Chryse in Blue only
Faint Red only
Faint Red only
North pole head difficult to see Actual pole cap not seen

Mars
CM ≈ 100°
Mag -2.0
Size = 20.6"

Drawing with
Red / Orange / Blue and no filters
5mm Radian / 1.7x barlow
(371x)

Light area at tip of Nilokeras very tough to see and only with Blue filter - however believe that it is real

Additional Hints

- Focus your telescope on the polar caps – not on the dark markings or the terminator
- Draw only what you see not what you think should be there, remember surface features can be obscured by local or regional dust storms
- Don’t try and make Mars redder than it is, determine its true color without using filters; most likely it will be more yellow than red through the telescope.
- If you are going to show Mars to the general public use a Tele Vue Mars B filter or equivalent.

Home Work – 4 for 4

Four Not-So-Easy

Mars Targets To Focus

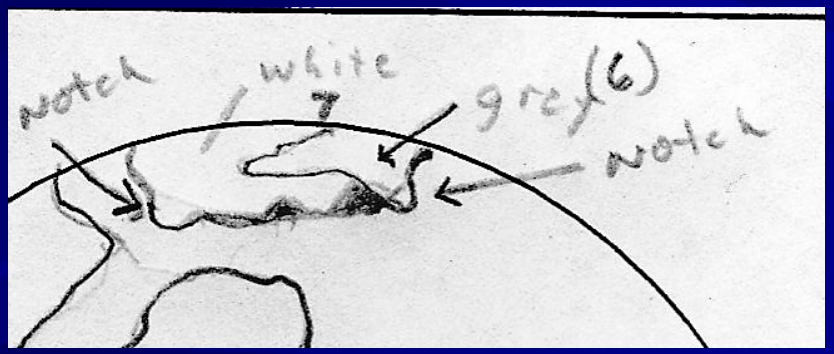
On For Telescopes 4-Inches or Larger in 2018

Target #1

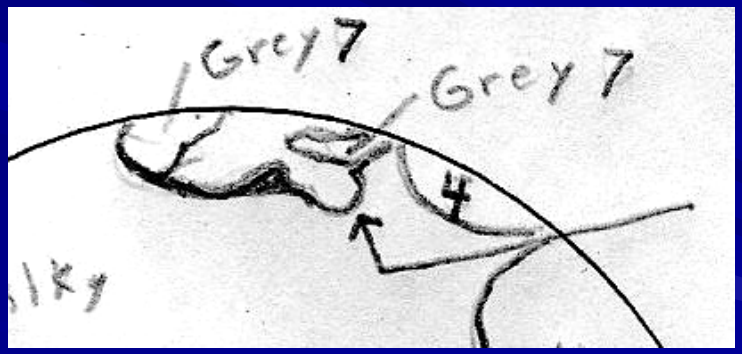
Observe changes in South Polar Cap

MARS DRAWING OF SPC DATA
CM = 3:00AM = 214 degrees
Telescope = 155mm Refractor
Magnification = 619x
Filters: Green #58 & Blue #80A
Size = 24.1", **Phase** = 98%
Magnitude = -2.6

12 August 2003, 1:00 am to 3:00 am (Local Time)

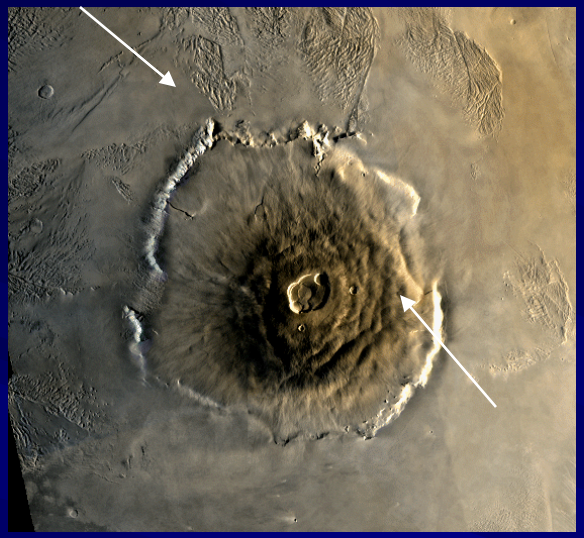


August 21, 2003



August 26, 2003

Prime Target 2 Find the Snows of Mt. Olympus



Four of the Tharsis Plateau volcanoes are truly giants, of which Olympus Mons is the biggest (420 miles across and 15 miles high).

Named the Snows of Mt. Olympus before space visits because of the white clouds that form above the mountain – best seen a few hours before sunset on Mars.

With a 6% slope none of the volcanoes cast a shadow that can be seen in telescopes

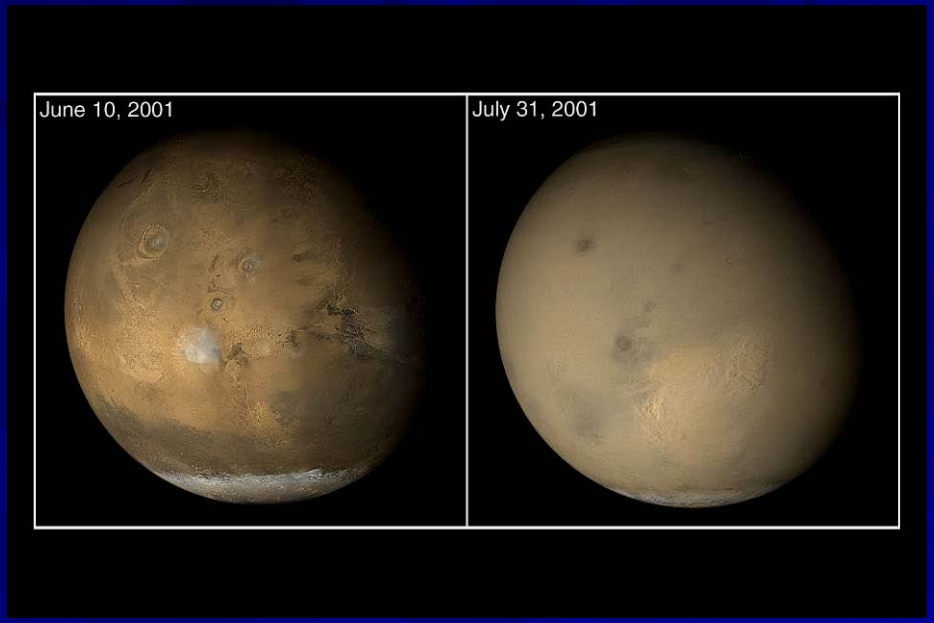
Only chance of seeing the volcanoes proper are during a dust storm when contrast is great (appear as dark spots).

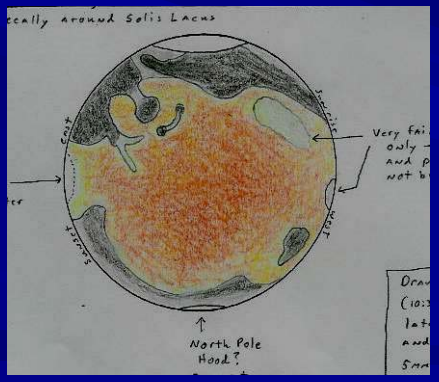
Prime Target 3

Observe Local/Global Dust Storms

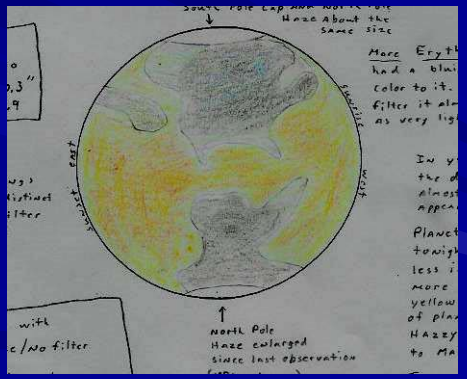
Global level dust storms are most likely at perihelion but local dust storms are unpredictable and should be looked for throughout the Mars opposition.

Dust Storms (Bright in Red; Faint in Yellow)





25 – JUNE – 2001



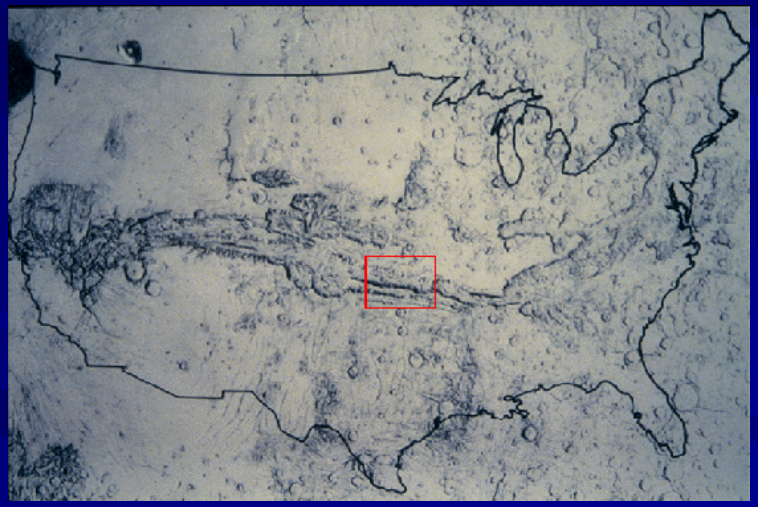
O2 – JULY - 2001

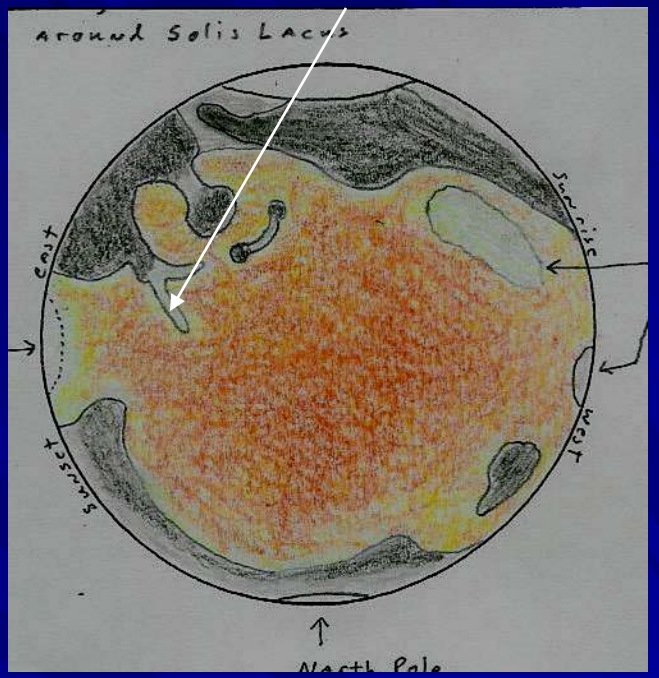
Prime Target 4 – Find Agnathadaemon (Valles Marineris)

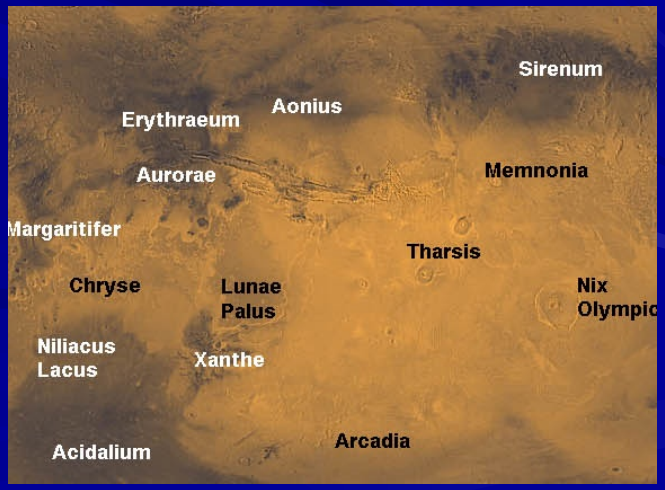
1/6 circumference of Mars

3,000 miles long, 6 miles deep, up to 120 miles wide

Formed when the lifting of the Tharsis Plateau







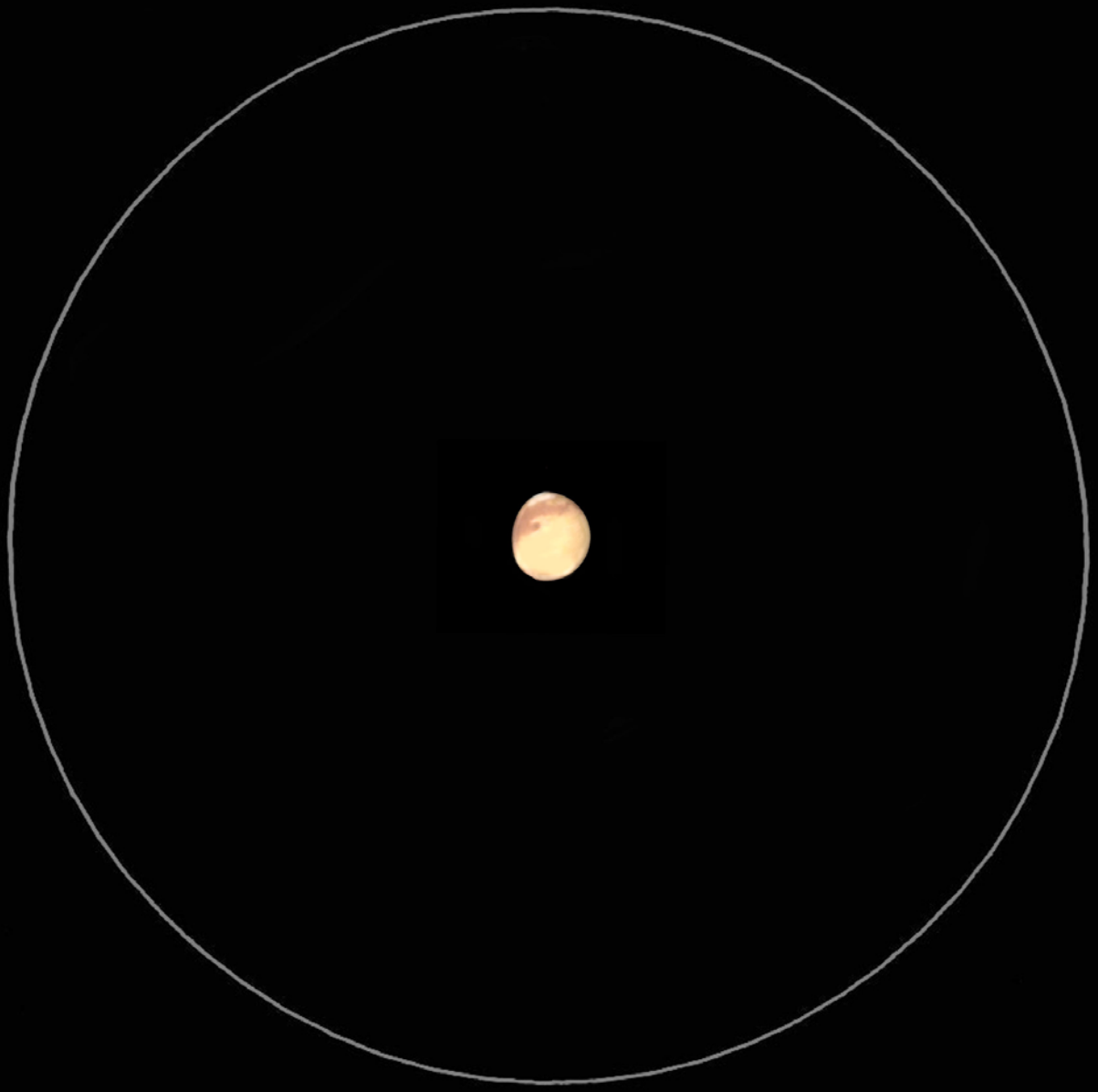
Mars so far in 2018

MARS

Magnitude: 0.01
Distance: 92,026,000 miles
Size: 9.5 arcseconds
Phase: 0.88%
CM: 101 degrees

Telescope: 155mm Refractor
Eyepiece: 3.5mm Delos (312x)
Filters: Mars B, Red #25,
Blue 80A, Green #58
F.O.V.: 0.23 degrees
Orientation: Inverted (South Up)

Date: 14-April-2018
Time: 04:45 to 06:00 EDT
Location: Deck of House
Drawing by: Richard Orr

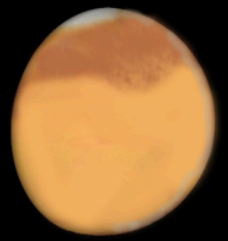


Mars

Magnitude: -0.56
Distance: 74,364, 645 miles
Size: 12 arcseconds
Phase: 0.89
CM: 217.4 degrees

Telescope: 155mm Refractor
Eyepiece: 3mm Radian (364x)
Field of View: 0.17 degrees
Orientation: Inverse View (south up)

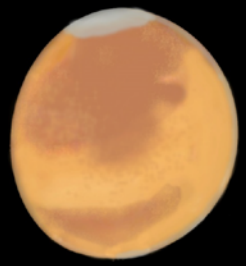
Date: 8-May-2018
Time: 05:00 EDT
Location: Deck of House
Drawing by: Richard Orr



Mars

Mare Erythraeum, Mare Acidalium, Solis Lacus & Chryse

Magnitude: -1.02
Distance: 61,332,500 miles
Phase: 0.90
CM: 42 degrees
Size: 14.2 arcseconds



Telescope: 155mm Refractor
Eyepiece: 3mm Radian (364x)
Orientation: Inverted (South-Up)

Date: 25-May-2018
Time: 04:00 EDT
Location: Deck of House
Drawing by: Richard Orr

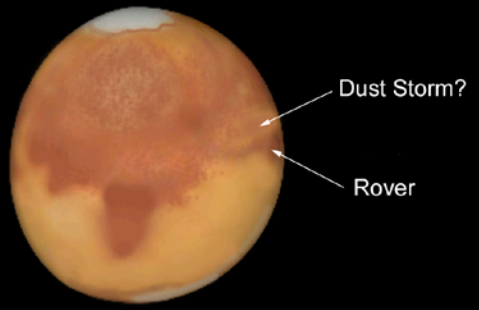
Mars

Constellation: Capricornus
Magnitude: -1.35
Distance: 55,773,480 miles
Size: 16 arcseconds
Phase: 0.92
CM (03:30): 291 degrees

Telescope: 155mm Refractor
Eyepiece: 3mm Radian (364x)
Filters: Mars B, Red #25
Blue #80A, Green #58

Orientation: Inverse (south-up)

Date: 5-June-2018
Time: 02:45 to 04:00 EDT
Location: Deck of House
Drawing by: Richard Orr

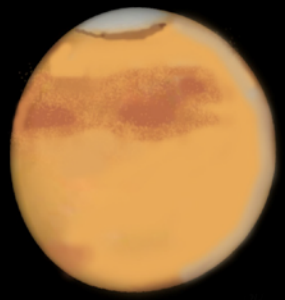


Mars

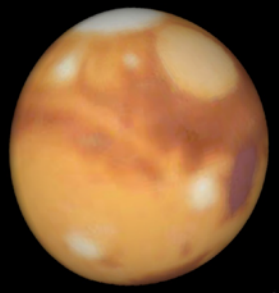
Constellation: Capricornus
Magnitude: -1.6
Size: 17.3 arcseconds
Distance: 50,196,136 miles
Phase: 93%
CM: 218 degrees

Telescope: 155mm Refractor
Eyepiece: 3mm Radian (364x)
Filters Used: Red #25, Green #58
Blue #80A, Mars B
Orientation: Inverse (South-Up)

Date: 12-June-2018
Time: 03:30 to 04:15 EDT
Location: Deck of House
Drawing by: Richard Orr



Actual



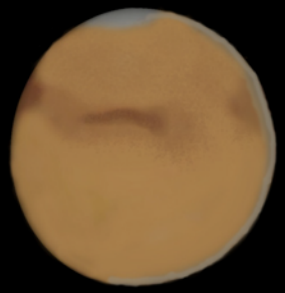
Expected

Mars With Dust

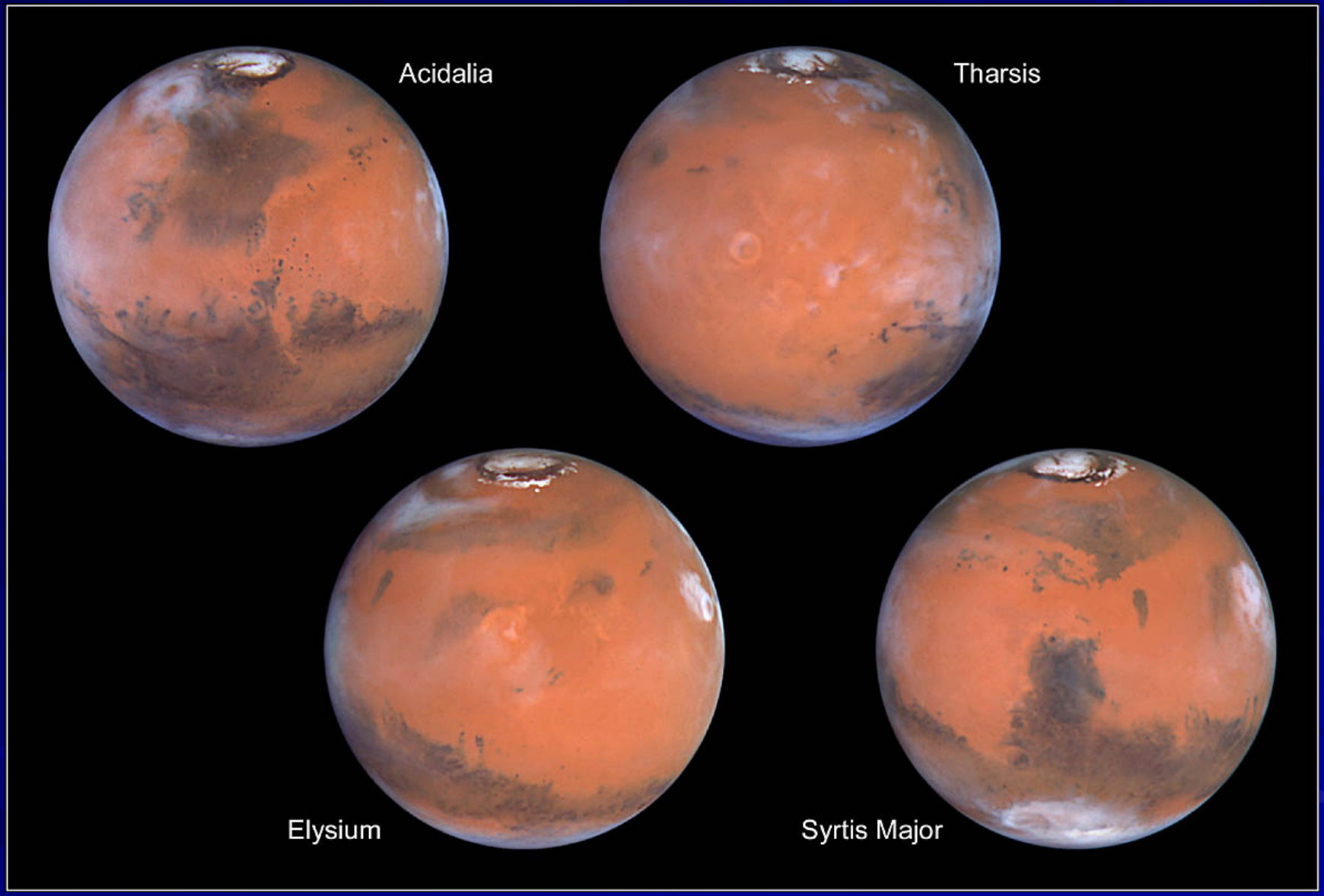
Magnitude: -1.69
Distance: 46,477,900 miles
Size: 18 arcseconds
Phase: 0.94%
CM (04:00) 196 degrees

Telescope: 155mm Refractor
Eyepiece: 3.5mm Delos (312x)
Filters: Mars B, Blue 80A,
Red 25, Green 58
Orientation: Inverted (South-Up)

Date: 16-June-2018
Time: 03:45 to 04:15 EDT
Location: Deck of House
Drawing by: Richard Orr



Mars as Hubble sees it



Once you look at Mars – You will never think of red light in the same way!