Get ready for Comet PANSTARRS

The brightest comet of the past six years will stand out in the evening sky this March.

by Michael E. Bakich

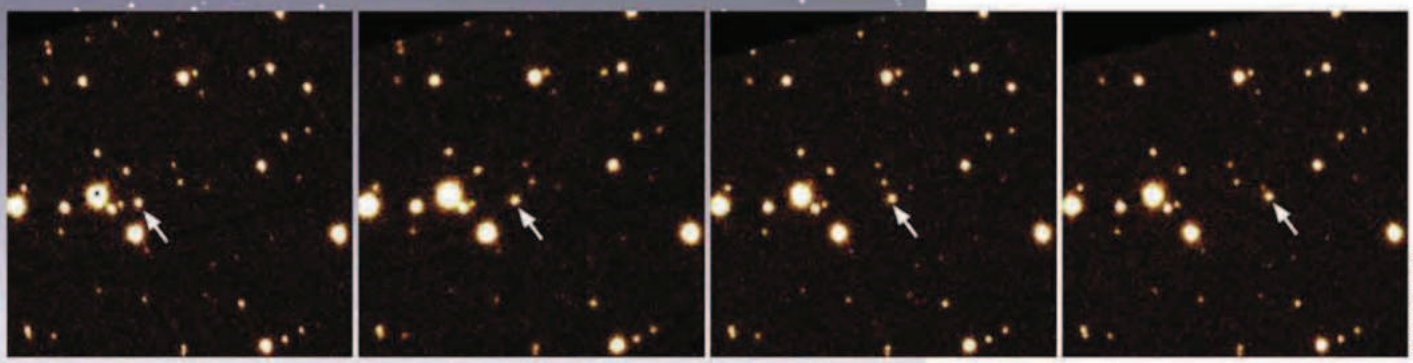
When it rains, it pours. At least that's the saying amateur astronomers are hoping relates to this year's two bright comets, the first of which, C/2011 L4 (PANSTARRS), becomes brightest in March. I discussed the other comet, C/2012 S1 (ISON), in the January issue.

ISON's best visibility occurs in the last two months of 2013, and we'll continue our coverage as it approaches our region of the solar system. And although PANSTARRS will provide a test for all the observing and imaging procedures amateurs plan to use on ISON, it looks like it will be a bright comet on its own.

A faint start

The official discovery announcement of Comet PANSTARRS came when the Central Bureau for Astronomical Telegrams at Harvard University in Cambridge, Massachusetts, issued Circular No. 9215. It stated, in part, "Richard Wainscoat, Institute for Astronomy, University of Hawaii, reports that an object discovered on four CCD images taken with the 1.8-m[eter] 'Pan-STARRS 1' [T]elescope at Haleakala … appeared to show slight non-stellar appearance; three follow-up 30-s[econd] r[ed]-band exposures were then acquired by M[arco] Micheli and Wainscoat with the Canada-France-Hawaii Telescope on Mauna Kea (queue observer Lisa Wells) on June 7.44 UT, showing that a coma is definitely visible with a subtle hint of a faint tail towards p[osition] a[ngle] 60 deg[rees]."

"Pan-STARRS" is an acronym for the Panoramic Survey Telescope and Rapid Response System, an innovative design for a wide-field imaging facility developed at the University of Hawaii's Institute for



ASTRONOMY: ALISON MACKEY

HENRY HSIEH/PS1SC

Astronomers documented the discovery of C/2011 L4 (PANSTARRS) in this series of images. The comet (arrow) glowed at a meager magnitude 19.5.

Astronomy. The system combines a relatively small 1.8-meter mirror with a 1.4-gigapixel digital camera. This results in a system that can observe the entire available sky several times each month. The prototype single-mirror telescope PS1 is now operational on Mount Haleakala. A collaboration among 10 research organizations in four countries is conducting its scientific research program.

Pan-STARRS acquired the four images during a 2.6-minute interval June 7, 2011. At the time of discovery, the comet sat at right ascension 16h10m40s and declination –16°38'39". Those coordinates placed it in the constellation Scorpius, 3.4° north-northeast of magnitude 2.5 Graffias (Beta [β] Scorpii). Astronomers listed the comet's brightness at discovery in the range of magnitude 19.4 to 19.6.

One unusual aspect to Comet PANSTARRS was how far it was from the Sun at discovery — nearly 8 astronomical units. (One astronomical unit [AU] is the average distance between the Sun and Earth, approximately 93 million miles [150 million kilometers].) When a comet lies so far from the Sun at discovery, it's notoriously difficult to pin down its orbit.

Fortunately, other astronomers using different telescopes had captured the comet on images without realizing it. When they went back and examined their data, they found 34 locations of C/2011 L4 between May 24 and June 8, 2011.

For example, American astronomer Steve Larson reported that Steward Observatory's 61-inch Kuiper Telescope atop Mount Bigelow north of Tucson, Arizona, had captured the comet May 24. He gave a brightness range between magnitude 18.9 and 19.2. And in mid-June, astronomers discovered that even Pan-STARRS had previously imaged the comet. On May 21, the telescope had acquired a set of four images that showed the comet glowing between magnitude 19.5 and 19.9.

A slow but steady climb

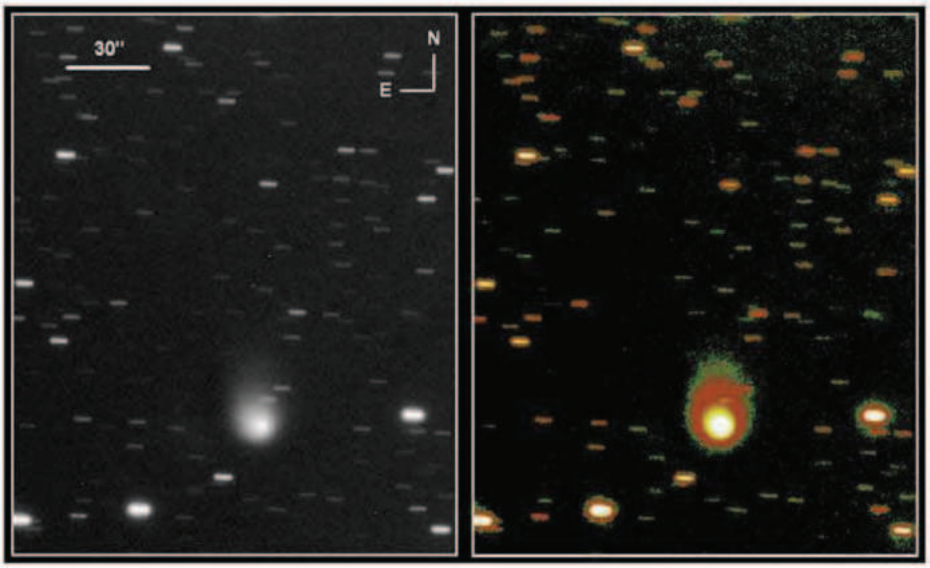
Comets orbit the Sun, so they don't stay in the same spot for long. From our perspective, however, their orbits aren't simple paths through the stars because Earth also

Michael E. Bakich *is a senior editor of* Astronomy *who will put his deep-sky observing on hold to view Comet PANSTARRS.*

WATCH COMET PANSTARRS BRIGHTEN AND FADE

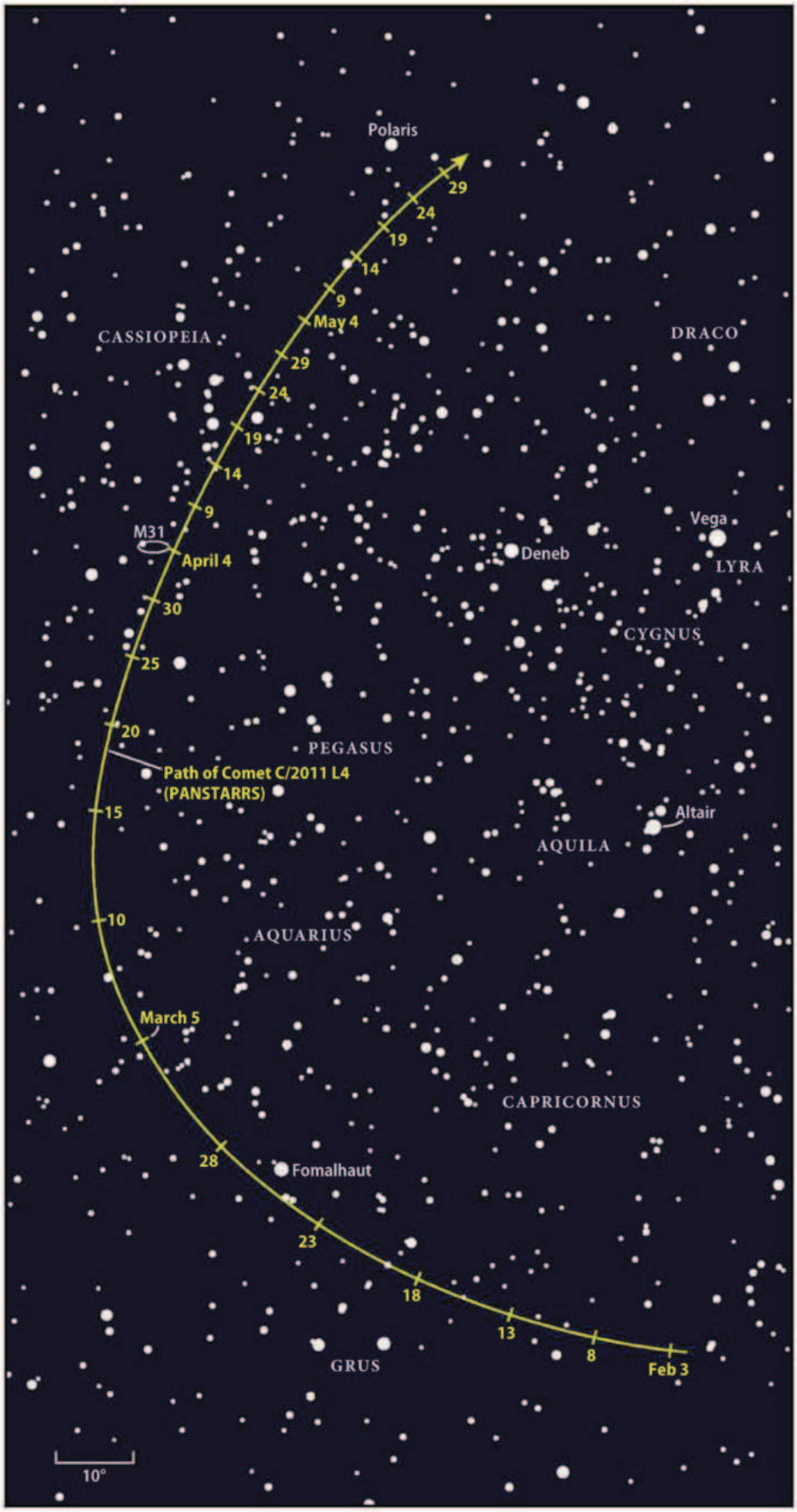
Date	Magnitude	Right ascension (2000.0)	Declination (2000.0)	Distance from Sun
Jan. 15	7.0	18h00m	–42°15'	30.8°
Jan. 24	6.0	18h38m	–43°56'	33.3°
Feb. 2	5.0	19h28m	–45°23'	34.7°
Feb. 10	4.0	20h27m	–45°16'	34.0°
Feb. 16	3.0	21h21m	–43°10'	31.8°
Feb. 21	2.0	22h10m	–39°15'	28.7°
Feb. 26	1.0	22h59m	–32°42'	24.4°
March 2	0.5	23h34m	–25°15'	20.6°
March 3	0.0	23h42m	–23°06'	19.7°
March 5	–0.5	23h56m	–18°27'	17.9°
March 9	–1.0	0h18m	–8°11'	15.5°
March 15	–0.5	0h33m	7°11'	16.4°
March 17	0.0	0h35m	11°43'	17.8°
March 22	1.0	0h35m	21°32'	22.3°
March 27	2.0	0h34m	29°38'	27.2°
April 2	3.0	0h31m	37°50'	33.2°
April 9	4.0	0h28m	46°03'	39.7°
April 19	5.0	0h22m	56°18'	48.1°
April 30	6.0	0h13m	66°21'	56.4°
May 15	7.0	23h29m	78°30'	65.7°
May 6	8.0	0h00m	72°15'	61.0°

Positions and estimates of brightness are for 0h UT on the dates given.



N. HOWES/E. GUIDO/G. SOSTERO

On May 18, 2012, Comet PANSTARRS glowed weakly at magnitude 14.9. Despite its dim appearance, a stack of five 60-second exposures through the 2-meter Faulkes Telescope South located at Siding Spring, Australia, revealed its glowing coma and the beginning of a tail. The right image is a logarithmic plot of the comet's brightness at various points. Such an image is better at showing the coma's structure.



Follow Comet PANSTARRS' northern trek after it encounters the Sun with the help of this chart. With each passing day, its distance from our daytime star increases. *ASTRONOMY:* RICHARD TALCOTT AND ROEN KELLY

is moving. Their positions change slowly when they're far from the Sun and rapidly when they lie close to it.

Between its discovery and July 8, 2011, Comet PANSTARRS moved a mere 0.2° northward and a bit more than 4° westward into Libra before creeping south for nearly a year. On May 28, 2012, it stood before Scorpius again only 4.4° west of globular cluster M4. It then headed north until August 4, when it stood 0.5° northwest of magnitude 3.2 Sigma (σ) Librae. By this encounter, the comet had brightened more than a hundredfold since discovery to magnitude 13.9.

Then, for the next seven months, it dipped southward. If predictions remain valid, on February 5, 2013, PANSTARRS will reach its maximum southerly declination, halfway between the celestial equator and the South Celestial Pole. At that time, it will lie only 5′ from the magnitude 7.3 star SAO 229866 in the nondescript constellation Telescopium. That star should provide a nice contrast to the magnitude 6.3 comet.

If your location allows you to view the pair on this date, I'd suggest keying in on three points to enrich your experience. First, how does the star's brightness compare to the comet's coma (the gas shell that surrounds the comet)? Second, is the coma large enough to envelop the star? And third, how long is the comet's tail?

Picking up the pace

From early February through the end of May, C/2011 L4 zooms 130° northward (from a declination of –45° to one of 85°). Comet-watchers should target February 21 through March 27. During that entire period, the comet should shine more brightly than a 2nd-magnitude star like the North Star, Polaris (Alpha [α] Ursae Minoris). Remember, however, that comet magnitudes are estimates of the light emitted by the entire object, while a star is a point source. So, when Comet PANSTARRS reaches magnitude 1.5, for example, it won't appear as bright as a magnitude 1.5 star because the comet's light will spread over a much larger area.

This nearly three-week span does include some highlight dates. On March 5, the 1st-magnitude comet reaches perigee — its closest approach to Earth. It then will lie 1.09 AU from our world. Search for the comet immediately after sunset 17° southeast of the Sun. Use binoculars or a telescope with a wide field of view. Because of where it is in relation to us, PANSTARRS

FOR COMPLETE COVERAGE OF COMET PANSTARRS, GO TO **www.Astronomy.com/news.**

Comet McNaught, also known as C/2006 P1 and the Great Comet of 2007, was the brightest comet in more than 40 years. It still looked great in a twilight sky January 18, 2007, six days after perihelion. How will Comet PANSTARRS compare? MARTIN MOLINE

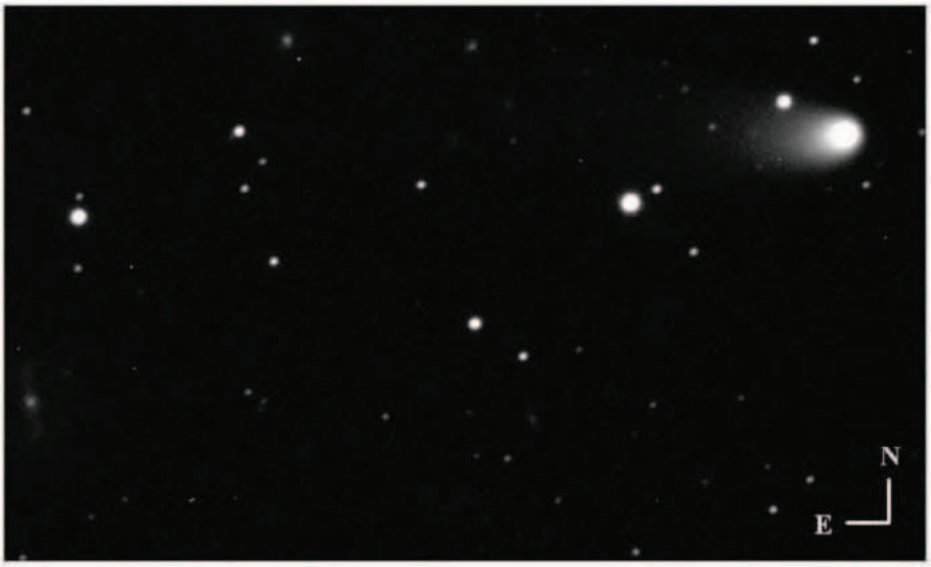
sets only 15 minutes after the Sun from mid-northern latitudes.

Five days later, on March 10 (Universal Time — it still will be the evening of the 9th in North America), C/2011 L4 arrives at perihelion (its closest approach to the Sun). At a distance of only slightly more than 0.3 AU from our daytime star, this is when the comet should appear most brilliant. The current estimate for its total brightness is magnitude –1.0, but it could be somewhat fainter — or brighter.

On the 10th, Comet PANSTARRS also sets later than it did at perigee. Because it stands 15° due east of the Sun, we'll have a whole hour to spot it low in the west after sunset. That pretty much guarantees that you'll be able to see it from any location with reasonably clear skies and an unobstructed western horizon. And there's the potential for more. If your site is dark, once the comet's head sets, you still may be able to see the tail arcing among the stars that lie above the western horizon.

And that's not all. New Moon occurs March 11, so light from our nearest natural satellite won't dilute Comet PANSTARRS' appearance when it's at its brightest.

After perihelion, the comet fades as quickly as it brightened. By April 19, it shines at 5th magnitude — still bright for a comet but a shadow of its former glory — having lost a full magnitude approximately every five days. Between then and July 1, the comet dims to magnitude 11, but its dark-sky presence will be better as its distance from the Sun increases to nearly 80°.



This image of Comet PANSTARRS taken remotely September 10, 2012, through the 2-meter Faulkes Telescope South shows a discernible tail. The imagers combined four 30-second red-filtered exposures. The barred spiral galaxy at far left is magnitude 15.8 PGC 53700. K. ROCHOWICZ/E. GUIDO/N. HOWES/G. SOSTERO

The best is yet to come

C/2011 L4 (PANSTARRS) should prove to be a fine sight for both casual observers and amateur astronomers, well worth observing and imaging throughout its path. But as bright as it might be, it's just the warm-up act for the headliner late in the year. That's when C/2012 S1 (ISON) should dazzle us. According to current predictions, Comet ISON will be 10,000 times as bright as Comet PANSTARRS. Now that's a holiday gift worth unwrapping!