What is Your Cosmic Connection to the Elements?

About the Poster

This poster illustrates the cosmic processes and events which give rise to the chemical elements. Each of the processes — the Big Bang, fusion in small and large stars, supernovae, and fragmentation by cosmic rays — forms the elements in our bodies and all around us. The poster illustrates this by pointing out objects on or around the girl and identifying the primary element that comprises that object. We have included it. Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.

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 project is designed to give you the opportunity to showcase what you know about where we come from.

Assignment

Cari Sagan once said, “To make an apple pie from scratch you must first track the apple tree back to the birth of the universe.” Your group’s assignment is to create a presentation that illustrates the meaning of this statement. You will pick an element that illustrates the meaning of this statement. You will pick an element that comprises that object. These elements are then connected to the cosmic process that creates them. (Note that the colors of the elements correspond to the colors of the name of the cosmic processes.) The large-print panels on the back of the poster further describe the processes and events that create the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

May find itself 5 or so billion years from now after the Earth is long gone. 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.

Project Parameters

• Every member of the group must participate in the presentation or contribute to design of the artistic element.
• The group must address all parts of the assignment in their presentation.
• Each presentation should be less than 15 minutes in length.
• Each presentation must contain an artistic element that complements the material being discussed.
• Each presentation must show a solid understanding of the scientific concepts being discussed.

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 and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins — essential to life.

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 partly from cosmic rays.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyelash frames were formed in supernovae. Supernovae also provide the iron in your blood.

Additional Resources

See the “What is Your Cosmic Connection to the Elements?” Information & Activity Booklet for more detailed information and more classroom activities. Access the booklet and other resources at http://imagine.gsfc.nasa.gov/docs/teachers/elements/ where you may post them when you initially display the poster, or you may put them up one at a time after your oral discussion of a particular element. The classroom activity “Grandma’s Apple Pie” see the subject together for your students. A link to the “Grandma’s Apple Pie” activity, and additional classroom activities, may be found by following the accompanying information/activity booklet, and on the “Cosmic Elements” web site (see below).

Acknowledgements

This poster was created by the education team at the Lab for High Energy Astrophysics. NASA’s Goddard Space Flight Center, with original design and artwork by Karen Shra. Classroom activities were developed by the “ELEMENTS 2002 Teacher Workshops” participants. We thank Suzanne E. Kistler, NASA’s Goddard Space Flight Center, for guidance in the development of the activity, and Dr. Bob Cass, NASA’s Goddard Space Flight Center, for guidance in the development of the presentation. Please take a moment to evaluate this product at http://bit.ly/gsc-nasa-education-educational_evaluation

Note to the Teacher

This poster may be used to supplement your chemistry, earth science, physics, or astronomy classes. Refer to the panel “About the Poster” for a description of the imagery.

The large-print panels on the back may be copied and enlarged for the benefit of special education students. Use the poster to highlight how the processes relate to specific elements. You may post them when you initially display the poster or you may put them up one at a time after your oral discussion of a particular element. The classroom activity “Grandma’s Apple Pie” see the subject together for your students. A link to the “Grandma’s Apple Pie” activity, and additional classroom activities, may be found by following the accompanying information/activity booklet, and on the “Cosmic Elements” web site (see below).

The large-print panels on the back may be copied and enlarged for the benefit of special education students. Use the poster to highlight how the processes relate to specific elements. You may post them when you initially display the poster or you may put them up one at a time after your oral discussion of a particular element. The classroom activity “Grandma’s Apple Pie” see the subject together for your students. A link to the “Grandma’s Apple Pie” activity, and additional classroom activities, may be found by following the accompanying information/activity booklet, and on the “Cosmic Elements” web site (see below).

Grandma’s Apple Pie

STUDENT HANDBOOK

Introductions

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 project is designed to give you the opportunity to showcase what you know about where we come from.

Assignment

Cari Sagan once said, “To make an apple pie from scratch you must first track the apple tree back to the birth of the universe.” Your group’s assignment is to create a presentation that illustrates the meaning of this statement. You will pick an element that comprises that object. These elements are then connected to the cosmic process that creates them. (Note that the colors of the elements correspond to the colors of the name of the cosmic processes.) The large-print panels on the back of the poster further describe the processes and events that create the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

May find itself 5 or so billion years from now after the Earth is long gone. 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.

Project Parameters

• Every member of the group must participate in the presentation or contribute to design of the artistic element.
• The group must address all parts of the assignment in their presentation.
• Each presentation should be less than 15 minutes in length.
• Each presentation must contain an artistic element that complements the material being discussed.
• Each presentation must show a solid understanding of the scientific concepts being discussed.

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 and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins — essential to life.

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 partly from cosmic rays.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyelash frames were formed in supernovae. Supernovae also provide the iron in your blood.

About the Poster

This poster illustrates the cosmic processes and events which give rise to the chemical elements. Each of the processes — the Big Bang, fusion in small and large stars, supernovae, and fragmentation by cosmic rays — forms the elements in our bodies and all around us. The poster illustrates this by pointing out objects on or around the girl and identifying the primary element that comprises that object. These elements are then connected to the cosmic process that creates them. (Note that the colors of the elements correspond to the colors of the name of the cosmic processes.) The large-print panels on the back of the poster further describe the processes and events that create the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

May find itself 5 or so billion years from now after the Earth is long gone. 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.

Project Parameters

• Every member of the group must participate in the presentation or contribute to design of the artistic element.
• The group must address all parts of the assignment in their presentation.
• Each presentation should be less than 15 minutes in length.
• Each presentation must contain an artistic element that complements the material being discussed.
• Each presentation must show a solid understanding of the scientific concepts being discussed.
The environment in which that element must describe the way in which these of active stars and supernovae. You the formation of elements in the cores here on Earth, as well as briefly the constant recycling of apple pie and trace its evolutionary statement. You will pick an element that illustrates the meaning of this assignment is to create a presentation in the universe." Your group's scientists have been studying the origins of the universe for much of the material being discussed.

Supernovae

The explosive power supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

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 partly from cosmic rays.

What is Your Cosmic Connection to the Elements?

About the Poster

This poster illustrates the cosmo processes and events which give rise to the chemical elements. Each of the processes -- the Big Bang, fusion in small and large stars, supernovae, and fragmentation by cosmic rays -- form the elements in our bodies and all around us. The poster illustrates this by pointing out objects or events that created the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.

Introduction

Scientists have been studying the origins of the universe for much of the material being discussed.

Assignment

Carl Sagan once said, "To make an apple pie from scratch you must first know about where we come from. Cars and houses and fragmentation by cosmic rays – form the elements in our bodies and all around us. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.

Assignment

Carl Sagan once said, "To make an apple pie from scratch you must first know about where we come from. Cars and houses and fragmentation by cosmic rays – form the elements in our bodies and all around us. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.
The environment in which that element existed may have played a role in its formation. Elements were dispersed from the star and entered the nucleus of the Earth, where they were incorporated into the Earth's crust.

Assignments

About the Poster

This poster illustrates the process of element formation and the processes by which elements are dispersed from the star and incorporated into the Earth. The poster provides a comprehensive overview of the history of the universe, from the Big Bang to the present day, and includes a description of the processes by which elements are created.

Introduction

Scientists have been studying the origins of the universe for many years. In this essay, we will focus on the processes by which the elements in the universe were created.

Assignment

Cari Sagan once said, “To make an apple pie from scratch you must first look at the origins and “life cycle” of that element. This project is designed to give you the opportunity to showcase what you know about where we come from.”

Project Parameters

1. Each member of the group must participate in the presentation or contribute to the design of the artistic element.
2. The group must address all parts of the assignment in their presentation.
3. Each presentation should be less than 15 minutes in length.
4. Each presentation must contain an artistic element that complements the material being discussed.
5. Each presentation must show a solid understanding of the scientific concepts being discussed.

Note to the Teacher

This poster may be used to supplement your chemistry, earth science, physics, or astronomy classes. Refer to the panel “About the Poster” for a description of the imagery.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

Additional Resources

http://wmap.gsfc.nasa.gov/ - The “Universe” section of this site for the Wilkinson Microwave Anisotropy Probe provides information on the Big Bang and cosmology.
http://cosmicmission.gsfc.nasa.gov/ - Information about the “Cosmic Elements” web site (see below).

Acknowledgements

This poster was created by the education team at the Lab for High Energy Astrophysics, NASA/ Goddard Space Flight Center, with poster design and artwork by Karen Snaile. Classroom activities were developed by the “Elements 2002 Teacher Workshop” participants. We thank Suzanne Ples, Antonio Caruso, NASA/Ames Research Center, “Grandma’s Apple Pie” activity, and additional classroom activities, the accompanying information/activity booklet, and on the “Cosmic Elements” web site (see below).

About the Poster

This poster illustrates the cosmic processes and events which give rise to the chemical elements. The large-print panels on the back of the poster further describe the processes by which the elements were created. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Elements were dispersed from the star and entered the nucleus of the Earth, where they were incorporated into the Earth’s crust. Heavy elements came later.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

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. Heavy elements came later.

Small Stars

Small stars fuse hydrogen into helium, and then fuse helium into carbon and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins – essential to life.

Large Stars

Large stars make heavy elements as well as light elements through the process of fusion in their cores. For example, large stars create the calcium in your bones and the oxygen you breathe, the silicon in the soil, and the sulfur that’s in your hair.

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 partly from cosmic rays.
The 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.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

Small Stars

Small stars fuse hydrogen into helium, and then fuse helium into carbon and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins – essential to life.

Large Stars

Large stars make heavy elements as well as light elements through the process of fusion in their cores. For example, large stars create the calcium in your bones and the oxygen you breathe, the silicon in the soil, and the sulfur that’s in your hair.

Grandma’s Apple Pie

STUDENT HANDOUT

About the Poster

This poster illustrates the cosmic processes and events which give rise to the chemical elements. Each of the processes – the Big Bang, fusion in small and large stars, supernovae, and fragmentation by cosmic rays – forms the elements in their bodies and all around us. The poster illustrates these by pointing out objects on or around the girl and identifying the primary element that comprises these objects. These elements are then connected to the cosmic process that creates them. (Note that the colors of the elements respond to the colors of the star, not the name of the cosmic processes.) The large-print panels on the back of the poster further describe the processes and events that create the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Assignment

Cari Sagan once said, “To make an apple pie from scratch you must first invent the universe.” Your group’s assignment 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, you may find itself 5 or so billion years through time and your creative vision of 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.

Project Parameters

• Every member of the group must participate in the presentation or contribute to the design of the artistic element.
• The group must address all parts of the assignment in their presentation.
• Each presentation should be less than 15 minutes in length.
• Each presentation must contain an artistic element that complements the material being discussed.
• Each presentation must show a solid understanding of the scientific concepts being discussed.

Note to the Teacher

This poster may be used to supplement your chemistry, earth science, physics, or astronomy classes. Refer to the panel “About the Poster” for a description of the imagery.

Acknowledgements

This poster was created for the education team at the Lab for High Energy Astrophysics, NASA’s Goddard Space Flight Center, with content design and artwork by Karen Shale. Classroom activities were developed by the “Elements 2002 Teacher Workshops” participants. We thank Suzanne Pleau Kinnison, NASA’s Elements Outreach Educator, “Beyond the Elements” author, and Education and Public Affairs Manager at NASA/Goddard Space Flight Center, for guiding us in the development of the educational content. Please take a moment to evaluate this product at the “Cosmic Elements” web site (see below).

Additional Resources

See the “What is Your Cosmic Connection to the Elements?” Information & Activity Booklet for more detailed information and more classroom activities. Access the booklet and web site site at http://imagine.gsfc.nasa.gov/docs/teachers/elements/.

This poster is found at:
http://gyh.gsfc.nasa.gov/edu/WallPoster/CosmicElementsPoster.html

It is also available as a downloadable product at:
http://pearl1.lanl.gov/periodic/ - Properties of each of the elements, with information about their discovery.
http://en.wikipedia.org/wiki/Table_of_elements - The “Universe” section of this site for the William Microwave Anisotropy Probe provides information on the Big Bang and early universe.
http://imagine.gsfc.nasa.gov/docs/teachers/elements/ - More resources for you and your students may be found at:

http://ehb2.gsfc.nasa.gov/edcats/educational_wallsheet

Please take a moment to evaluate this product at http://bit.ly/hs-goddard-exucational_element

The nucleus 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 partly from cosmic rays.
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 fuse hydrogen into helium, and then fuse helium into carbon and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins – essential to life.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

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 partly from cosmic rays.
The 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.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in light-weight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

Small Stars

Small stars fuse hydrogen into helium, and then fuse helium into carbon and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins – essential to life.

Large Stars

Large stars make heavy elements as well as light elements through the process of fusion in their cores. For example, large stars create the calcium in your bones and the oxygen you breathe, the silicon in the soil, and the sulfur that’s in your hair.

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 partly from cosmic rays.

About the Poster

This poster illustrates the cosmic processes and events which give rise to the chemical elements. Each of the processes – the Big Bang, fusion in small and large stars, supernovae, and fragmentation by cosmic rays – form the elements in our bodies and all around us. The poster illustrates this by pointing out objects on or around the girl and identifying the primary element that comprises that object. These elements are then connected to the cosmic processes that created them. (Note that the colors of the elements respond to the colors of the name of the cosmic process.) The large-print panels on the back of the poster further describe the processes and events that create the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.

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 project is designed to give you the opportunity to showcase what you know about where we come from.

Assignment

Cari Sagan once said, “To make an apple pie from scratch you must first invent the universe.” Your group’s assignment 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. Your discussion should address why the element is found in your pie and relate it to the processes responsible for its creation.

Project Parameters

• Every member of the group must participate in the presentation or construction of the artistic element.
• The group must address all parts of the assignment in their presentation.
• Each presentation should be less than 15 minutes in length.
• Each presentation must contain an artistic element that complements the material being discussed.
• Each presentation must show a solid understanding of the scientific concepts being discussed.

Note to the Teacher

This poster was created by the education team at the Lab for High Energy Astrophysics, NASA/ Goddard Space Flight Center, with custom design and artwork by Karen Shale. Classroom activities were developed by the “Elements 2002 Teacher Workshops” participants. We thank Suzanne pine Akerlof, NASA/Ames Education “Grandma’s Apple Pie”, and the accompanying information/activity booklet, and on the “Cosmic Elements” web site. (See below.)

Acknowledgements

This poster may be used to supplement your chemistry, earth science, physics, or astronomy classes. Refer to the panel “About the Poster” for a description of the imagery.

Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.

The large-print panels on the back may be copied and added to your presentation, or used as a reference to help the processes relate to specific elements. You may post them when you initially display the poster, or you may put them up at a time after your presentation is finished.

The classroom activity, “Grandma’s Apple Pie,” may be used as an example for your students. A link to the “Grandma’s Apple Pie” activity, and additional classroom activities, may be found on the accompanying information/activity booklet, and on the “Cosmic Elements” web site. (See below.)

Additional Resources

See the “What is Your Cosmic Connection to the Elements?” Information & Activity Booklet for more detailed information and more classroom activities. Access to the booklet and additional resources may be found on:
http://imagine.gsfc.nasa.gov/docs/teachers/elements/

Supplemental information on the life cycles of stars and a slide presentation are also available in the “Cosmic Elements” activity booklet.
http://imagine.gsfc.nasa.gov/docs/teachers/elements/ Additional resources for you and your students may be found at:
http://apart.net.edu/posters/Properties of each of the elements, with information about their discovery.
http://nupb.epsrc.ac.uk/index.html - A broad overview of nuclear fusion reactions that occur in stars.


http://www.lbl.gov/education/element/element - Cosmic Evolution From the Big Bang to Heavy Elements.

http://spaceeds.gsfc.nasa.gov/education/elemental.html
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 fuse hydrogen into helium, and then fuse helium into carbon and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins – essential to life.

The nucleii 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 partly from cosmic rays.
About the Poster

This poster illustrates the cosmic processes and events which give rise to the chemical elements. Each of the processes—a Big Bang, fusion in small and large stars, supernovae, and fragmentation by cosmic rays—form the elements in our bodies and all around us. The poster illustrates the key processes and objects on or around the girl and identifies the primary elements that comprise those. Elements are then connected to the cosmic process that creates them. (Note that the colors of the elements correspond to the colors of the name of the cosmic processes.) The large-print panels on the back of the poster further describe the processes and events that create the elements. The periodic table in the background is likewise color-coded to match the elements to their cosmic origin. The full periodic table is reproduced below.

Some elements come from more than one process. If a second process contributes more than 30% to the abundance of the element in the universe, we have included it.

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 project is designed to give you the opportunity to showcase what you know about where we come from.

Assignment

Cari Sagan once said, “To make an apple pie from scratch you must first invent the universe.” Your group’s assignment 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. Your discussion should address briefly the constant recycling of matter. This project is designed to give you the opportunity to showcase what you know about where we come from.

Project Parameters

- Every member of the group must participate in the presentation or contribute to the design of the artistic element.
- The group must address all parts of the assignment in their presentation.
- Each presentation should be less than 15 minutes in length.
- Each presentation must contain an artistic element that complements the material being discussed.
- Each presentation must show a solid understanding of the scientific concepts being discussed.

What is Your Cosmic Connection to the Elements?

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.

Supernovae

The explosive power of supernovae creates and disperses a wide range of elements. The gold used in jewelry and the titanium used in lightweight eyeglass frames were formed in supernovae. Supernovae also provide the iron in your blood.

Small Stars

Small stars fuse hydrogen into helium, and then fuse helium into carbon and nitrogen. Carbon is a basic building block of life and nitrogen is a part of all proteins – essential to life.

Large Stars

Large stars make heavy elements as well as light elements through the process of fusion in their cores. For example, large stars create the calcium in your bones and the oxygen you breathe, the silicon in the soil, and the sulfur that’s in your hair.

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 partly from cosmic rays.

Note to the Teacher

This poster may be used to supplement your chemistry, earth science, physics, or astronomy classes. Refer to the panel “About the Poster” for a description of the imagery.

The large-print panels on the back may be copied and enlarged for junior high students. Choose excerpts from how the processes relate to specific elements. You may post them when you initially display the poster, or you may post them one at a time after your group has observed several cosmic processes.

The classroom activity, “Grandma’s Apple Pie,” see the subject together for your students. A link to the “Grandma’s Apple Pie” activity, and additional classroom activities, may be found in the accompanying information/activity booklet, and on the “Cosmic Elements” web site (see below).

Acknowledgements

This poster was created by the education team at the Lab for High Energy Astrophysics, NASA/ Goddard Space Flight Center, with design and artwork by Karen Snaile. Classroom activities were developed by the “Elements” 2002 Teacher Workshops participants. We thank Suzanne Price-Antonini, NASA/ Goddard Space Flight Center, and David Wilkins, New Yourself, for guiding us in the development of the educational activities.

Please take a moment to evaluate this project at http://bit.igts nasa.gov/evaluation/elemental_education/curiosity Shop, for guidance in the development of this site for the Wilkinson Microwave Anisotropy Probe provides information on the Big Bang and its early history.

http://www.that’s_usgs.gov/xnotes.html - The “Universe” section of this site for the Wilkinson Microwave Anisotropy Probe provides information on the Big Bang and its early history.

http://www.caltech.edu/publications/curiosity shop/ - An overview of nuclear fusion reactions that occur in stars.


http://www.lctfs.jhu.edu/continuation/exploration - Cosmic Exploration from the Big Bang to Star Birth.


Additional Resources

See the “What is Your Cosmic Connection to the Elements?” Information & Activity Booklet for more detailed information and more classroom activities. Access to the booklet is available at http://curiosityshop.gsfc.nasa.gov/educational_wallsheet/EdCat.html.

Supplemental information, such as bulletin board activities and a slide presentation are also available in the “Cosmic Elements” section of the Imagine the Universe Curiosity Shop.

http://www.that’s_usgs.gov/xnotes/elements/education/curiosity Shop/ - An overview of nuclear fusion reactions that occur in stars.


http://www.lctfs.jhu.edu/continuation/exploration - Cosmic Exploration from the Big Bang to Star Birth.


http://www.lctfs.jhu.edu/continuation/exploration - Cosmic Exploration from the Big Bang to Star Birth.