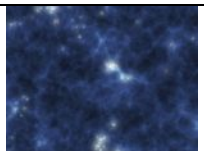
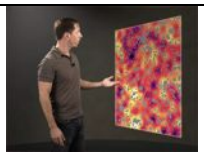
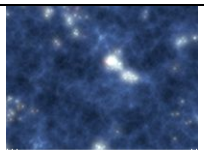
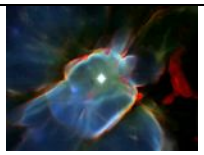
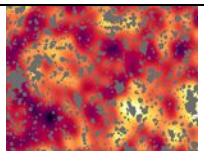
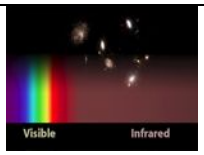
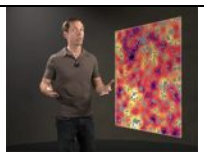
Hidden Universe #5: Seeing the First Light	
Astronomers peering deeply into the cosmos think they have found something remarkable… the light from the first objects to form after the universe was born!	
This is the Hidden Universe of the Spitzer Space Telescope, exploring the mysteries of infrared astronomy with your host, Dr. Robert Hurt.	
Do you think it's possible to get something from almost nothing? Dr. Sasha Kashlinsky of NASA's Goddard Spaceflight Center thinks you can. He and his team have stared deeply into the backgrounds of images from the Spitzer Space Telescope, in between all the obvious stars and galaxies. And what they've seen may be the first objects in the Universe! According to the Big Bang theory, everything in our universe burst into being in a tremendous explosion about 13.7 billion years ago. This includes not only matter and energy, but space and time as well!	
The initial afterglow soon faded and the expanding universe was filled with cooling gas clouds of hydrogen and helium. During these "dark ages" gravity slowly pulled the gas into filaments and clumps. After about 400 million years the densest regions lit up with the very first generation of stars.	
"…if the first population of stars were very massive, unlike anything we see today, and it is thought on theoretical grounds that this is what they should have been, they should have produced enough light, with enough structure, that would be measurable in measurements such as what we have done here."	
Such stars would have been brilliant and huge, maybe as much as 1,000 times the mass of our sun. Their nuclear furnaces forged the very first heavy elements in the universe. Supernova explosions recycled these new materials back into space giving later generations of stars the building blocks for making planets, and even people.	
To look for this first population of stars, Dr. Kashlinsky and his team used a series of very deep exposures from the Spitzer Space Telescope, which stared at these small patches of sky for many long hours.	
"So we took deep images and eliminated foreground galaxies and we could see this glow produced by objects that could not be observed in normal telescopes. These are the very first and very early populations in the universe that we cannot see by any other means."	

Because this light has traveled for so long and so far across our expanding universe, it cannot be detected with visible light telescopes. The original ultraviolet and visible light photons have been redshifted into the infrared part of the spectrum that Spitzer was designed to study.	
These distant objects are so tiny and faint that they can't be seen individually, so astronomers actually blur the images. This brings out the combined light patterns that provide clues about these mysterious objects. It's like looking at fuzzy pictures of fireworks and figuring out what the sparks are like.	
"So we know these sparks had to be individually faint, faint meaning they had to be at individually large distances from us. And when we reasonably assign distances to them we place them well within the first billion years of the Universe's evolution, which is when the first objects had to form."	
Kashlinsky's team initially reported this result in late 2005 after studying a single patch of sky. But if you're making a claim that applies to the whole universe you need to make sure the result is the same everywhere! Now they've studied five different areas and the results have all matched.	
Interestingly, this was a very efficient use of Spitzer's time. Kashlinsky's team "scientifically recycled" images that were already available from other research projects.	
"So we essentially used what others did not use. Our signal was what others were not interested in."	
It's difficult to determine exactly what generated this diffuse infrared background light. Astronomers believe it could be coming from the first generation of massive stars, or perhaps from superheated gas that is falling into ancient black holes.	
Either way they hint at the beginnings of galaxy formation that eventually led to the Milky Way. But for more answers we may have to wait for upcoming missions like the James Webb Space Telescope, designed to study this early era in greater detail. For the Spitzer Science Center, I'm Dr. Robert Hurt.