COLUMBUS ASTRONOMICAL SOCIETY

Prime Focus

Volume 58 Number 6 June 2009
The Columbus Astronomical Society Newsletter

Contents

From the President

Wired for Astronomy:

How can you make the most of your observing time? What is up there, and when can I see it? This is where planning software shines. And there are a few that will make your sessions easier.

Sky Tools is a commercial package many of our members like. It has many bells and whistles, and comes in two flavors, standard for the casual observer and professional for the more serious observer. Go to http://www.skyhound.com/index.html for more information.

http://www.deepsky2000.net/ is the home for Deepsky, a program that has been around for many years, and has always been one of my favorites. This program has many of the features of the previous program, but is a little lighter on the pocketbook. In addition, it interfaces well with Sky Charts, a free sky atlas you can download here: http://www.stargazing.net/astropc/. While here, BTW, grab the Virtual Moon Atlas!

Graphdark generates graphics that let you know whether an object will be visible from your location at a given time. Get it here: http://home.clara.net/rfleet/graphdark/gdkindex.html

Real-Time Interactive Windows Software for Astronomical Observers is a planning program that interfaces with a GOTO scope. It will also interface with Sky Charts. And it is free, just go here: http://www.rtgui.com/

Whatever program you use to plan your sessions, it is likely to help you enjoy the sky.

Greetings fellow stargazers:

We moved Astronomy Fair from September to August this year and we need your help. The CAS will staff all functions at the fair to give the Perkins' folk a break for a change. We need volunteers to make the fair a success.

I'd like you to think of the A-fair as a science fair. Bring a homemade telescope or an educational item, set up a table, and demonstrate it to eager minds, young and old. We'll need members to help with parking, tours, demonstrations etc. Please contact me at stargrokker@yahoo.com if you'd like to volunteer for a specific function; otherwise, c'mon out and have some fun.

Don Stevens will present ***The Electromagnetic Spectrum*** at the June CAS meeting.

Clear Skies!

Tom Beck
President, CAS

What's Up
Brad Hoehne

Summer in the northern hemisphere begins on June 21st at exactly 1:45 AM EDT when the **sun** reaches its most northerly spot in the heavens. Today, this point is in the southeast corner of the constellation Taurus. Two and a half millenia ago, when this spot was named, it resided in the constellation of Cancer, which gave it its name- the Tropic of Cancer. Over the intervening years, the *precession of the equinoxes* has dragged the Tropic across the Gemini and into Taurus. An observer wading through the turquoise waters off Great Exuma Island in the Bahamas- which straddles the Tropic of Cancer- will feel the sun bake the very top of their pate from directly overhead at around noon on that date.

Back in Ohio, throughout June, amateur astronomers and other lovers of the night will be experiencing, and likely ruing, almost 15 hours of daylight per diem. An Ohio astronomer interested in celestial bodies might do well to set aside June to explore the most import one to us- our own star. There's just one small problem. The sun, of late, has been *boring*. Why is this?

From 1826 through 1843, German astronomer Heinrich Schwabe observed the sun every chance he could get. He was attempting to catch a glimpse the searing planet "Vulcan" as it crossed the face of the Sun inside the orbit of Mercury. Though he failed in his quest to find the proposed world (Only in the Star Trek universe does a world named "Vulcan" exist.) his meticulous observations of sunspots led to his publication of the idea that the Sun goes through regular cycles of activity.

Swiss astronomer Rudolf Wolf was one of the few contemporaries intrigued by Schwabe's idea- which likely required more than 17 years of data to prove. After scouring astronomy archives (not easy in those days) he discovered that the number of sunspots one can see varies on a roughly 11 year cycle. He devised a numbering scheme for each of these cycles, beginning with "1" for the 1755-1766 period- the first clear cycle after the curious Maunder Minimum- a 70 year long spell of very low solar activity. In Wolf's system, each solar cycle begins with the *Solar Minimum*- that period of time when the fewest spots can be seen. The peak time is called the *solar maximum.*

In the early years of the 20th astronomers discovered that sunspots were associated with strong magnetic fields. These patches of magnetism were found to have either North (N) or South (S) *polarity* like a bar magnet. Also, it was observed that sunspots tended to come in oppositely polarized pairs, with one spot N and the other S. This makes sense. In nature, whenever there's a magnetic "North", there must always be a "South". Over time, it was recognized that the pattern of sunspot polarity shifted in time with the 11-year cycle. For 11 years, all sunspots at a given solar latitude might see N sunspots rotate into view, followed closely by a S sunspots, then, when the end of a cycle came along, that same latitude would see an abrupt shift to S sunspots followed by N sunspots.

The sun has been boring lately because we have been at the very bottom of the solar sunspot cycle. Over the past year, very few sunspots have been seen by amateur astronomers. During a typical solar maximum an observer using excellent instruments (some sunspots can quite small) can count around 100 sunspots per month. Since April of 2008, the most seen in any given month has been five. From last July to September, there were none to be seen at all.

Last December, Astronomers began to detect signs that the polarity of the few sunspots they could see had changed, marking the beginning of a new 11 year half-cycle- the 24th since 1755. This week, a committee of solar scientists from the National Oceanic and Atmospheric Administration (NOAA is the agency responsible for gathering the data that leads to your weather forecasts) predicted that solar maximum would occur sometime during 2013, and that it would be relatively mild- peaking at a rate of roughly 90 sunspots per month. However, this sort of thing has proven extremely hard to predict. Things could turn out differently.

Until May of this year, some astronomers were puzzled by what seemed to be an unusually long, and quiet, solar minimum. However, the sun is beginning to stir. (It turns out that the this cycle's minimum was long, but not markedly so.) Just this week, a distinct sunspot grouping- called "1019"- became visible, and should still be visible by the time this article arrives in your electronic (or not) mailbox. In addition, radio astronomers have noted a slight uptick in the radio emissions from our star, another phenomenon that goes up and down with the solar sunspot cycle.

Those with solar telescopes or filters should begin to see sunspots increase in number over the next four years. As always, *do not stare at or look through any sort of telescope or binoculars at the sun unless you are using equipment specifically designed for the task.* (There, I've done my duty.) If you are without a solar filter, you can use a *small* telescope (a large telescope may focus too much heat to do this safely) or pair of binoculars to project an image of the sun on a piece of paper. Similarly, one can cover a small, flat, cosmetics mirror with paper, but for a pea-sized hole, and reflect a fairly good image of the sun onto a wall. A very low-tech technique is to punch a small hole in a piece of paper or foil, and simply allow the sun to shine through. The largest sunspots can be seen using this technique.

Along with sunspots, sightings of strong **Auroras** should become more common over the next few years. Aurorae are seen when charged particles that get caught up, and then belched out of distended and tangled knots in the solar magnetic fields smash into our Earth's magnetic field.

Elsewhere in the solar system, the current apparition of **Saturn** is past its prime and the ever-more-edge-on ringed planet is beginning to make its plunge into the evening twilight. It likely will be visible in the evening through mid-August.

The most beloved of the dwarf planets, **Pluto,** reaches opposition on June 23. However, the tiny bit this shaves off our immense distance to it will do very little to improve its visibility. Unless you're gifted with exceptional night vision, at Mag 14.1, you will likely need a 6-inch, and probably an 8-inch telescope to detect it.

Next to rise are **Neptune** and **Jupiter,** which form a close, though not distinct, pair all month. If you've never spotted Neptune's cool-blue dot, Jupiter will give you a helping hand this month. Mid-month, in the hours before dawn,

(Continued on page 3)

look for Neptune as a 7th magnitude star in roughly the 2:30 position about one full-moon width from Jupiter.

Venus and **Mars** form another pair in the heavy morning twilight. Mars is still over on the other side of the Sun from Earth, and subtends a measly 4.8 arcseconds- far too small for any detail to be seen when it is close to the horizon. Indeed, Mars appears only 20% wider than distant **Uranus**, which rises two hours earlier.

Near the end of the month, look for **Comet Q3 Garradd** to leap up from the southern horizon in the early evening. Its predicted peak of magnitude is 6 may occur around July 1. If it does in fact become this bright, it should be fairly easy to spot in binoculars as it courses along the eastern edge of Corvus. It will pass near M104 during the first week of July, and will get mixed in with the many faint fuzzies of the Virgo cluster later that month. Can you tell a comet from a galaxy?

What's Far

For those who can't abide a month without at least some deep sky observing, there's still six good hours of darkness in June to work with.

Winding around the North Celestial Pole, between the Big and Little Dippers, is **Draco** the dragon. Draco encompasses territory that extends across 11 hours of right ascension, the most of any constellation that doesn't actually contain the pole. Parts of it are at their best observing angle- high in the sky- for nearly six months out of the year.

The double star **Nu Draconis** is an easy first target. It consists of two, equally bright, golden stars which, to me, appear like distant incandescent headlights. At 1 arcminute separation, rock steady observers should just be able to split this pair in good binoculars.

More challenging is **Mu Draconis**, a triple star consisting of two evenly bright white stars, separated by 2 arcseconds, and a 13th magnitude "third wheel" drifting 13 arcseconds away. A good small refractor should be sufficient to split the main pair.

I'm always on the lookout for beautiful color in the skies. The carbon star **RY Draconis**, varies from a brilliant orange to faint LED red over about 6 months. Since this star is a faint 11th magnitude at its dimmest, and reddest, and because a dim star image may not be bright enough to tickle the color receiving cone cells in our eyes, a medium to large scope will be helpful in observing and appreciating this gem. A cool greenish-blue in medium-to-large telescopes, **the Cat's Eye Nebula, NGC 6543,** rewards patient observers. This bright planetary nebula gives up its secrets when the seeing is at its best. Those with medium-sized telescopes (8 to 10 inches) should be able to see 11th magnitude central star, the elongation of the nebula, a slightly darker center, and a faint outer haze reminiscent of a slightly fogged eyepiece. Isaac Cruz describes the shape of this nebula as looking like the "hands" logo of the United Way charitable organization.

Moving outward, there are many superb galaxies to be seen in Draco. I'm particularly fond of the edge-on spirals **NGCs 5981, 5965, 5908 and 5907.** NGC 5907 is the best of the quartet, stretching a full 12 arcminutes in length, and appearing like a ghostly 10th magnitude javelin flying through the night.

What's Faint

Though it's a respectable magnitude 11, and is one of the closest galaxies to our own Milky Way (only 260,000 light years away, 1/8th the distance to Andromeda), you probably won't be able to see **UGC-10822, the Draco Dwarf**. First of all, its stars are spread out over an area the size of the full moon. Second, its brightest stars are roughly Magnitude 18- so no resolving it as one can do with the Leo Dwarf. Finally, conditions in Ohio may simply not be up to the task- light pollution is nowhere completely absent, our altitude is low, emissions from local power plants create haze, and the collected muck and moisture of a continent's worth of weather quite often pauses overhead. I have tried for several years to spot this elusive patch of light in several different instruments in the clearest and darkest of Ohio conditions but have never successfully bagged it. However, there are a handful of reports posted on the internet of successful sightings of this object that convince me that it may not be impossible. All successful observations are with small to medium sized scopes at the lowest practical power. One such observer suggested observing with a "monk's hood"- a fancy term for draping a black cloth over one's head like an old glass plate photographer. So, if you happen to be making a summer trip to the clear, dark, skies of the high Rockies, and have brought along your 120mm refractor, a nice low power eyepiece, and a towel, why not give this object a try?

Beautiful 22° halo and tangential arc, captured by Brad Hoehne, May 17 2009. Camera and settings unknown.

Scoring More Energy from Less Sunlight

For spacecraft, power is everything. Without electrical power, satellites and robotic probes might as well be chunks of cold rock tumbling through space. Hundreds to millions of miles from the nearest power outlet, these spacecraft must somehow eke enough power from ambient sunlight to stay alive.

That's no problem for large satellites that can carry immense solar panels and heavy batteries. But in recent years, NASA has been developing technologies for much smaller microsatellites, which are lighter and far less expensive to launch. Often less than 10 feet across, these small spacecraft have little room to spare for solar panels or batteries, yet must still somehow power their onboard computers, scientific instruments, and navigation and communication systems.

Space Technology 5 was a mission that proved, among other technologies, new concepts of power generation and storage for spacecraft.

"We tested high efficiency solar cells on ST-5 that produce almost 60 percent more power than typical solar cells. We also tested batteries that hold three times the energy of standard spacecraft batteries of the same size," says Christopher Stevens, manager of NASA's New Millennium Program. This program flight tests cutting-edge spacecraft technologies so that they can be used safely on mission-critical satellites and probes. "This more efficient power supply allows you to build a science-grade spacecraft on a miniature scale," Stevens says.

Solar cells typically used on satellites can convert only about 18 percent of the available energy in sunlight into electrical current. ST-5 tested experimental cells that capture up to 29 percent of this solar energy. These new solar cells, developed in collaboration with the Air Force Research Laboratory in Ohio, performed flawlessly on ST-5, and they've already been swooped up and used on NASA's svelte MESSENGER probe, which will make a flyby of Mercury later this year.

Like modern laptop batteries, the high-capacity batteries on ST-5 use lithium-ion technology. As a string of exploding laptop batteries in recent years shows, fire safety can be an issue with this battery type. "The challenge was to take these batteries and put in a power management circuit that protects against internal overcharge," Stevens explains. So NASA contracted with ABSL Power Solutions to develop spacecraft batteries with design control circuits to prevent power spikes that can lead to fires. "It worked like a charm."

Now that ST-5 has demonstrated the safety of this battery design, it is flying on NASA's THEMIS mission (for Time History of Events and Macroscale Interactions during Substorms) and is slated to fly aboard the Lunar Reconnaissance Orbiter and the Solar Dynamics Observatory, both of which are scheduled to launch later this year.

Thanks to ST-5, a little sunlight can go a really long way.

Find out about other advanced technologies validated in space and now being used on new missions of exploration at nmp.nasa.gov/TECHNOLOGY/scorecard. Kids can calculate out how old they would be before having to replace lithium-ion batteries in a handheld game at spaceplace.nasa.gov/en/kids/st5_bats.shtml.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration

Helen Johnson, a spacecraft technician at NASA's Goddard Space Flight Center, works on one of the three tiny Space Technology 5 spacecraft in preparation for its technology validation mission.

June 2009

Columbus Astronomical Society Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5 Venus at greatest Western elongation	6
7	8	9	10 Moon at apogee	11	12	13 CAS Meeting 8 PM
14	15	16	17	18	19	20
21 Summer solstice	22	23 Moon at apogee Pluto at opposition	24 PF Articles deadline	25	26	27
28	29	30				

July 2009

Columbus Astronomical Society Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
July 16th, 4:00 PM Perkins Observatory Celebration of the Sun. Bring your solar telescopes!			1 Uranus stationary	2	3	4 Earth at aphelion
5	6	7 Moon at apogee Penumbral Lunar eclipse	8	9	10	11 CAS Meeting 8 PM
12	13	14 Mercury at Superior conjunction	15	16 New Vistas Perkins program	17	18
19	20 40th anniversary of Apollo 11 lunar landing	21 Moon at perigee	22 Total solar eclipse (Asia and PAcific ocean)	23	24	25
26	27	28	29 PF Articles deadline	30	31	

How to Make a Cloud Mobile

What you need:

- 2 or 3 large Styrofoam take-out boxes (like you get from a restaurant)
- 2 thin, lightweight sticks, 10 -12 inches long (such as wooden skewers for grilling shish kabobs)
- Mylar shred (such as used for gift baskets)
- White sewing thread or lightweight string
- Scissors
- Pencil
- Large needle (optional)
- White glue
- Cloud patterns (or make up your own). Patterns are included at the end of the article.

How to make:

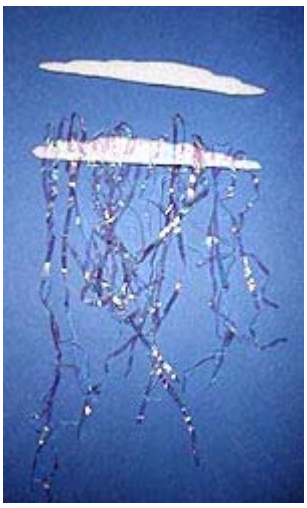
Make clouds:

Cut out cloud shapes from flat areas of Styrofoam. For clouds that will be "raining," cut two shapes that will be glued together with the Mylar "rain" glued between them.

For our mobile, we made a big cumulonimbus cloud. Real cumulonimbus clouds can reach as high as 40,000 feet! Our cumulonimbus reaches from the lowest altitude, which it shares with the rainy nimbostratus cloud, all the way up to the highest, wispiest cirrus clouds. Our cumulonimbus also has multiple layers to make it look more 3-D.

To make "rain," take individual strands of Mylar, fold them in half, and glue onto the cloud, with the strands coming out the cloud bottom.

Cut a tiny piece (about ½ inch square) of Styrofoam and glue the two sides of the cloud together with the small piece of Styrofoam between them. This will give your cloud more depth and not squash the Mylar strands as they "rain" out of the cloud. Trim off any Mylar that sticks out from the top of the cloud.

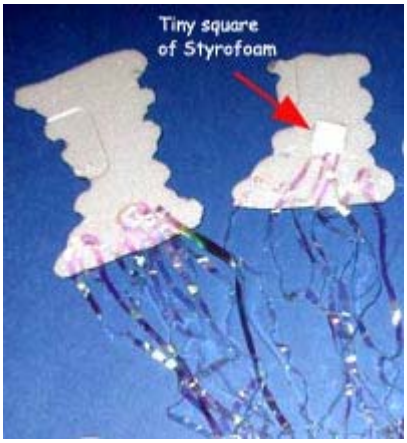


Make Mylar rain come out of your clouds.

Tie threads:

Find the spot on each cloud where it will hang evenly from the thread or string. For some roundish cumulus clouds, it might not matter. But, a long nimbostratus cloud would look odd hanging lop-sided. You can find this exact balance point by poking the threaded needle in where you think it will balance and trying it out. Or, if you don't have a needle, just poke a little hole with the pencil point and put thread through the hole. Keeping poking the thread through in different spots until you find the exact balance point.

Tie one end of the thread securely to the cloud. Leave about 15 inches of thread for tying to the sticks.



Glue the front and back of the clouds together with a tiny square of Styrofoam between them.

Assemble Your Mobile:

To make a mobile like ours, first tie the cumulonimbus cloud to one end of one stick. Tie the thread tightly enough so it won't slip, but not so tightly you can't move it along the stick.

Now, break or cut about three inches off the other stick. Tie the other rain cloud (with Mylar strings coming out of it) to the middle of this shorter stick.

Now tie the two sticks together: To do this, tie the thread to the middle of the short stick and to the end of the long stick opposite the big cumulonimbus cloud. Try to make do it so that the bottoms of the two clouds hang even with each other.

Tie the cirrus clouds to the long (top) stick, even with the top of the cumulonimbus cloud.

Tie the fluffy cumulus clouds to the short (bottom) stick on either side of the nimbostratus.

Now, tie a thread near the center of the long stick and hang the mobile somewhere where it can dance freely in the breeze.

Balance Your Mobile:

You will probably have to do some adjusting, moving the knots around on the sticks until everything balances nicely.

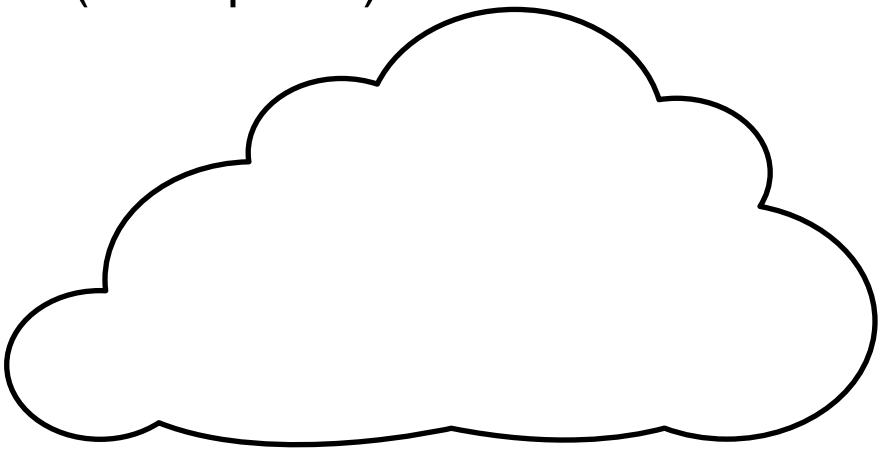
You can also trim the clouds a bit here and there to make the mobile balanced.

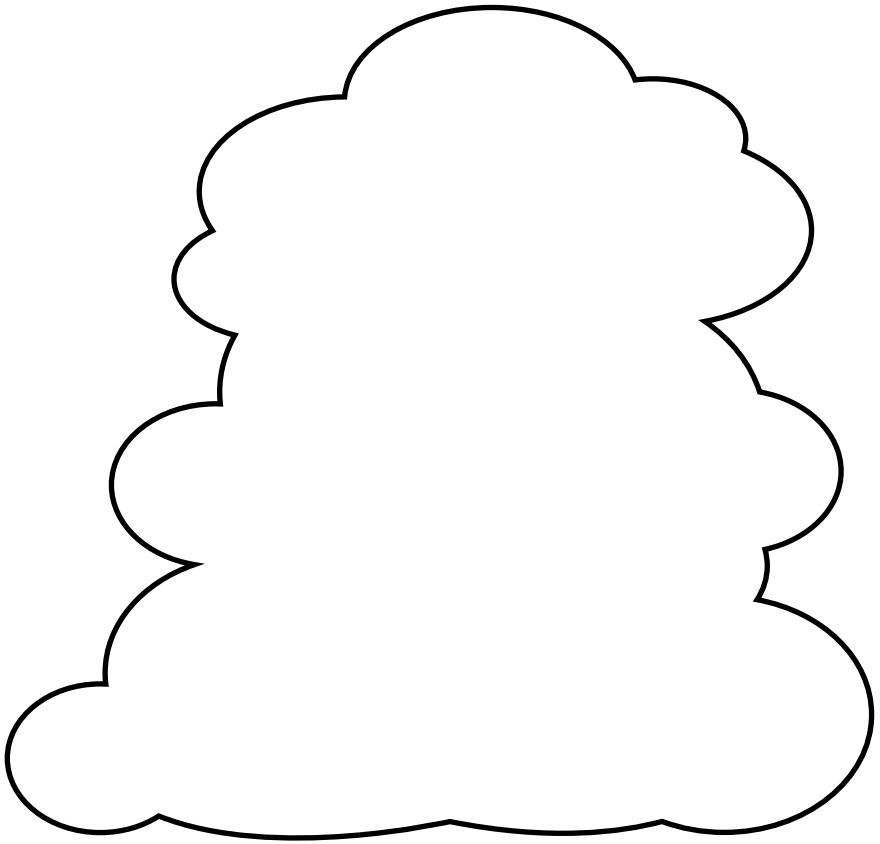
When you have everything balanced just right, put a drop of glue on each knot.

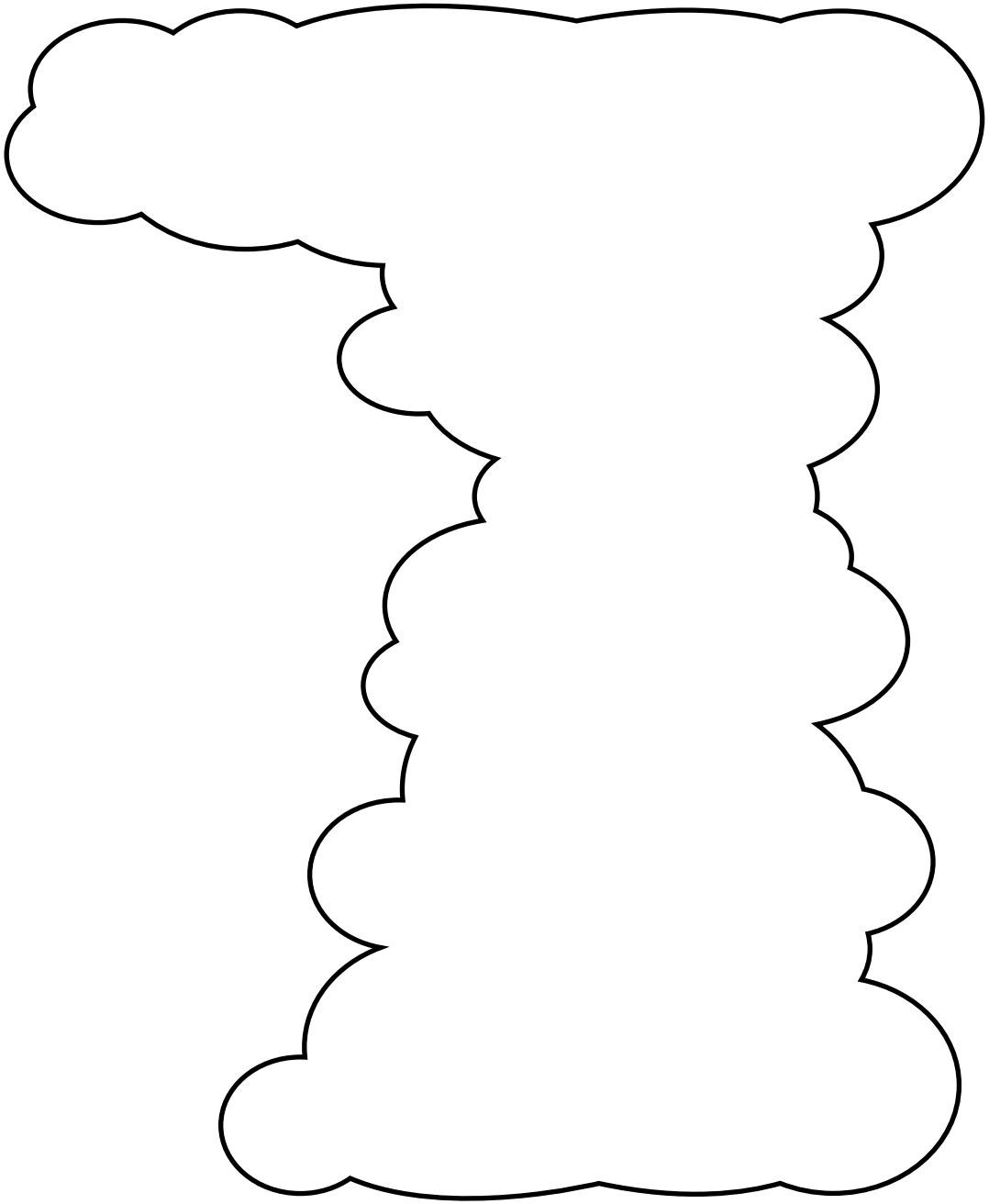
Unlike real clouds, your "mobile clouds" will stick around so you can enjoy them forever!

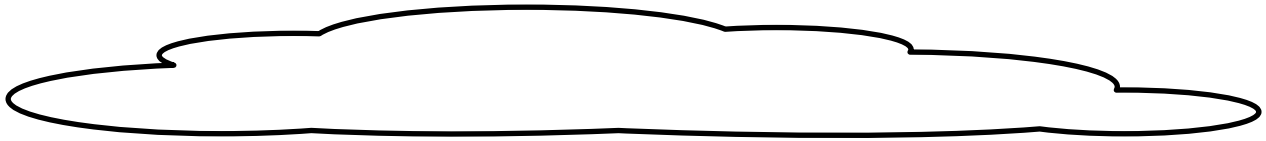
Instructions from NASA Space Place

Cumulonimbus
(multi-piece)

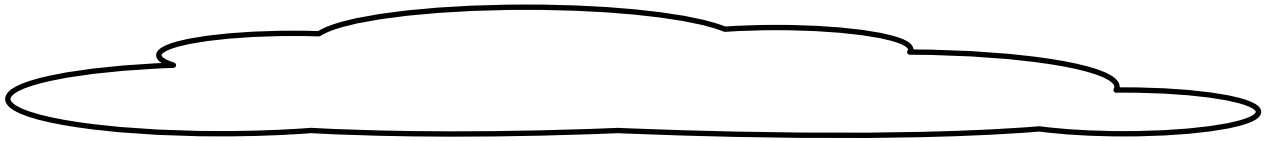




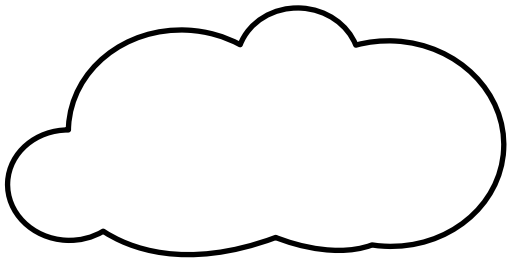




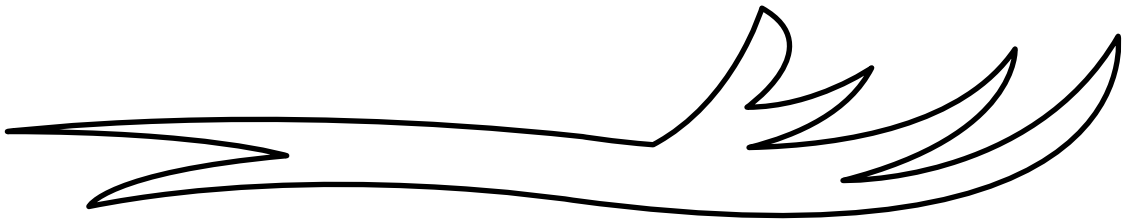
Nimbostratus



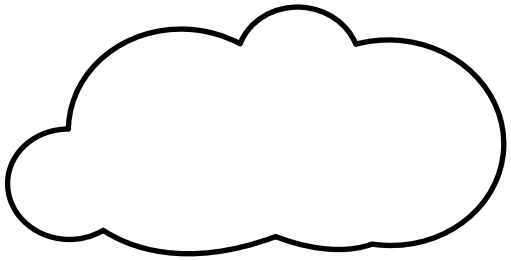
Nimbostratus



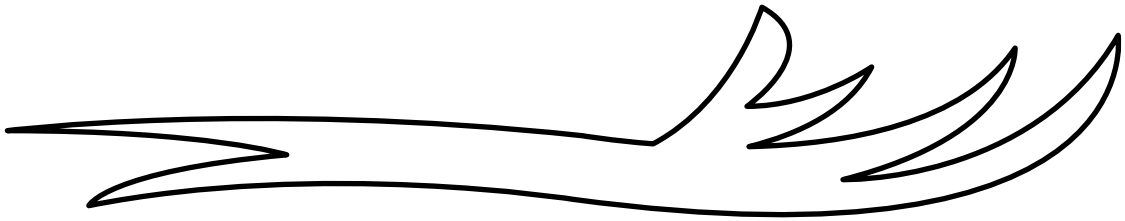
Cumulus



Cirrus



Cumulus



Cirrus

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The Prime Focus is the monthly newsletter of the Columbus Astronomical Society, a not for profit group of amateur astronomers interested in the night sky. Information can be obtained by writing to the address below. Society members build telescopes, observe the splendors of the universe, contribute to scientific research and educate the public at public programs around the city and at Perkins Observatory.
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