

# Making the Sky Amazing Any Season

Public star parties are a great way to promote astronomy and share knowledge of the sky with as many people as possible. But spring offers a challenge to amateur astronomers at star parties. The planets and moon make great targets, but what do you show afterwards, or worse yet, what if these bright objects are not out at all? The challenge lies in the fact that most springtime objects are faint galaxies which look less than spectacular in moderate telescopes to untrained eyes.

This is the perfect times to unleash some impressive astronomical knowledge and really wow people, even when they're looking at faint fuzzy objects through your scope. In fact, these are good facts to have on hand when a star party gets clouded out, or during solar viewing sessions when only one object is available. The following facts are guaranteed to amaze both beginning and experienced stargazers.

## **Astronomical Distance and Galaxies**

The best way to make a faint galaxy seem impressive is to give a sense of the distance across which the observer is looking. Astronomical numbers are so, well, astronomical, that it is hard for people to relate to them. So try describing the distance in steps. It makes the numbers more accessible, plus it makes them even more impressive.

Say your telescope is pointed at one of the many galaxies in the Virgo Cluster, such as M100 or M87. These galaxies lie about 70 million light-years away. The average member of the public might not know what a light-year is. Try explaining it this way:

Light travels 186,000 miles per second. That means a photon of light could circle the Earth seven times in one second. At that speed, light takes 1.3 seconds to reach the moon. Saturn is about an hour away at the speed of light. Pluto is around 4 hours distant at that speed. For comparison, the fastest spacecraft ever built, New Horizons, will take nine years to reach Pluto from Earth. That's how incomprehensibly fast the speed of light is.

Now, the nearest star, Alpha Centauri, is 4.3 light-years away, meaning it takes light over four years to reach us from that star. 4.3 light years is around 26 trillion miles. If New Horizons were headed toward Alpha Centauri, it would require 63,000 years to get there. The nearest galaxy, the Andromeda Galaxy, is 2.8 million light years away. This alone is a mind-boggling number. Going one step farther to the Virgo Cluster,

light takes 70 million years to reach us. That means the light we see left when there were still Tyrannosaurs walking the Earth!

Relating distances in this manner tends to put a faint galaxy in perspective. The reaction is great when someone truly realizes the scale of our universe!

## **The Sun and Stars**

Individual stars usually don't look too terribly impressive through a telescope. They do tend to sparkle a bit and show some color, but to make them really astounding, tell your observers about the true scale of a star. Here's one interesting way to do it:

Our own star, the sun, is a pretty average star. Not too big, not too small, not too hot, not too cool. (Cool being a relative term, since even the "coolest" stars have surface temperatures of thousands of degrees.) Like all stars, the sun is powered by a nuclear reaction in its core. The mass of the star crushing down on the gas inside heats up the atoms to such a high temperature that they fuse together. This fusion creates the light that we see from the sun or any other star. The reaction taking place converts hydrogen in helium. In the sun, the rate of this reaction is such that the sun converts 600 million tons of hydrogen into helium every single second!

This naturally begs the question of how the sun doesn't run out of fuel. Well, eventually it would. But the sun is so massive that it has enough fuel to power it for billions of years. Even then, only a small part of the sun goes into fueling its nuclear fusion. That should help put the sun in perspective. The fact that 600 million tons of hydrogen runs out every second, 3600 seconds per hour, 24 hours a day, 365 days a year, for billions of years, and yet only a tiny fraction of the sun's mass is ever used up!

The sun produces as much energy in one second as all the power plants on Earth, running at full capacity, could generate in a million years. That's trillions of times the power output of all of humankind's advanced technology, every second. That puts not only the sun but also ourselves in perspective!

How about the physical size of the sun? You could fit the Earth inside the sun a million times over. And the sun has more than 300,000 times the mass of our tiny planet.

And finally, consider that the sun is again a very average star. Antares, the brightest star in Scorpius is 700 times the size of the sun. Deneb, in Cygnus, is 100,000 times brighter than the sun. These facts should put even ordinary-looking points of light in the sky into perspective.

Use these fascinating facts at the next star party, and even if the skies seem less than impressive, you will make them astounding for the stargazing public!