OBSERVING MARS 2012

Mars (god of war)

Nirgal (star of death)

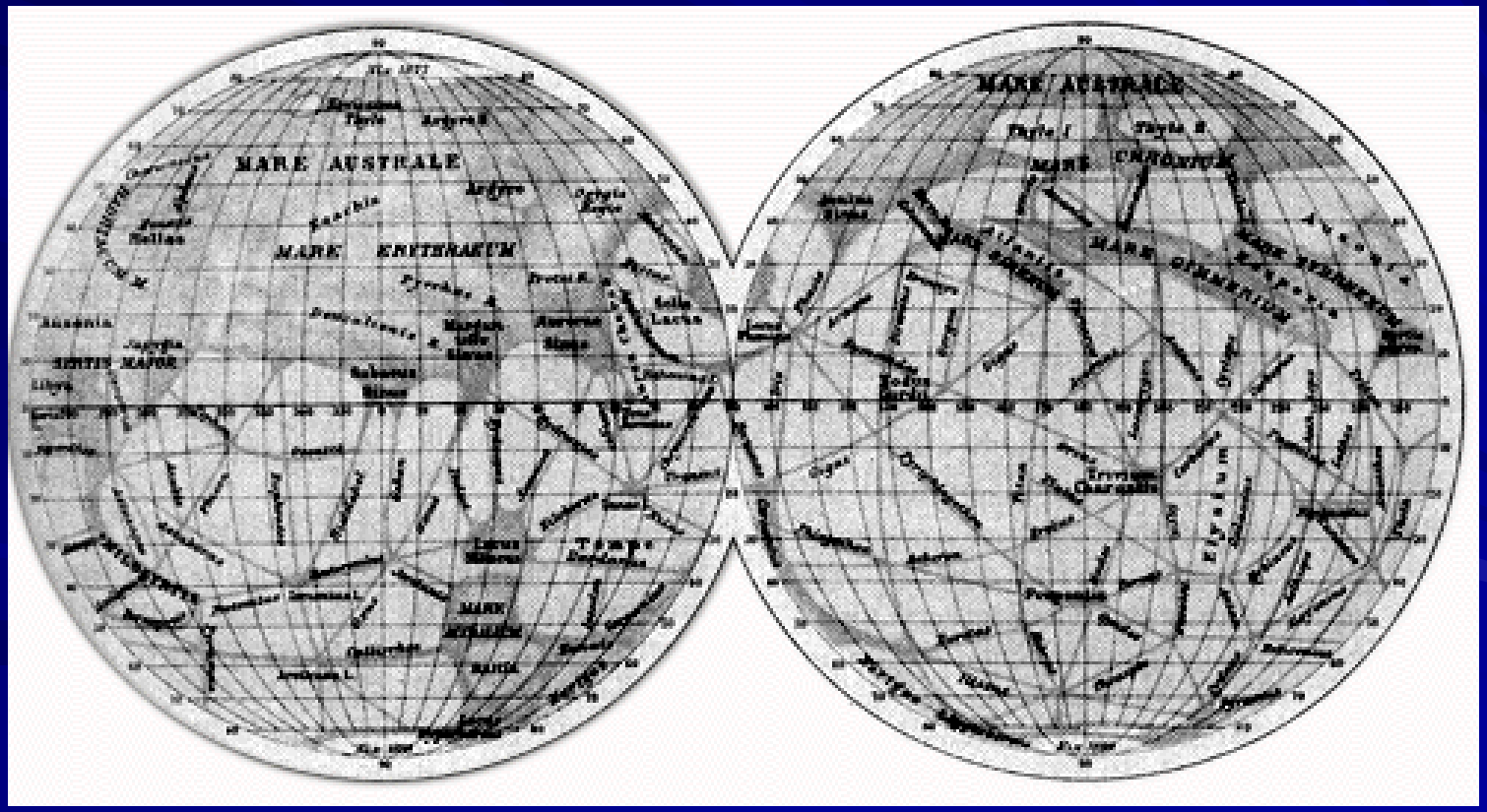
Angakara (burning coal)

Huoxing (fire star)

A DROP OF CURDLED BLOOD IN THE NIGHT SKY

“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

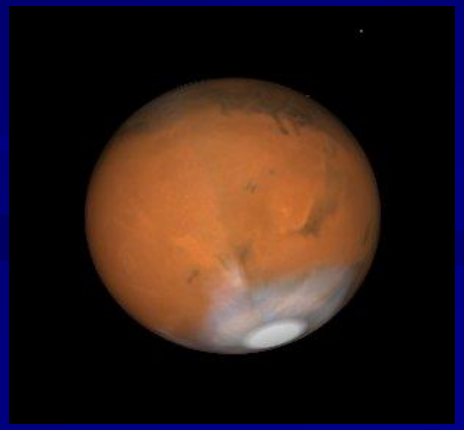


The GOOD, the BAD, the UGLY

- **The Good:**
  - You can see clouds, dark markings, the polar cap or hood plus much more surface detail than on any other planet
  - Mars is placed high in the sky much more so than in most apparitions
  - You can observe Mars when the moon is bright
- **The Bad:**
  - Mars only gets 13.9” in size at maximum in the apparition of 2012
  - In the dead of winter – clear skies but often very unstable
  - Mars is going to be small, very bright, with its surface markings subtle. At first all you are likely to see is a yellow-orange ball with bright edges and an ill -defined dusky brown-smudge or two if lucky. Not like enhanced highly processed photos or even detailed drawings.
- **The Ugly:**
  - Viewing Mars will be like trying to see details within a medium-sized lunar crater at full moon -- while the crater is covered in a thick Los Angeles like-smog

Mars 2012

- Mars will reach opposition on March 3rd and will be closest to Earth on March 5th. At that time it will reach 13.9 arcseconds in diameter at a distance 62,622,315 miles.
- It is not until July 2018 that we get a close approach where it will peak at 24.3”.
- From now through March the NP Cap will be shrinking (Martian northern spring season) while the SP Hood will be expanding.

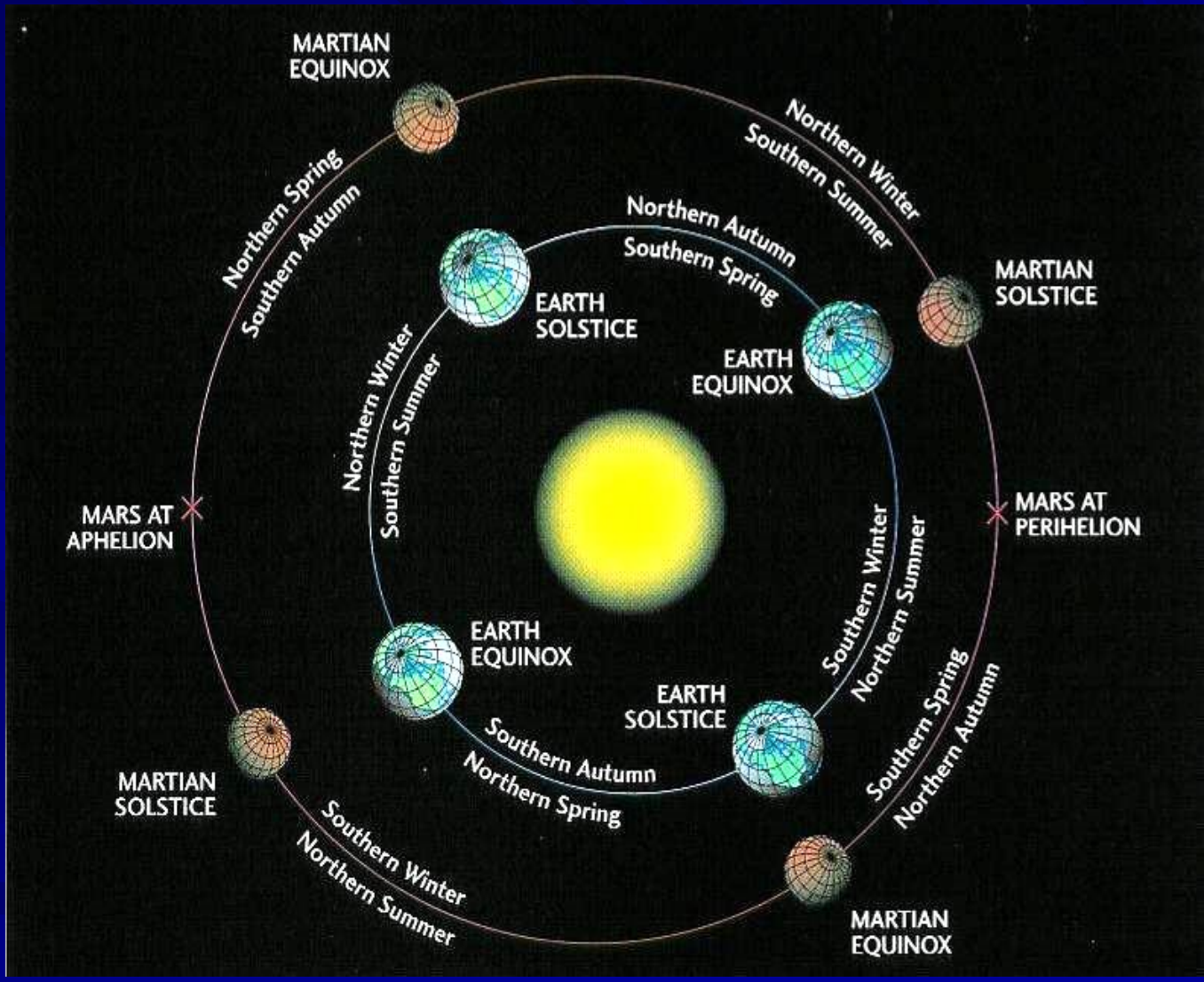


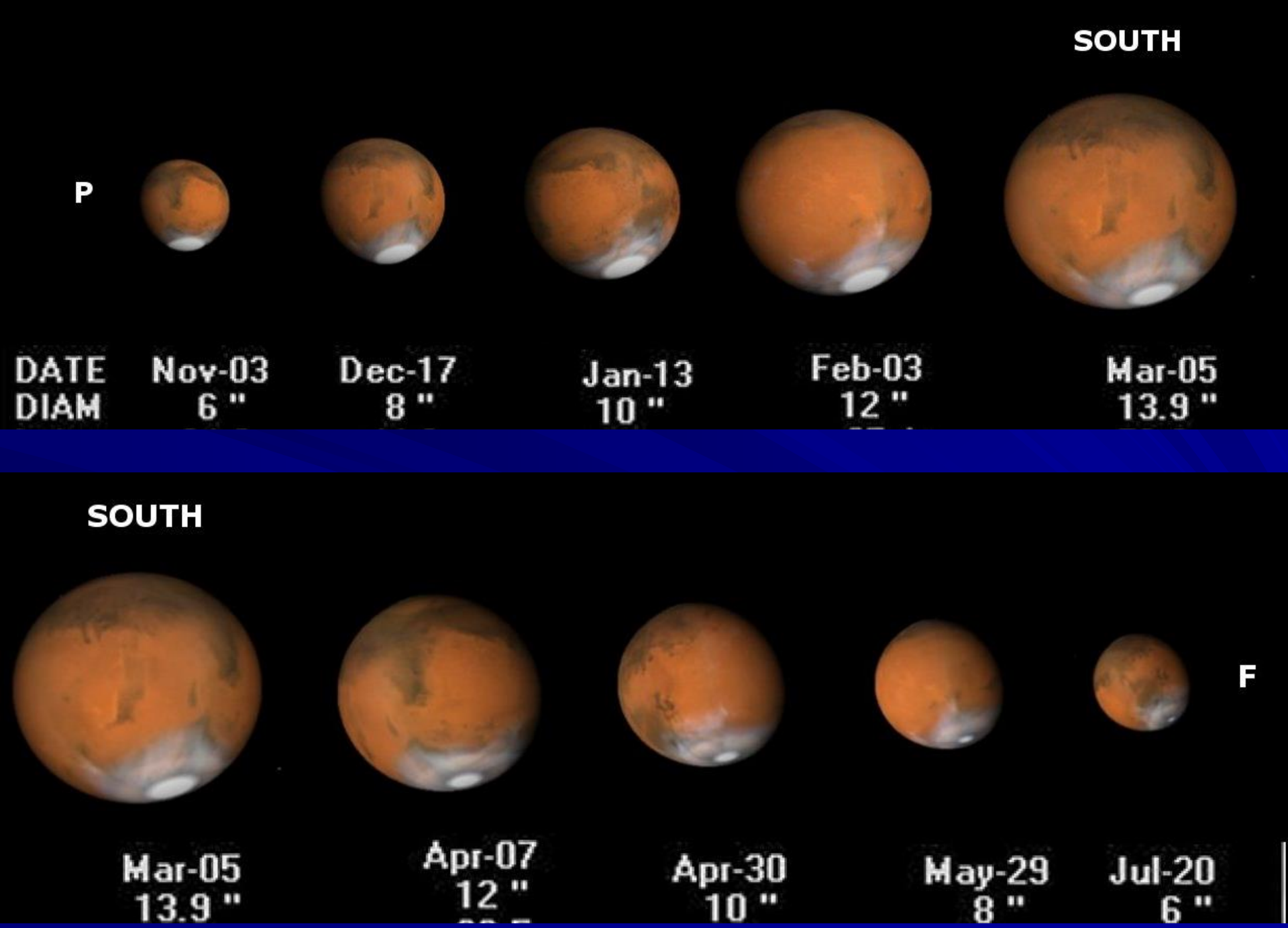
A simulated view of the appearance of Mars during opposition at 2004 UT on March 03, 2012 (78.1° Ls, CM 189.8°)

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)



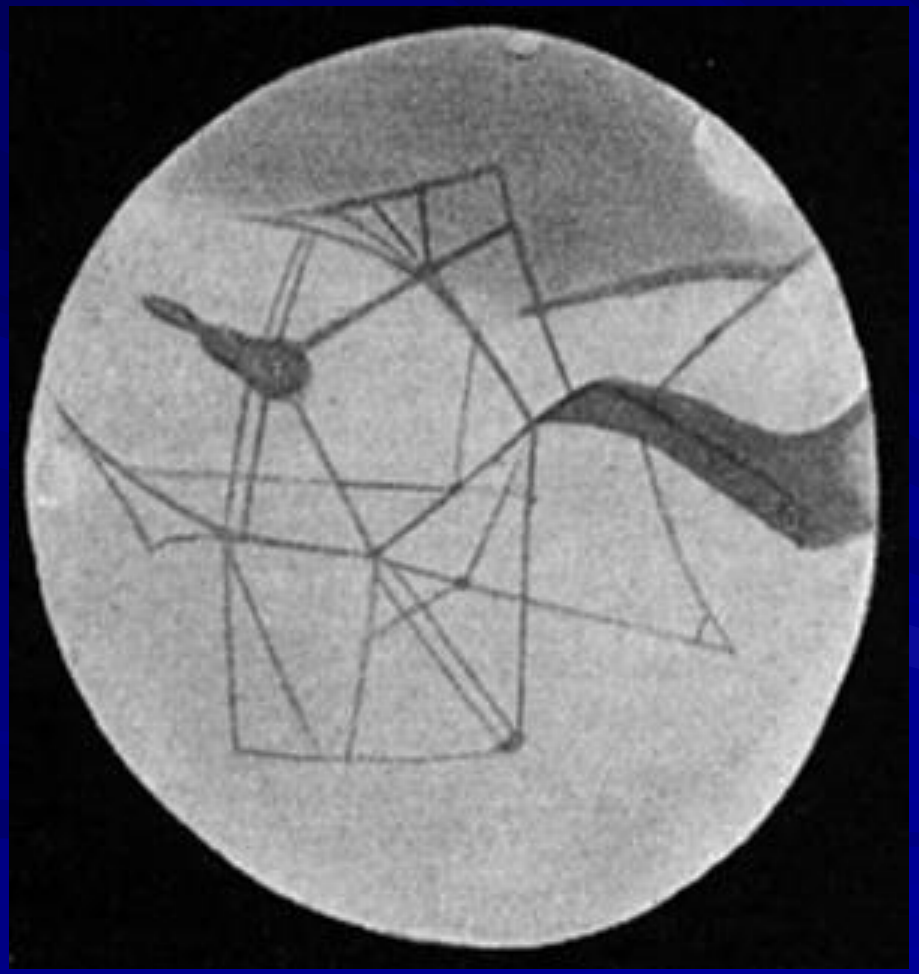

SOUTH
P
DATE Nov-03 Dec-17 Jan-13 Feb-03 Mar-05
DIAM 6 " 8 " 10 " 12 " 13.9 "
SOUTH
F
Mar-05 Apr-07 Apr-30 May-29 Jul-20
13.9 " 12 " 10 " 8 " 6 "

"Oft expectation fails, and most oft / there / Where most it promises."

Shakespeare -- All's Well That Ends Well, 2.1.145

"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)

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



To See Mars at its Best

(small bright with subtle markings)

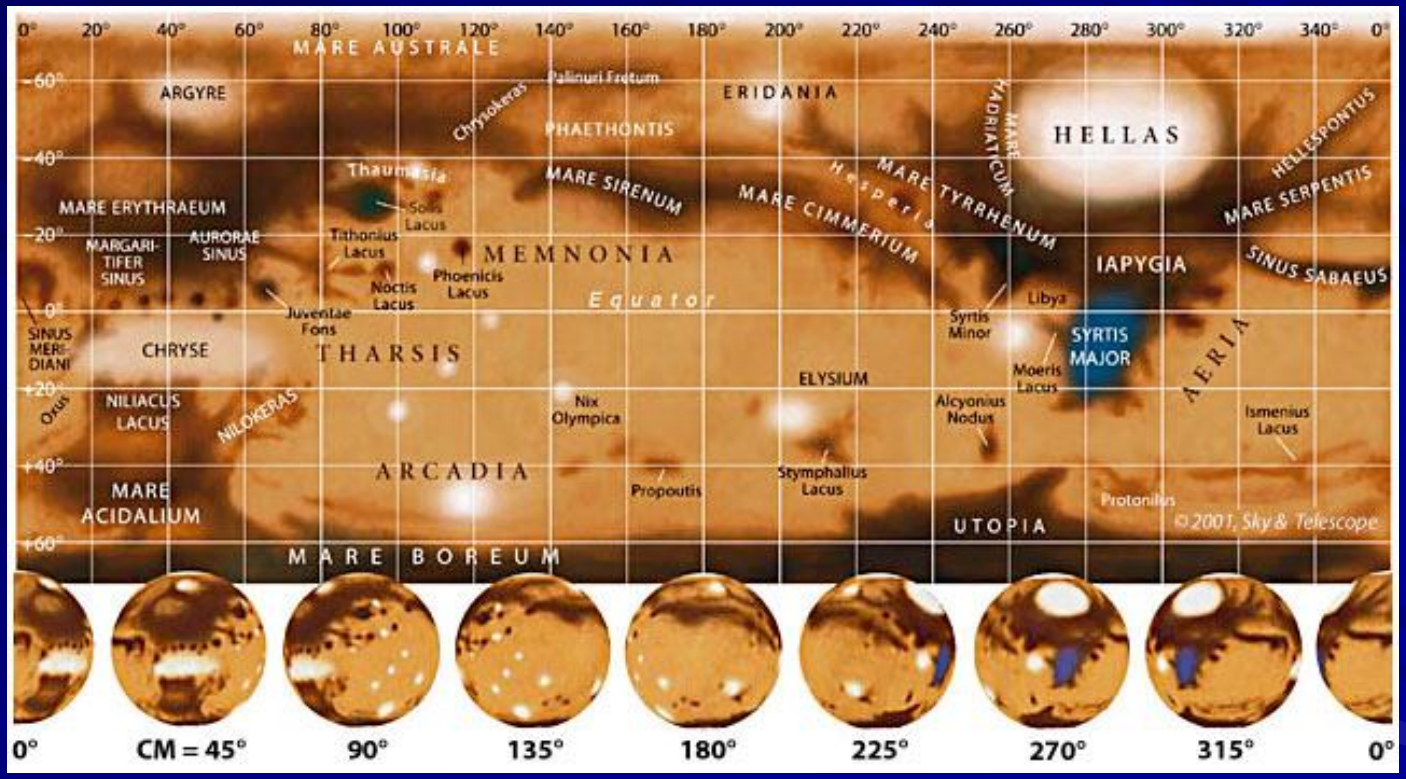
- **Telescope (quality, size) Your goal is to maximize contrast and resolution**
  - **Resolution (Dawes limit) vs. contrast**
  - **Dobsonians – collimation is the key**
  - **MAK & SCT – watch for tube currents**
  - **Trust your telescope – expect to be disappointed in your initial image of Mars**
- **Location of Telescope**
- **High Power (60-75x/inch on 8” or less; on 12” or more 500x) – eyepiece/barlow quality – refractors dump the diagonal if you can**
- **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 AND VISUAL SIDE

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

Light Red Areas = lots of fine-grained dust

White Areas = clouds, frost, ice, fog



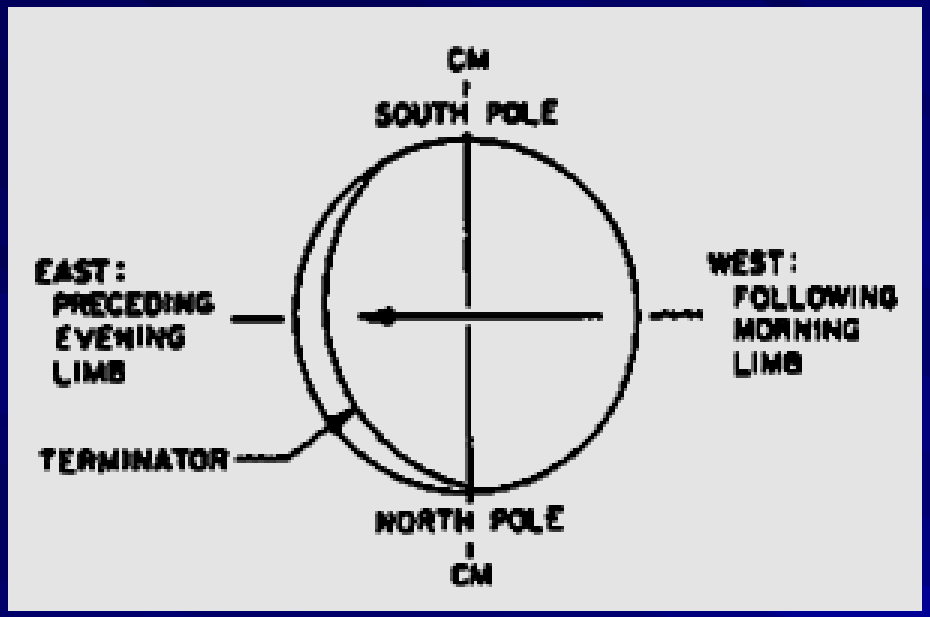
Getting familiar with Mars

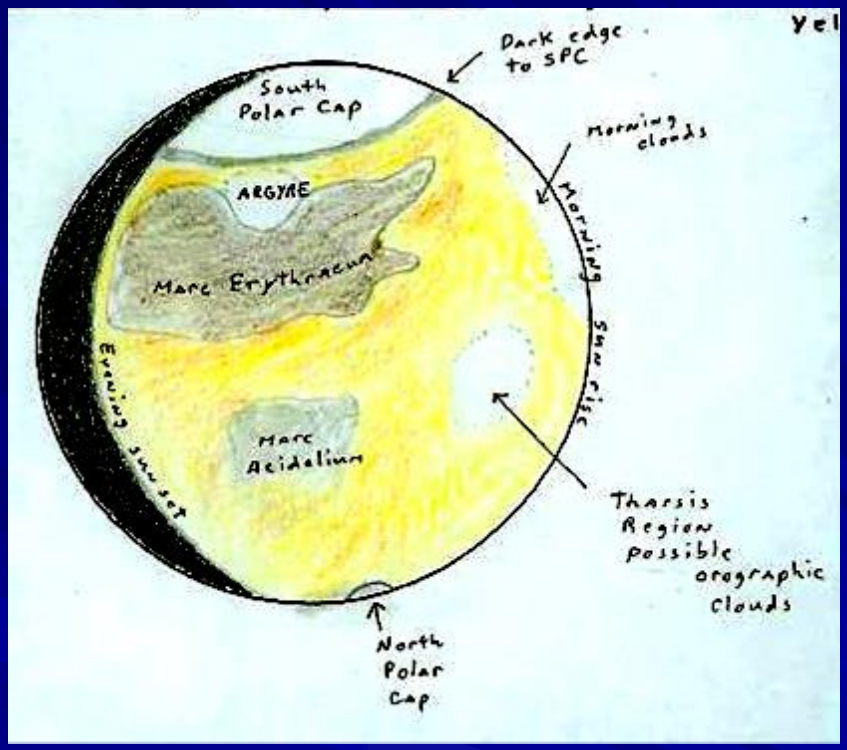
1) Syrtis Major[1]
2) Hellas[2]
3) Sinus Sabaeus
4) Sinus Meridiani[3]
5) Utopia
6) Sinus Sirenum[5]
7) Sinus Cimmerium[5]
8) Sinus Tryrrhenum[5]
9) Proponitis Complex
10) Solis Lacus[4]
11) Mare Erythraeum
12) Mare Acidalium

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



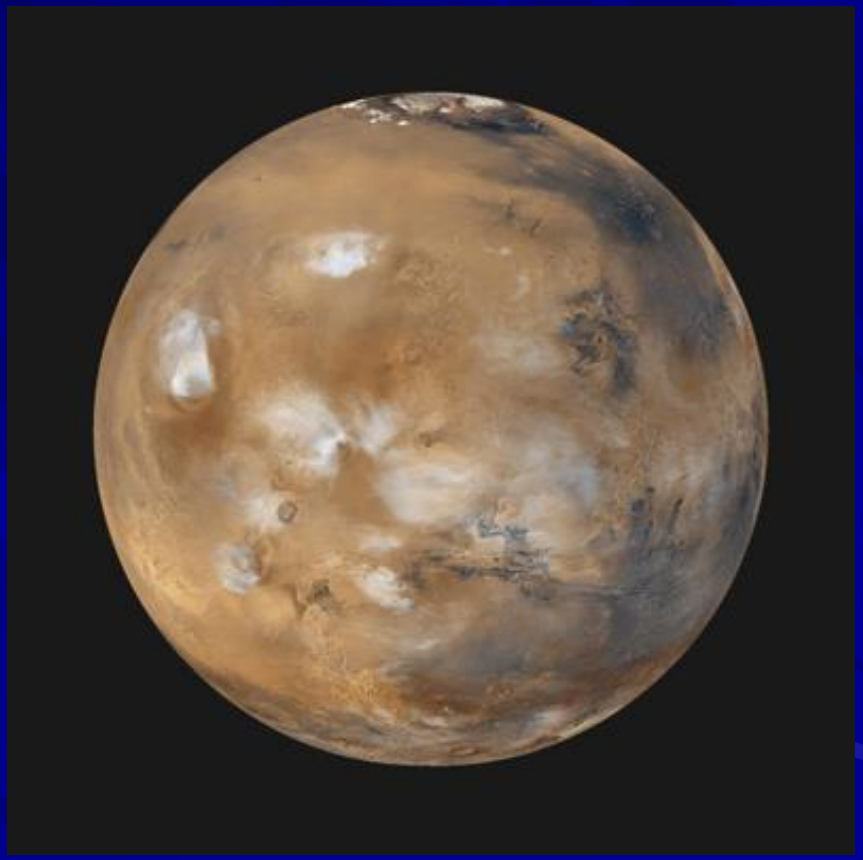


Day on Mars = 24 hours, 37 minutes – therefore if you observe the same time night after night the surface features appears to back up (anti-rotational) about 9 degrees every night causing an illusory retrograde rotation of about 36 days.

Polar caps will be offset from the apparent up and down in your eye-piece.

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 Cloud 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)



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).


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

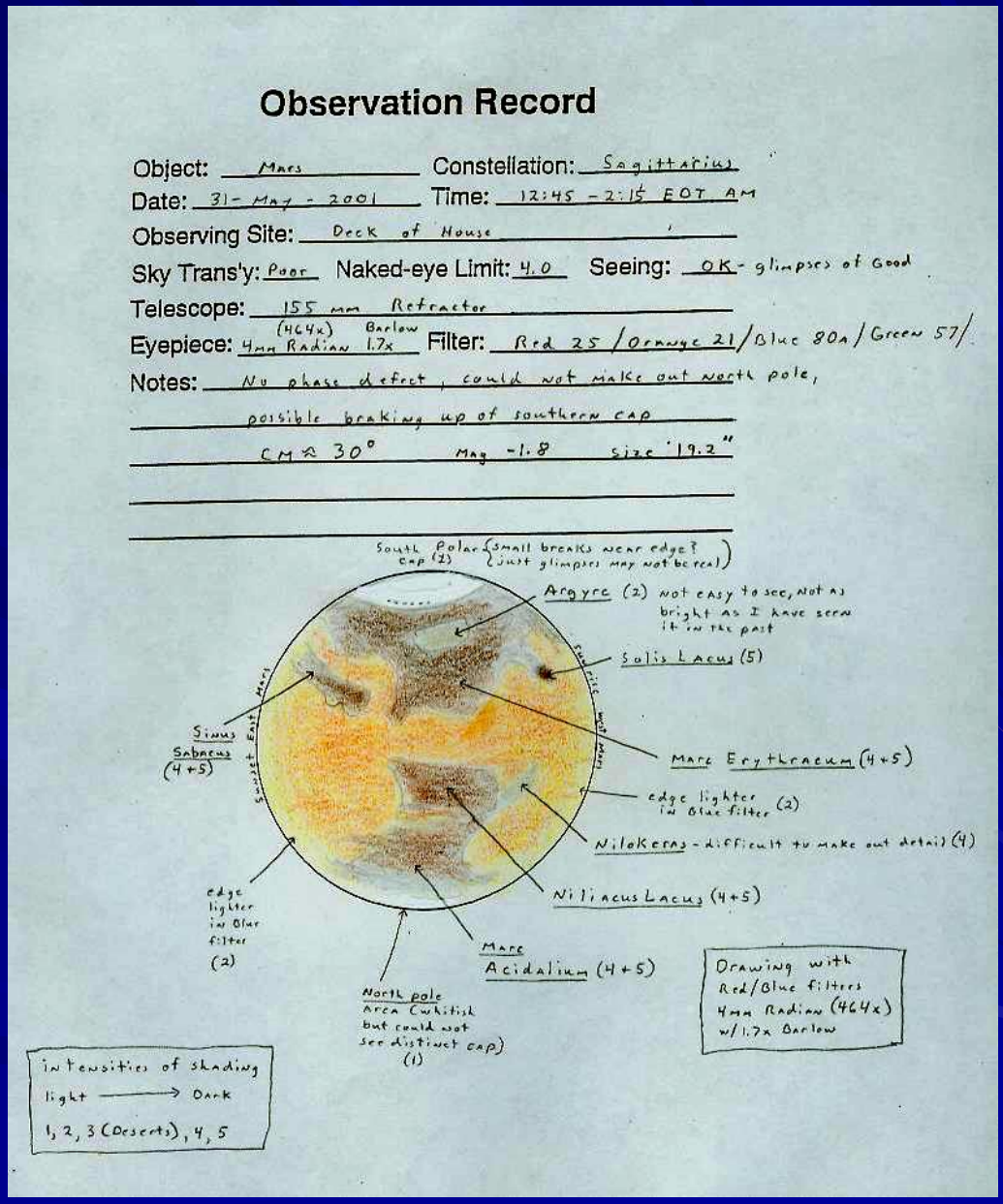
MAKE A DRAWING

1) Drawing helps you see better – observe a while before starting the drawing
2) ALPO = 42mm disk

   BAA = 50mm disk

   I use = 72mm disk

   Best = 3mm/arcsecond



Observation Record

Object: Mars Constellation: Sagittarius
Date: 31 - May - 2001 Time: 12:45 - 2:15 EDT AM
Observing Site: Deck of House
Sky Trans'y: Poor Naked-eye Limit: 4.0 Seeing: OK - glimpses of Good
Telescope: 155 mm Refractor
Eyepiece: 4mm Radian (464x) Barlow 1.7x Filter: Red 25 / Orange 21 / Blue 80A / Green 57
Notes: No phase defect, could not make out north pole, possible breaking up of southern cap
CM ≈ 30° Mag -1.8 size 19.2"

South Polar cap (2) {small breaks near edge? just glimpses may not be real}
Argyre (2) not easy to see, not as bright as I have seen it in the past
Solis Lacus (5)
Sinus Sabaeus (4+5)
Mare Erythraeum (4+5)
edge lighter in Blue filter (2)
Nilokeras - difficult to make out detail (4)
Niliacus Lacus (4+5)
edge lighter in Blue filter (2)
Mare Acidalium (4+5)
North pole Area Cwhitish but could not see distinct cap) (1)

Drawing with Red/Blue filters 4mm Radian (464x) w/1.7x Barlow

intensities of shading
light ⟶ Dark
1, 2, 3 (Deserts), 4, 5

MAKE A DRAWING

1) Drawing helps you see better – observe a while before starting the drawing
2) ALPO = 42mm disk

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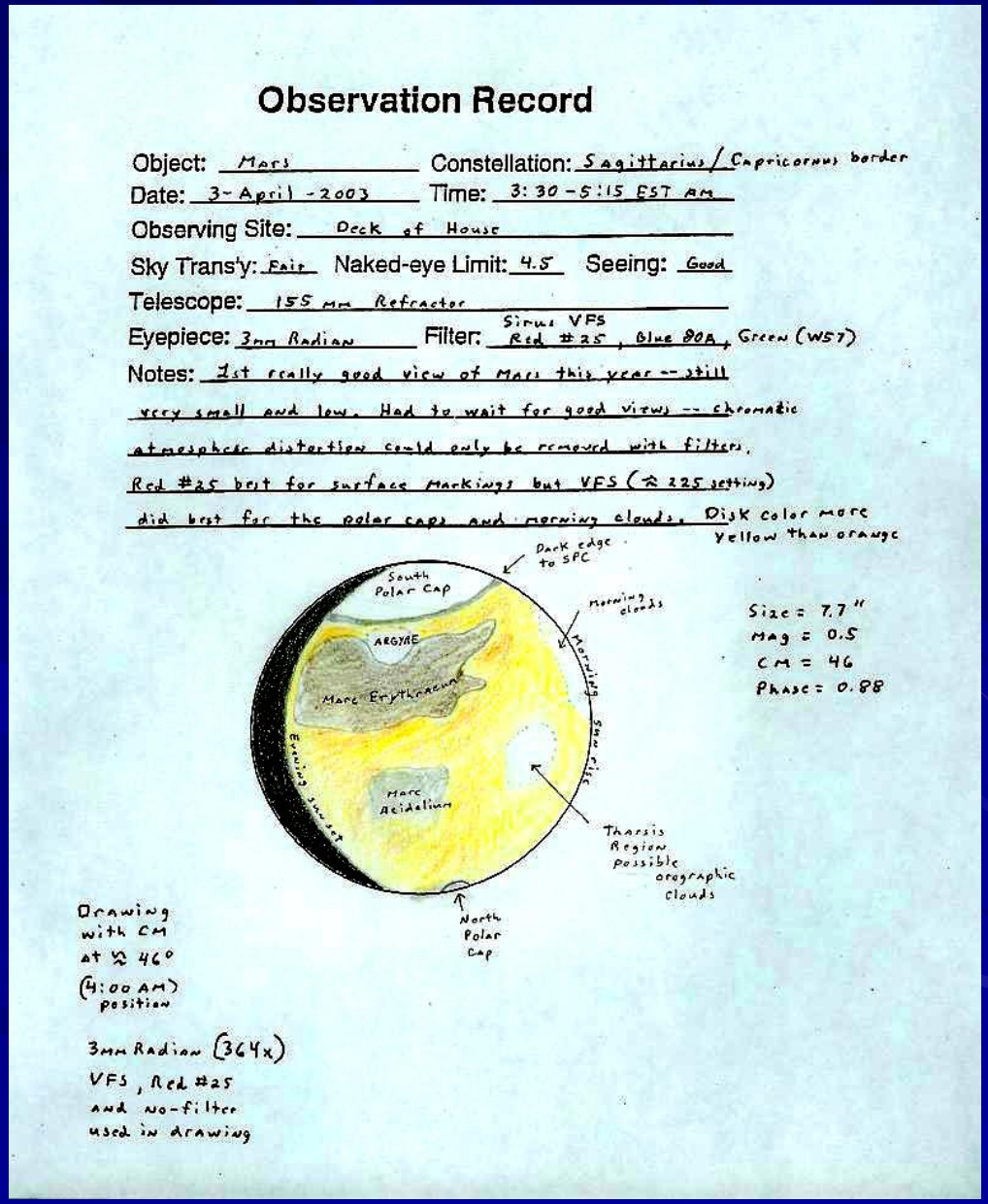
   I use = 72mm disk

   Best = 3mm/arcsecond

3) Draw in Phase and PC – take notes

4) Next draw in darker areas (I use a Televue Mars B 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

Dark edge to SPC
South Polar Cap
Morning clouds
ARGYRE
Morning clouds
Mare Erythraeum
Mare Cimmerium
Mare Acidalium
Thaumasia
Tharsis Region possible orographic clouds
North Polar Cap

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

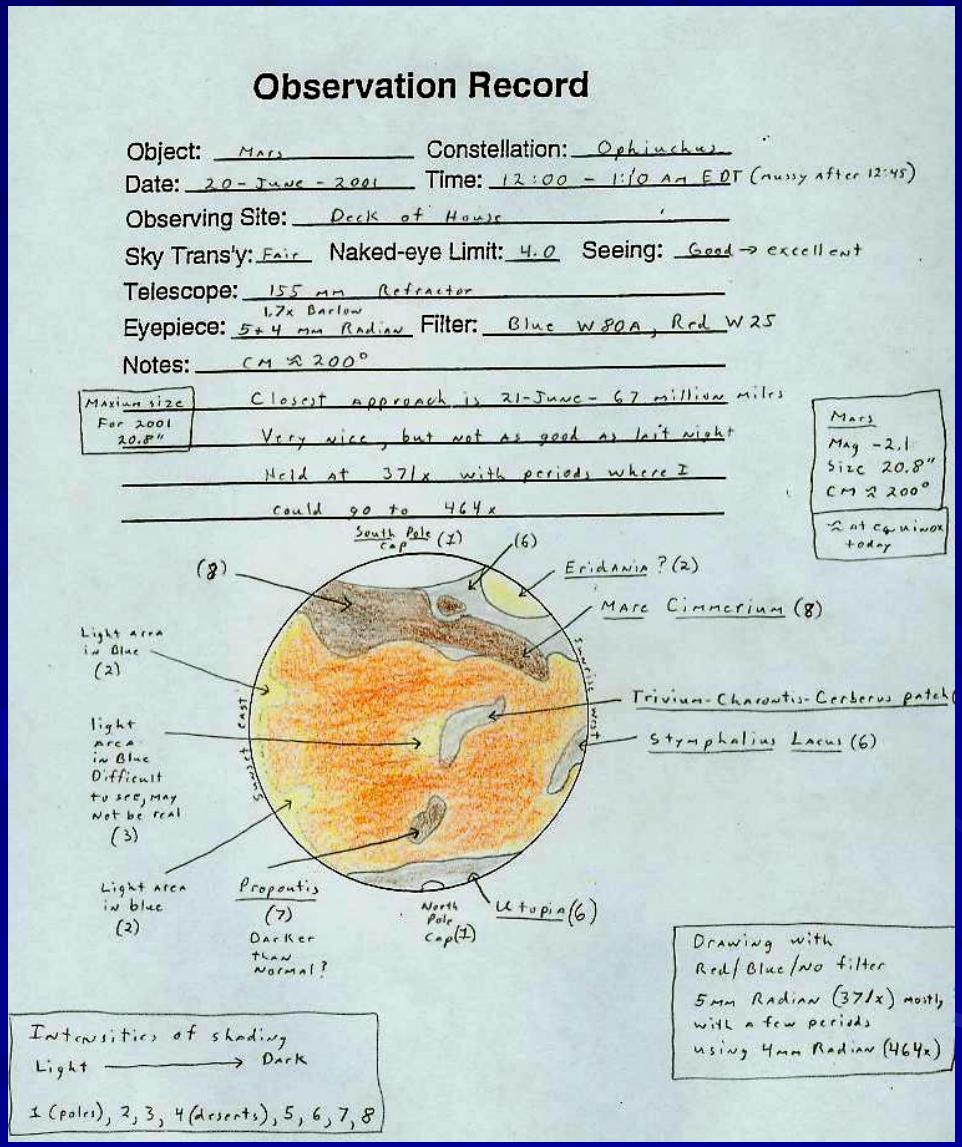
MAKE A DRAWING

1) Drawing helps you see better – observe a while before starting the drawing
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 (I use a Televue Mars filter B)
5) Examine with (no filter) the red, green, blue filters make changes to drawing – take notes



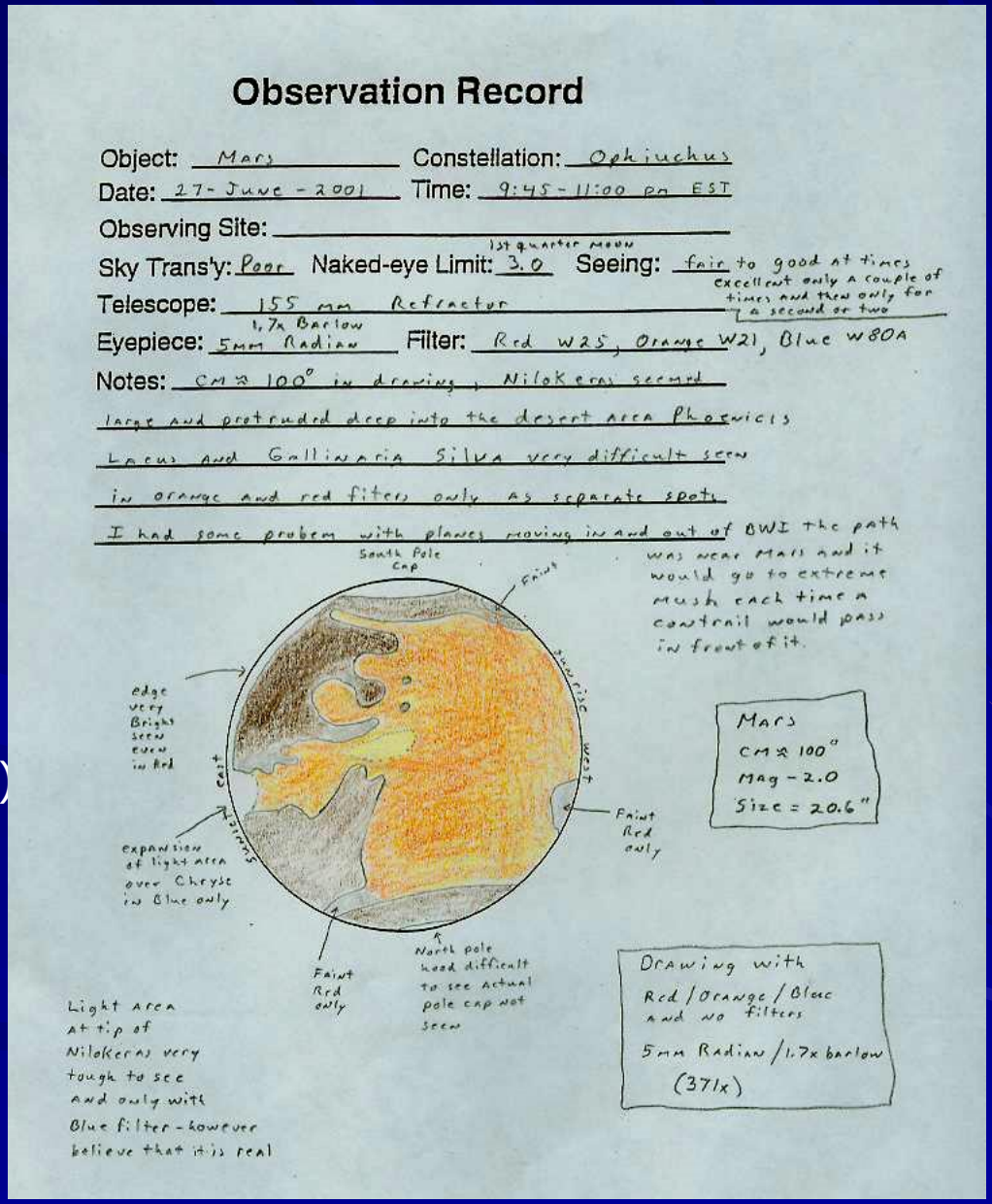
MAKE A DRAWING

1) Drawing helps you see better – observe a while before starting the drawing
2) ALPO = 42mm disk

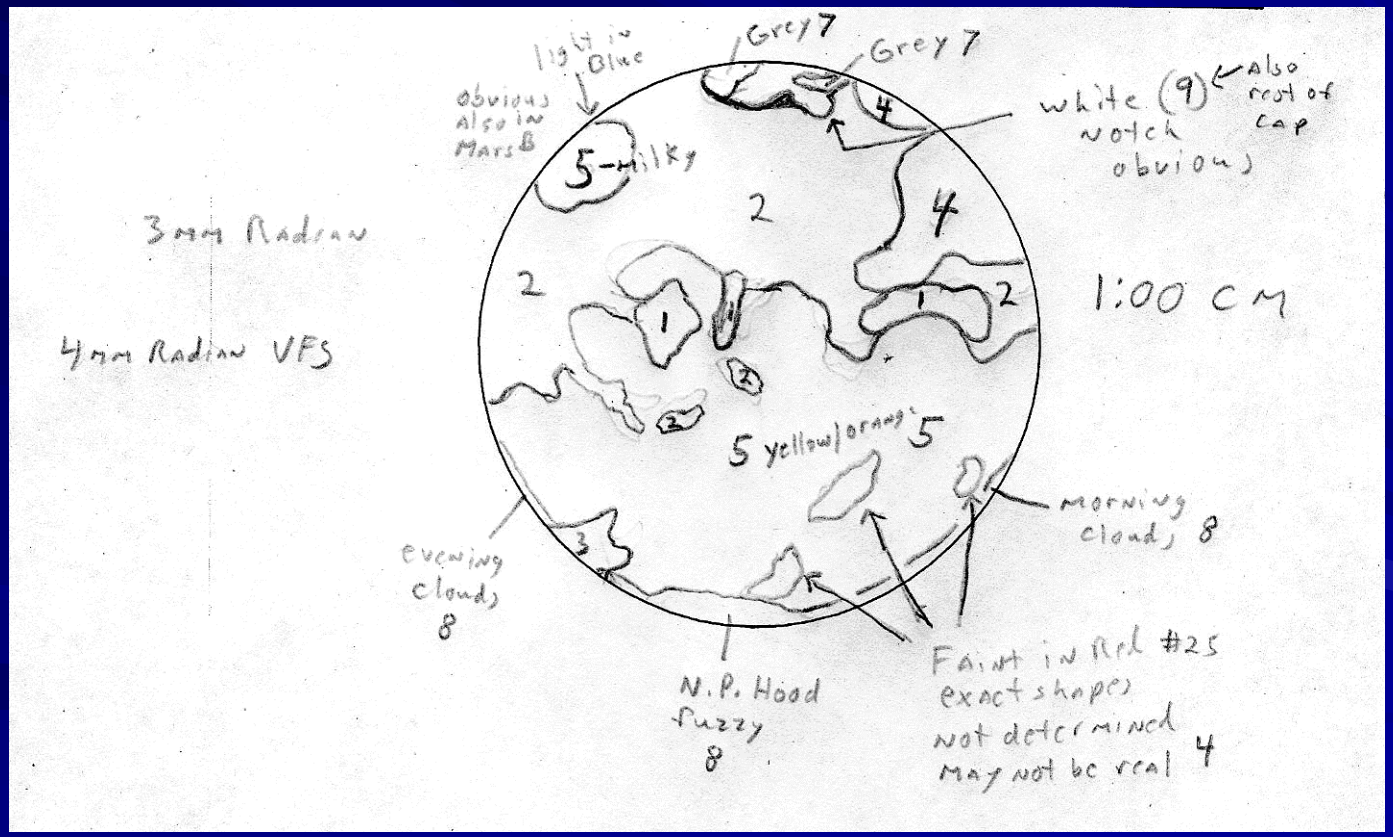
   BAA = 50mm disk

   I use = 72mm disk

   Best = 3mm/arcsecond
3) Draw in PD and PC – take notes
4) Next draw in darker areas – take notes (I use a Televue Mars filter B)
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

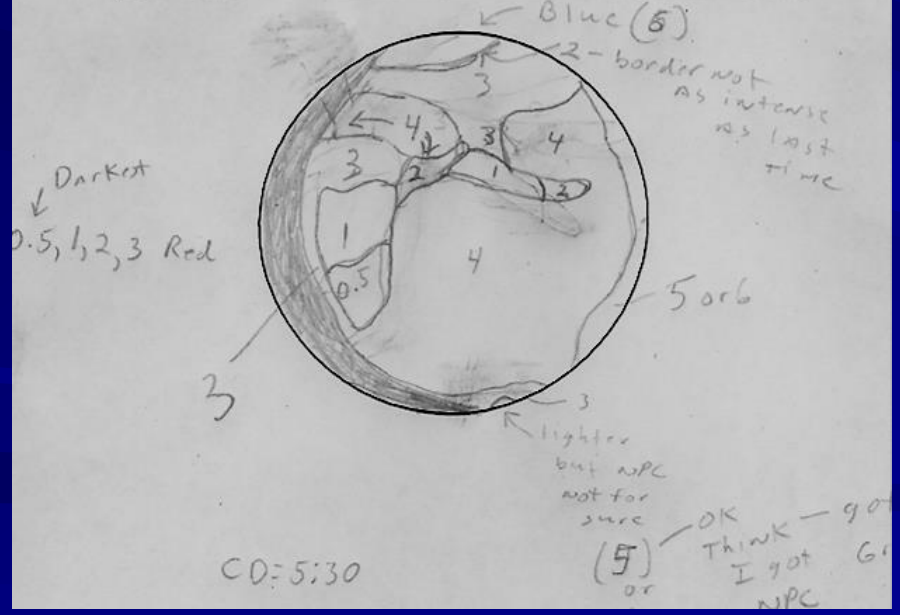


August 21, 2003 Size = 24.9”, 155mm Refractor 619x



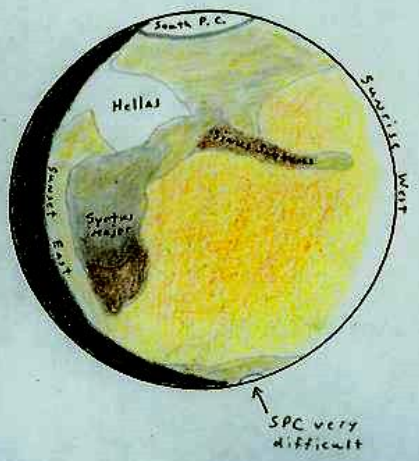
Observation Record

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



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/moon) 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



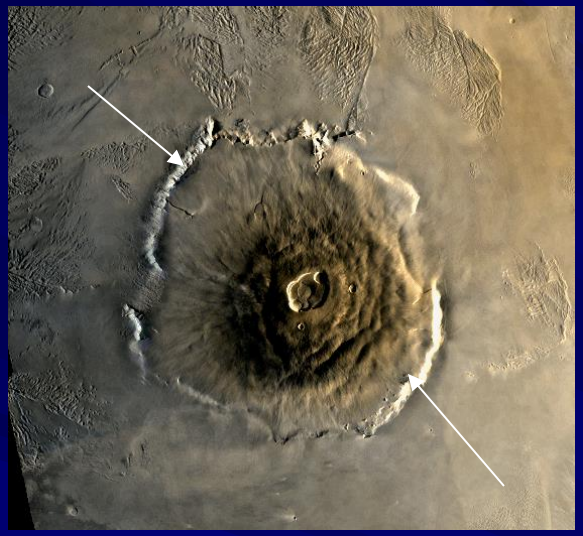
Drawing position
5:30 AM EDT
CM 317.
Phase 87%
Mag 0.3
Size 8.3"

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

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 red, determine its true color without using filters; most likely it will be more yellow than red through the telescope.

Prime Target 1 Nix Olympica – Olympus Mons



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

Two reasons for size of the volcanoes 1) ridged crustal plate over a hot spot and 2) weaker gravity effects the lava buoyancy

Surrounded by a ½ mile rim of unknown origin (current thinking is that this rim is a sea cliff).

Named the Snows of 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 2 -- Valles Marineris

1/6 circumference of Mars

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

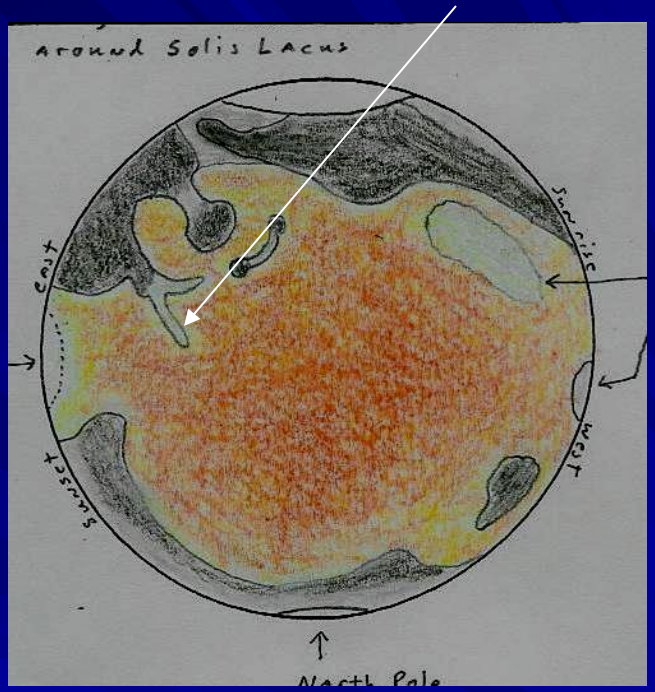
Formed when the lifting of the Tharsis Plateau fractured the planet's crust

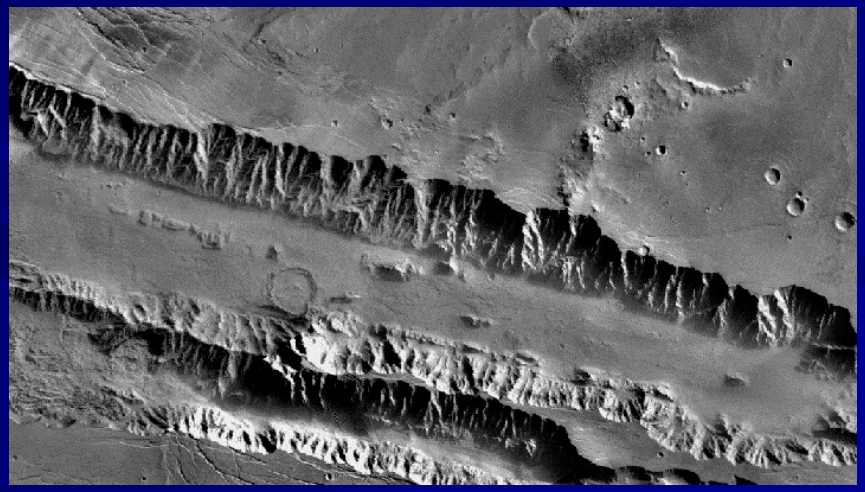
Sculpted by wind, water and land slides

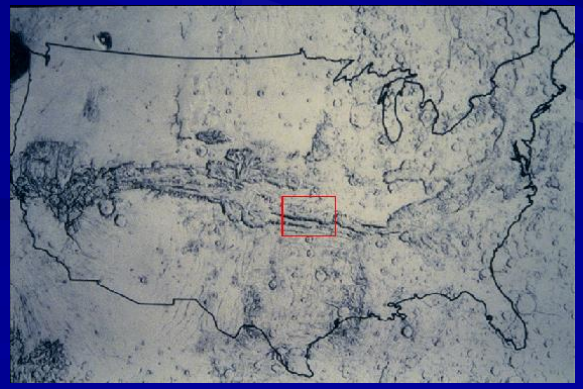
Canyon walls are layered throughout (origin?)

Faults along canyon's sides are locations of the youngest volcanism on Mars (less than 1ml yr)

Agathadaemon

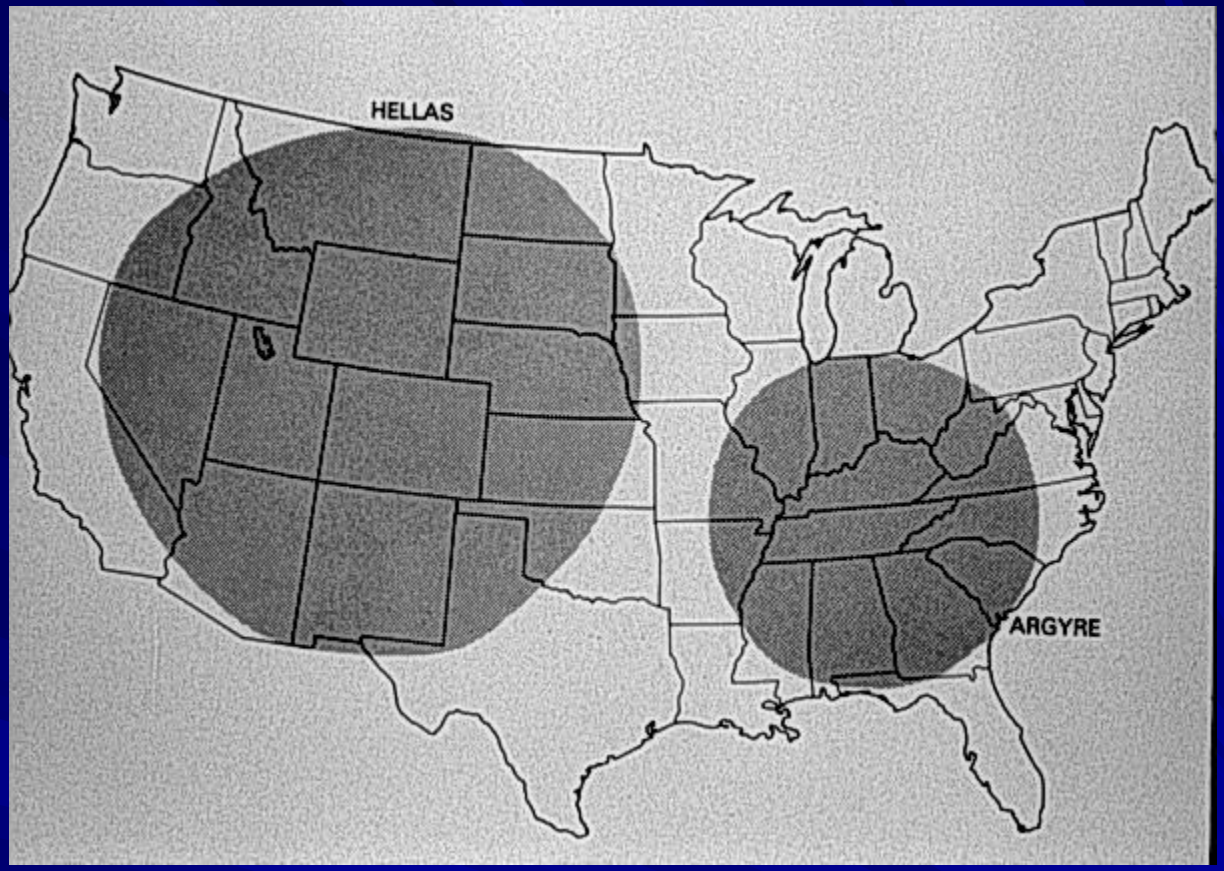






Prime Target 3

Impact Basins



Hellas (Greece) – 1,800 miles across and 5 miles deep

Argyre – 480 miles across

Both visible when frost covered

Observation hint – if the NPC is pointed toward you and you can also see Syrtis Major and the SPC looks big and bright you are likely mistaking Hellas for the South Pole Cap

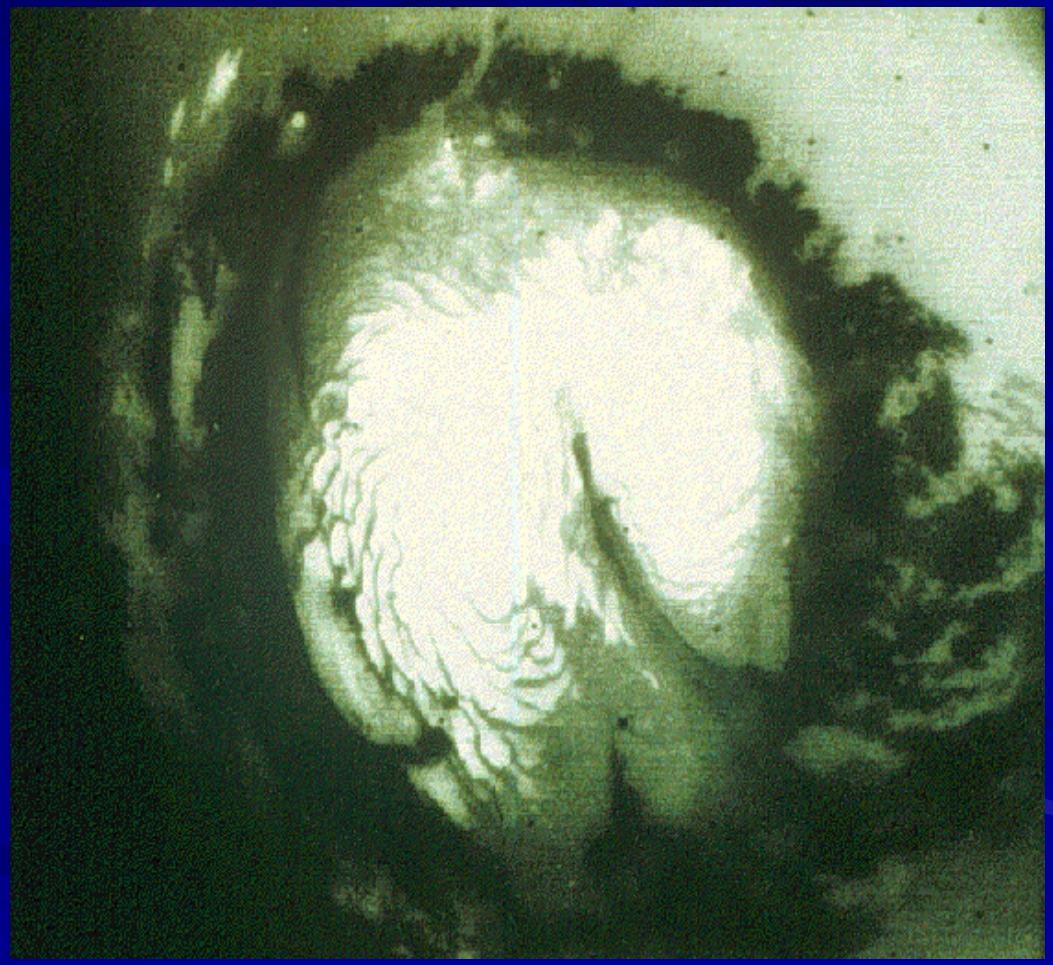
Prime Target 4 -- LOWELL BAND

As the NPC retreats it becomes surrounded by a dark blue collar expanding 19 miles a day towards the south

Once regarded as a melt water and later as expanding vegetation

In reality it is a large clay sand sea that covers an area the size of the Sahara with dunes about 3/10 of a mile apart

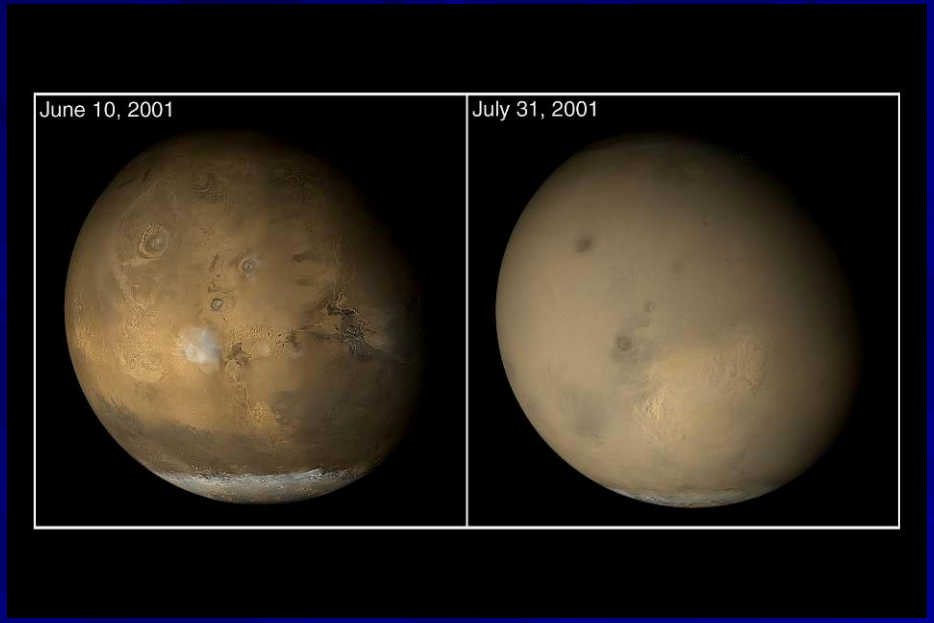
It appears to darken because of the greater distribution of light colored dust at this time of the year in the southern desert regions

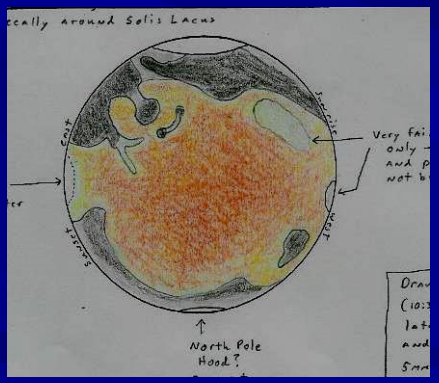


Prime Target 5

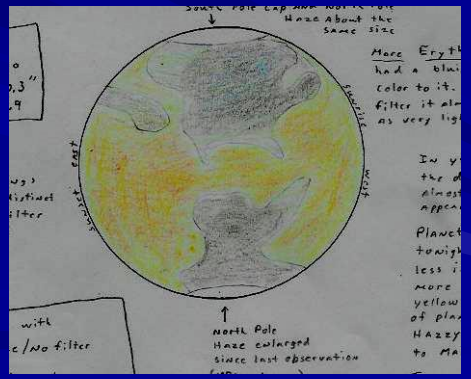
Local Dust Storms

Global level dust storms are most likely at perihelion but local dust storms are unpredictable and can occur even at aphelion and should be looked for especially from the middle of June 2012 to the end of the year.

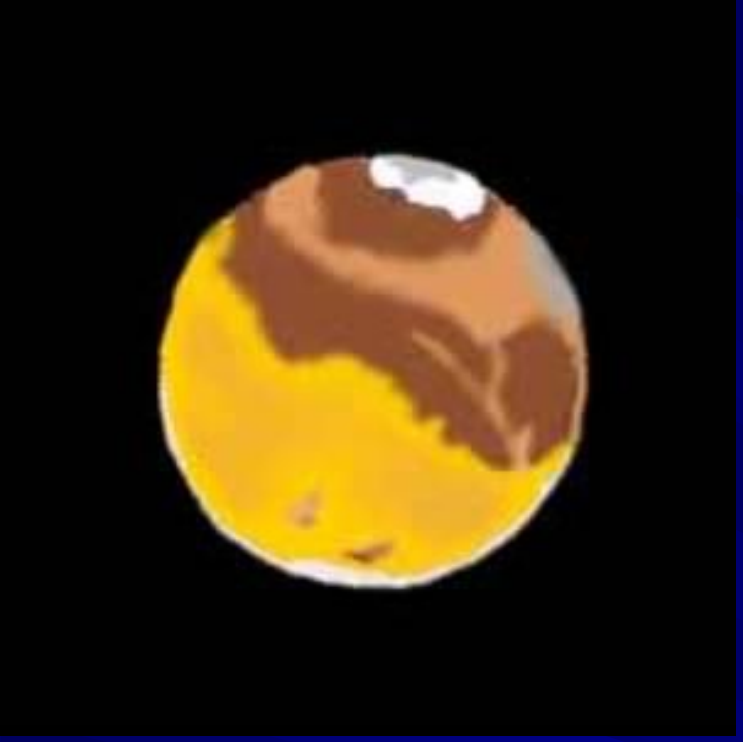




25 – JUNE – 2001



O2 – JULY - 2001

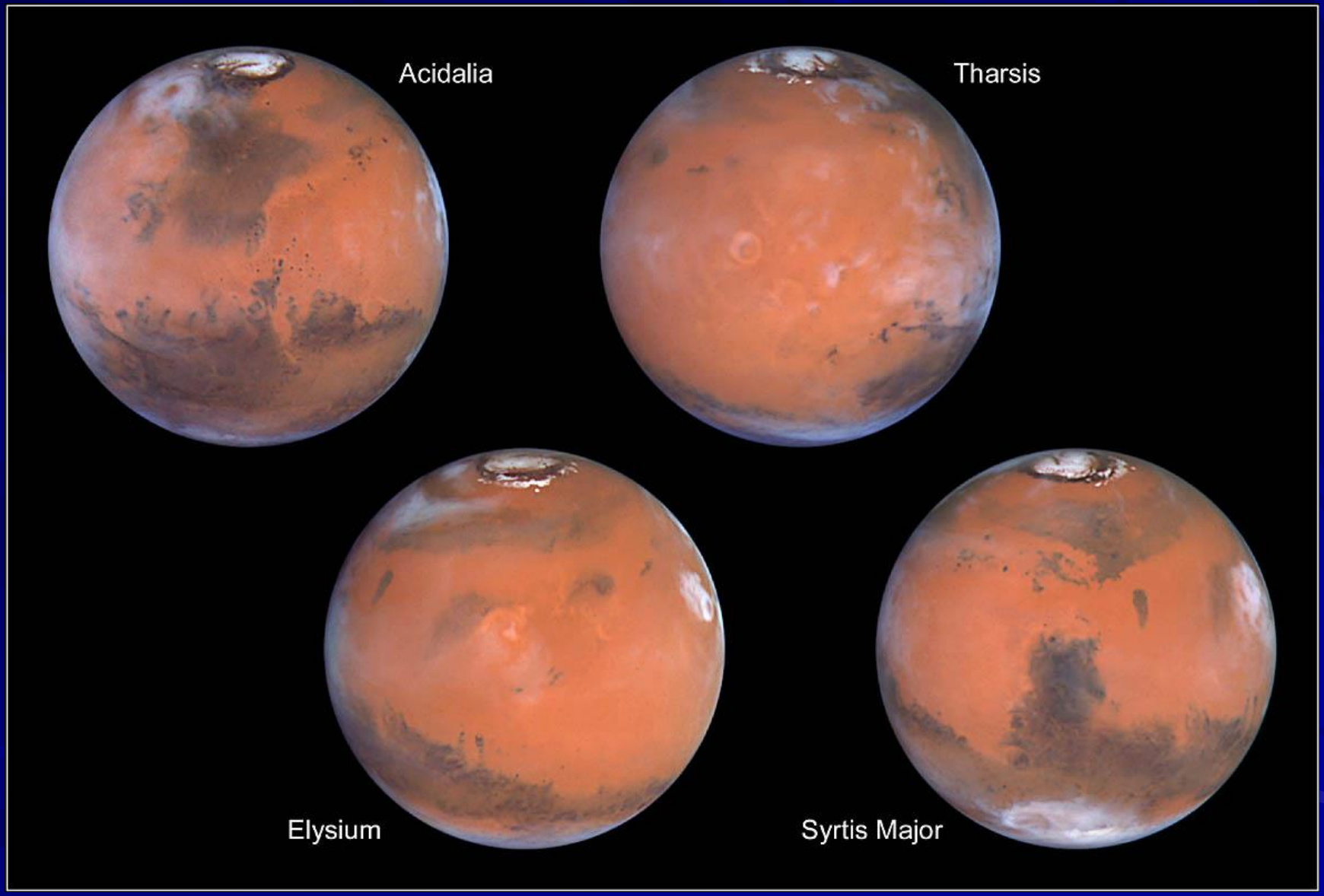


MARS DRAWING DATA
CM = 2:00AM = 199 degrees
Telescope = 155mm Refractor,
Magnification = 464x & 619x
Filters: Bandmate Mars Type 2 (augmented with Red #25, Green #58, Blue #80A)
Size = 24.1", Phase = 98%,
Magnitude = -2.6

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)

Mars as Hubble sees it



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