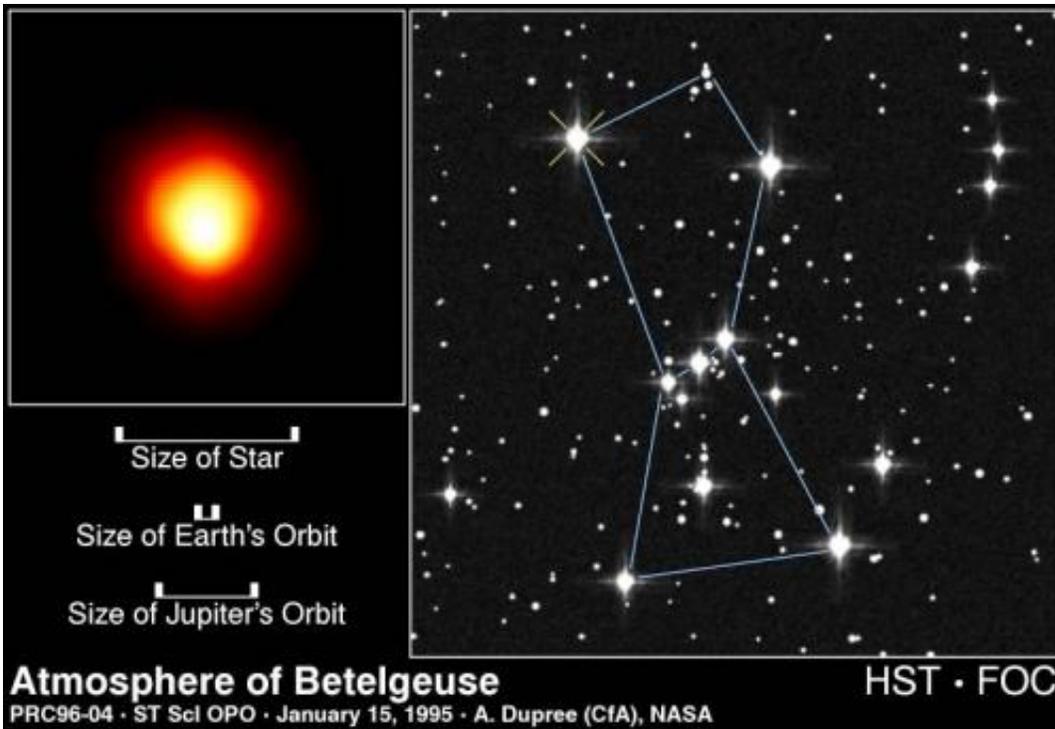


What's happening in the universe right now?

January 30 2015, by Fraser Cain



Betelgeuse, as seen by the Hubble Space Telescope.

There are some topics that get a little frustrating in their pedantry, but can really draw attention to the grand scope and mechanics in our Universe. This is definitely one of them.

We know looking through a telescope is like looking into the past, both out from and towards our Earth. We know if alien ships were looking at the Earth right this moment from distant star systems they'd could well

be watching dinosaurs chomping on each other's adorable little faces.

So how do we know what's actually going on right now in other parts of the Universe? No matter how close together, the real challenge of defining "now" simultaneously for two different spots in the Universe is that these points are always separated by a bit of distance. Since nothing can travel faster than light, it will always take a some time for an indicator that an event has "happened" to reach you.

So, on the small scale. If your friend 3 meters away from you says "Enterprise was a terrible show" right "now", it will still take about 10 nanoseconds for the light of your friend to reach you. It will take about 8 milliseconds for the sound of your friend's voice to reach you. Shortly thereafter you'll decide to slap your friend, because seriously who needs that kind of negativity. You might say that is close enough to be the same "now". As in "I slapped my friend just now, because he said something stupid".

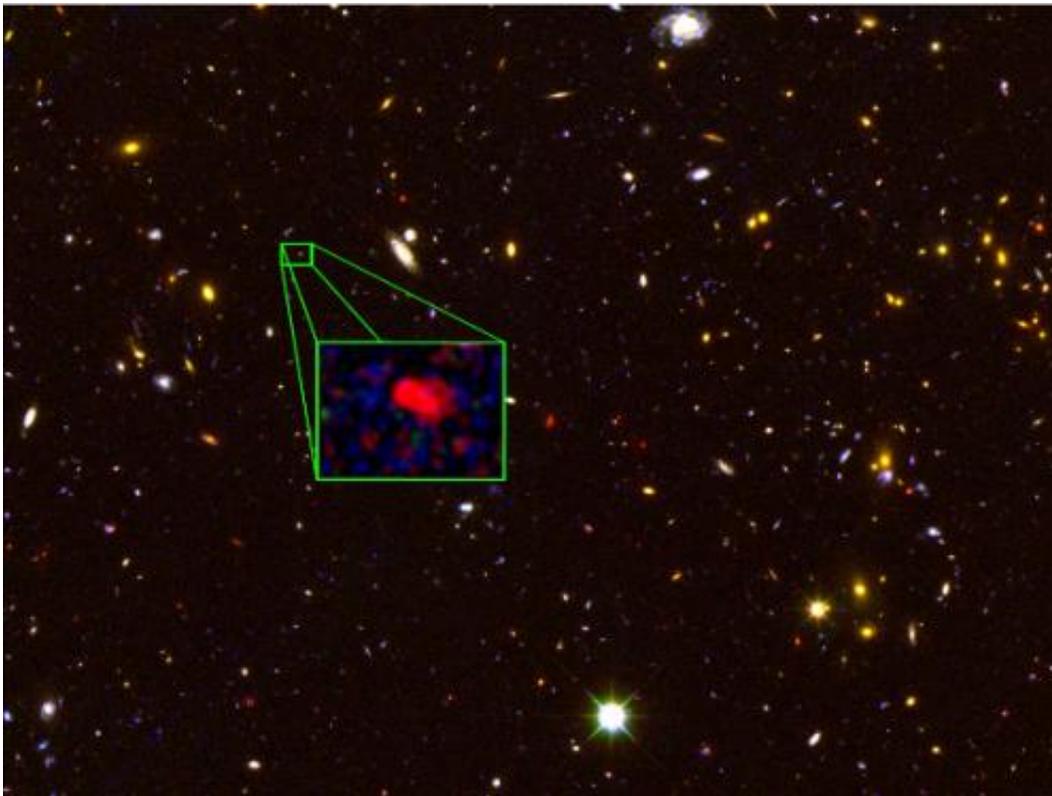
For how our brains perceive time, and the relative length of our lifespans, you probably can get away with it, because sure, that's "now". We can consider a moment to occupy a span to encompass all these events. Although, you shouldn't slap your friends. Even if they say mean things, and really didn't give it a chance. You're lucky your friend won't have to wait too long to hear an apology from you as milliseconds after you say you're sorry, they'll hear you. Which, for our purposes, would be "right now".

Over larger distances this doesn't quite work as well. If you looked up in the sky and saw Betelgeuse become a [supernova](#), would you argue that it is happening now? Some people might say yes. Until you know about an event, you can't say it is happening. So, "Hey look, that star is going supernova right now" is what your brain might think. You received an indicator the event is beginning to happen, which for our purposes

indicates it just started "now".

Except, as one of our viewers, you're way too smart for that. You would argue that since Betelgeuse is 640 light years away, the supernova actually happened 640 years ago, and it's just taken that long for the light to reach us. We're all good so far, as soon as I started talking about light years, you knew what was going on. It looks like it just happened now, but we're aware that's not the case. It happened before, we're only aware it's happening now.

Here is where it gets weird. The most [distant galaxy](#) yet discovered is z8 GND 5296. It's 3.4 billion light years away. If we happened to observe a supernova in that distant galaxy, when would we say it happened? Obviously it's not "just now".



Galaxy z8_GND_5296 (seen in the inset) is the earliest galaxy that astronomers

have measured the distance to accurately. It formed approximately 700 million years after the Big Bang, and is forming stars at an incredibly rapid rate. Credit: V. Tilvi (Texas A&M), S. Finkelstein (UT Austin), the CANDELS team, and HST/NASA

When the light we currently observe left that galaxy, it was about 3.4 billion [light years](#) away. So should we say it happened 3.4 billion years ago? Sure sounds reasonable based on our Betelgeuse example. However, since our Universe has been expanding, it actually took the light 13.1 billion years to reach us. So we could say it happened 13.1 billion years ago.

Which one do we use? The real catch is that there is no cosmic definition of "now" in the Universe. Because of special relativity, the rate at which time flows for a particular object depends upon your point of view and your velocity. For a rocket travelling near the speed of [light](#), a journey to Alpha Centauri might take a week. For us it would seem like 4 years. As a result of relativity, even the meaning of "simultaneous" is relative to your point of view.

The answer to what is happening now, is "it depends". It depends on your frame of reference, and how flexible your attitudes about "now" are, what constitutes a moment, and quite probably how long lived your species is. I'm sure Jack Harkness and the night eternal Face Of Boe would give very different answers, well at least, depending on when you asked them.

Source: [Universe Today](#)

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