What Can I See In The Sky
<u>From My Back Yard In The Suburbs?</u>

Take-Home Handout:
How To Find What You're Looking For In The Summer Sky
(To Be Used In Conjunction With The Take-Home Sky Chart)

<u>How To Use The Sky Chart</u>

The sky chart shows the midsummer sky with the south horizon at the bottom, east to the left, and west to the right. To use the chart, face south and imagine that the chart is rising up from the horizon and curling over your head. The point directly overhead is near the top of the chart – the exact point changes as the sky slowly rotates around the north celestial pole. Stars are shown by dots: the larger the dot, the brighter the star. The chart shows those stars that are bright enough to be seen naked-eye from a fairly dark suburban location. You probably won't be able to see all the stars shown on the chart. The imaginary lines that organize the stars into recognizable constellations are also shown. Because the sky always appears to be moving, it probably won't look exactly the way it's shown in the chart, but it's close enough that it will enable you to find your way around the sky anytime during the Summer months.

<u>Summer Targets</u>

The Summer Triangle: the stars **Deneb**, **Vega** and **Altair** are the three brightest stars directly overhead at 11 pm in early August – they're farther to the east on dates (and times) earlier than that, and farther to the west on later dates. They form a large triangle pointing towards the south. Find them first, not only because they're bright and easy to find, but more importantly because they will be your roadmap for most of our other summer sights in the sky.

South of the triangle:

Look in the area between Altair and the southern horizon to find a star nearly as bright as the Summer Triangle stars, with a distinctive orange color even when seen naked-eye. That's **Antares**, whose name means "The Rival of Mars" in Greek. It got that name because its color is similar to the color of Mars, known as The Red Planet. Antares marks the heart of the constellation **Scorpius** (The Scorpion).

If you look up and to the right from Antares, you'll see three fairly bright stars marking the Scorpion's head. If you aim a small telescope at the one farthest to the north, called **Beta Scorpii**, at a magnification of 75x or more, you'll find that it's a double star with two blue-white components, one noticeably brighter than the other.

If you look at Antares in binoculars, you'll find that it forms the south end of a five-sided group of stars, looking sort of like a lopsided celestial home plate. This is one of the most often-photographed areas of the sky, because it is an area full of dust and gas: the dust around Antares reflects its golden light, the dust around one of the other stars reflects its blue light, and the area around a third star glows with a characteristic red color given off by a cloud of ionized hydrogen that surrounds it. Dark clouds of dust form winding lanes meandering through this colorful field. Unfortunately, none of these colors are visible to the unaided eye. The area is named for the star at the north end of this group, called **Rho Ophiuchi**. If you look at it carefully in binoculars or a telescope, you may see why some of us call it the Mickey Mouse star.

If you have especially good vision, you may also see a fuzzy "star" just to the right of Antares. That "star" is actually a star cluster called **M4**. If you look at it in a small telescope, you'll see a dense ball of thousands of stars packed together so closely that only the largest telescopes will show them all as separate pinpoints of light.

Scan to the left from Antares to spot the **Teapot** shape of the constellation Sagittarius. Slightly above and to the left of the Teapot's handle, see if you can make out the stars that form the **Teaspoon** asterism. If you can't see them naked-eye, try spotting them in binoculars.

In and Around the Summer Triangle:

The least bright member of the Summer Triangle, **Deneb** (located at the Triangle's northeast corner), marks the tail of the constellation **Cygnus the Swan**. The Swan's body and the inner parts of its wings form a large † shaped figure known as **The Northern Cross**.

At the other end of the Northern Cross, the star that marks the Swan's head is called **Albireo**. In a telescope, Albireo is one of the most beautiful double stars in the sky, combining a wonderful deep yellow star with a lovely sky blue one. The pair can be separated even at low magnification.

The line from Albireo to **Altair**, at the southern tip of The Summer Triangle, is an important roadmap to some other summer sights. As you scan north from Altair in binoculars, about halfway between it and Albireo, you'll come across a pair of almost-identical white stars right next to each other, aligned with the line you're following. Those are the tail-feathers of the constellation **Sagitta, the Arrow**. If you scan to the left and slightly upwards from the tail feathers, you can almost put the entire arrow into your binoculars' field of view.

Next, scan in binoculars along a line from Altair to **Vega**, the brightest star of the Summer Triangle, located at its northwest corner. Just under halfway along that line, you'll find one of the sky's most amusing sights, formally known as Brocchi's Cluster but more commonly called **The Coathanger**: a four-star "hook" extends downwards from a six-star line, giving us the distinct image of a coathanger floating upside-down in space!

Looking at Vega in binoculars (or naked-eye from a dark site), you can see that it forms one corner of a small triangle of stars sticking out from the top of a parallelogram: those six stars together form the figure of the constellation **Lyra, the Lyre**.

The other star in the triangle portion of Lyra is called Epsilon Lyrae, known as **The Double Double**. Binoculars show Epsilon as a double star, but in a telescope at high power (at least 120x) you'll see that each of those stars is also a double, with the two pairs oriented roughly perpendicular to each other.

At the bottom of the Lyra parallelogram, a telescope will give you a view of a **planetary nebula**, a dying star that has shed its outer layers of gas, which are now expanding outward around the remains of the star. This planetary nebula, known as **The Ring Nebula** or **M57**, is just west of center on the line forming the bottom of the parallelogram. In photographs, it shows green and red coloring due to the gases that compose it, but in a telescope the colors are too faint to activate our eyes' color sensors, so it appears as a gray smoke ring floating in space. Use a magnification of 100x or so to see the nebula's ring shape.

Our final quarry in this part of the sky is a long shot as a backyard target, depending on how light-polluted your view is, but it's worth a try. To find it, you'll have to be able to see the stars that form the outline of the constellation **Aquila (The Eagle)**, which extends south from Altair (at the southern tip of the Summer Triangle). Altair is part of a large diamond-shaped group of stars, with a long "handle" extending from the diamond to the southwest: you're looking for the three stars at the far end of the "handle," which will guide you to the target. In binoculars or your finderscope, those stars form the first part of a semicircle of stars. Our target, a star cluster known as M11, will appear as a gray haze or a fuzzy "star" just below the semicircle. Now switch to your telescope eyepiece at 75x or higher magnification and the haze will resolve into a huge number of discrete stars, with a shallow-V-shaped line of stars at one end that resembles the vanguard of a flock of birds in flight, and led an imaginative 19th Century astronomer to name it **The Wild Duck Cluster**.

West of The Summer Triangle:

The principal attractions in the area west of The Summer Triangle lie along a line between two bright stars. The first is **Arcturus**, which you can find by locating the Big Dipper asterism in the northern sky and following the arc of the Dipper's handle until you "arc to Arcturus," a bright star that looks slightly orange.

Once you find Arcturus, look due east to find **Vega** at the northwest corner of The Summer Triangle. Draw an imaginary line from Arcturus to Vega, then divide that line into three equal segments. Where the first segment ends, one-third of the way from Arcturus to Vega, you'll see a star that's bright enough to see naked-eye, but nowhere near as bright as Arcturus or Vega. That star is **Gemma**, the brightest star in the constellation **Corona Borealis (The Northern Crown)**. In binoculars, you can trace the broad U shape of the crown, which represents the laurel wreath that encircled the heads of Greek heroes and champions.

Two-thirds of the way from Arcturus to Vega you'll find **The Keystone**, a lopsided square that marks the torso of the constellation **Hercules**. The stars of The Keystone might not be bright enough to see naked eye from your yard, but binoculars will reveal them (although they won't all fit within a single binocular field of view). If you aim your binoculars or a telescope midway between the center and north end of the line forming the west edge of The Keystone, you'll find **The Hercules Cluster (M13)**, one of the largest, brightest, and most impressive globular clusters in the sky. Binoculars will only show the cluster as a large fuzzy "star," but a telescope will begin to reveal some of the half-million individual stars that make up this summer showpiece.

North of The Keystone, binoculars will reveal a slightly smaller lopsided box of stars marking the head of the constellation **Draco the Dragon**, which forms a triangle with the Keystone and Vega. You can also find the Dragon's head by following a line from Altair to Vega and continuing another half step in the same direction. With wide-angle binoculars, you can put the Dragon's head into a single field. The two brightest stars in the Dragon's head mark its eyes: those are the two stars closest to The Keystone, as if the Dragon is keeping a close eye on Hercules. The star at the upper right corner of the Dragon's head (at the end of the short side of the box), known as **Nu Draconis**, is sometimes also referred to as **The Dragon's Eyes**, since a telescope reveals that it's a double star consisting of two nearly-identical bright white components with enough separation that they can be seen as double even with low magnification (50x is plenty).

For our final Summer target, we'll return to The Summer Triangle but this time, we'll change it from a triangle to an M by adding two bright stars to the east and west: the star Enif to the east, and the star **Ras al Hague**, also called **Alpha Ophiuchi**, to the west. A little to the right (west) and slightly north of Ras al Hague is another star with a difficult name, **Ras al Gethi** a/k/a **Alpha Herculis**. If you closely examine Ras al Gethi in a telescope, you'll find that it's a very unequal double star: the brighter component is distinctly red, and the fainter component – which is actually a yellow star much like our Sun – appears to be green due to contrast effects with the red primary star. The components of this double are pretty close together, so use fairly high power – at least 100x – to see them both.

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Helpful web addresses

naperastro.org	Naperville Astronomical Association
spotthestation.nasa.gov	Register here to receive email notices when the International Space Station will be visible from your location
aa.usno.navy.mil/data/docs/mrst.php [or just Google *solar system USNO*]	US Naval Observatory, Astronomical Applications Dept., *Rise/Set/Transit Times for Major Solar System Bodies and Bright Stars*