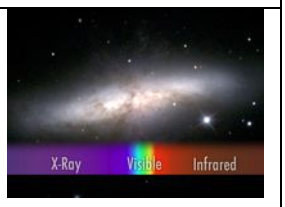
The Hidden Universe of the Spitzer Space Telescope

Episode 2: Exposing the Exploding Cigar Galaxy

It's been called an exploding galaxy, and three of NASA's Great Observatories have teamed up to show it like it's never been seen before.	
This is the Hidden Universe of the Spitzer Space Telescope, exploring the mysteries of infrared astronomy with your host Dr. Robert Hurt.	
Sigmund Freud once protested that sometimes a cigar is just a cigar. However, astronomers studying the so-called "Cigar Galaxy," have discovered there's much more going on than meets the eye. That's why they've looked beyond just visible light to understand this galactic oddity…	
The Cigar Galaxy, more commonly known as M82, lies in the northern skies in the constellation of Ursa Major. It's about 12 million light years away… not exactly a next-door neighbor, but pretty close as galaxies go. And while it does look a bit like a cigar, it's actually shaped like a disk. We're just seeing it edge-on.	
Our exploration starts with the Hubble Space Telescope. It celebrated its 16th anniversary by releasing a dramatic new image of M82. This picture reveals in extraordinary detail what we can see in visible light. Dark dust lanes block our view of the star-filled disk, and unusual filaments of hot hydrogen gas extend far above and below the disk. But what's causing this gassy fireworks display?	
The Chandra X-Ray observatory, working at the high energy end of the spectrum, helps answer this question. These X-rays originate from million degree gas in M82, heated by violent star-forming activity known as a "starburst." Here in a tiny region in the galaxy's core, stars are forming ten times faster than within our entire Milky Way galaxy combined. Giant stars are exploding as supernovas every twenty years or so. These blasts drive out the hot gas in geyser-like flows moving at millions of miles an hour.	

At the other end of the light spectrum, the infrared eye of the Spitzer Space Telescope adds a surprising new discovery. At shorter infrared wavelengths the starlight from M82 shines clearly through the dust. We can see all the way into its central starburst. The real surprise is the huge ***dust*** halo seen at longer wavelengths. It's over 20,000 light years across and is the brightest ever seen around a galaxy. This dust is made of organic compounds similar to those found in car exhaust or on a barbeque grill… the cigar is indeed smoking! And its smoke reveals the same elements that make up planets, and even people, may be escaping into intergalactic space along with the gas.	
So what causes a nice galaxy to blow it's top? It may be due to a dust-up with its neighbor. Not far from M82 is its companion galaxy M81. It's pretty normal as galaxies go, with regular spiral arms.	
Spitzer's infrared view shows its red-tinted dust lies in orderly lanes along the spiral arms, not in a chaotic halo like M82.	
Astronomers think that half a billion years ago, these two galaxies had a "close encounter." The gravitational tides were much harsher on M82, disrupting it and creating its starburst.	
When we combine the x-ray, visible, and infrared views from Chandra, Hubble, and Spitzer, we see this tortured galaxy in a way the human eye never could. Starlight glows in yellow-green, the hot gas is blue and the smoky dust is red. This Great Observatory composite of M82 reveals at a glance this complex starburst galaxy and the materials it's recycling back into the universe.	
The Hidden Universe is produced by the Spitzer Science Center at the California Institute of Technology in Pasadena. The Spitzer mission is managed by NASA's Jet Propulsion Laboratory.