The fading light of a flaring young star has shed light on a puzzle involving crystals and comets…	*Excerpt from animatoin*
[Titles]	*Opening titles*
For the most part, the universe changes very slowly compared to, well, us. The stars appear much the same today as they did to our ancestors.	*Host (wide)* *Bkg: starfield*
So it's a rare treat when astronomers actually catch a star "in the act" of doing something unexpected, especially when it helps solve a long-standing puzzle.	*Host (CU)*
The star of this special event is about 500 light years away and known as EX Lupi. It's probably a close match to what our own Sun was like in its infancy almost 5 billion years ago.	*Host (wide)* *Infogfx with title, distance, stats*
Early in 2008 it flared dramatically in brightness, due to material from its disk falling onto the central star. The star's brightness increased by a factor of 100, heating the disk far from the star. It appears that tiny dust particles far out in the disk melted slightly, or annealed. As they cooled they took on a new crystalline structure. This is the first time astronomers have ever caught crystals in the act of forming in a circumstellar disk.	*Release animation*
So how is it possible to detect such tiny crystals around a star that's so far away?	*Host (CU)*

Well, dust is a specialty of NASA's Spitzer Space Telescope. Not only has Spitzer shown that dusty disks are common around young stars, its infrared spectrograph also allows us to study their compositions.	*Spitzer Beauty shot*
By splitting up its light into a spectrum, astronomers can look for unique features, like spectral fingerprints, that correspond to specific minerals. This first observation of EX Lupi was made in 2005 and shows the signature of silicate minerals, pretty typical for dust.	*Host (wide)* *Spectrum plot*
A second spectrum of this star taken about 3 years later in 2008 shows a subtle but remarkable change. The extra bump comes from tiny olivine crystals mixed in with the dust, crystals that weren't there before.	*Spectrum plot highlighting new feature*
These crystals are a form of the mineral olivine, known as forsterite. Spitzer has seen this material in many places, surrounding young brown dwarfs too small to become stars as well as white dwarf remnants of long dead stars. It's even seen in the winds around supermassive black holes in the cores of distant galaxies.	*Sequence of animations of protostellar disks, AGN*
This discovery is remarkable because astronomers had never before witnessed such an ongoing chemical change in the disk around a young star. But it also solves a puzzle, not about distant stars and galaxies, but about comets in our own solar system.	*Host (CU)* *Bkg: comet*

On July 4th, 2005, NASA's Deep Impact probe smashed into the comet Tempel 1. Spitzer's spectrograph observed the plume of ejected material and found the comet contained the same kind of crystalline olivine.	*Deep Impact animation*
This seemed odd since comets come from far out in the cold recesses of the solar system. Crystalline olivine, however, will only form at high temperatures, presumably close to the young Sun. So how could these crystals end up inside comets from all the way out there?	*Host (wide)* *Bkg: Uniview rendering of outer to inner solar system*
The forsterite forged around EX Lupi could solve the puzzle. These brilliant flare-ups in EX Lupi, which may happen every few decades, will heat up more distant parts of the disk. This would form the crystals in areas that would otherwise be too cold. If our own Sun experienced similar flare-ups in its youth, it could explain how forsterite ended up in comets like Tempel 1.	*Repeat of animation, cut to Deep Impact sequence*
Sometimes a small wiggle in a spectrum plot can tell a big story to the scientists who know how to read it. And sometimes a discovery around a distant young star can tell us a lot about what's happening in our own astronomical back yard.	*Host (wide)* *Bkg: spectrum*
For the Spitzer Science Center I'm Dr. Robert Hurt, reminding you that there's a hidden universe just waiting to be discovered.	*Host (CU)*