



FRED'S 2017 ASTRONOMY CHALLENGE

Below are a list of astronomical objects available for viewing and/or photographing in 2017. From the wonders of the Great Orion Nebula at the beginning to the Ursids meteor shower in December, there are hundreds upon thousands of interesting things in the night-time sky. I have listed top twenty things that I challenge the members of the society to view. For the more experienced members, it will be a good excuse to re-visit old faithful favourites, and others of us to get used to searching the skies and learning where some of the easiest things to find are. There should be all the details you will need to find the objects, and I have listed out some basic points for photographing them, if you are so inclined.

As most of you know, the Earth travels around The Sun (Orbit) on a tilt of approximately 23 degrees (which gives us our seasons). This means that celestial objects show themselves at their best at different times of the year. For instance, the Orion Constellation is not visible at night in the Northern Hemisphere during the late spring and summer months, and yet the Plough which holds Alcor and Mizar are best viewed in the summer. Some of the challenges rely solely on the weather at the time, including some of the meteor showers, but most are visible for months at a time, so there should be plenty of opportunities to see them.

There will be many references to taking and stacking photographs within this document. I am planning a talk and demonstration of the procedure for those unfamiliar with why and how it is achieved.

1. Venus

How to find: Visible fairly low to the South or south-west before it sets. Venus is the brightest of all the planets, although it is not often that you get to see all of it because it is an inner planet, and therefore we mostly see the dark side of it where the sun doesn't shine off it. However, often known by either the Morning or Evening Star, it is often misinterpreted as something else by non-astronomers.

Visual/Binoculars: Early in the year, it is easily visible as a low star in the evenings. Look southward from sunset, and it will be the brightest object bar the sun and moon. Setting in the south-west around 7:30-8pm (Jan/Feb)

Telescope: Any telescope will pick out the difference between Venus and a regular star. The surface of Venus is fairly bland, so is often more a pointer than a viewing object.



Photo: Through a scope, then plenty of quick succession exposures > 15fps, and stacked can show some of the faint surface detail. Better photographed wide-angle with something else in the frame including the moon, even using a camera-phone.

2. M45 – Pleiades Cluster (*Star chart available*)

How to find: Often known as the seven-sister. The brightest of all of the star clusters, it emerges from the east for the first couple of months of the year, and through the night travels over the very zenith of the sky. Late evening/night, it can be found by viewing the Orion Constellation and following the three belt stars up to the right past Aldebaran to the small clump of bright stars.



Visual/Binoculars: Easily visible and larger than a full moon. Defined by the five brightest stars and shaped similar to the Plough.

Telescope: Best with short focal-length smaller scopes. Will appear very bright, especially in faster scopes.

Photo: With either a scope of a 100mm+ focal length camera, then many short <20sec exposures stacked together will show some of the nebulosity associated with this cluster. If guided, then a few minute exposure can create the most spectacular of images.

3. Orion Constellation (*Star chart available*)

How to find: Orion the Hunter. Probably the most recognised of the winter constellations next the the Plough and Cassiopeia. Rises from the East after sunset, it travels south at about 45° before midnight. Used in ancient times to predict the floodings of the Nile, and when to plough and harvest the crops.

Visual/Binoculars: Visual only for the whole constellation Defined by the red-giant Betelgeuse at the top-left, Bellatrix at the top-right, the mighty blue giant Rigel bottom-right, and the belt of three stars in the middle. Home to an abundance of nebulosity including the Horsehead Nebula, which is recorded as the most photographed deep-sky object (not usually visible for amateurs except through long-exposure photography).



Telescope: N/A for the whole constellation, although there are plenty of treasures in and around.

Photo: Anything from an iPhone to a 50mm DSLR to show up the stars. If mounted on a tripod, then 15-20 second exposures are possible to show up some of the star colours and even some colour of the Great Orion Nebula (see No. 4). Equatorial mounts giving multiple four minute exposures (stacked and stretched) will gradually bring up very faint details including Barnard's Loop.

4. M42 – The Great Orion Nebula (*Star chart available*)

How to find: Find the three stars that make up Orion's Belt, and look below them at what's known as the sword. Visually, there will appear to be three fainter stars, which look slightly fuzzy and without defined edges. The Great Orion Nebula is the larger of the objects, and the easiest nebula to see with the naked eye in the northern-hemisphere.



Visual/Binoculars: The easiest of the nebulae to see with the naked eye, it shows up as a grey explosion of dust and cloud through even small binoculars. High-powered binoculars will show a lot of detail.

Telescope: Best viewed through a small wide-field scope. The same size (30-arc minutes) as a full moon, and very bright. For many people, the favourite sight during the winter months.

Photo: Best through a wide-field telescope. Lots of short exposures will show all of the details, whereas long exposures through a motorised mount will show all the colours and cloud formations.

5. M31 – Andromeda Galaxy (*Star chart available*)

How to find: The first in the challenge that will be difficult to find easily unless you know where to look. Give it a few million years, and it will be a lot easier to see. Follow down from Cassiopeia into the constellation of Andromeda it shows itself as a small out-of-focus patch just beside the star Mirach, and best viewed slightly in peripheral vision.



Visual/Binoculars: Not easy to distinguish with the naked eye, but through binoculars you will easily be able to see the core and some of the structure.

Telescope: Wide-field telescope as the whole of M31 is six-times larger than the full moon. Easily visible are the two satellite galaxies M32 and M110 that it is devouring (as will ours in time).

Photo: Most people will be able to get reasonable results photographing the galaxy from any kind of mount or tripod. Many 10-30 second exposure stacked will show all of its detail. Exposures greater than three-minutes will normally completely blow out the core.

6. Jupiter

How to find: My favourite planet to view and photograph. Almost as bright as Venus, it looks larger even though the distance is five-times further away. A huge gas-giant, and our personal Hoover and protector. As with all the planets, it will travel across the same equatorial path as the sun. Visible mid-year in the evenings, it will be in the sky for the longest amount of any of the planets during 2017.



Visual/Binoculars: Visually it appears as a big, bright star. Even through small binoculars it will be possible to see the four main moons, Io, Europa, Calisto, and the mighty Ganymede, as well as the bands of fast running clouds circling it's equator.

Telescope: Any telescope will show some detail and the colours of the moons. However, a larger scope, either tracking or not will bring up the coloured bands of the storms and some beautiful detail.

Photo: A Jupiter day is only 4.5 hours. Therefore, you can only photograph it with very short exposures if you want to keep any detail. A planetary camera with 15 or more frames per a second is good, and a cheap modified webcam (SPC900) will produce almost NASA quality images. Because of the effects of the atmosphere show up mostly when taking short exposures, stacking is more a necessity than a desirability.

7. Polaris (*Star chart available*)

How to find: A pre-requisite for any astronomer, Polaris is used to set up most polar-aligned telescope, and is the first star to know how to find. Pointed to by the two-stars in the pan of the Plough and between the Plough and Cassiopeia, it is however in a fairly sparse section of the sky.

Visual/Binoculars: Follow the line in the last two stars in the Plough until you get to the next brightest star. Not visually impressive, it is used as a pointer only.

Telescope: Not a lot to see. Only in the challenge to ensure it is instilled into people minds.

Photo: Best photographed long exposure with a short lens, and not guided or motorised in any way. A five-thirty minute exposure will show beautiful circular trails of different colours as the Earth rotates.

8. Comet 45P/Honda-Mrkos-Pajdusakova

How to find: This is, even weather permitting, likely to be the hardest object to see for the amateur. More experienced members will be asked to help others in difficulty locating it. Although predicted to be one of the brighter comets of 2017, it is still too dim to see without equipment of some kind. Also, as it is moving over the sky, and even going behind the Sun and out of sight for a while at the beginning of the year, it's trajectory needs to be plotted or downloaded to see where it is at a given time. Charts showing movement and magnitude will be available.

Visual/Binoculars: Unlikely to be a naked eye object, it should be possible to see through small binoculars. It will show itself as a greeny-blue fussy object. More powerful equipment may show some tail.

Telescope: Comets are always interesting to see through a telescope because they appear very different from any other objects, especially their colour. We will need to see what magnitude the comet will be, but should be seen in most medium-sized scopes.

Photo: Long exposures with a reasonable lens >150mm should show up a tail. Best photographed on an motorised mount, either tracking the comet, which will blur the stars, or tracking the stars, which will blur the comet. Either way, the comet will look different to anything else in the view.

9. M51 Whirlpool Galaxy (*Star chart available*)

How to find: One of the most beautiful nearby galaxies, the Whirlpool is a favourite with all levels of astronomers. It is found just below the first star (Alkaid) in the handle of the saucepan shaped Plough. It is bright enough that the smallest binoculars will pick it up as a blurry fuzz with two bright cores. Wide-field photographs of the Plough (Ursa Major) with $\geq 100\text{mm}$ lens will easily pick up M51, as well as another neighbour to our galaxy, M101.



Visual/Binoculars: Not easy to see visually because the cores are very small, but most binoculars will show the faint object. Binoculars may need to be mounted on a tripod to keep steady for best viewing.

Telescope: All telescopes, even finder scopes will show some detail. Anything over 1500mm focal length will show the dust formations and lanes almost full aperture.

Photo: Best photographed in colour through a guided setup. A sub-frame of five-minutes will show all of the dust lanes as well as the bright yellows and reds that this object emanates.

10. Mercury

How to find: Never finding itself very high in the sky, and only properly visible at sunrise or sunset, Mercury is the closest planet to our Sun. However, don't be fooled that it is the hottest; the side that faces away into darkness is ridiculously cold. Mercury appears to be a reasonable star, but of course moves across the equatorial. It will be best viewed around June in the south-west right on sunset. For much of the year, it will be close to Saturn, which if you can see one, then you should go for the other.

Visual/Binoculars: Easily visible with both, although through binoculars should show the crescent as the sun shines on one side.

Telescope: Not the easiest object to view in a scope because the skies are still fairly light while it is in the sky. Best found with a go-to setup, or pointed to using the naked-eye.

Photo: Lots of very fast exposures. Because it is close to the horizon, any photographs are hindered by the atmosphere, so this is a target where stacking many images is best for good results.

11. Alcor and Mizar (*Star chart available*)

How to find: Before the days of Specsavers, these two close stars were used to assess someone's eyesight. The two stars appear at first sight to be one and are located one in from the handle of the Plough. Can you see one or two stars when you look at it unaided?

Visual/Binoculars: Easily visible, but when you look through binoculars you will be able to see the huge Mizar against its much smaller twin.

Telescope: Easily found with any setup.

Photo: Any exposure over 10 seconds will pick up the two separate stars, and particularly easy to photograph with a mobile telephone camera.

12. M16 Eagle Nebula (*Star chart available*)

How to find: Found within the spiral arms of our Milky Way and in the constellation of Serpens, The Eagle Nebula is the highest of the group that live there, and so is on show for the longest. Showing itself from June to October, it is found by looking at the arms of the Milky Way on a clear night, and finding where two of the dust lanes split, about 30° up from the horizon southwards. The world was astounded by the first long exposure photograph taken by the Hubble telescope of this nebula.

Visual/Binoculars: Visually a small fuzzy blob, but shows more definition through binoculars.

Telescope: I have seen the Eagle nebula through small 70mm and 12" apertures, and shows itself as a donut of nebulosity with a lighter grey core.

Photo: This is where a photographer can shine. A guided five minute exposure of the core of M16 will bring up one of nature's beauties; the Pillars of Creation. 2017 is going to be my year for getting a good photograph of this object. Best photographed as depicted above with narrowband filters.



13. M81 – Bode's Galaxy (*Star chart available*)

How to find: Another of our neighbouring galaxies, M81 is found at an oblique angle to the pan of the Plough. Closely located to the Cigar galaxy of M82, Bode's is easier to see.

Visual/Binoculars: Visible the whole year round, but best around the meridian mid-year onwards, it is hard to see solely visually, but with binoculars it is possible to find.

Telescope: Most scopes will be able to pick it up and show the spiral arms coming from the centre. It is large enough to fill a reasonably high-powered eyepiece.

Photo: Very easy to photograph with any kind of equatorial setup with any kind of DSLR. Lots of >10second exposures will show it, but for the full beauty then five minutes will bring it to life.



14. Perseids Meteor Shower (Peaks on August 12th & 13th)

How to find: Peaking at up to 60 meteors per hour. As with any shower, and this is the first of three main ones this year, it is all down to the luck of the weather on whether we get to see it.

Visual/Binoculars: Visual only. Best viewed after midnight, away from the point where the meteors are coming from in the constellation of Perseus, which will be on the horizon towards the north-east. Don't forget to make a wish with every one you see.

Telescope: N/A

Photo: Mount a camera on a tripod pointing up towards the point where the meteor will emanate outwards, and set for long exposure. If you are lucky, you will pick up images with streaks coming away from the middle of the frame.

15. Leo Triplet (*Star chart available*)

How to find: Located to the left side of the constellation of Leo and made up of three galaxies: M65, M66 & NGC3628. Directly south between 9-10pm in May, although high in the sky during the nights from the beginning of the year right through to mid-summer. It is found between the two great stars of Arcturus and Regulus



Visual/Binoculars: Requires binoculars at a minimum to view properly.

Telescope: Best view though a refractor to get all three galaxies in view at the same time.

Photo: Either a DSLR with a ≥ 100 mm lens, or through a telescope. 3-6 minute guided exposures produce the best results.

16. M13 – Great Hercules Cluster (*Star chart available*)

How to find: A late in the year object, M13 is one of the largest and most spectacular of clusters. Located between Vega and Arcturus in the constellation of Hercules.

Visual/Binoculars: Just visible with the naked-eye, but better in binoculars.

Telescope: A medium sized (6-8") scope will show up all the detail of the countless coloured stars making up the cluster.



Photo: This is a definite guided object if it to be photographed without blurring the stars. Anything from 1 minute to 10 minute exposures. As with all clusters, it is testament to how good your tracking is if you get good clear frames.

17. Pegasus Constellation (*Star chart available*)

How to find: The great horse of Pegasus dominates the southern sky from late August. Made up of four main bright stars, with dimmer ones making up the neck and head, and the legs. From the northern hemisphere, the horse is upside down, with the neck coming out from the bottom-right.

Visual/Binoculars: Visual only due to it's size.

Telescope: N/A

Photo: A very much point and shoot object. Mount a camera on a static tripod and take a 20 second image for great results.

18. Orionids Meteor Shower (Peaks on October 21st/22nd)

How to find: The Orionids is an average shower of up to 20 meteors per hour. It is produced from the dust grains left by from Hailey's Comet. As with any shower, it is all down to the luck of the weather on whether we get to see it. The shower runs annually from October 2nd to November 7th

Visual/Binoculars: Visual only. Best viewed after midnight, away from the point where the meteors are coming from the great constellation of Orion the Hunter, which will be right on the eastern horizon.

Telescope: N/A

Photo: Mount a camera on a tripod pointing up towards the point where the meteor will emanate outwards, and set for long exposure. If you are lucky, you will pick up images with streaks coming away from the middle of the frame.

19. M27 Dumbbell Nebula (*Star chart available*)

How to find: A spectacular deep sky object, it is high in the sky throughout autumn and winter. It is found between the great stars of Vega, Altair and Deneb on one of the spiral arms of the Milky Way, and thus is rich with stars. Not visible with the naked eye, it is superb through a reasonable scope.



Visual/Binoculars: Not visible with the naked-eye, and very dim with binoculars.

Telescope: Visible with all kinds of scope that are longer than 420mm focal length. Best through fast scopes to F/6 focal ratio.

Photo: Guided only really, this nebula shines with blues with a red ring around it. In the centre is the star that shed it's atmosphere to give us this wonderful sight.

20. Geminids Meteor Shower (Night of December 13th/14th)

How to find: King of the meteor showers, it will peaking at up to 120 meteors per hour of multi-colours. As with any shower, it is all down to the luck of the weather on whether we get to see it. It is produced by debris left behind of the 3200 Phaethon asteroid, discovered in 1982.

Visual/Binoculars: Visual only. Best viewed after midnight, away from the point where the meteors are coming from the constellation of Gemini near the two main stars of Castor and Pollox in the east of the sky. This one should be spectacular this year with the waning crescent moon giving us good dark skies.

Telescope: N/A

Photo: Mount a camera on a tripod pointing up towards the point where the meteor will emanate outwards, and set for long exposure. If you are lucky, you will pick up images with streaks coming away from the middle of the frame.

CHART YOUR PROGRESS ON THE CHALLENGE HERE

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.
11.	12.	13.	14.	15.
16.	17.	18.	19.	20.