

Peek into the earth



SOME OF THE greatest mysteries of the world lie right beneath your feet. Think about it: No one has really explored inside the Earth.

Oh, some deep holes have been dug. But the deepest is only about 7-1/2 miles. That's not

much, considering it's about 4,000 miles to the center of the Earth.

We've landed on the moon 240,000 miles away. Why have we only scratched the surface of the Earth? Because it's too difficult, too hot, and too expensive. But that doesn't mean people don't wonder what's down there.

In the 16th century, English astronomer Edmund Halley (of Halley's Comet fame) theorized that the Earth was hollow and had a luminous core at least partly filled with gas.

His vision inspired some fascinating fictional accounts. The most famous, "Journey to the Center of the Earth," was published by Jules Verne in 1864. The book chronicles the adventures of a geologist and his nephew as they descend into a volcanic crater. They encounter prehistoric beasts, spewing lava - even the lost city of Atlantis.

Even into the 1900s, there were some pretty kooky theories about the Earth's interior. One envisioned a place where billions of people might live. Another anticipated a space with a small sun, which could be reached through openings at the Earth's poles. (The explorer, Adm. Richard Byrd, disproved this when he flew over both poles in the 1920s and found no large holes.)

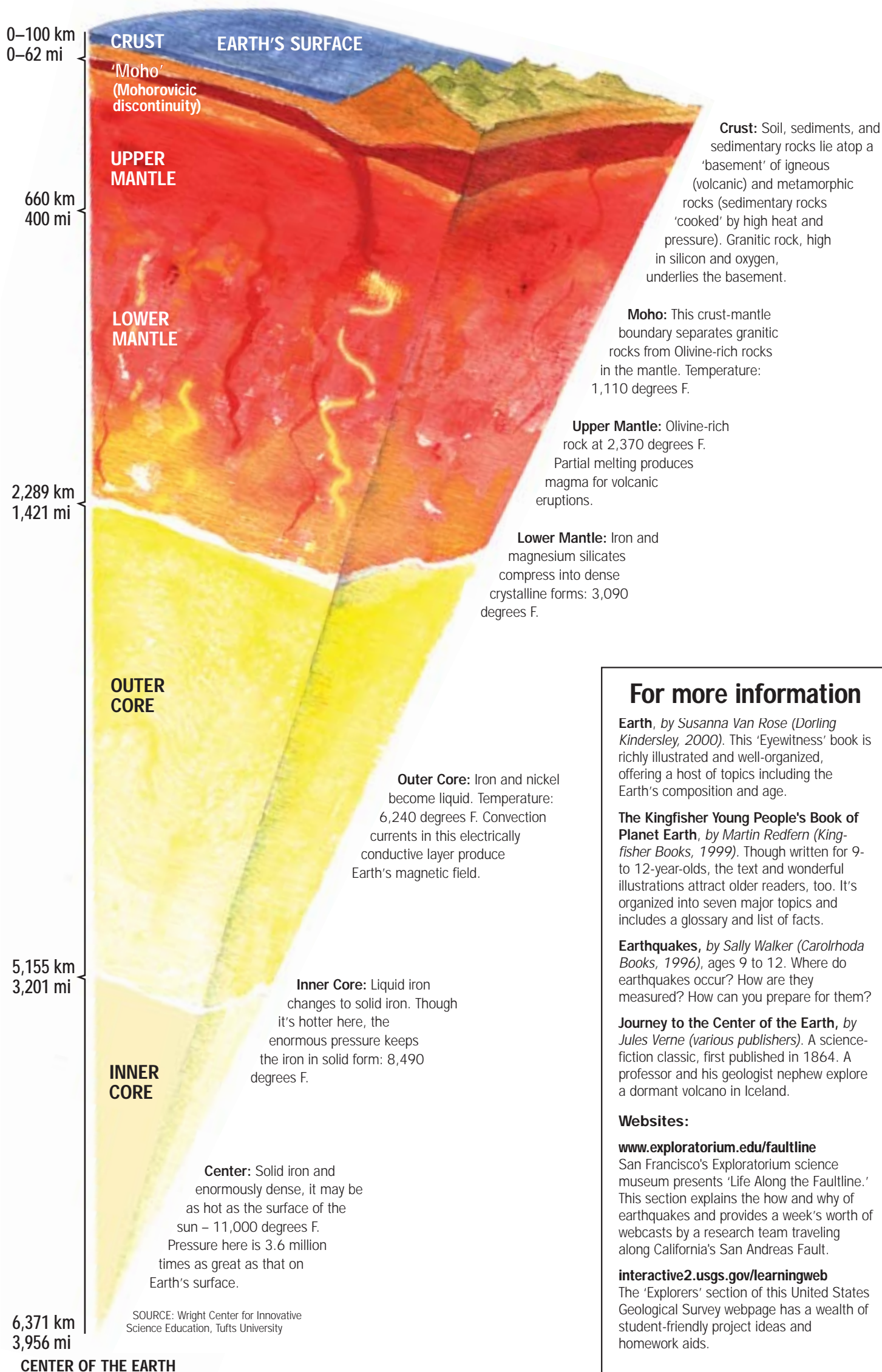
Sorry, no alien hideouts

Today scientists largely agree on the basic structure of the Earth. It does not include alien hideouts or underworlds of any kind. Some diagrams compare the layers of the Earth to an egg (a round egg, mind you). The yolk represents the core, the egg white the mantle (a semisolid layer of rock). The shell of the egg is the crust, the thin brittle "skin" on which we live.

That's the theory, anyhow. It's based on scientists' observations of earthquakes and volcanoes. It's also based on experiments using small amounts of material and subjecting them to high heat and pressure. That's the only way researchers can get an idea of the effect of conditions deep underground.

Eric Muller, who works for the Exploratorium, a science museum in San Francisco, says the inner core may be as hot as the surface of the sun - about 6,000 degrees Celsius (11,000 degrees F). The inner core is also under extreme pressure, an estimated 3.6 million times as much pressure as on the

Continued on next page



For more information

Earth, by Susanna Van Rose (Dorling Kindersley, 2000). This 'Eyewitness' book is richly illustrated and well-organized, offering a host of topics including the Earth's composition and age.

The Kingfisher Young People's Book of Planet Earth, by Martin Redfern (Kingfisher Books, 1999). Though written for 9- to 12-year-olds, the text and wonderful illustrations attract older readers, too. It's organized into seven major topics and includes a glossary and list of facts.

Earthquakes, by Sally Walker (Carolrhoda Books, 1996), ages 9 to 12. Where do earthquakes occur? How are they measured? How can you prepare for them?

Journey to the Center of the Earth, by Jules Verne (various publishers). A science-fiction classic, first published in 1864. A professor and his geologist nephew explore a dormant volcano in Iceland.

Websites:

www.exploratorium.edu/faultline
San Francisco's Exploratorium science museum presents 'Life Along the Faultline.' This section explains the how and why of earthquakes and provides a week's worth of webcasts by a research team traveling along California's San Andreas Fault.

interactive2.usgs.gov/learningweb
The 'Explorers' section of this United States Geological Survey webpage has a wealth of student-friendly project ideas and homework aids.

Continued from previous page

surface of the Earth. Because of this pressure, the core of the Earth is thought to be a solid metal ball surrounded by a slightly cooler molten outer core.

Scientists theorize that after the Earth formed billions of years ago it began to cool slowly. Denser materials – iron and nickel, common to our Solar System – sank into the core. Lighter elements floated near the top.

If the Earth were an apple, the crust would be as thin as the peel. So far, no one has even drilled through the crust. The most ambitious attempt to do so began in 1958 and ended in 1966. “Project Mohole” was to be Earth sciences’ answer to the space program.

Russia wins ‘inner space’ race

Project Mohole’s goal was to reach the point where the crust and upper mantle meet. This region is called the Mohorovicic Discontinuity, after Croatian geologist Andrija Mohorovicic, the first to suggest its existence.

Because the crust is thinnest on the ocean floor, Project Mohole began drilling off the coast of Mexico, 11,700 feet underwater. The drill reached 601 feet below the seafloor. It stopped short of the “Moho.” Congress ended the project.

Deeper holes have been drilled on land, including oil wells of 20,000 feet. A research borehole on the Kola Peninsula in northeastern Russia was twice that depth.

Miners in South Africa routinely go deeper into Earth than any other humans. The deepest gold mine there is 2-1/8 miles below the surface. Temperatures can be unpleasant at that depth, reaching 120 degrees F.

Drilling and mining provide information about the Earth’s crust, but it’s the movement of Earth’s crust that reveals most about the layers below. The crust is made up of continent-size plates that float on a layer of molten rock beneath. Where these “tectonic plates” meet, earthquakes and volcanoes are most likely to occur. Earthquakes help scientists “see” into the Earth.

Alan Kafka, a professor at Boston College, studies the movements of these plates. He conducts research at the Weston (Mass.) Observatory near Boston. Some people call him “Dr. Quake” or “Seismo-man.” “Seismos” is Greek for “shock.” The study of earthquakes is called “seismology.” How does seismology help us see inside the Earth?

To explain, Dr. Kafka leads a reporter to a display case in a hallway outside his campus office. Inside is a seismograph, a scientific instrument which ever-so-

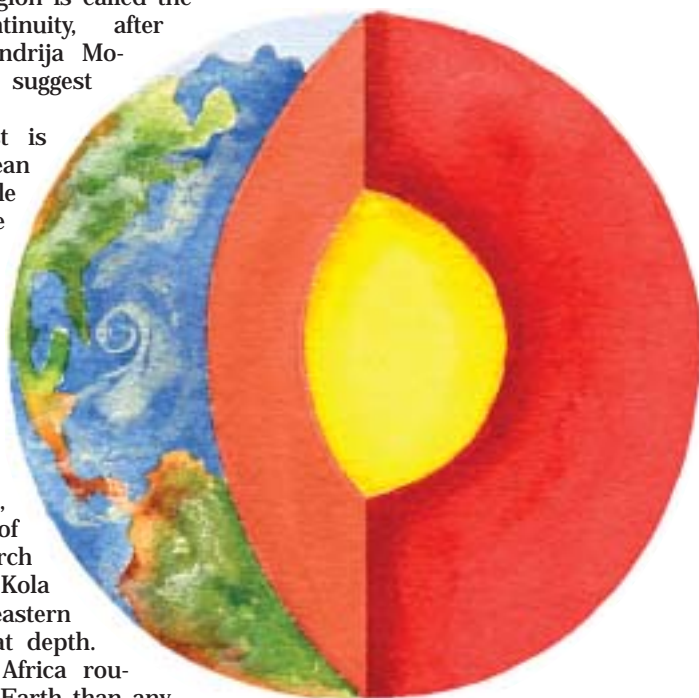
slowly records vibrations it detects in the Earth. The vibrations are recorded by a zigzag line on the recording paper mounted on a drum.

When the ground shakes hard during a big earthquake, the recording needle of the seismograph moves way up and down, drawing dramatic spikes. Milder, unfelt quakes occur more often. They look as if the line hiccuped.

Students who see this seismograph sometimes are surprised to learn that it may be recording vibrations that occurred far from Boston, in New York, El Salvador, or the other side of the globe.

When an earthquake occurs, two kinds of seismic waves fan out through the ground. One kind (longitudinal P-waves, for “primary” or “pressure”) travels through rock or soil at 3.8 miles per second, and through water much more slowly. Shear or S-waves travel at only 1.9 miles per second.

Knowing this, scientists can make an



ILLUSTRATIONS BY KAREN N. SCHNEIDER – STAFF

A seismic wave travels through the Earth in 20 minutes. By tracking it, researchers learn.

X-ray of sorts using data collected by seismographs around the globe. By comparing when waves are received at various points, they can determine the thicknesses and densities of the material the waves pass through.

The waves go faster through hard dense rock, and slow down in softer rock. Where the layers change (lighter-density rocks atop more dense ones, for example), seismic waves may bounce back or change direction.

By studying seismic waves’ direction and speed, scientists have figured out about how deep Earth’s layers are. (See **diagram on facing page.**) As scientists continue to study the Earth, they may someday be better able to predict earthquakes, volcanic eruptions, even a switch in the magnetic poles’ charges – which, they say, has happened before.

Ross Atkin

TODAY'S ARTICLE ON CHRISTIAN SCIENCE

Helping children learn about God's care

Are you being bullied?

KIDS AND ADULTS on a local TV news show were talking about bullying. When kids make fun of someone who is different in some way – maybe not smart or very smart or overweight or new to the school, or just different, it hurts. It might make you want to stay home from school and hide out. Or worse, you might start believing the put-downs about yourself and start feeling guilty – feeling as if the bullying is really your fault. You’re sure no one wants to be your friend.

Here’s what they said you should do if you’re being bullied: Don’t lose your cool and react. And don’t believe the hateful things anyone says about you. But how can you do that?

Apparently, most kids are bullied at some point. But the kids who are confident about who they really are don’t pay any attention, and then the bullying just stops.

The kids on the show said that you need to be careful about what you think about yourself. What you think becomes the message you send out about yourself. A strong protection is knowing your own worth, having confidence in yourself. Then people are less likely to put you down.

You can be sure you’re a good, worthy, just, and right kind of person. Maybe you’re not like everyone else, but wouldn’t it be boring if everyone were just the same? You can know you’re great because you’re God’s child. The Bible tells how God made everything, including us. It says that God made us to be like Himself. Then when God finished with what He made, He looked at it all and saw how good it was.

God made you and knows you are good. That’s important information about who you really are. Knowing this changes how you think about yourself. You feel confident. You know you’re an OK person, with talents and lots of good qualities.

Nothing can change the way God made you. So if someone says you’re ugly or stupid or whatever, it can’t be true. You’re God’s child, and nothing can change that.

Jesus told everyone that God is our Father and that God loves and cares for each of us all the time. So you don’t need to be afraid.

There’s a promise in the Bible about this that says: “The Lord will keep you going out and coming in from this time on and forever more” (Ps. 121:8). God is with you wherever you go.

Everyone needs help sometimes. That’s why it’s important to tell an adult whom you trust that you’re being bullied. They can help you not believe the teasing and can help you know how good you really are. No one deserves to be hurt.

The kids on the show gave advice about what to do if you see someone else being bullied. They called this “spectator responsibility.” They said that by speaking up, you can usually stop the bullying. You could say, “Stop that.” Or you might interrupt the bullying by changing the subject or moving the people involved onto another activity.

You can also reach out to those being bullied. You can find a way to make them feel OK and show that you respect and like them. If you’re not quite sure what to do in any situation, you can ask an adult you trust. You can also ask God to

show you.

What if you’re a part of the bullying? I remember being really hateful toward someone else. I didn’t think about what I was doing and how it hurt that person. When I did think about it, I was so sorry and stopped being hurtful.

Two best friends were on that TV show. Several years earlier, when one of them was overweight and new to the school, the other girl was part of a group who bullied her. Later, they became good friends. They were both so sorry for what had happened. That’s why they were on the show. They want kids to stop bullying. They know that bullying can hurt. But they also know that it can be stopped.

You’re God’s child,
and nothing can change that.
God is with you
wherever you go.

For inspirational articles, discussions, chats,
e-cards and more everyday, go to:

 spirituality.com™
A site inspired by Science and Health