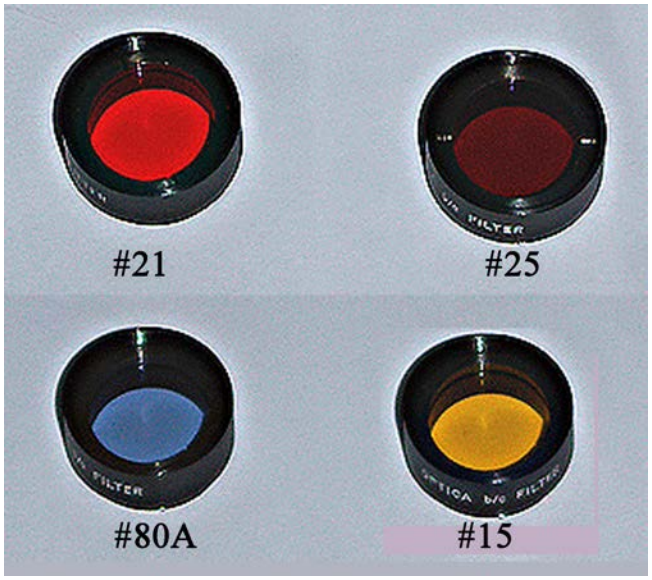
Mars Opposition 2018—telescope tips
(based on the 2018 June JRASC article by Denis Fell, RASC Edmonton Centre)

Introduction
About every two years, when Mars is close enough to Earth, amateur astronomers with telescopes can visually resolve surface detail and weather on Mars. The dark markings (albedo) on the surface change as they are covered and uncovered by blowing dust and clouds grow and move around the planet; dust storms move across the face of the planet, sometimes obscuring large portions or even the entire surface; polar caps shrink or grow with the season. For general information about the 2018 Mars apparition, see the article by Murray Paulson in the PLANETS AND SATELLITES chapter of the current *RASC Observer's Handbook*. Below, you will learn about how to most effectively use your telescope to observe Mars. A companion piece to this discusses sketching Mars.

Equipment
Mars remains at some distance from Earth until late northern hemisphere spring, presenting a small disk diameter for the observer to work with. Your telescope therefore has to be capable of high magnification without exceeding the limits of the instrument. As atmospheric conditions vary greatly, they further limit what the telescope itself can deliver. Average resolution of fine detail is limited to 1 arcsecond or worse, often as bad as 3 arcseconds due to air movement, both at high altitude and from ground effect. Degradation of transparency due to clouds of various types and altitude also greatly influences the ability to resolve fine detail on the planetary surface.

Most instruments available to amateurs today have short focal ratios. There is a plethora of telescopes having focal ratios f/5–f/7, both refractors and Newtonian reflectors. The exceptions are Schmidt-Cassegrains at f/10 and Maksutov-Cassegrains at f/12– f/15. To provide the long effective focal lengths required for planetary viewing with currently available eyepieces, use a magnification amplifier such as a Barlow lens or TeleVue PowerMate™ (see figure below). These devices boost the focal length of the telescope by 2x–5x. For example, with a 2x Barlow, a 100-mm refractor with focal length 500 mm becomes a telescope with an effective focal length of 1000 mm, so a 10-mm eyepiece will give 100x instead of 50x. Besides getting higher magnification, the observer enjoys the advantage of greater eye relief, which reduces eye fatigue. Not only will you enjoy the view better, you will observe more detail.

Be careful not to exceed the magnification limit for the size of the objective (2x the aperture in millimetres) or the image will be degraded. Choose magnifications according to viewing conditions—some nights will allow very high magnification and others will not. Generally 200x is tops for small-to-medium instruments and 300x for large telescopes. As a guide, you should strive for an apparent disk diameter close to ½°, that is,



the diameter of the full Moon seen without optical aid. For example, in a high-quality 150-mm telescope, the maximum magnification of 300x would magnify the 10” disk of Mars (late April and late November) to 1.7 full Moons; at 12” (mid May and late October) the same magnification gives 2 full Moons; and at 24” (near opposition in late July/early August), 4 full Moons. Using a magnification of 200x will yield smaller disk views, but still enough to see a sufficient amount of detail, atmospheric seeing and transparency willing. Obviously, telescopes of all apertures will give the best views in July and August.

To fine-tune the eyepiece view, consider using standard dyed-glass colour filters, mainly Orange #21, Red #25, and Light Blue #80A (Kodak Wratten series)—red and orange to accentuate surface albedo markings and dust clouds, and light blue to enhance atmospheric clouds. Yellow #15 is used to cut through some of the haze and dust present in our own atmosphere. Dyed-glass filters act by blocking all but the actual color of the filter itself. Modern filters are multicoated, allowing sharper, cleaner definition of planetary detail. Be aware that filters block some light from the image so choose the filter that works best for your telescope and eyepiece combination.

If you can find one, the discontinued Tele Vue Mars Bandmate™ Type-A filter is very effective, allowing the passage of green and red wavelengths while rejecting all other visible colors. The effect provides an integrated view (best for public observing), enhancing detail on the Martian surface while preserving the natural color of the polar caps and rest of the surface. The Mars Type-B filter has a high efficiency, single band dielectric coating that achieves penetrating views of the dark albedo regions on the Martian surface.

Links to sites where you may view the work of others:

1. Yahoo Mars Observers Group
https://groups.yahoo.com/neo/groups/marsobservers/info

2. ALPO 2018 Mars apparition
http://www.alpo-astronomy.org/jbeish/2018_MARS.htm

3. ALPO Japan Mars
http://www.kwasan.kyoto-u.ac.jp/~cmo/cmomn4/CMO465.pdf

4. International Mars Observers
www.mars.dti.ne.jp/~cmo/ISMO.html

As always, Denis welcomes questions or comments on this topic, email at denisfell872@gmail.com. Enjoy Mars 2018 and share your drawings and experiences.

Bibliography

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Patrick Moore on Mars, Sir Patrick Moore, Cassell, London, 1998

Backyard Astronomer's Guide, Terence Dickenson & Alan Dyer, Firefly Books, 2002

The Planet Observer's Handbook, Fred W Price, Cambridge University Press, New York, 1994