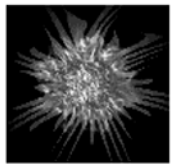
What is Your Cosmic Connection to the Elements?

Note to the Teacher

Additional Resources

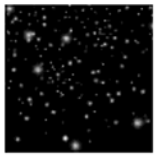
Acknowledgements

Big Bang



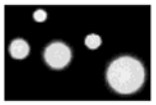
The Big Bang created all the matter and energy in the Universe. Most of the hydrogen and helium in the Universe were created in the moments after the Big Bang. Heavier elements came later.

Small Stars



Small stars fuse hydrogen into helium, and then fuse helium into carbon, nitrogen, and oxygen. These last three elements make up the air we breathe and more than 85% of our body weight.

Large Stars



Large stars fuse heavy elements as well as light elements. For example, large stars create the calcium in your bones and the iron in your blood, the silicon in the soil, and the sulfur that's in your hair.

Grandma's Apple Pie

STUDENT HANDOUT

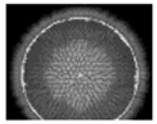
Introduction

Scientists have been studying the origins of the universe for much of history. Our recent classroom study has focused on this, by taking a critical look at the origins and 'life cycle' of matter. This problem is designed to give you the opportunity to showcase what you know about where we came from.

Carl Sagan is quoted as saying that, 'To make an apple pie from scratch you must first invent the universe.' Your group's problem is to create a presentation that illustrates the meaning of this statement. You will pick an element that can be found in good old American apple pie and trace its evolutionary history back to the birth of the universe itself. You will also share your vision of the environment in which that element may find itself 5 or so billion years from now after the Earth is long gone. Your discussion should address briefly the constant recycling of elements here on earth, as well as the formation of elements in the cores of active stars and supernovae. You must describe the way in which these elements were dispersed from the star through space and ultimately to the Earth. Both your tracing of the element back through time and your creative vision of that element in the future should show a solid understanding of the 'life cycle' of matter. Each presentation should also include an artistic element – an original song, an illustration, a poem, a video, etc. that better explains the scientific concepts you are trying to illustrate.

Problem Limitations

Supernovae



The explosive power of supernovae creates and disperses a wide range of elements. For example, the chlorophyll in green plants contains magnesium from supernovae. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae.

Cosmic Rays

The nuclei of the elements formed in the big bang, stars, and supernovae rain down on us from space in the form of cosmic rays. Lithium, used in watch batteries, comes primarily from cosmic rays.

NASA Resources for Educators