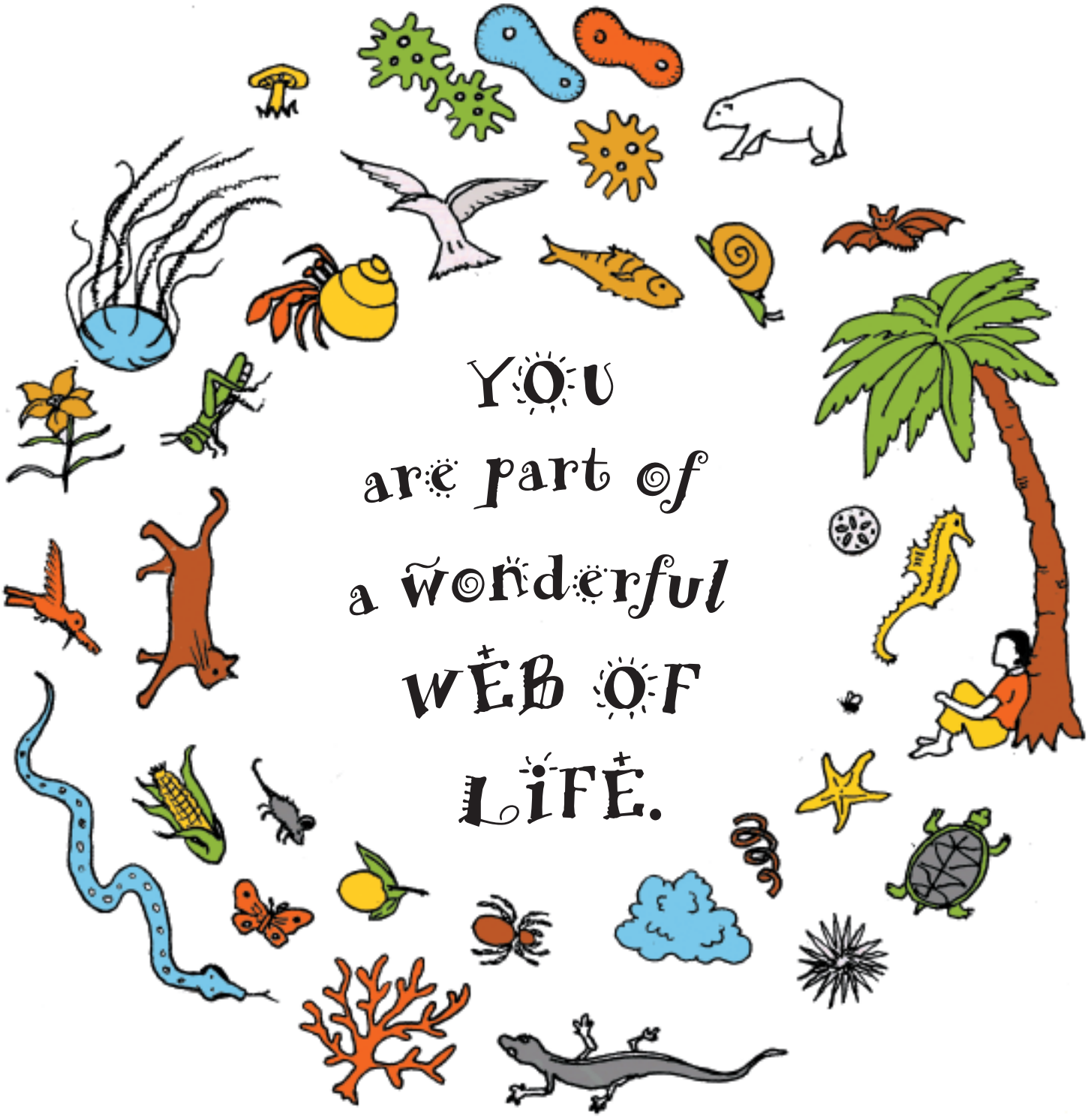
YOU
are part of
a wonderful
WEB OF
LIFE.

The Kids' Book of Awesome Stuff

Charlene Brotman

illustrated by
Jeila Gueramian

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Reordering information

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Dedicated

to the memory of
Barbara Marshman and Ann Fields.
Together we envisioned this book.
I feel their presence in
every page.

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Awesome Stuff #1
You're Made of
Star-Stuff
Did you know...
You wouldn't be alive today
if ancient stars had not died and blown apart?
Even Earth would not exist!
And did you know...
you're made of STAR-STUFF,
the chemical elements that were
once *inside* the stars that died?
Those exploding stars
hurled their elements out
into space in gigantic clouds of dust and gas.
Over time, some of the elements from
the stars formed the Earth and the Sun.
Some of that star-stuff ended up in
YOU!
That makes YOU a STAR-KID from outer space!
And I'm a STAR-DOG!

A Blinding Flash

The chemical elements you're made of, such as oxygen, iron, carbon, hydrogen, nitrogen, and calcium, are all star-stuff from outer space. Parts of stars are in your blood, your bones, your whole body.

Elements from stars make up everything on Earth, just as ingredients make up a cake. You and air, water and rocks, bacteria, beetles, and buzzards are created from these elements.

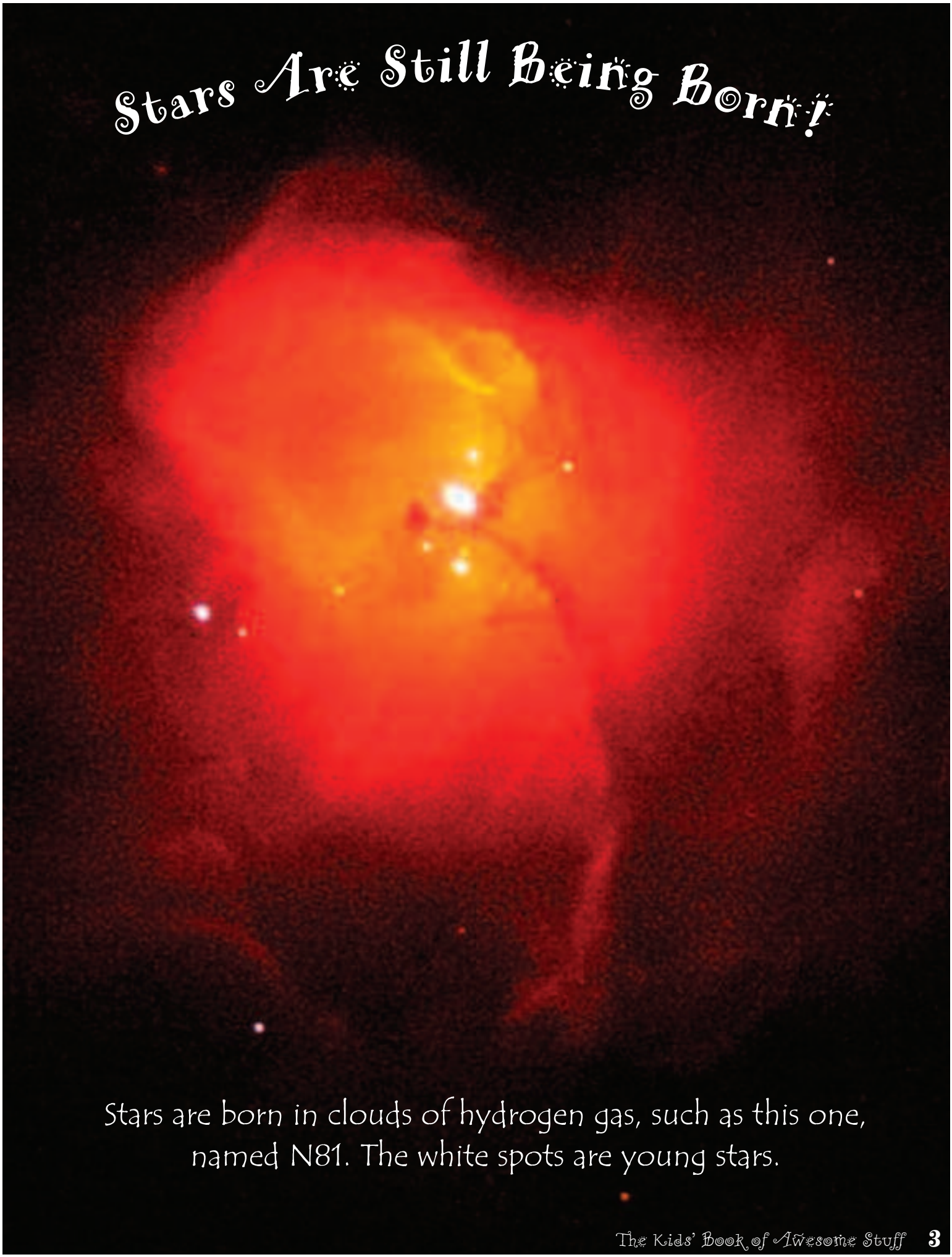
The story of the star-stuff that became YOU goes all the way back to the Big Bang, when the Universe began 14 billion years ago. It's a story about stars that were born, and stars that died.

First came the blinding flash of the Big Bang, and then the Universe was left pitch-black. No stars. No planets. No light. Nothing existed in the whole Universe, except for some gases that floated in the blackness. Those gases were mostly hydrogen and helium.

But in time, gravity pulled and crammed clouds of hydrogen and helium atoms together so tightly that they heated up. Atoms, the smallest pieces of an element, got squashed. The giant clumps of gas grew hotter and hotter. And then…they lit up.

The first stars in the Universe were born!

Stars Are Still Being Born!



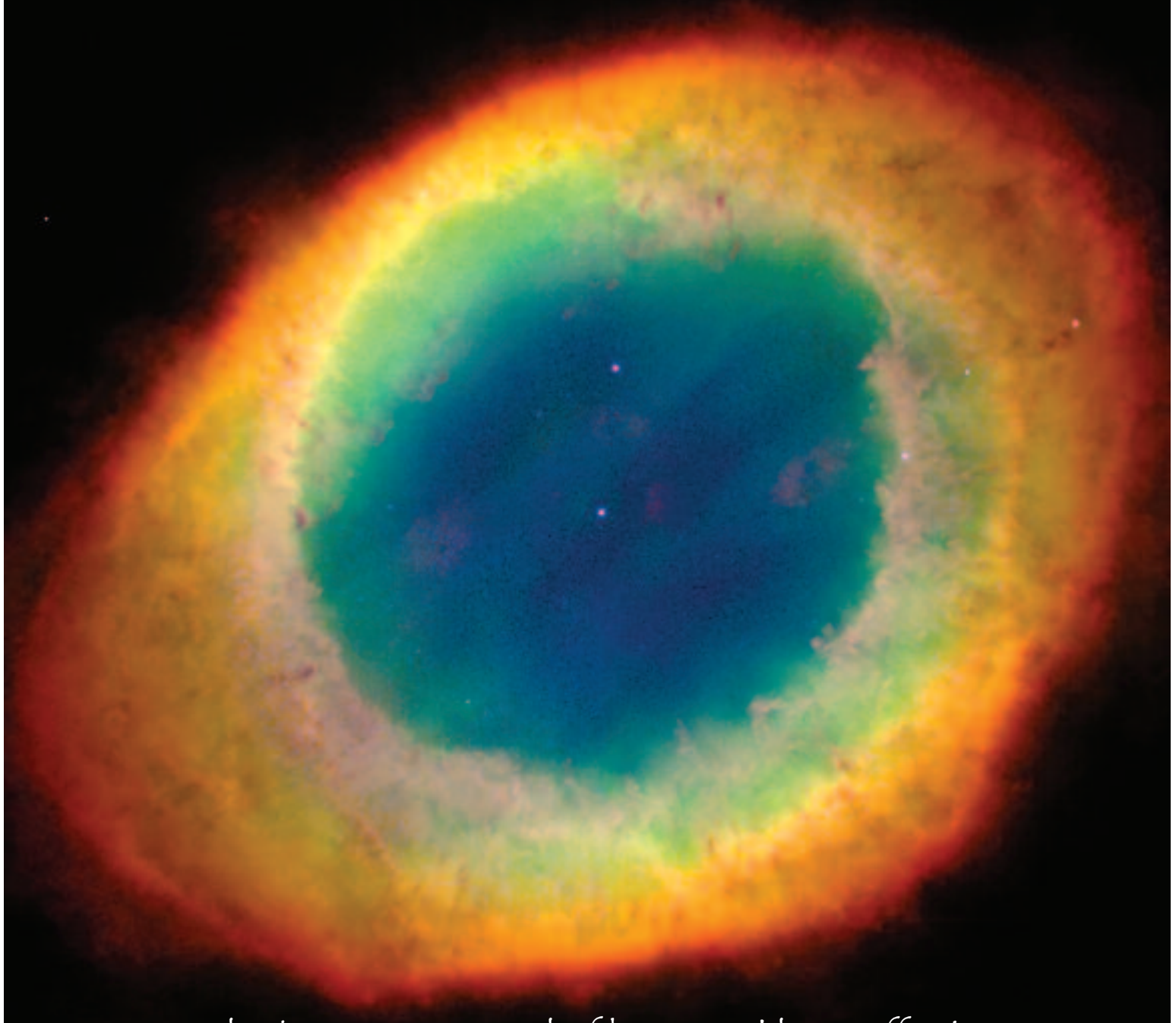
Stars are born in clouds of hydrogen gas, such as this one, named N81. The white spots are young stars.

Stars are giant balls of glowing gases, mostly super-heated hydrogen. A star is a sun, and the Sun is a star.

Starlight and sunlight come from ***nuclear fusion***, not from flames. Deep in the core of a star, where it's hottest, immense heat makes atoms fuse—join together—and become a different, heavier element. Hydrogen atoms change into helium atoms, and helium atoms join to form atoms of carbon and oxygen. The bigger the star, the hotter it gets, and the hotter it gets, the more kinds of elements it can make inside itself.

A star's fuel is hydrogen gas. When a star runs out of fuel, it is doomed to die.

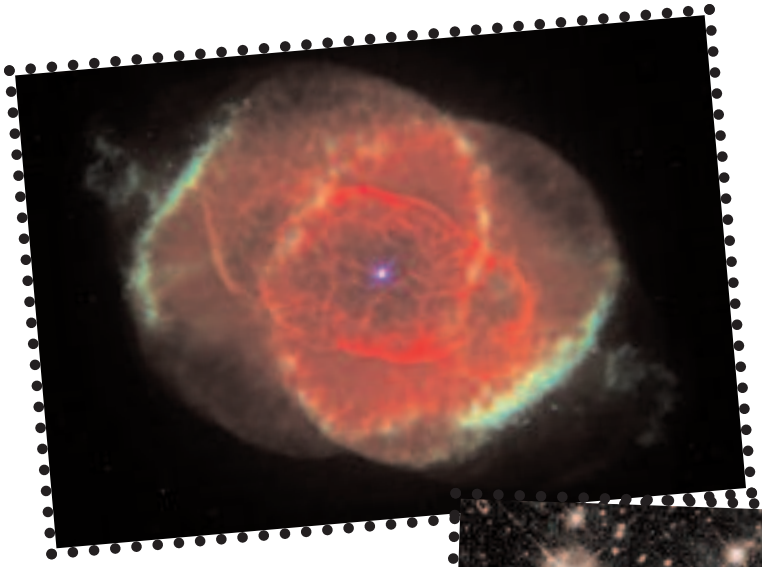
Dying Stars Fling Stuff (elements) into space!



You are looking into a tunnel of hot gases blown off a dying star. This is called the Ring Nebula. In this photo the element helium is represented by blue, oxygen by green, and nitrogen by red. All that is left of this dying star is its core—the white speck in the center. The scattered white dots are other stars.

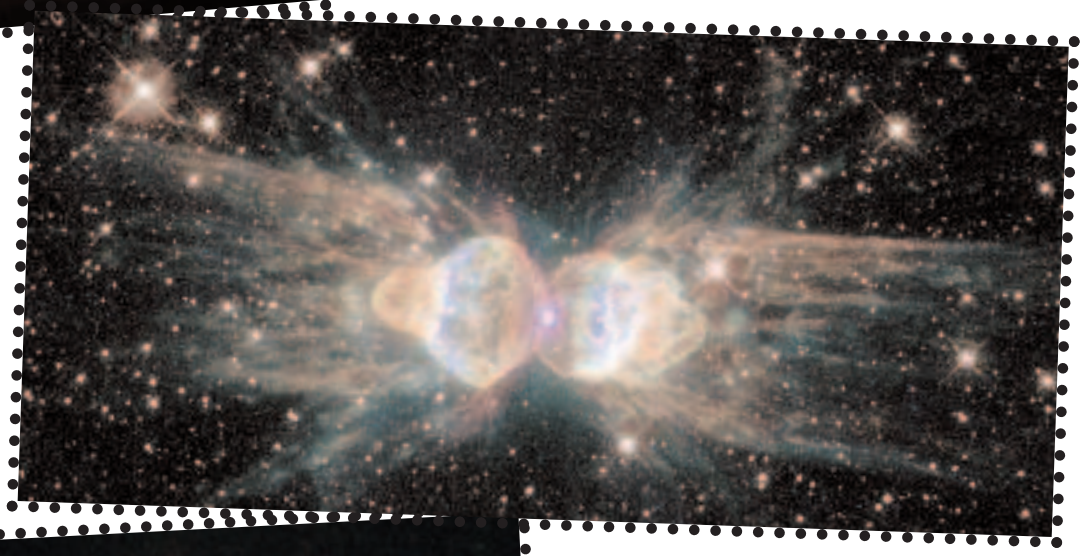
Doomed Stars

Medium-sized stars like our Sun puff off their outer layers when they die. The glowing puff of gas is called a nebula. Each dies with its own kind of fireworks.



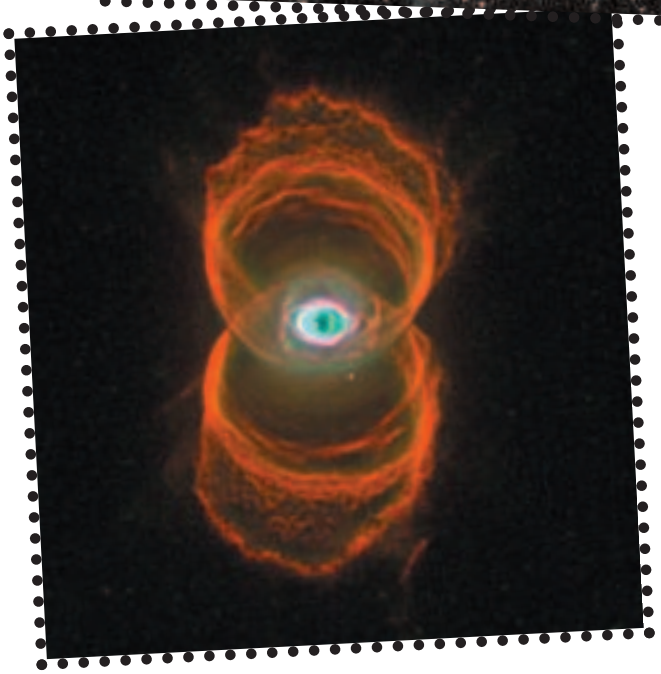
Cat's Eye Nebula

The point of light in the center is the dying star. It ejects its gases like a lawn sprinkler that twirls around and around.



Ant Nebula

The white spot in the center of the "ant" is the dying star. It ejects gases like two jet engines.

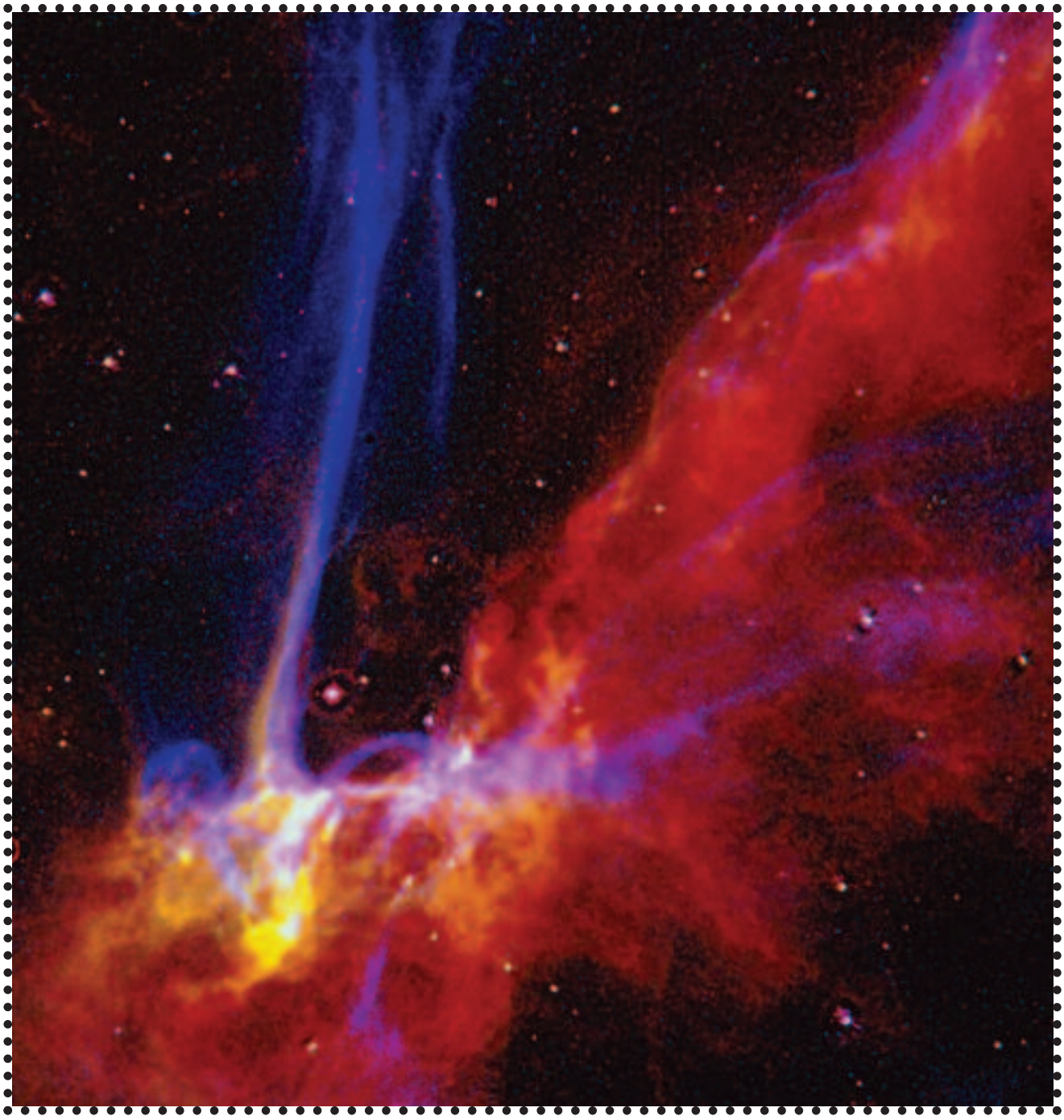


Hourglass Nebula

The reddish-orange rings of gas are nitrogen. The star's core—its nuclear furnace—is the white dot in the center.

Check it out

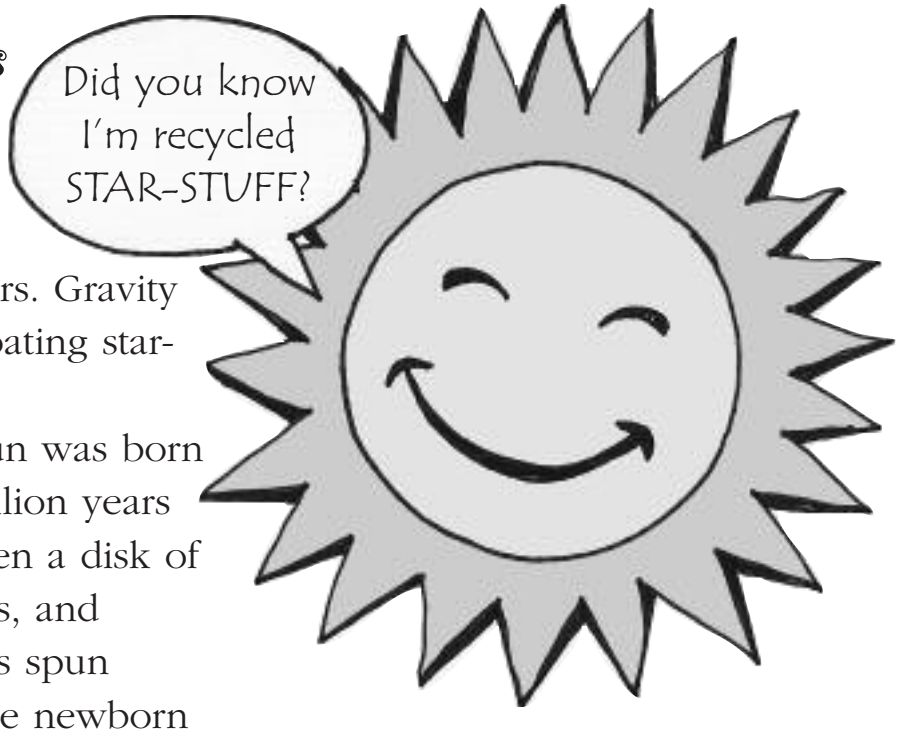
Our galaxy has more than a thousand dying stars!



Cygnus Loop supernova

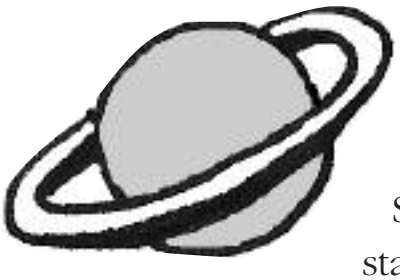
When a *giant* star dies, it erupts and crashes in on itself. This is called a **supernova**. The titanic explosion instantly creates even more kinds of elements through nuclear fusion, such as gold, silver, lead, and tin. The photo above shows part of the Cygnus Loop supernova, which exploded 15,000 years ago. Its blast wave is still slamming into clumps of gas in outer space, heating the gas and making it glow.

Star-stuff gets recycled

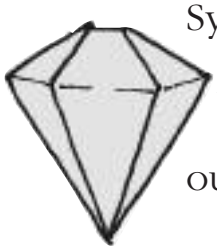


in space. Elements from stars that died float in space for billions of years. Gravity recycles some of this floating star-stuff into new stars.

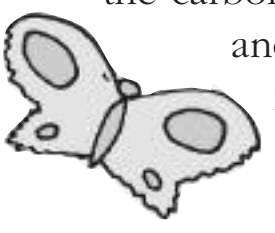
The star that is our Sun was born about 5 billion years ago. Then a disk of dust, gas, and elements spun around the newborn Sun. The spinning star-stuff clumped together to form nine planets, their moons, icy comets, and rocky asteroids. This is the Sun's family—the Solar System. You live on the third planet from the sun.



A star that lived and died before our Sun was even born made the calcium in your bones and teeth, and in egg shells and coral, moon rocks and marble.



An ancient star cooked up the carbon in your muscles, and in diamonds, moths, and mushrooms. Carbon from a star is in everything alive today.



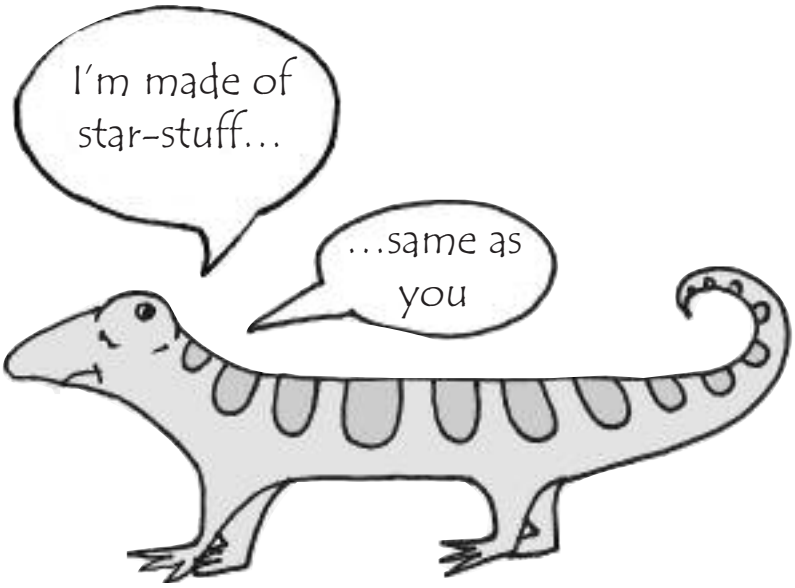
And billions of years ago, a dying star created the iron that's in your blood right now, and the iron in comets and in the Earth's core.

Did you know?

Scientists have discovered more than 100 moons in our Solar System!

You are related to everything else in the world, since you and all things come from the same star-stuff.

You're related to your favorite rock and your favorite sea shell. They're made of star-stuff, the same as you. You're related to green grass, lizards and thunder clouds—all from the same star-stuff.



I'm related to _____

(fill in the blank)

Lakota Native Americans say:

Mitakuye Oyasin

pronounced:
mee-DAK-oo-yay
o-yah-seen

We are all related

Mitakuye oyasin means "We are all related" in the Lakota language.

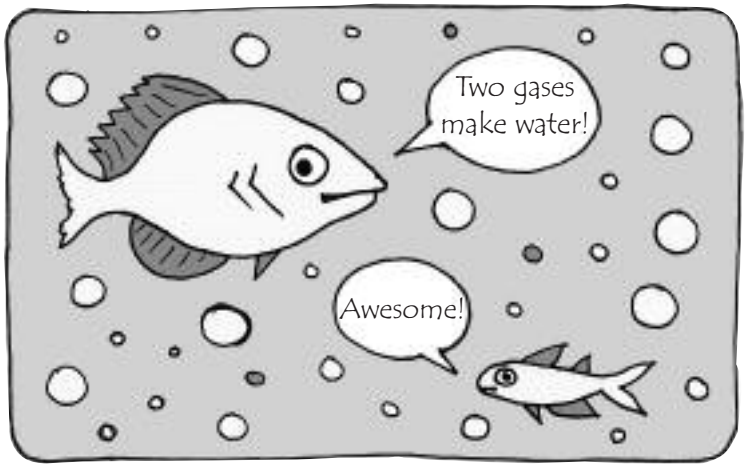
Lakotas believe that all people, animals, insects, trees, plants, birds, and rocks are our relatives. We are all related in a wonderful web of life on the Earth we share.

A Lakota person usually ends each prayer or speech by saying "Mitakuye oyasin!"

Awesome things can happen when elements hang out together. Guess what you get when one atom of a poisonous, greenish-yellow gas (the element chlorine) joins up with one atom of a silvery metal (the element sodium)? The answer is table salt or sodium chloride.

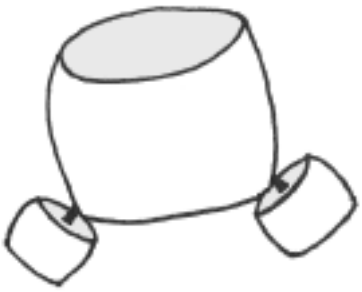
It's hard to believe, but atoms of a deadly gas and a metal combine to become something you sprinkle on your food.

When atoms of two or more elements join together, they turn into a *compound* that is totally different from those elements—almost like magic. Atoms of oxygen and silicon transform into sand when they combine. Sugar is made of carbon, oxygen, and hydrogen atoms.



Q: What do you get when two atoms of hydrogen, a gas, combine with one atom of oxygen, another gas? (Hint: it's not a gas.)

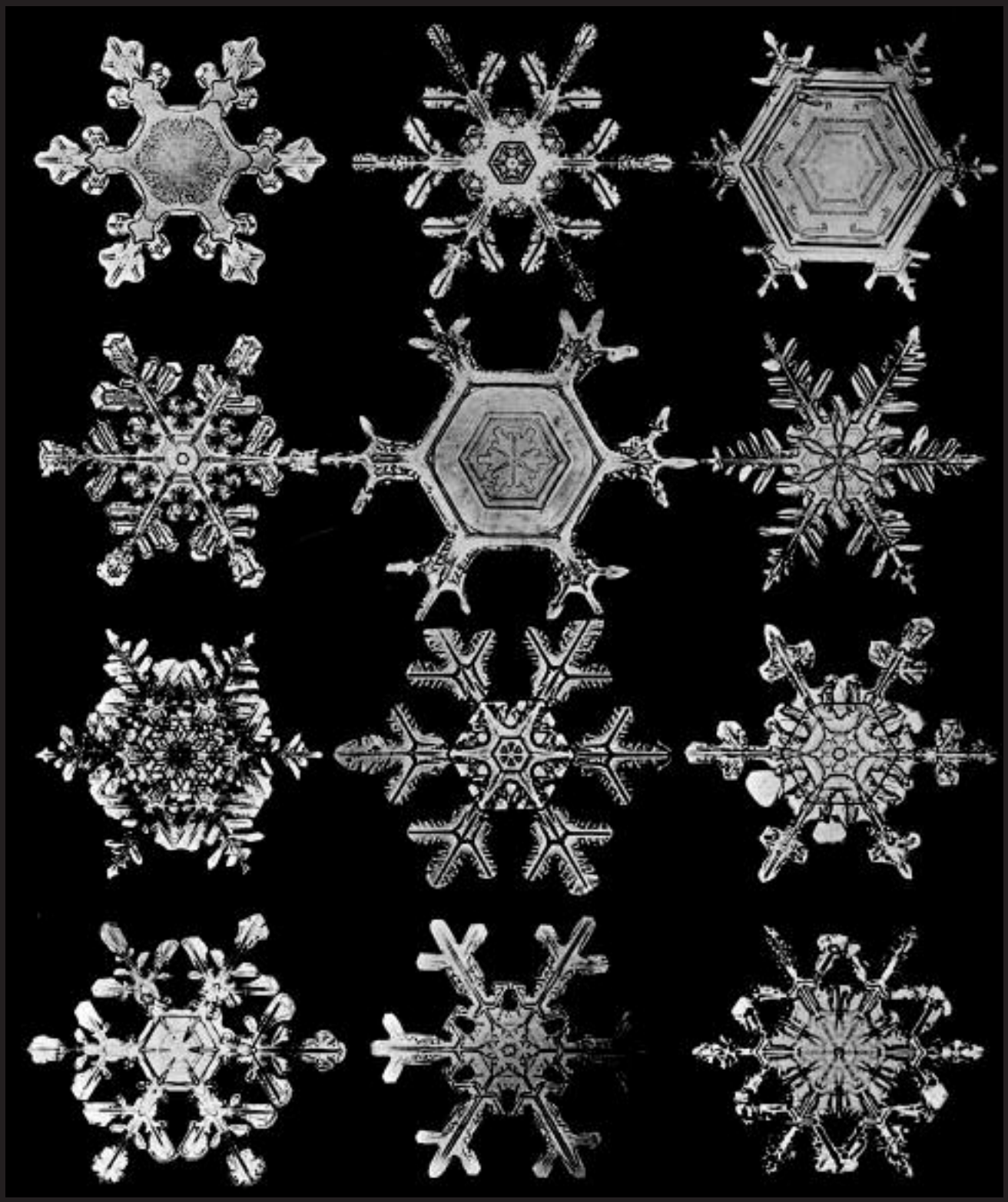
One Sweet Molecule of Water



Easy to make, fun to eat!
With toothpicks, connect two small marshmallows to a big marshmallow. This is a way to picture a water molecule.

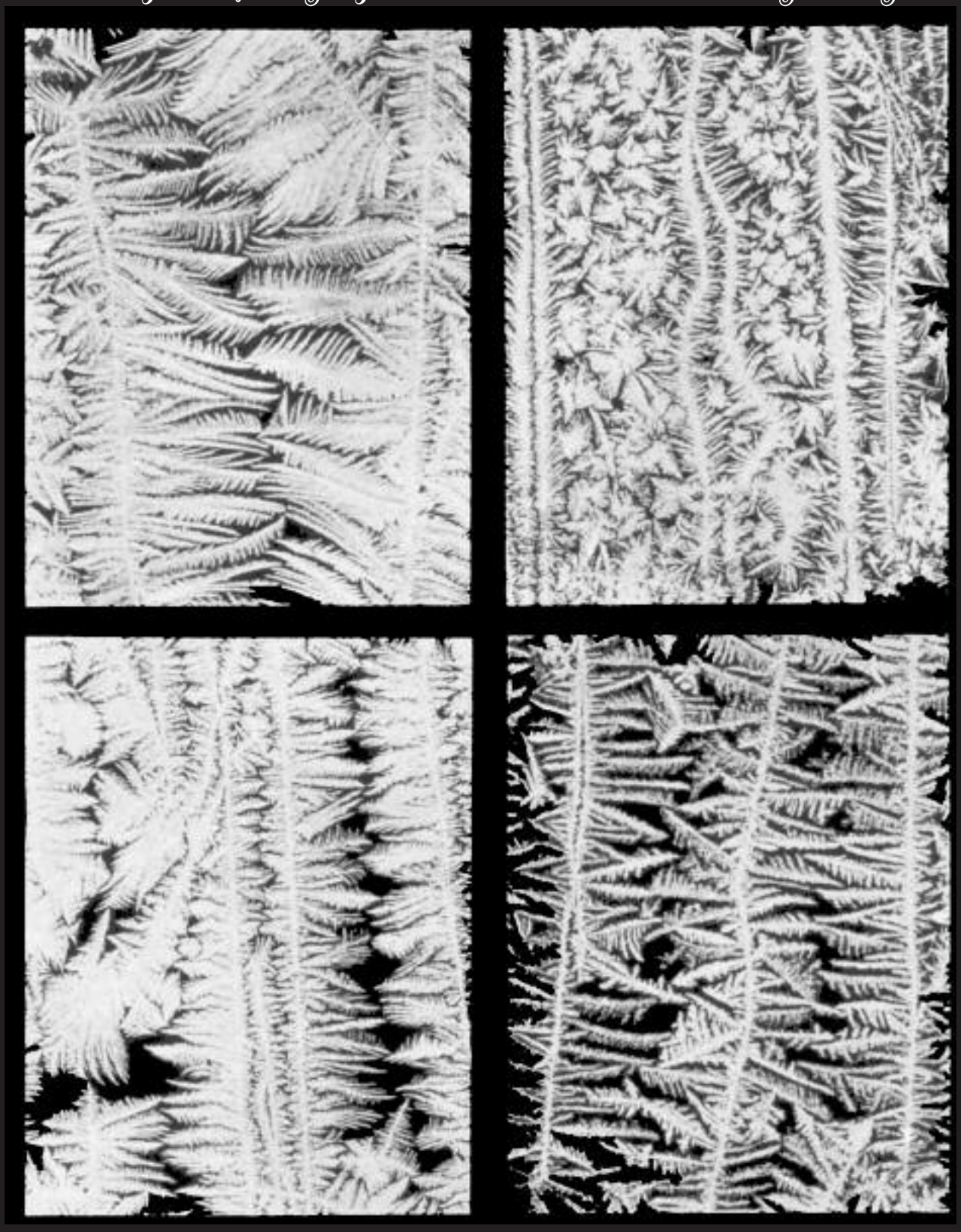
The big marshmallow stands for an atom of oxygen. The two small marshmallows represent two atoms of hydrogen.

Photos of Real snowflakes...



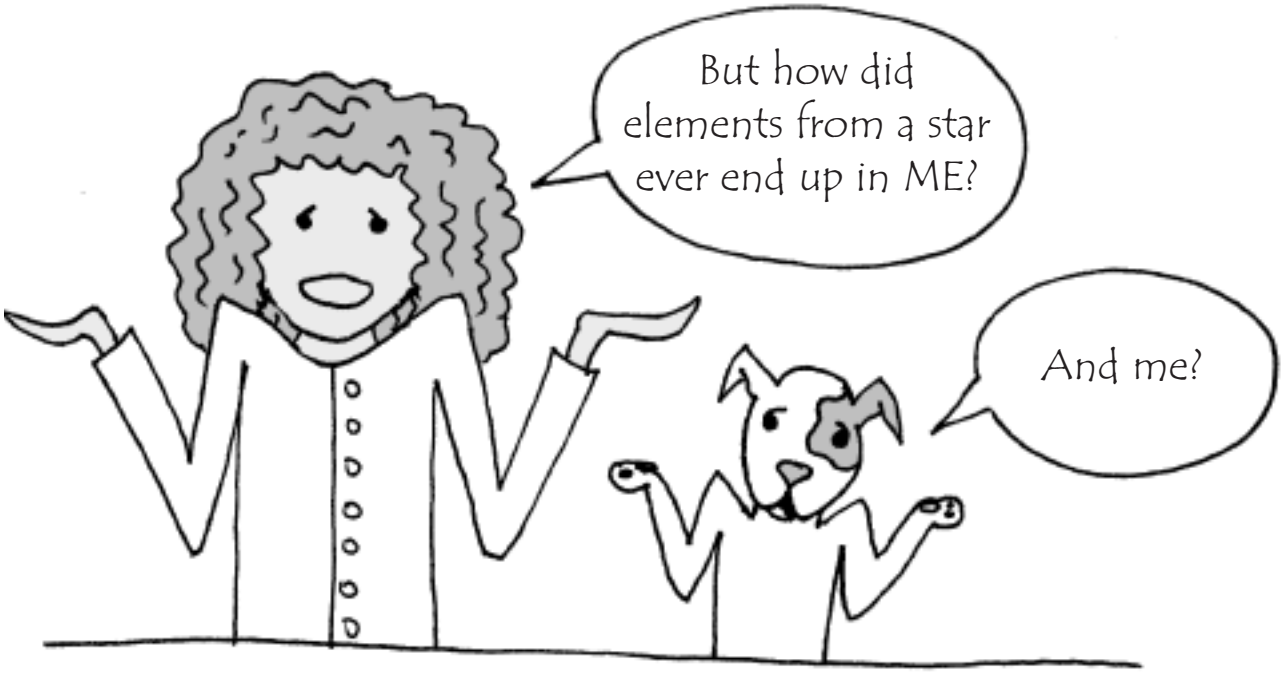
Since snowflakes are a form of water, they are also made of hydrogen and oxygen atoms. Just think, snowflakes have their beginnings in the blast furnace of a star.

...and frost, magnified to show the amazing designs.



Frost is also made of hydrogen and oxygen from a star.

Did you know...a lot of YOU is also hydrogen and oxygen? One reason is that over half of your body's weight is water. You are mostly made of hydrogen, oxygen, and carbon, but you have small amounts of most of the other elements. The hydrogen in your body is as old as the beginnings of the Universe!



The elements from stars that died never get used up or destroyed or lost on planet Earth. They just get **recycled.** Over and over. And finally, some ended up in YOU.

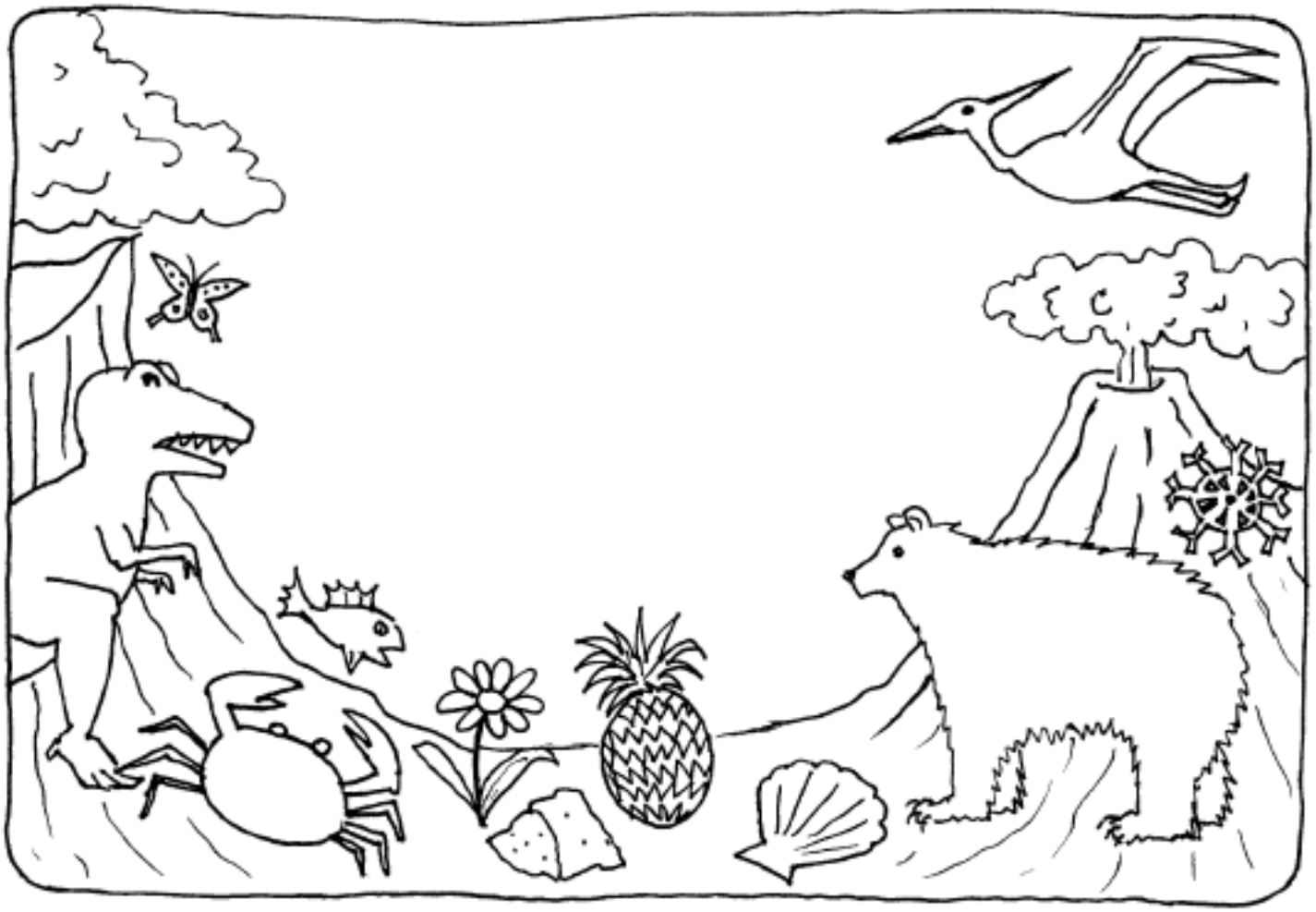
When any living thing dies, it decays and all of the elements that were combined together break apart. It is just as if you pulled a Lego™ construction apart until it goes back to all the little pieces you started with.

The elements that break apart from each other go into the air…or soil…or water. They may become part of rocks and clouds and oceans. Or they may become food for plants. Those plants become food for animals and people.

Then the animals, people, and plants die and decay, and the elements recycle all over again. Some of the recycled elements now make up your own body.

The Long, Long, Back-and-Forth Journey

The same elements that are now part of your body may once have been part of these:



Add something to the picture above that you think might have had elements that are now part of you.

On their journey, the elements recycle from living things to non-living things and back to living things, throughout the ages.

When you die, the elements in your body will journey on to become part of earth, or air, or another living thing.

And so that is the story—the story of how it came about that you are made of star-stuff.

You are alive today on this planet Earth, because of ancient, glowing stars. You're a Star-Kid from outer space! You're *awesome.*

Make Your Own

STAR-STUFF JOURNAL

Record All the Cool Things You Find in Nature!
All you need is a drawing pad, pen, or pencil and a curious mind.

A journal is a record of *your* experiences and ideas. Start by putting the date and place on your journal page. Now make quick sketches of the cool stuff you see, hear, and find outdoors. Look for colorful mushrooms, animal tracks, cobwebs, seed pods, flowers, and leaves. Look under old logs (be sure to replace them carefully), inside tree holes, and in puddles. *Whatever you sketch, it's made of star-stuff, the same as you!*

Sketching helps you to really notice details of an object, and to remember them better.

Once you start your journal, you'll find that you see many things you never noticed before. You see with "new eyes."

STAR-STUFF Word Search

Find the names of some of the elements that were once inside a star. The names go forward, backward, up, down and on the diagonal.

oxygen
hydrogen
gold
copper
nitrogen
carbon
iodine
lead
iron
calcium
helium
sulfur
silicon
mercury
chlorine

N U I D O S G P X O C N
O E O A X D M G X T O E
C H G E L E E T G B P G
I E O O R H G L R I P Y
L N G C R E C A G O E X
I I U L D T C L I D R O
S R L A M U I D O S T P
Y O E G Z L X N D U O E
C L T B Y N O R I L B P
R H Y D R O G E N F D P
E C A L C I U M E U A O
M U I L E H D O I R C Z

Tonight...

Go outdoors
and look at a star.

And look at your hands
and your whole self,
made of elements
that were once in a star.

How do you feel
about being a
STAR-KID?