

# My Grandson The Rock

by Robert Krulwich  
November 11, 2010

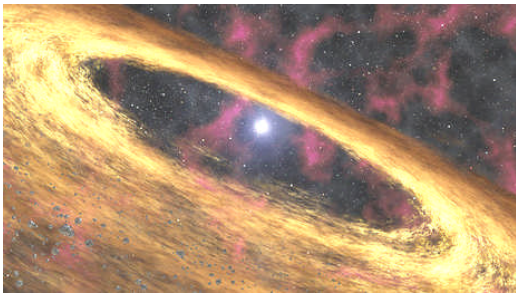
Audio for this story from NPR Morning Edition will be available at approx. 9:00 a.m. ET

Rocks aren't alive. Life is.

So think of them as separate. Rocks over here; life over there.

Then along come Robert Hazen and his colleagues with their study, "Mineral Evolution," published in the *American Mineralogist* and all of a sudden categories shatter. I'm amazed. I hadn't thought of this, even remotely.

Here's what they found:



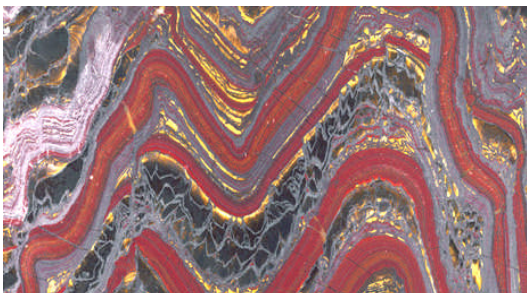
What the bits and pieces of a star might look like after a supernova.

When Professor Hazen tells the story of how minerals formed in the universe, he begins 13 plus billion years ago with a burst of energy, then a cooling, then gravity takes over and we get stars.

Eventually a few of those stars blow up — that's how some stars die — and in a blaze of intense heat, we get the first 12 or so minerals: atoms forged by starbursts. Carbon, nitrogen, silicon, iron all come from stars. Dr. Hazen says the universe's original minerals include (and this is kind of cool) diamonds, as in *Lucy in the Sky With...* teeny bits of diamond dust floating in deep space.

Then gravity keeps on pulling dust together, forming asteroids. Those asteroids collide, baby planets form, then bigger planets, then planets with volcanoes and planets with plate tectonics that pull rocks on the surface down under, melting them, freezing them. Then water appears and trillions of drips later, rocks have water molecules locked inside them and if you stop there, 10 billion years after creation, and count all the minerals that have evolved, the number has grown from the original 12 to about 1,500. That's 1,500 different ways to organize atoms into topaz and feldspar and clay and iron and all those words that end in "ite."

Not a bad number, 1,500.



At more than 3 billion years old, this formation is one of the oldest rocks on the planet.

Now comes the surprise. About 3.5 billion years ago, here on our planet, life began. No one knows how, people argue about why, but one would think the presence of life would be a ho-hum for the minerals. They're rocks. What do they care?

But life is a great sculptor. One very early form of pond scum figured out how to exhale oxygen into the air, and soon (well, not THAT soon, but soon enough) our atmosphere had enough oxygen to create rust, to combine with organic chemicals to make creatures with shells and bones and those creatures died and became rocks. What is coral but a clump of dead skeletons? Look at the White Cliffs of Dover — that's a heap of dead plankton.



Some very white cliffs!

Life is such a changeling, it created plants with roots that can rip rocks apart (slowly, but that's what they do) and worms that can ingest rocks and break them into soil. So let's step back and ask, how many new minerals have been created by living things on Earth?

Remember we start with 1,500 minerals before life.

After life, the number jumps to 4,500.

Life begets rocks! Whoa!

We all know that living things need minerals. When you eat a raisin, you are putting iron in your blood. We drink milk to put calcium in our bones. So we need minerals. What I didn't know is that minerals, in some sense, need us. The presence of life on Earth nearly tripled the rock population.

In our broadcast, (click the "Listen" button above to hear our dramatic version of this story), Professor Hazen says: "This is it. It's the coevolution of life and rocks. Rocks make life. Life makes rocks."

Of course this makes sense. We are, during our four score and twenty, a delicate package of water, organic chemistry and minerals held together, perhaps, by something like will. Then, when we die, we go ashes to ashes back into the ground and become minerals again until those same minerals get reorganized into plants, which get eaten by a cow that gets made into a Whamburger that gets eaten by a child who goes out and throws a Frisbee. I guess it's no surprise the two sides dance with each other.

I just didn't realize that the more life there is, the more rocks there are. Who knew? When you think about it, it seems so beautiful.

---

Special thanks to Chris Impey of Arizona State University who mentions Bob Hazen's study in his new book *How It Ends: From You To The Universe*, (Norton, 2010). That's how I found out about it.