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Amid Cosmic Fatigue, Scarcely a Star Is Born

By DENNIS OVERBYE

It's evening in the universe.

The stars we have are dying, and we're not making new ones the way we used to. A group of British and American astronomers recently reported that the birthrate of stars in the universe has declined precipitously and continuously over the last 11 billion years.

The universe today is only producing stars one-thirtieth as fast as it was at its peak in the lusty primordial days when protogalaxies, all gas and spume, were bouncing around like pups in a closet, colliding and merging, popping with blazing bright new stars.

In a news release issued by the Royal Astronomical Society, the astronomer David Sobral of Leiden University in the Netherlands said, "You might say that the universe has been suffering from a long, serious crisis: cosmic G.D.P. output is now only 3 percent of what it used to be at the peak in star production." Dr. Sobral and his colleagues published their paper in the Monthly Notices of the Royal Astronomical Society.

They calculated that the current consolidation rate of "starstuff" into stars amounts to about a half a trillion tons per year per cubic light-year. The Sun is about 2,000 trillion trillion tons.

In a fundamental sense, this cosmic fatigue is not really new. Other surveys, including one led by the aptly named Alan Heavens of the University of Edinburgh a few years ago, have come to similar conclusions. But one detail of this new study hit me.

Dr. Sobral and his colleagues said that if this decline in breeding goes on, it means the universe has already made 95 percent of the star mass that it will ever make. As eternity goes on — and on and on — the cosmos, like Palm Springs, will be dominated by older and older stars.

There is no cause for immediate alarm. Stars live for millions or billions of years, depending on their masses; the biggest burn out quickly, while the smaller ones can limp on as red

dwarfs for a trillion years or more. The Sun, a middle-size and middle-aged star, has another 5 billion years or so to go.

Our own Milky Way galaxy, moreover, is still busily hatching stars out of dense gas clouds in places like the Eagle Nebula, home of the famous Pillars of Creation. If you ever agonized about missing out on Paris in the 1920s or Italy in the Renaissance, at least you can take comfort that we live in the Golden Age of the Milky Way.

To paraphrase Bob Dylan, it's not dark yet, but it's getting there.

The news brought me back to the darkening days of November in the Catskills, where I used to live. When the woods suddenly become lighter and more transparent because branches are bare, the sun slants off silvery tree trunks. The ground is luminous, carpeted with red and gold leaves that are about to be buried in snow.

The notion that 95 percent of the stars that will ever shine have already shone reminded me that I had once read that 6 percent of all the humans that have ever lived are alive today. The latter statistic is a consequence of the exponential growth of the human race (and, if it keeps growing, could eventually create problems for the idea of reincarnation).

You might not think it has anything to do with the stars. But philosophers and cosmologists have wondered if there is an answer to the question of why we live where and when we do.

The cartoon history that they would like to tell goes like this: Coming out of the Big Bang 13.7 billion years ago, the universe consisted of hydrogen and helium and a little lithium. Our bodies are made of oxygen, carbon, nitrogen and iron that had to be synthesized in thermonuclear reactions in successive generations of stars that went bang and seeded space and future stars with heavier elements.

That took time. The Milky Way was born near the height of the star baby boom, about 10 billion years ago. The Sun and solar system, with its heady mix of life-ready elements, came into being 4.5 billion years ago. It took evolution another 3.8 billion years to make us, the putative princelings of the cosmos. Could it all have happened faster to someone else some place else? Nobody knows.

Nobody knows for sure, either, why cosmic star production has slowed down, the astronomers say.

In recent years, they have found evidence that some of the more violent denizens of the

modern cosmos, like giant black holes and supernova explosions, can create powerful winds that blow the gas out of galaxies, preventing it from condensing into stars. One black hole in the galaxy NGC 1275 was found to be "singing," or belching pressure waves, to the tune of a B flat 57 octaves below middle C, thus squelching star formation over much of the entire Perseus cluster — hundreds of galaxies.

Some theorists, notably Freeman Dyson of the Institute for Advanced Study in Princeton, have suggested ways that life could go on past the twilight of the stars, by extracting energy from black holes, for example. But that was before astronomers discovered that dark energy — what appears to be a sort of cosmic antigravity — is speeding up the expansion of the universe.

If this continues, the future is really dark. Eventually the universe will be expanding so fast that most other galaxies will disappear from view forever. Eventually even atoms could be ripped apart.

Time for bed.

Sometimes the universe seems to me like one of those black-humored toys: a box with a button. When you push the button, a hand comes out 14 billion years later and turns the button off.

This article has been revised to reflect the following correction:

Correction: November 21, 2012

An article on Tuesday about the birthrate of stars in the universe misstated the sound made by pressure waves coming out of a black hole in the galaxy NGC 1275. The sound is that of a B flat 57 octaves below middle C, not 27 octaves.

This article has been revised to reflect the following correction:

Correction: November 21, 2012

An earlier version of this article misstated the rate of star production in the universe today. The current consolidation rate of "starstuff" into stars is about a million tons per minute per cubic light-year, or half a trillion tons per year per cubic light-year. It is not a million tons per year per cubic light-year.