

- [Home](#)
- [Blog » »](#)
- [Projects » »](#)
- [Chuck Stuff » »](#)
- [Contact](#)

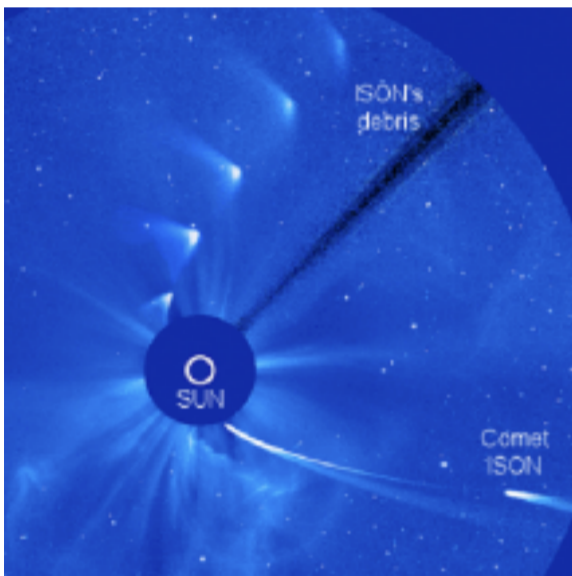
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[Home](#) > [Blog](#) > Comet ISON Afterlife

Blog

Comet ISON Afterlife

Posted by admin on December 4, 2013



Ever since icy Comet ISON emerged from the depths of the solar system, it has surprised the astronomy community with its temperamental behavior. In an era when amateur astronomers and professionals alike can readily weigh in on the debate of a comet's composition and character, each can produce valuable and valid evidence for the dialogue. While reports of Comet ISON's demise have been repeatedly countered by the spunky visitor's actions, astronomers continue to extract understanding from more (or even lack of) data from spacecraft. Is Comet ISON "mostly dead"? It's a great realm in which to make predictions.

Comet ISON approaches the sun from the bottom right, has an apocalyptic experience as it rounds the sun, and heads upward in the field of view of the SOHO spacecraft.

Inbound Comet

Astronomers are in the business of making predictions. Not the predictions of horoscopes and pseudoscience, but of the movements and behavior of celestial objects based on past observations, interpretations of evidence, and rigorous challenge. When Comet ISON came along, the stage was set for a display of science in action.

Here was a virgin comet from the Oort Cloud--an apparent reservoir of comet nuclei that are remnants from the early formation of the solar system, vastly far from the sun. If earth were one pace from the sun (one Astronomical Unit), and Jupiter was 5 paces, Saturn was 10 paces, and Neptune about 30 paces, then to get to the Oort Cloud you'd have to walk maybe a couple of days. And this comet was going to be a sungrazer, dashing dangerously close to the searing heat and unrelenting forces of the sun. Fewer than a million miles, or about one solar diameter from its surface. The Oort Cloud/active sungrazer combination probably has [not been witnessed in centuries](#). Yet we would be fortunate enough to see it with digital cameras and an armada of modern spacecraft repurposed temporarily to catch it like a speedster tripped up by a radar gun.

In early 2013, the record of Comet ISON started to grow, along with predictions of its eventual brightness. Mid-summer the comet became obscured by the intervening sun, and reports of a dimming nucleus put the prediction factory in overtime. All summer we waited for ISON to re-emerge.

For awhile it wasn't holding up as well as expected. At the CIOC website there was a [graph showing a peaking curve](#) of what an ideal comet would look like, and dots of reality from observers weren't quite pegging along it. An amateur like me might not know exactly what $n=1$ or $af(\rho)$ values meant, but it was clear the comet was underperforming by some measure.

Late in the game, Comet ISON had some upticks in brightness, too. Maybe there had been a disconnection event, or maybe it was starting to break up, some astronomers proffered. Regardless, all along its trajectory were calm heads saying wait and see. Comets are fickle, and ISON was [behaving like a comet](#).

Day of Reckoning

On November 28, 2013, which was Thanksgiving Day in the United States, Comet ISON made its closest approach to the sun. Because of its proximity to the sun, amateur astronomers had to abandon ground-based observations in the week preceding perihelion. Again, predictions were in high gear. Would ISON survive? Personally, a suggestion by a Hubble scientist gave me hope, but then the opinions of newly discovered (to me) astronomers gave me reason to doubt the comet's likelihood of being around to see in December.

Once again, spacecraft were to provide the front row seat to watch Comet ISON's fate. The intrepid SOHO spacecraft, the amazing Solar Dynamics Observatory, and the STEREO pair of spaceborne imagers led the way. It was a good day to be a taxpayer watching your dollars at work.

SOHO and STEREO-A clearly showed the inbound comet brightening, with "blooming" of the comet's apparent head as the excessive photons spilled over onto adjacent pixels on the detector. Woohoo, it's showtime! See a [great video of STEREO-A imagery](#) and other sequences compiled by [Emily Lakdawalla](#)



Then, just before perihelion, the pattern reversed and Comet ISON started to wane. The predictors of doom were watching the realization of their expectations. Comet ISON was in the throes of annihilation by the sun.

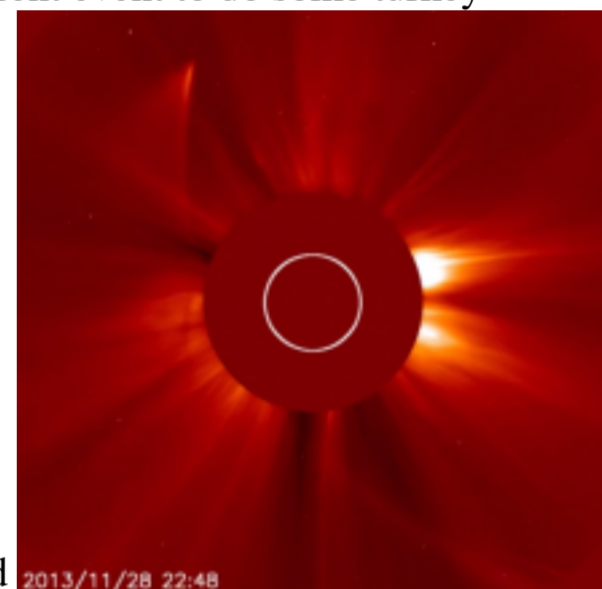
On the [Comet Festival website](#), I had clearly highlighted the Solar Dynamics Observatory (SDO) images at perihelion to be the target of choice. Gather friends and family around the...computer, I said. This is it. A [live Google+ Hangout by a NASA team](#) brought a bundle of cred and emotion to the gathering. Meanwhile, I had over two dozen family members at my house waiting for some turkey to be cooked. And when the SDO was moved onto its targeted field of view and settled, and perihelion came, the SDO saw...nothing.



There was no image of any comet to be seen, as discerned by perhaps the greatest solar telescope ever made. Actually, the spacecraft wasn't going to image the comet itself, but was expected to detect the debris as it adjusts from being cold to extremely hot. As I understand it, the SDO is tuned to pick up a signature of ionized oxygen, so it didn't matter whether the comet was intact.

If nothing else, this is a cool development. Sure, it may mean Comet ISON is history, or it could mean that we had to change our understanding of what to expect of a comet. It's like dialing into a number on a radio dial and getting nothing, when just a few digits away is the bounty of orchestral music we had been seeking. Maybe ISON was in the field of view but not detected where our limited sample of Oort Cloud/active sungrazer comets suggested it should be. But then I had to break from the current event to do some turkey preparations.

This was a serious uh-oh moment. Was this frozen turkey that had rounded the sun now a burnt carcass? Would it emerge again, or was it completely cremated? The next time I checked my computer, reports were coming in that disputed the early demise of ISON. I posted in the [Comet Festival Facebook page](#), "ISON may be like Mark Twain, in which the report of its death may be an exaggeration. Stay tuned." Comet ISON was at it again, like a frustrating juvenile delinquent that you still love. Yes, I was emotionally attached and had personified a frozen chunk of crud from the early solar system.



Death Knell

Obviously some iteration of Comet ISON was swinging around on the approximate trajectory that I had seen illustrated a hundred times before. It seemed spread out and diffuse (keep in mind [Emily's insight](#) on phase angle), but Comet ISON had clearly suffered. I'm no expert, but the spacecraft images sure seemed to suggest this wasn't going to be a stunning apparition in the morning sky. Comet ISON was tanking in brightness, and moving away from the sun's most intensive realm. If it could only hold on for a little bit longer.

At some point my naive optimism had to concede things weren't looking good for Comet ISON. Maybe it would have some potential for a later outburst, for I had seen Comet Holmes brighten surprisingly when I heard reports of its bizarre behavior. When Karl Battams posted his tongue-in-cheek [In Memoriam](#) to Comet ISON on the [NASA Comet ISON Observing Campaign \(CIOC\) blog](#), and when some more of those newfound (to me) astronomers who I had come to respect in the previous year started to echo his sentiments, I knew hopes of an icy phoenix were dim.

Ghost of a Comet

One of my favorite components of the Comet Festival was a scheduled series of [Google Hangouts with astronomers](#). Our guests were truly talented astronomers who were giving their time to support our local program in particular and the general population in, well, in general. During the third Hangout, which I had dubbed *Eulogy for a Comet*, on the NASA CIOC Facebook page a new video was making news.

It seems the STEREO HI1-A was showing a [comet-looking feature moving outward](#) from the sun. Of course, this was a dim object that the sensitive cameras processed to look bright. The point, though, was a recurring surprise--had Comet ISON again defied the astronomers who too early wrote of Comet ISON as deceased?

Thankfully, Karl Battams had stated upfront that this was not the last word on Comet ISON, and Padma Yanamandra-Fisher did a fine job on the Hangout and on the CIOC Facebook page discerning the difference between dead comets and extinct comets. Perhaps this is all an issue of nomenclature, but everyone agreed that ISON had been cataclysmically altered and that we were likely seeing a poof of the former comet from which we had at one time such great expectations. I'm just going to call it the ghost of Comet ISON for now. In the Hangout, Pamela Gay dubbed it cometary purgatory.

In raising the issue, though, contributor to the CIOC dialogue Dan Fischer invoked his colleagues to do once again what science calls of them--make a prediction. He writes, "Quantitative calculations and predictions of what the situation will be one week from now, please! (Knowing that 'prediction' and 'ISON' should never be used in the same sentence.)"

I don't care what you may say of Comet ISON's visual spectacle, it has been one heck of a comet.

When I told my daughter of the latest discussion on Comet ISON's existence, we took a 2013 perspective on it and laughed over two snippets from pop culture that add their own spin to Comet ISON's fate:

- Might Comet ISON "be okay?" ([Scene from Groundhog Day.](#))
- Is Comet ISON "mostly dead?" ([Scene from The Princess Bride.](#))



[« Previous](#)

[Next »](#)

▶ 2014

▼ 2013

▼ December

[Comet ISON Afterlife](#)

▶ November

▶ September

▶ August

▶ July

▶ May

▶ April

▶ March

▶ February

▶ January

▶ 2012

Tags



