TC

Q1 Sci.

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Science 8
Quarter 1

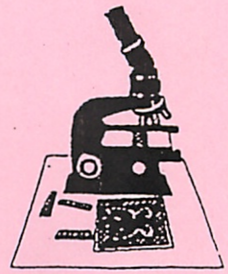
What Will I Investigate?

how scientists make and use models
what the inside of the Earth is like
how the Earth's surface moves
how mountains form
what causes earthquakes and volcanic eruptions

How will I share my discoveries?

I will use all I have learned to create a brochure that educates the members of a community located near an earthquake or volcano hazard site.

TASK ROLES
OF
HANDS-ON SCIENCE GROUPS



TIMEKEEPER: Keeps track of time to be sure that the activity is completed in the allotted time.

EQUIPMENT PERSON: Collects and returns the necessary equipment.

SPILL CONTROL: Reports breakage and spills to the teacher. Does necessary cleanup.

LIASON: The only person from a group who speaks to the teacher.

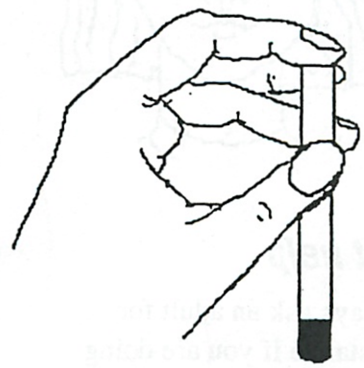
READER: Reads directions or other materials so the group can perform the activity.

TECHNICAL SUPPORT CREW: Performs tasks not specifically mentioned.

Lab Expectations

Some things to remember while you are doing science

When doing hands-on science,
there are some rules you must follow.
This kind of learning is different from other subjects.
If you don't follow the rules, you may end up
hurting yourself or others.



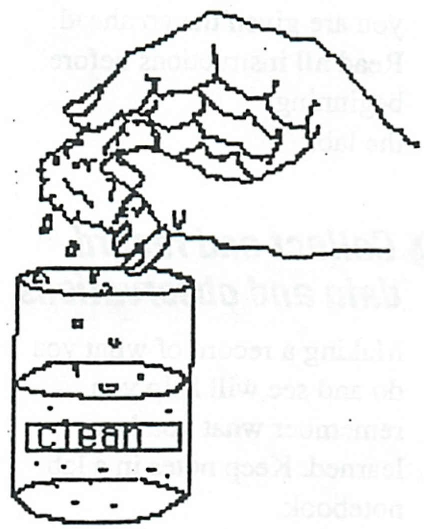
Safe behaviors

❶ *Wear safety goggles*

Keep them on your eyes all the time, if your teacher or adult leader says you must wear them. Wearing them around your neck or on top of your forehead does not count. You only have two eyes, so protect them.

❷ *Detect odors safely*

Hold the container 3 inches in front of your nose and wave the fumes toward your nose with your hand. Some strong smells can bring tears to your eyes!



❸ *Wash all spills immediately*

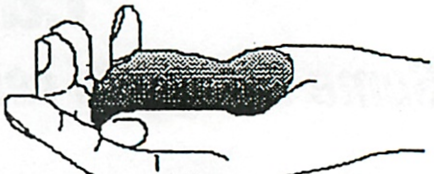
Avoid getting the materials on your skin, unless the instructions say to do so. If you spill something on your skin, wash it with water immediately and tell the adult leader.

❹ *No running, pushing, or shoving*

Horseplay in the classroom could break expensive equipment, spill solutions, or hurt someone!

❺ *Clean up your mess*

Make sure all equipment and work areas are cleaned properly. Follow the instructions for the activity to see where you should return supplies. Dispose of waste material as you are instructed.



Great behaviors

❶ Listen quietly to all directions

Ask questions if you are unsure. Do not begin doing what the instructions say until you are given the go ahead. Read **all** instructions before beginning the lab.

❷ Collect and record data and observations

Making a record of what you do and see will help you remember what you have learned. Keep notes in a lab notebook.

❸ Think "How come...?"

Doing hands-on science is more than just fooling with equipment. Try to understand what you see going on by explaining it to yourself or your group.

❹ Watch closely what happens

Some experiments happen quickly. Look for unusual or unexpected changes.

❻ Get help

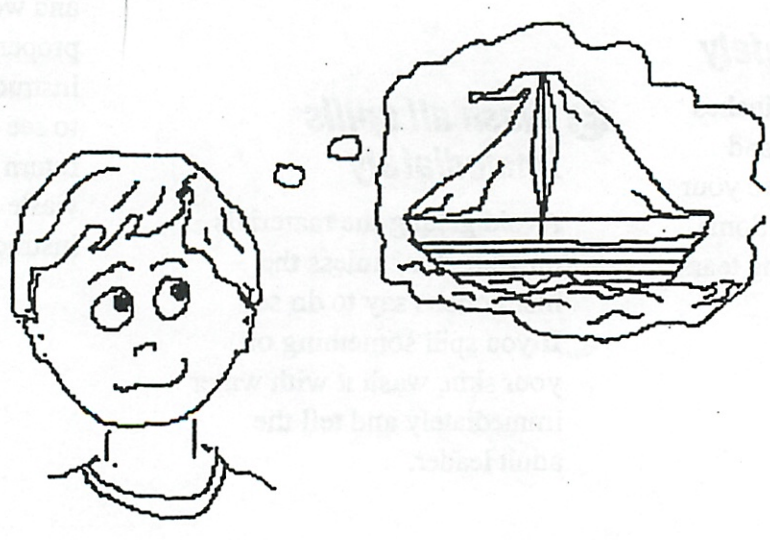
Always ask an adult for assistance if you are doing any of the "Other things *you* can do!" at home. Have fun doing science with an adult!

❼ Eating

No eating or drinking ~~during the experiment~~.

❽ No unauthorized experiments

Follow the directions on the instruction sheet. Ask the activity leader before you try your own idea!



Quiz 9/17

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SCIENCE

SAFETY RULES

*****AT ALL TIMES IT IS THE RESPONSIBILITY OF EACH STUDENT TO FOLLOW ALL OF THE SAFETY RULES*****

1. **Be prepared.**
   Students should prepare for each laboratory activity by reading all instructions BEFORE coming to class. Follow all directions. Make note of any deviations announced by your teacher. Use only the equipment authorized by your teacher.

2. **Be organized.**
   Arrange the materials needed for the investigation in an orderly fashion. Work areas should be kept clean and tidy and free of everything except those materials necessary for the investigation. Store books, backpacks, etc., out of the way. Students should wash the laboratory work area at the conclusion of each lab activity.

3. **Dress appropriately.**
   Tie back long hair. Wear long pants and close-toed shoes. Remove bulky and dangling items (including jewelry).

4. **Use safety equipment.**
   Always wear a lab. apron. Safety goggles and gloves are worn when working with chemical, hot liquids, and apparatus that can break.

5. **Protect your eyes.**
   Do not wear contact lenses when working with chemicals. Wear your safety goggles over your eyes, not your hair or neck.

6. **No eating.**
   Food, gum and beverage are NEVER PERMITTED in the laboratory. **Never** put anything in your mouth and **never** touch chemicals with your hands, unless specifically instructed to do so.

7. **Report Accidents.**
   All accidents no matter how minor need to be reported immediately to the teacher. If you spill any chemical, wash it off immediately with water. Report the spill immediately to your teacher.

8. **Read labels.**
   Make sure you use the right chemical by checking all labels three times. Label all your materials.

9. **Handle glassware carefully.**
   Take care that glassware is clean. Use **hot hands** or forceps for transferring heated glassware. Broken glassware should be swept up immediately (never picked up with your fingers) and discarded in the **special broken glass container**.

10. **Clean up thoroughly.**
Dispose of chemicals and wash used equipment according to the teacher's instructions. Clean tables and sinks. Put away all equipment and supplies. Make sure all water, burners, and electrical appliances are turned off. Return all laboratory materials and equipment to their proper places. Wash you hands before leaving the laboratory.

11. **Use heat sources carefully.**
Always keep the burner or hot plate clear of flammable materials especially alcohol. Always attend a lit burner or hot plate. Point the mouth of the test tube away from people. Never bring any substance into contact with the flame unless instructed to do so.

12. **Approach laboratory work with maturity.**
Students should be alert and proceed with caution. Take care not to bump another student and remain at your lab station. Never run, push, or engage in practical jokes of any kind. Use laboratory materials and equipment only as directed.

First aid	
Injury	**Safe response**
Burns	Apply cold water. Call your teacher immediately.
Cuts and bruises	Stop any bleeding by applying direct pressure. Cover cuts with a clean dressing. Apply cold compresses to bruises. Call your teacher immediately.
Fainting	Leave the person lying down. Loosen any tight clothing and keep crowds away. Call your teacher immediately.
Foreign matter in eye	Flush with plenty of water. Use eyewash bottle or fountain.
Poisoning	Note the suspected poisoning agent and call your teacher immediately.
Any spills on skin	Flush with large amounts of water or use safety shower. Call your teacher immediately.

SAFETY CONTRACT

I, Michael Plasmeier, have read and understand the safety rules and first aid information listed above. I recognize my responsibility and pledge to observe all safety rules in the science classroom at all times.

Michael Plasmeier — *signature*

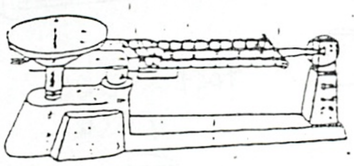
9/9/04 — *date*

Name Michael Plasmeier Date 9/9/04 6

Directions: Please write the name of the instrument pictured below and the type of units tl instrument measures in.

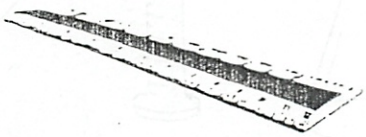
1. This instrument is a graduated cylinder

It measures volume in ml.



2. This instrument is a triple beam- balance

It measures mass in g.



3. This instrument is a ruler

It measures length in cm.

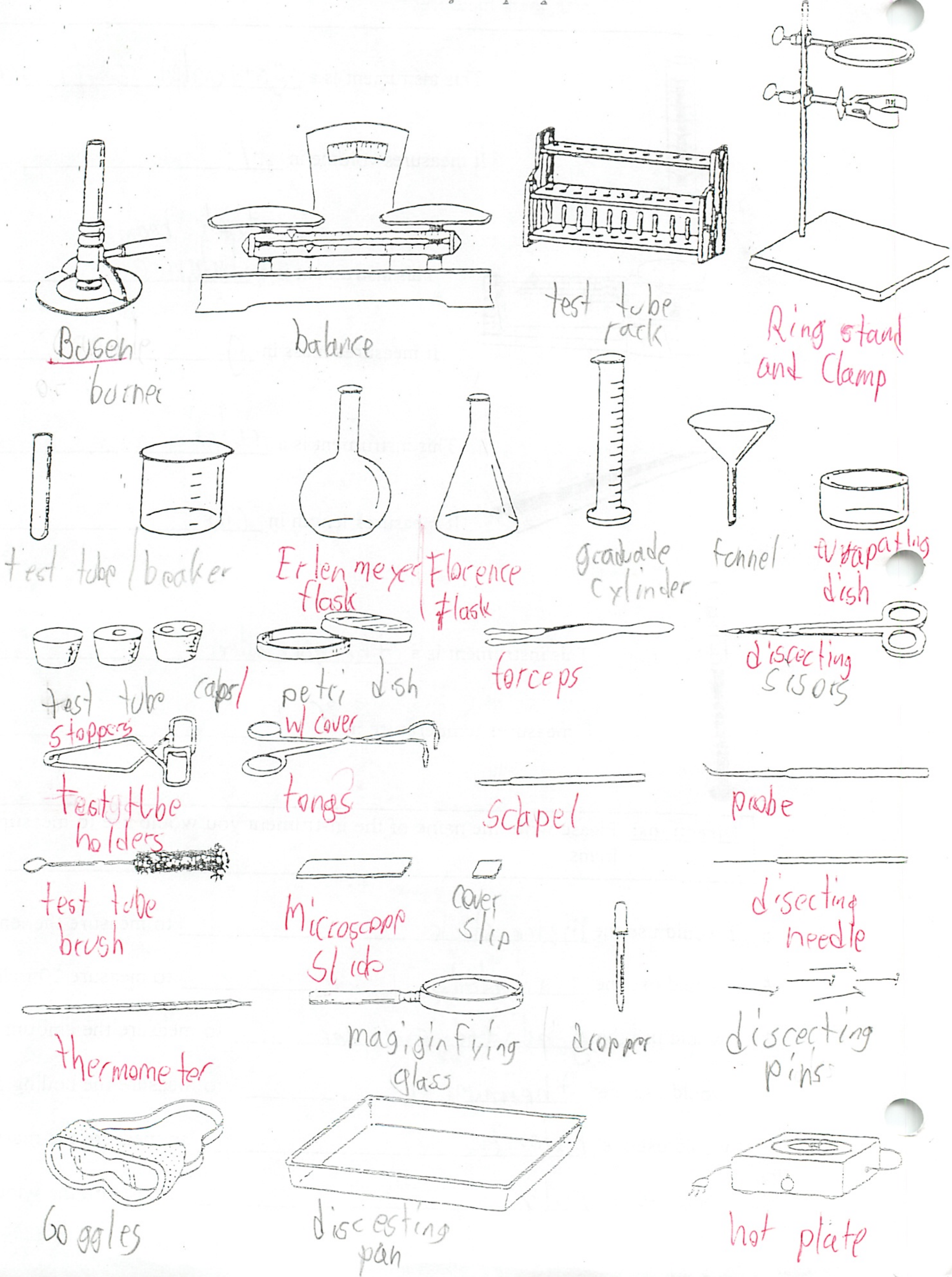
4. This instrument is a thermomater.

It measures temperature in °C.

Directions: Please write the name of the instrument you would use to measure the followi items.

5. I would use the meter stick to measure the length of my cla
6. I would use the graduated cylinder to measure 20 milliliters of mill
7. I would use the gradated cylinder to measure the amount of soda in a
8. I would use the thermomater to measure the boiling point of wate
9. I would use the balance to measure the mass of a pencil.
10. I would use the ruler to measure the width of a pencil

Laboratory Equipment



Designing experiments

Start with a good question

Will a car roll faster down a steeper hill?

This is a good research question because we can test it with an experiment. We could set up ramps at different angles and measure the speeds of cars as they roll down the ramp. Once you have a good question, you can design an experiment to help you find the answer.

Suppose you find that a car on a steep ramp rolls faster than a car on a ramp at a lower angle. Can you say that your experiment proves steeper ramps have faster cars?

Identify all the factors when designing experiments

Maybe, and maybe not. Before you can design a good experiment, you must identify all the factors that affect how fast the car moves down the ramp. Maybe you pushed the car on one ramp. Maybe one car was heavier than another. Your observation of higher speed *because* the angle was steeper *could* be correct. Or, the speed could be higher for another reason, like a push at the start.

Variables

Factors that affect the results of an experiment are called variables.You can think about variables in terms of cause and effect. The weight of the car is one variable that may have an effect on the speed of the car. Some other variables are the angle of the ramp and how far down the ramp you measure the speed.

Change one thing at a time

When you can identify more than one variable that could affect the results of your experiment, it is best to change *only variable at a time.* For example, if you change both the weight of the car and the angle of the ramp, you won't know which of the two variables caused your speed to change. If you want to test the effect of changing the angle, keep ALL the other variables the same.

Control variables and experimental variables

The variable that you change is called the experimental variable. The variables that you keep the same are called control variables. When you change one variable and control all of the others, we call it a controlled experiment. Controlled experiments are the preferred way to get reliable scientific evidence. If you observe that something happens (like the car goes faster), you know why it happened (because the ramp was steeper). There is no confusion over which variable caused the change.

A controlled experiment is an experiment where all environmental factors or conditions are controlled (kept constant or normal) except for the factor being tested.

A variable is an environmental factor or condition.

An independent variable is the factor or condition being tested.

The dependent variable is the factor which responds to the change in the independent variable. It's response is measured as data.

Controlled variables are all other factors or conditions which are kept constant or normal during the experiment.

Most experiments have two groups of subjects - an experiment group and a control group. The number in each group is determined by the designer of the experiment.

The experimental group is the group being tested by having the independent variable changed.

The control group is the group in which the independent variable is not changed but treated as a controlled variable.

THE SCIENTIFIC METHOD

The scientific method is a logical and systematic approach used be scientists to collect information.

The following steps are used:

1. **IDENTIFY THE PROBLEM**
   State the problem to be solved or the question to be answered.

HOW IS IT POSSIBLE TO THROW AN EGG AGAINST AN OBJECT AND NOT HAVE IT BREAK?

2. **COLLECT INFORMATION ABOUT THE PROBLEM**

3. **FORM A HYPOTHESIS**
   ...a proposed solution - a prediction or "best guess" based on known facts.

4. **TEST THE HYPOTHESIS**
   ...do an experiment.
   ...the hypothesis is tested by making observations.

Does Support or not Support

5. **~~ACCEPT OR REJECT~~ THE HYPOTHESIS**
   If the information obtained from the tests show the hypothesis to be true, the hypothesis is ~~accepted~~, if not, the hypothesis is ~~rejected~~.
   supported not supported

6. **REPORT THE RESULTS**
   Scientists publish the result of their work in journals so that it can be used by other scientists.

Some good ideas here — 9/13

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Name Michael Pleasmeier Period 3 Date 9/13

Pre-Assessment: Our Dynamic Planet

Directions: Use complete sentences and proper grammar, to answer the following questions.

1. **What are volcanoes and why do they occur where they do?**

Volcanoes are holes in the earth that spew magma from under the earth. They start when the preasure grows, and (from the magma) the magma cools down after it comes out of the volcano to form more land.

2. **What are earthquakes and what causes them?**

Earth quakes are when the ground rumbles and shakes making buildings collaps sometimes. These occure when the earth's tectonic plates shift and grind against each other

3. **How are earthquakes and volcanoes related?**

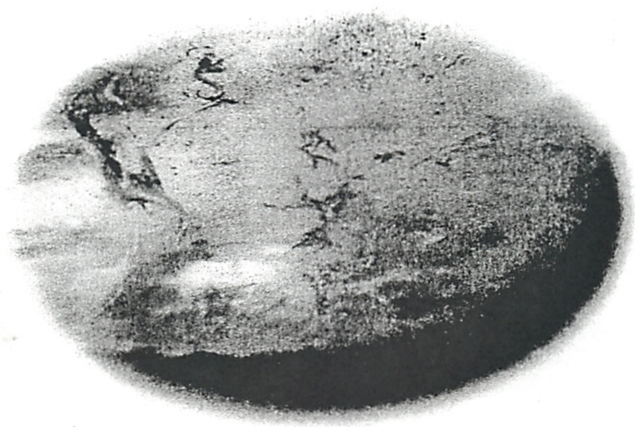
Earth quakes and Volcanos are similar because they both form mountains, they both shape and change the earth. they also are dangerous.

4. **How do mountains form?**

mountaines form with both forces of nature. the cooled down magma makes moutains, and when tectonic plates shift on top of each other, pushing the land upwords.

Example

Student Journal Cover Sheet
Investigating Our Dynamic Planet



Name: Michael Plasmeier

Group Members:

1. Meredith O'Neill
2. Lawrence Todd
3. Louise Rohres
4.

Teacher: D'Andrea

Class: Science

Dates of Investigation:

Start ______________ Complete ______________

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Name Michael Plasmeier Period 3 Date 9/14

What I Know About the Planet Earth
The Earth.....

1. It is constontaly changing.
2. It has volcano + earthquakes.
3. It has tectonic plates.
4. Volcano + Earthquakes can kill people.
5. San Fricksco is over due for an earthquake.
6. Our oil is going to run out soon.
7. Earthquakes are measured by the rictor scale.
8. Earth is 3rd Planet from sun.
9. Earth is a sphere.
10. Earth's surface is 75% water.

Earth has 1 moon
The Earth is tilted on its axis

over →

What I Would Like to Know About the Planet Earth:

1. How do the tectonic plates move?
2. Ho do fault lines clues?
3. Is the earth geting bigger?
4. Will humans ruin the earth?
5. How is water created?
6. How / Were is magma created?
7. How old is the Earth??
8. How did the earth form?
9. ?
10. ?

See #8 top on

Continued from top on back

The Earth is constantly changes

7 contents

Name: Michael Masmeier

Earth System Connection Sheet

When you finish an investigation, use this sheet to record any links you can make with the Earth system. By the end of the module you should have as complete a diagram as possible.

Atmosphere

1 1. I learned how hard it is for scientist to learn about the earth.

1 2. Earthquakes help Scietists make models of the earth

2A 3. Droping a peeble into water is like a earthquake

2A 4. Earthquakes make sismic waves

2B 5. There are 2 types of sismic waves that travel differently

2B 6. P waves travel faster then S waves

Geosphere

2C 7 Waves change speed/ "direction" when they go in different layers of Earth

2D Waves change direction when they go into different layers.

2D There is a chowdow zone where Earthquakes don't accure

3 How plates moved

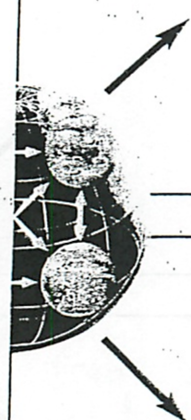
4 Plates which move towds each other (content-content) form mountains

5 Plates can move in 3 directions, causing 3 different plates

(!) 5 The 2 types of plates (oceanic, contental) which are different

6 The Pangea-most excepted thory

Biosphere

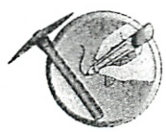


Hydrosphere

Inquiry Processes

- Explore questions to answer by inquiry.

- Design an investigation.



- Conduct an investigation.

- Collect and review data using tools.

- Use evidence to develop ideas.

- Consider evidence for explanations.

- Seek alternative explanations.

- Show evidence and reasons to others.

- Use mathematics for science inquiry.

Introducing Dynamic Planet

1. Earthquakes and volcanoes provide "clues" about the interior of the Earth and the history of our planet.

2. Earthquakes and volcanoes occur as part of a process (plate tectonics) that has opperated to billions of year.

3. Slow rates of change (ex. plates move at a rate of 5 cm per year) can produce great changes seperate continets, and form ocean) when they opperate over long periods of time (millions of years)

Investodtium 1
Gathering Evodence + Modleing

Key Qu - How do you make a motel of someting you can't see.

Pre-Ans Well you have other sences besides sight. You can tach, hear, smell, taste things too. However it will be hard with out sight. This is what geologist do because they can't see in the earth. They also use complicated instrum-ents and methods to figure that out

BACKGROUND INFORMATION
INVESTIGATION 1: GATHERING EVIDENCE AND MODELING

What you are about to do represents a scientific approach to gathering evidence. The data you will collect is the evidence. Sight, touch, smell, sound, and in some safe instances, taste, can all be used to make observations. Observations can provide evidence that can then be evaluated and analyzed to provide explanations for scientific inquiry questions. Accurate observations are crucial in this respect and that this often means taking a systematic approach. Without this, it is easy to overlook something that might be important to accuracy, and therefore the validity of the observation.

In this investigation you will be using three senses: smell, touch, and hearing. Do not touch anything until instructed to do so. This is important. Touching too soon can sometimes interfere with the validity of a test. Observations of sound can be important scientific data. For example, a doctor listening to a patient's heartbeat with a stethoscope. Work quietly to ensure good sound observations. We often use our sense of touch to identify objects, especially when they are hidden from view, like items in coat pockets or small things in a school backpack. How would you find your way around a room if it were suddenly plunged into darkness because of a power outage at night. Be systematic about using touch.

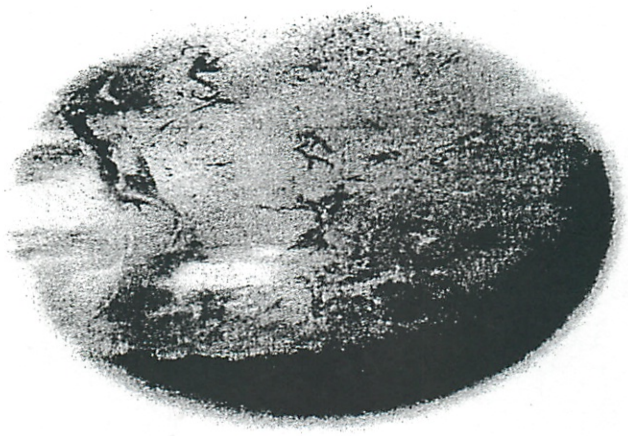
Models are tentative schemes or structures that correspond to real objects, events, or classes of events, and that have explanatory power. Models help scientists and engineers understand how things work. Models take many forms, including physical objects, plans, mental constructs, mathematical equations, and computer simulations. Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to be observed directly, or that are too vast to be changed deliberately, or that are potentially dangerous.

Geoscientists have been developing models of the Earth's interior for well over 100 years. Before the end of the nineteenth century, geoscientists had only a dim conception of the interior of the Earth. The size and mass of the Earth had been measured quite some time before, so the average density of the Earth was known. That average density is much greater than the density of typical crustal rocks, so it was concluded that the deep interior must be denser that average. The existence of the Earth's magnetic field also gave the clue that the core consists at least partly of iron. The most important guide to the nature of the Earth's interior has come from interpretation of how seismic (earthquake) waves pass through the Earth.

Investigation 1

Gathering Evedence + Modeling

Student Journal Cover Sheet
Investigating Our Dynamic Planet



Name: Michael Plasmeier

Group Members:

1. Meredith O'Neill
2. Sam Bolter
3. Louise Rohrer
4.

Teacher: D'Andreia

Class: Science

Dates of Investigation:

Start 9/21/04 Complete

What are the Contents of the Mystery Bag?

Hypothesis

Plastic Ball or big object

SMELL

Model

Evidence

~~Foses~~
~~flowery Smelll~~
Orangy smelll - sort of fake

HEARING

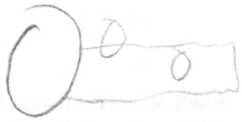
Model

Evidence

hevey doesn't really shake
coins
multifiple objects

TOUCH

Model



Evidence

hard - iregular sphere (apple?)
Spoongy part - long
irregular shape
multiple objects
hard bone shape
Sink

FURTHER TESTS

- could try droping to see if it breaks + feeling it again or it leaks
- open the bag
- Weigh it

Activity Three – Serial Ordering

Place the five objects in order of the following:

a. smallest to largest (shortest to longest)

1. ring
2. magnify glass
3. test tube
4. Cylinder
5. pencil

1. ring
2. pencil
3. test tube
4. magnifiy glass
5. cylinder

b. roughest to smoothest

1. magnify glass
2. ring (rough part)
3. pencil
3.5 smooth mag. glass
4. test tupe
5 cylinder

c. ??? your group should come up with one more category here: Shortest to longest

Activity Four – Shadow Boxing

Look at the shadow on the screen in the front of the room. Describe the shadow below, including what you think the object is.

Out line of bugs

· probley plastic because perfect shape

Closing Question??

Why is making good observations an important skill in scientific investigations?

Making observations are important because they give you evidnce which you answers to your hypotheses.

DIRECTIONS
THE INTERIOR OF THE EARTH
INVESTIGATION 2
PART A: OBSERVING WAVES AND MEASURING WAVE SPEED
IES: OUR DYNAMIC PLANET

BACKGROUND INFORMATION

Scientists use earthquake waves that pass through the Earth to make models of what the Earth is like. In some ways, this is like an x-ray of the Earth, because like earthquakes, an x-ray source sends energy into an object and the energy travels in the form of waves. In making a model of the Earth, it is important to find out the time it takes for an earthquake wave to travel from the location of the earthquake to a recorder (called a seismograph). How long the wave takes to travel, and whether or not the wave makes it to the seismograph, provide important evidence about the interior of the Earth. In this investigation, you will focus on MEASURING THE SPEED OF WAVES IN WATER.

You will be measuring the distance between two points, measuring how much time it takes for a wave to travel from one point to another, and calculating the average travel time and average speed of the waves.

For test results to be accurate, the test itself must be free of uncontrolled variables, other than those that are intentionally uncontrolled. It is crucial that the test be conducted in exactly the same way every time if it is to be counted as reliable (or, in the language of scientific experimentation, "fair").

Sometimes part of the experiment doesn't go according to plan. If you think that you have not made a "fair and objective" measurement (e.g. the stopwatch was not started at the instant that the pebble hit the water), then don't use that data for your calculations. Use your best judgment about when to do this, as a scientist would. It is highly desirable to do a few practice runs and get the procedure well worked out. At the end of Part A, record possible sources of error in your journal.

Safety Precautions:
Pebbles **should not** be thrown, and goggles should be worn. Spills should be reported to the teacher and wiped up as instructed.

Things to keep in mind BEFORE doing this investigation:

A distance of at least 40 cm between points is recommended.

Record the distance between the two points as accurately as possible.

Water need not be very deep in the containers. Two to three centimeters (about one inch) works just fine.

The height for dropping the pebbles should be about 5 centimeters. (2 inches)

The accurate recording of information is crucial in science. Using a data table is a good way of organizing this recording.

Investigation 2

The interior of the Earth

Part A - What is the interior of the Earth Like

Student Journal Cover Sheet

Investigating Our Dynamic Planet

Name: Michael Plasmeier

Group Members:

1. Mellisa Mc Gowan
2. Mark Clinton
3. John Tomson
4. Christabel York

Teacher: D'Andra

Class: Sci - PD3

Dates of Investigation:

Start 9/27 Complete ______

Key Quest

What is the interior of the earth like?

The interior is made of rock and lots of other things like the crust, mantle.

25 cm Distances

Trial Number	Distance Wave Traveled (cm)	Wave Travel Time (s) in sec	Notes About Quality of Measurement
1	25	M 2.22	J
2		2.68	Ⓜ - Droped Sideways
3		2.40	Ⓜ
4		C 1.60	C
5		C 2	M
6		C 2.78	M
7		C 2.71	Ⓜ
8		C 3.18	C Stoped Late
9		C 3.10	Ⓜ
10		C 2.5	Ⓜ
11			
12			
13			

Mark: stoped Late

Baisn too Small
You hit stop/Start fast
only about .5 if done correctly

it Should be when wave comes back

24a

Invest 2a
Follow up

9/28

7. 2.517 seconds = Adverage travel times

8. 9.93 = Adveage wave speed (cm/s)

9a. 5 sec
b. 10 sec
c. 20 sec
} about

10. It would cut the average travel time in half.

11a. the stone dropping
b. the ripples in water
c. the water
d. the flashlight + the dot

Responce:
We think that our answer is wrong because it was too hard to stop and start the watch because our interval was too small to accertuly measure. A biger pan may help us get an accurate measure. Our process is signefinty flawed.

Floaty Thing

24b

Invest 2b - kinds of Sicmic Waves

Student Journal Cover Sheet
Investigating Our Dynamic Planet

Name: Michael [illegible]

Group Members:

1. Nick
2. Mark C.
3. ?
4.

Teacher: D'Andria

Class: Sci 10D 3

Dates of Investigation:

Start 10/5 Complete 10/6

2C

Background Information
Investigation 2: The Interior of the Earth
Part B: Kinds of Seismic Waves

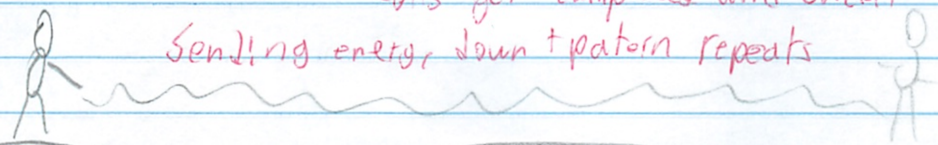
In this investigation you will use Slinkys© to observe two kinds of seismic waves: **compressional waves** and shear **waves.** Compressional waves travel differently than shear waves, as well as travel faster that shear waves. Scientists study the arrival times and amplitudes (height of the waves from trough (bottom) to crest (top)) of seismic waves to study the interior of the Earth.

Compressional shear
travel differently
faster

2B Experment

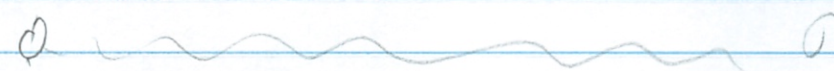
2. Compressan - when you hit w/ fist it goes up and down
a parallel bigget compessan and has to expand
Coils get compressed and uncoil - coils gets compressed
Sending energy down + patern repeats

Side



3. Shear - a perpendicular to slincky
Like an "S"

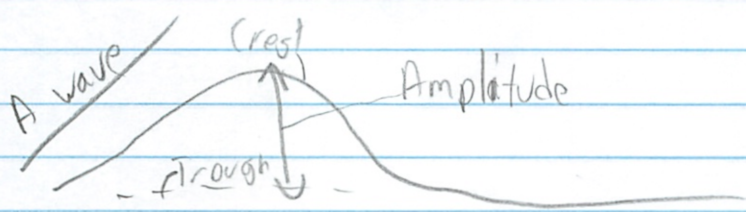
Top View



goes side to side - it sharees side to side (the slinky)

Slinky must twist it's self to accomadate the wave.

4. The Compressinal wave typically arrive 1st. Ours didn't



2b Notes

10/6

1. Friction caused the compresional wave to die out before reaching the other end. + not enough force

2. The Slinky coils were compressed together as the push-pull wave passed

3. The Slinky coils slid past each other (were sheared) as the shake waves passed

4. If the wave reached the other end, it bounced back (reflected) off the person's fist

5 Push-pull waves travel parallel to direction of the Slinky, Shake waves travel perpendiclar to the orientation of the Slinky.

6. Earthquake waves travel through the rock, Ex: a passing truck can fell vibrations

Gisting

Reading for main ideas by summarizing selected sections of an article into 20 clear, concise words.

1. Read the article, Earth.

2. Summarize the **first paragraph** in no more than or no less than *20 words*. Decide what is important to keep and what is not important to keep. You must begin the gist with the word **who** or **what**. Gists must be written in sentence form. You determine the number of sentences.

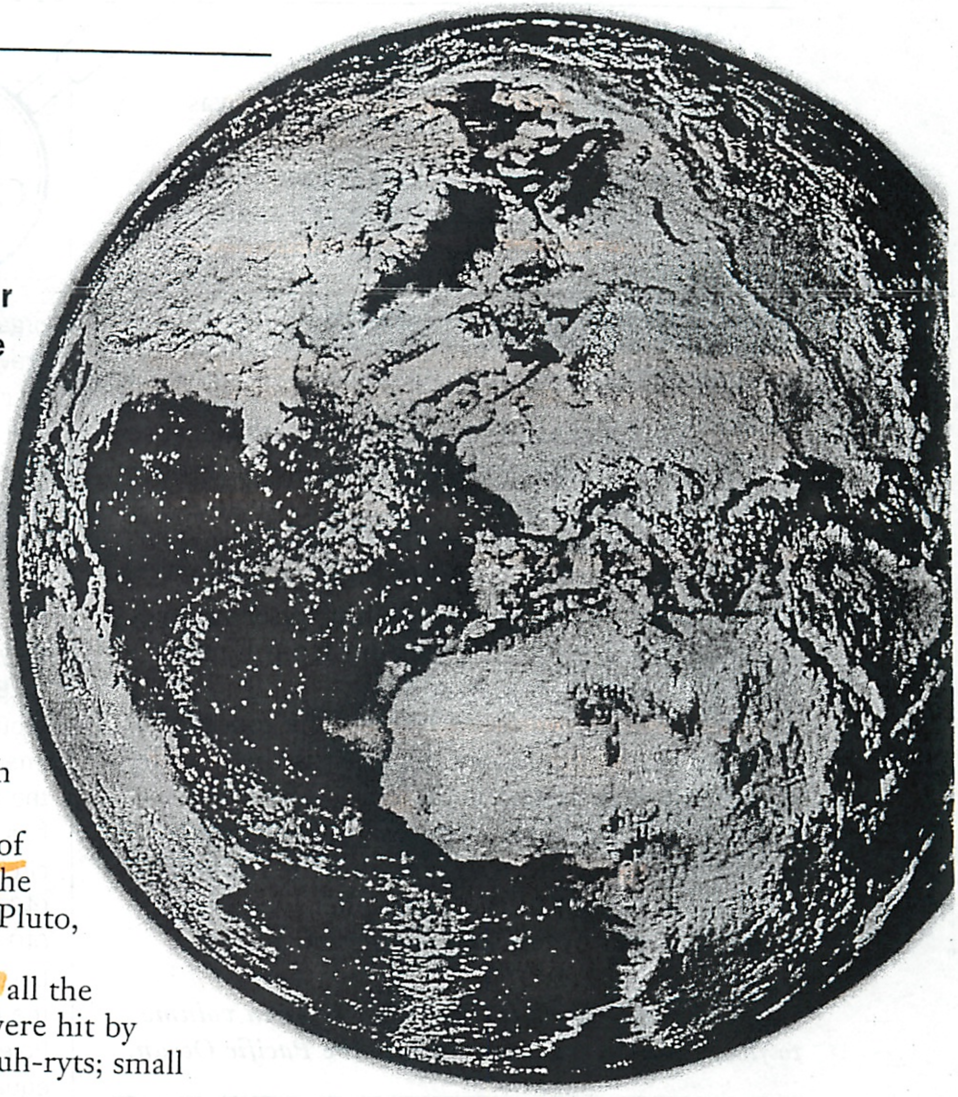
3. Summarize the **first and second paragraphs** togheter in no more or no less than *20 words*. Again, decide what is important to keep and what is not important to keep. Again, begin the gist with the word **who** or **what**.

4. Continue the above process until all ~~10~~ 9 paragraphs are summarized in 20 words.

Note: If you do not finish this assignment in class today, it must be completed over the weekend. Keep all work in your Science ~~Binder~~ folder. Don't hesitate to ask for help if you need it.

Earth

The only planet in our Solar System able to support life



A satellite image of Earth showing Africa, the Arabian peninsula, and Europe.

Around 4.6 billion years ago Earth and the other planets that orbit the Sun were formed. These planets, their moons, many asteroids (AS-tuh-ROYDZ; minor planets), and the Sun make up the Solar System. The closest planet to the Sun is Mercury, followed by Venus, Earth (which is about 94 million miles away from the Sun), and Mars. Each of these planets is made of rock. The more distant planets, excluding Pluto, are made mainly of gas.

Shortly after their formation, all the rocky planets and their moons were hit by countless meteorites (MEE-tee-uh-ryts; small particles of matter). These meteorites made craters, which are easily seen on Earth's Moon. Earth's surface is no longer covered with craters. This is because it is constantly being weathered and changed by the atmosphere.

There have been many different ideas about how Earth was formed. In ancient times, people thought that Earth was at the center of the Universe. In the 16th century, Polish astronomer Copernicus (1473–1543) suggested that Earth revolved around the Sun. This idea was later proved by the observations of Italian astronomer Galileo (1564–1642). These astronomers' early ideas led to a number of different theories about how the Solar System had formed.

Pierre-Simon Laplace (1749–1827), a French astronomer, suggested around 200 years ago that the planets and the Sun were formed from a hot cloud of gas. Modern theories say that the gas

HIGHLIGHTS

- ♦ Earth is the only planet in the Solar System with lots of water and therefore plenty of life.
- ♦ Scientists believe that Earth is about 4.6 billion years old.
- ♦ Earth moves around the Sun in one year and rotates around on its own axis each day.
- ♦ Day and night are caused by Earth making one complete revolution in 24 hours.
- ♦ Earth is not shaped like a perfect sphere. It bulges out at the equator.
- ♦ Earth's crust moves; giant slabs of crust, called plates, gradually move apart and collide, carrying the continents with them.

cloud was cold. Gradually, rocky matter was formed as the gas and dust came together. ravity drew the material into bigger chunks. Some of these chunks move through space as asteroids. Others grew into large planets.

Life and features on Earth

Earth is a unique planet because it is the only place in the Solar System that is filled with living organisms. Organisms can live on Earth because it is at just the right distance from the Sun for water to exist as a liquid. Water is a precious liquid that is essential for all life. Nearly three-quarters of Earth is covered by the oceans. Mercury and Venus have only hot water vapor and not liquid water. Farther out from Earth, on Mars, water is frozen solid.

Earth is made of three layers. The top layer is called the crust. Below the crust is the mantle, and in the very center is the core. The crust is surrounded by a layer of gases. This layer is called the atmosphere. It contains the oxygen (about 21 percent of the atmosphere) essential to many living organisms. The atmosphere absorbs and traps heat from the Sun, making the surface of Earth a pleasant place to live. The atmosphere also acts as a protective shield. Dangerous ultraviolet rays from the Sun are kept out by a layer of ozone (OH-zohn; a form of oxygen with three atoms) high in the sky.

he Columbia River is the largest river in volume to flow from North America into the Pacific Ocean.

LOOK CLOSER

Earth's Gravity

One of the most important forces on Earth is gravity. This force pulls objects toward each other. Living organisms, including humans, are held on Earth by gravity. Earth itself is kept in its orbit around the Sun by gravity. An object's weight is the strength of its pull by gravity toward Earth. Without gravity, Earth would not have an atmosphere to enable animals to breathe. Because the Moon is much smaller than Earth, it has less gravity. The Moon's gravity is too weak to hold an atmosphere around it. Astronauts on the Moon are not held down so much as on Earth, so they can bounce and jump around on the Moon.

Because Earth rotates on its axis, it has a bulge around its middle, at the equator (ih-KWAY-tuhr; an imaginary circle around Earth at equal distances from the North and South Poles). This is where the Earth has been stretched by its spinning motion. Earth's circumference around the poles is 24,860 miles (40,007 km) and at the equator it is 24,901 miles (40,074 km). The nearer someone is to the center c Earth, the more they are pulled down by gravity and the more they weigh. Someone standing on the North Pole weighs a little bit more than if they stood on the equator. This is because at the North Pole they are slightly nearer the center of Earth than at the equator, where Earth bulges. In addition, since the person at the equator is moving around a large circle at high speed, a centrifugal (sen-TRIH-fyuh-guhl; center-fleeing) force would counteract a small fraction (less than one percent) of his or her weight as measured by standing on a bathroom scale.

Earth's crust

The continents of Earth have the overall composition and density of granite (GRA-nuh an igneous (IG-nee-uhs) rock, which means it was once molten. This type of rock has solidified

STORY OF SCIENCE

Flat or Round?

Many years ago, people thought that Earth was flat. They believed there were steep cliffs at the edge of the world and that people could fall off into space. As people began to study Earth more, they began to question this idea. It was noticed, for example, that when a ship sailed into the distance it did not suddenly disappear over the horizon. It would gradually move over the horizon. First the hull disappeared, followed by the tops of the masts. This made people think that perhaps Earth was a sphere and not flat. There was other evidence, too. Sailors noticed that as they traveled north they saw different stars and constellations in the night sky. The stars they saw at home were no longer there. If they were sailing on a sphere-shaped Earth, these observations could be explained.

In addition, when an eclipse of the Moon takes place, Earth's shadow falls on the Moon. This shadow is round, the type of shadow that only a sphere could produce. So for hundreds of years people have believed Earth to be round. They have been able to prove it by using simple observations such as these. Today, people have the most striking evidence possible—photographs taken from space. These show Earth as a beautiful sphere with large landmasses and oceans, swirling cloud patterns, and ice caps.

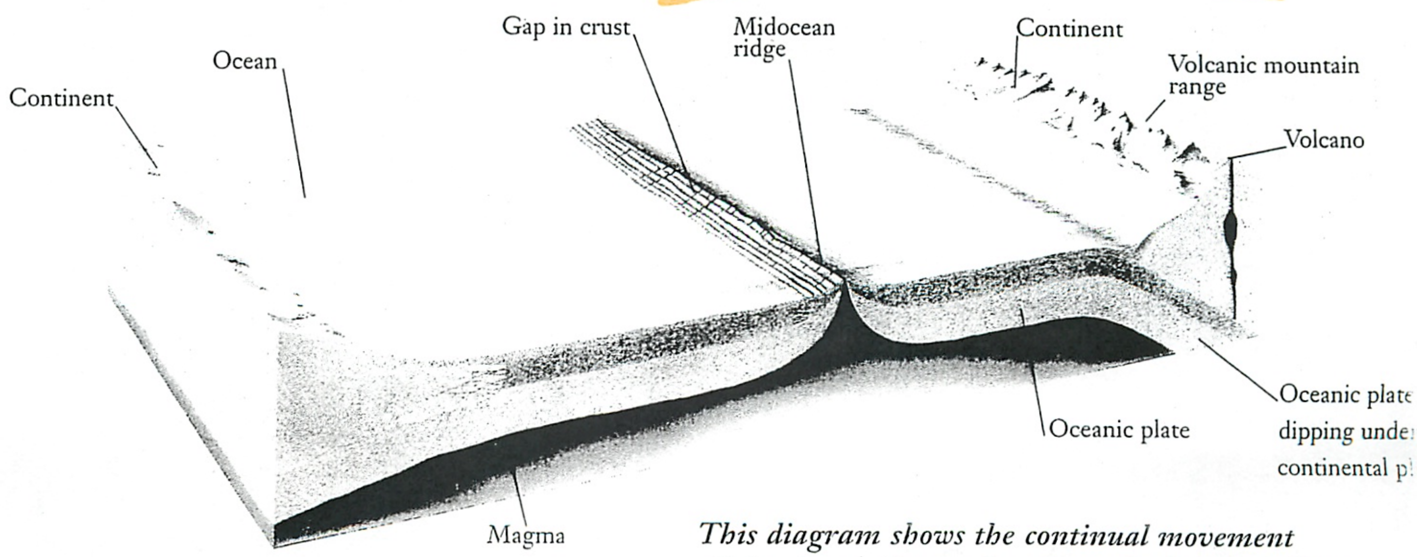
deep in Earth's crust from molten rock called magma (MAG-muh). Many other rocks also appear in the continental crust. These rocks include sedimentary (seh-duh-MEN-tuh-ree) rocks made of sand, clay, and pebbles. There are also metamorphic (MEH-tuh-MAWR-fik) rocks, which have been changed by heat or the pressures caused when continents move about. Marble is metamorphosed (MEH-tuh-MAWR-fohzd; changed) limestone. The continental crust may be 60 miles (96 km) thick.

Mountain chains are a typical feature of the continents. These chains run in narrow bands, usually where two old landmasses have collided. One of the longest mountain chains runs from the Pyrenees (PIR-uh-neez) in Spain through the Alps to the Himalayas. The highest point on Earth is Mount Everest in the Himalayas, which peaks at a height of around 5½ miles (9 km).

Land is constantly attacked by extreme forces. Water is the most powerful of these. Rapidly running rivers cut deep valleys, frozen glaciers carve away the mountain summit, and seas batter the coastline. The fragments worn away from the land, such as pebbles and sand, are deposited in the sea. There they form new sedimentary rock layers such as sandstone.

Oceans

The floors of the oceans are made of basalt (buh-SAWLT), which is a volcanic rock that has cooled from molten lava (LAH-vuh). The sea



This diagram shows the continual movement of the plates of crust deep beneath the ocean floor.

Name Michael Ploemeier

Gisting for: Earth

Paragraph 1

Who?	The	Earth	started	4.6
billion	years	ago.	It	is
made	of	Rock.	Other	distance
planates	are	made	of	Gas

Paragraph 1 & 2

What?	Earth	4.6	billon	years
old.	Made	of	Rock	Planets
hit	by	metorites.	See	these
on	moon	Not	on	Earth

Paragraph 1, 2, & 3

Who?	16 th	century	astromors	though
how	Earth	formed	4.6	billion
years	ago,	after	metorites	hit.
Thought	Earth	goes	around	sun.

4. Pierre-Simon Laplace said Planets formed from gas and dust 4.7 billion years ago. Metiors hit, scientists suggest Sun center System.

5. Earth supports Life, 4.7 billon years old. hit by mideorites, made of rock. Sci said formed of gas, orbits sun

6. Earth 3 layers. Crust, mantle, core. Has atmosphere which trap gas. 4.7 billion years, rock, formed out of gas, orbits sun

7. Several type of rockss, granite, igneous, magma, sedimentory, medimorfic, 4.7 billion, rock, formed from gas, orbits sun, has 3 layers

8. Mountains formed when 2 land collide, 4.7 billion years, rock, formed from gas, hit by metiorie, orbits sun, 3 layers

9. Land attched , by water, 4.7 billion, rock, formed from gass, hit by medorites, orbits sun 3 layers, mountains, living things

30a

Invest 2c

Retraction of Waves

Student Journal Cover Sheet
Investigating Our Dynamic Planet

Name: Michael Plasmeier

Group Members:

1. Christabell York
2. Maria
3.
4.

Teacher: D'Andrea

Class: Sci PD3

Dates of Investigation:

Start ______________ Complete ______________

BACKGROUND
Investigation 2: The Interior of the Earth
Part C: Refraction of Waves

In investigation 2: Part C: Refraction of Waves, you will simulate what happens when a seismic wave crosses a boundary between two kinds of materials. compressional P waves up and down

Read steps 1-8, pages 12-14.

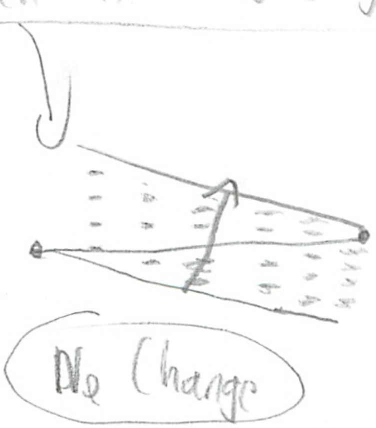
The diagram on page 13 shows a row of students who march toward a "boundary line." The row of students represents the front of a wave that is moving through the Earth. The white line represents a boundary between two kinds of materials. **As each part of the wave crosses the boundary line, its speed changes**, because the **speed of a wave depends upon the material through which it is traveling**. This holds for compressional waves as well as shear waves.

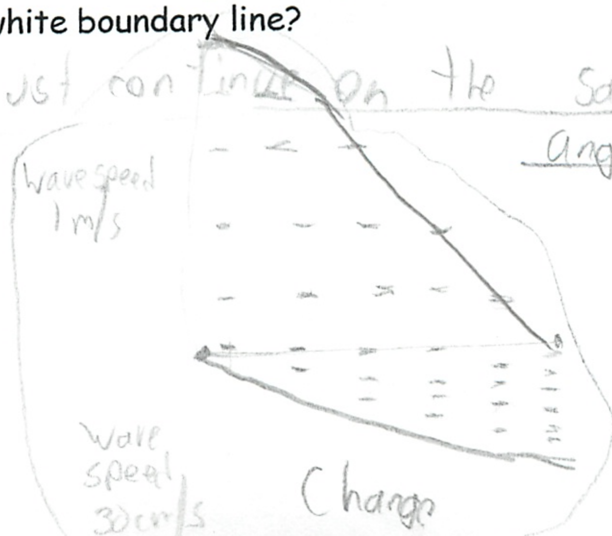
Does a change in the speed of a wave have any effect on its path or direction? (explain)

No. but the shape of the wave changes The path is same. People still walk straight

What would happen if students **did not change the speed of their marching** after they crossed the white boundary line?

Then it would just continue on the same angle





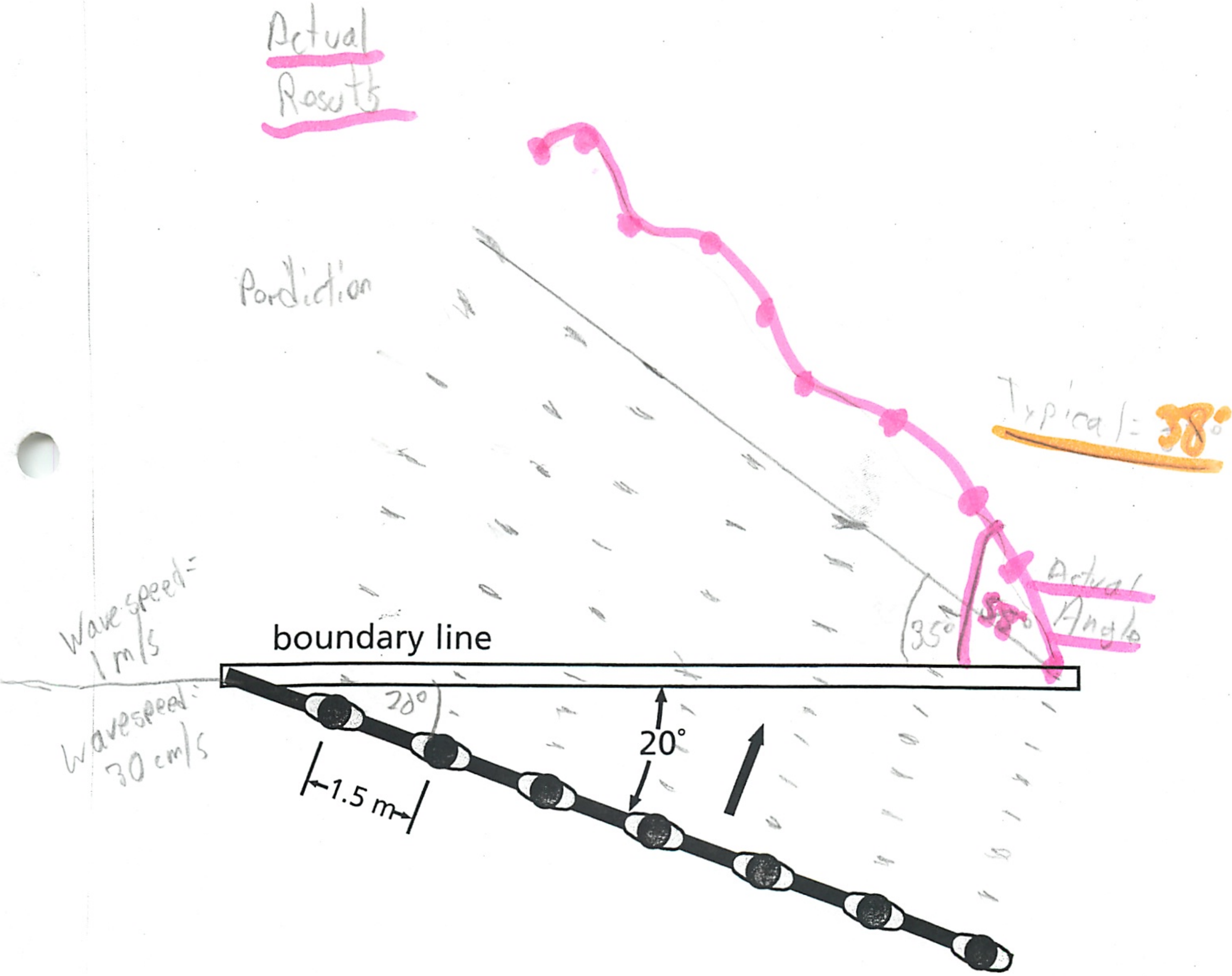
What would happen if the students increased the speed of their marching after crossing the boundary line?

The new angle would be greater

See Bottem Right of Front

Predict what the line of students will look like after the last person has crossed the boundary.

Modeling Wave Refraction



2c Questions + Notes

p14 10/12

#8 c. It does form a different angle. The first was 20°, 2nd was 55°, typical 38°

d. The people moved at different speeds and that changed the total angle (different "direction" of total wave, not people)

e. It changes angle or "direction" it travels on. It could change angles **Bending**

Notes

10/13

1. A change in the speed of a wave changes the direction of its path.
2. If the speed of a wave remains constant (does not change) then the angle of the 2nd red chalk line would be equal to the angle of the 1st red chalk line

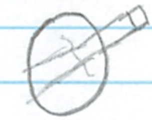
   This would mean that the density inside the earth from layer to layer is constant and so, we would expect the waves to have a constant speed and follow a straight path
3. As the students increased their speed after crossing the white line, we observed a change in the direction or path of the wave they created

2c 11, 12

Refraction of Light

10/14

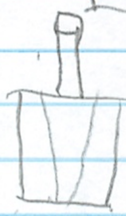
11. a. The pencil looks like 1 continuse peace

Top  

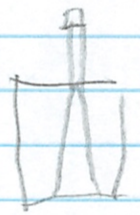
b

Side 

The pencil lookes broken, 2 pieces and larger in the water

Front 

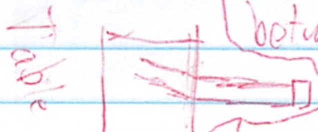
The pencil get bigger twards the top of the glass

Back 

The penicl get bigger twords the bottom of the glass

b. Different speeds because the pencil appears broken, it bending as the wave did in experment 2C.

crosses water lines and bends

12.  

12. Ans. When a wave crosses a boundry between 2 diffrent materals, the greater the change in speed the greater the refraction

Light travels $\frac{3}{4}$ x faster in water then in a vacume

11. Ans The surface of the water is a boundry between air And water. In order to see the pencil, light waves must first travel through air, and then after being refracted through water. The angle would not change if the light waves travel at the same speed through air as they do water

Model Readings

p 4,5,6 — 10/12

1. Physical models are made actuals subjects. Conseptual models are in people's minds and on paper. There is no actual things.

2 Hypothesis are guess made without all facts. Models are made based off facts.

3 Math models take prior evidence and use rules to perdict what will happen

4. Computers can do things much faster then humans can. Computers are also good at finding things that humans cant

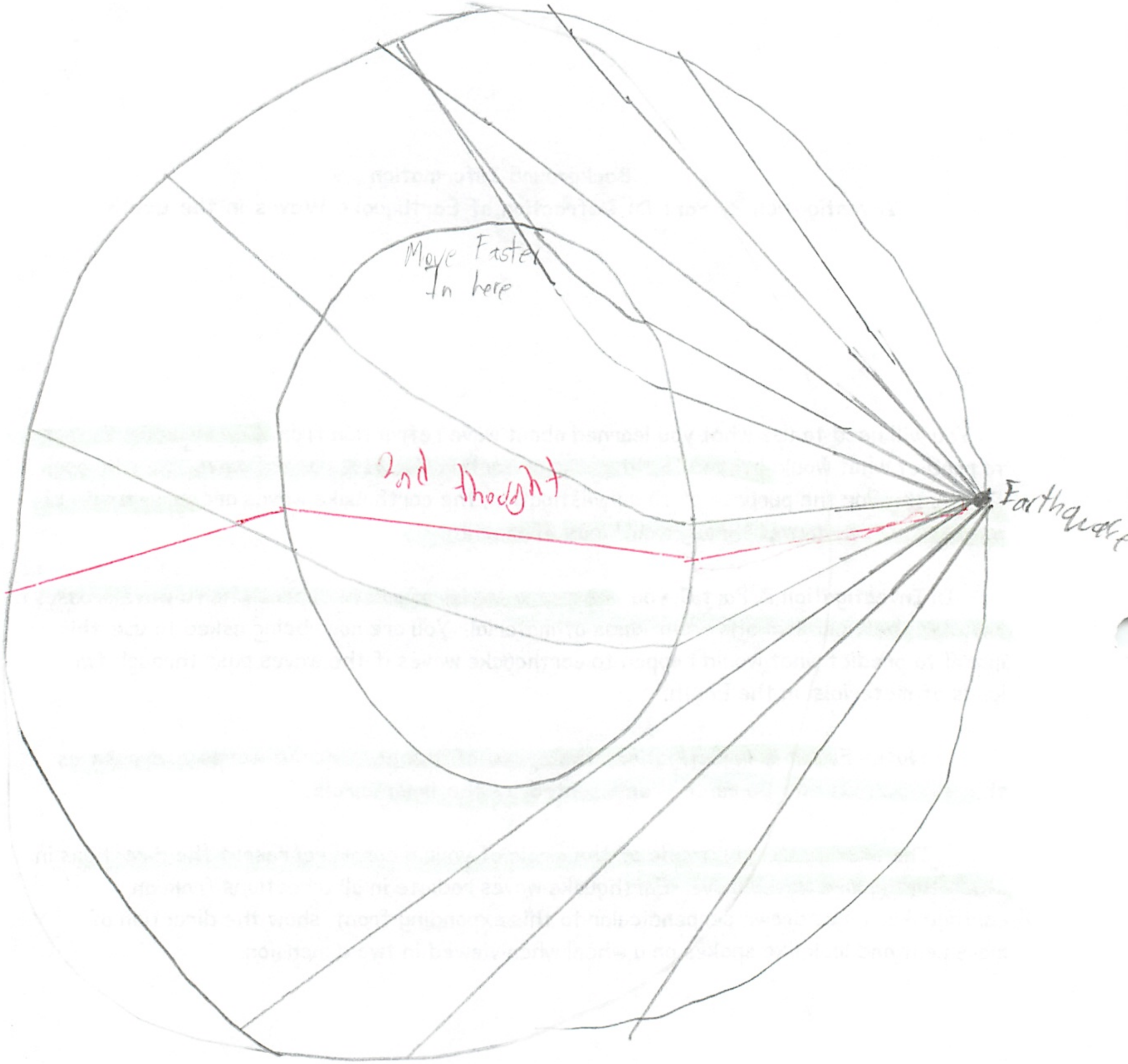
Background Information
Investigation 2, Part D: Refraction of Earthquake Waves in the Earth

You will need to use what you learned about wave refraction from Investigation 2, Part C, to predict what would happen to the paths of earthquake waves as the waves pass through the Earth. For the purpose of this investigation, the earthquake waves are **compressional waves, and can travel through all kinds of matter.**

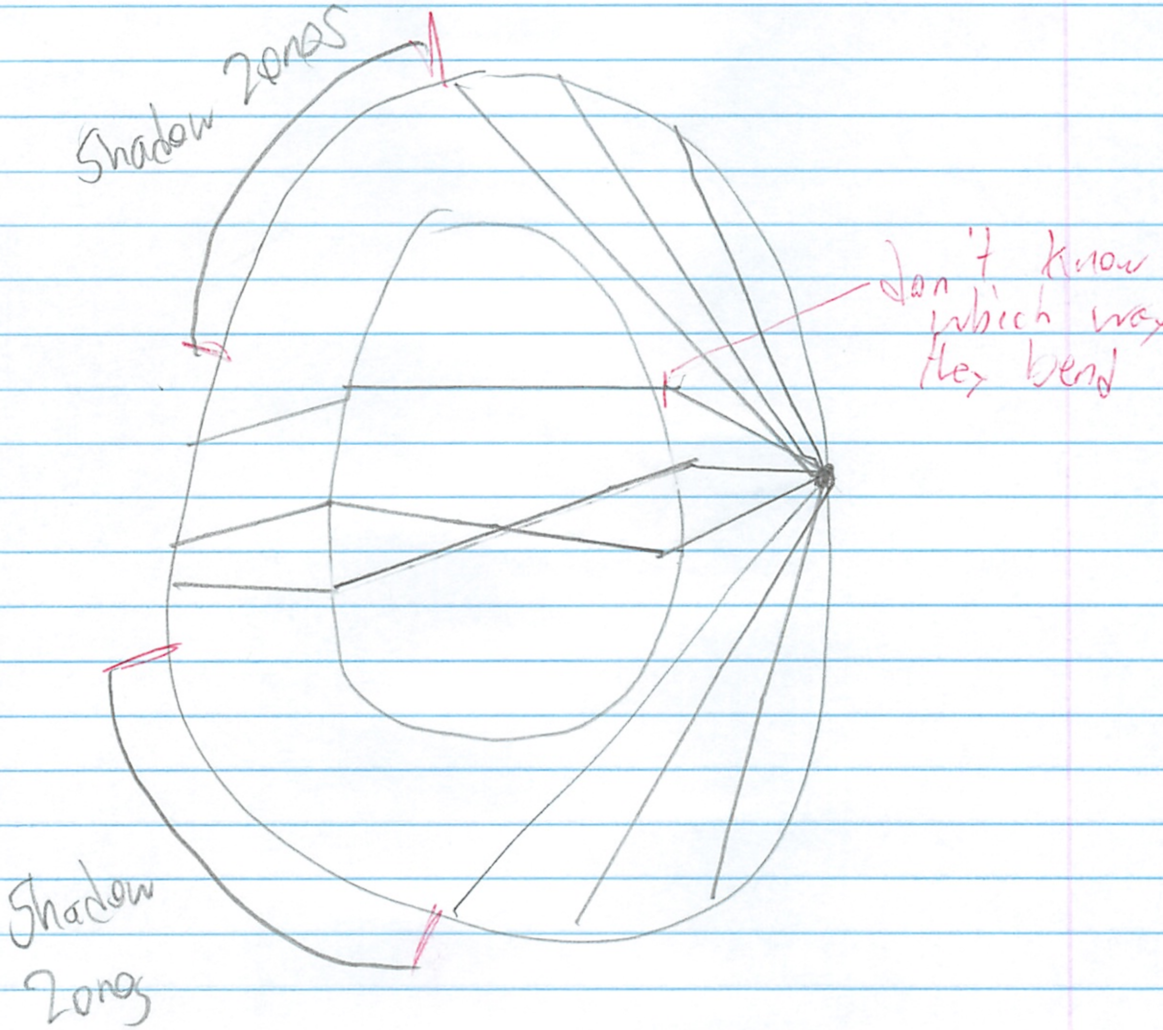
In Investigation 2, Part C, you **created a model** of what happens when a wave crosses a boundary between two different kinds of material. You are now being asked to **use this model** to predict what would happen to earthquake waves if the waves pass through two kinds of materials in the Earth.

Note: For this investigation, the speed of the earthquake waves decrease as the waves cross the boundary represented by the inner circle.

The lines on the right side of the circle of your diagram represent the directions in which earthquake waves move. Earthquake waves radiate in all directions from an earthquake. Lines drawn perpendicular to this expanding front, show the direction of movement and look like spokes on a wheel when viewed in two dimensions.


Move Faster In here
2nd thought
Earthquake

2 P
p16, 17
tiers + Notes



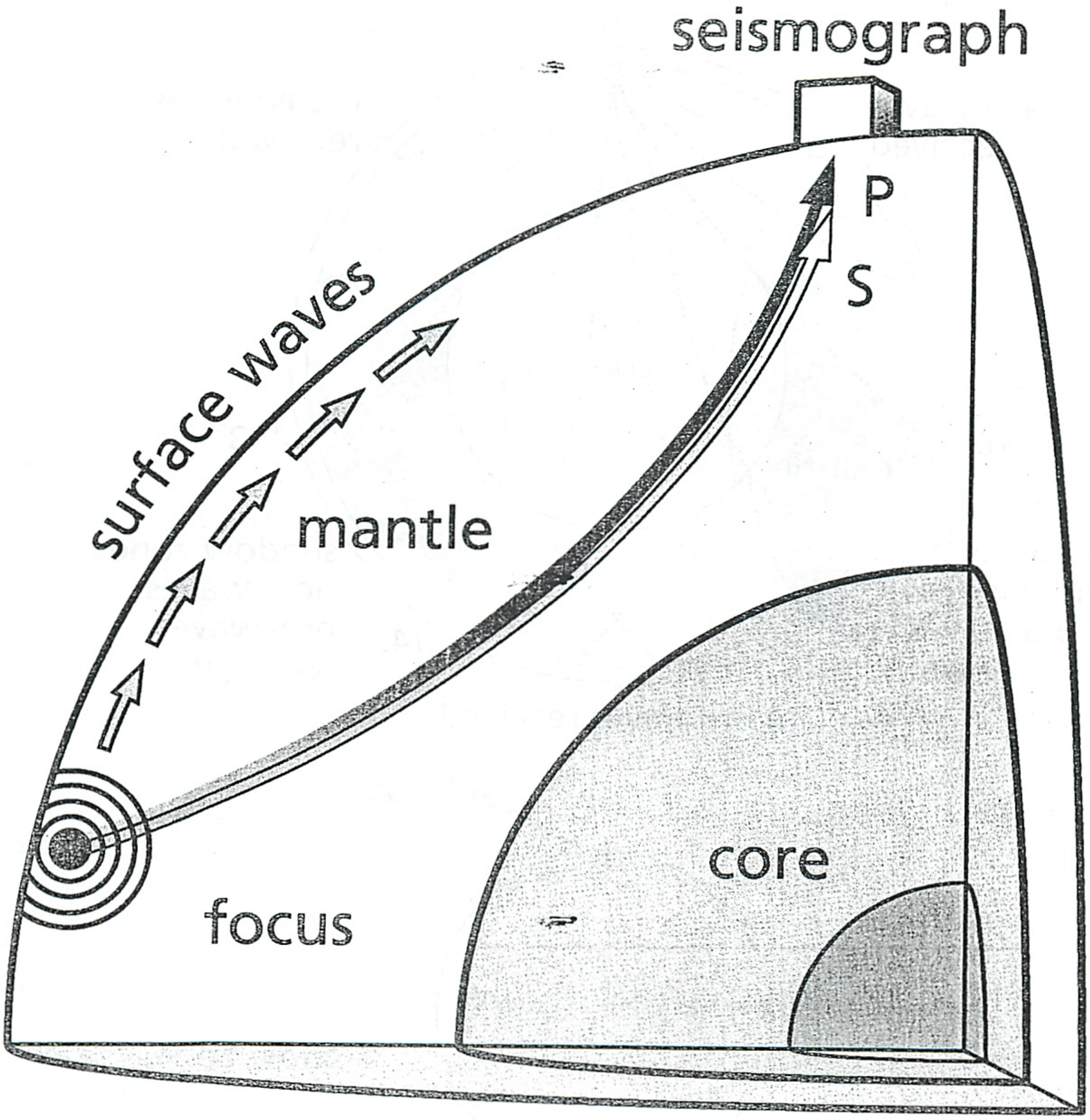
4.a. There are shadow zones where no waves reach the other side

b. The patern helps them follow waves

Mike P   37

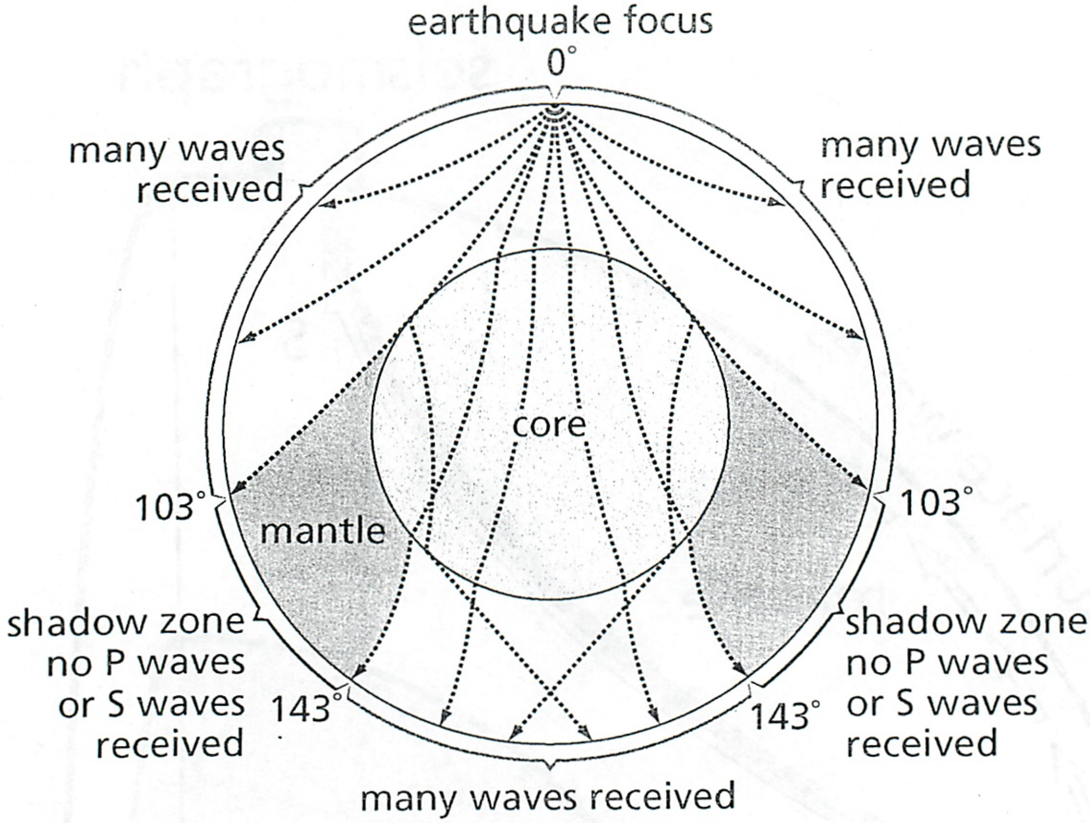
Blackline Master *Our Dynamic Planet* 2.4

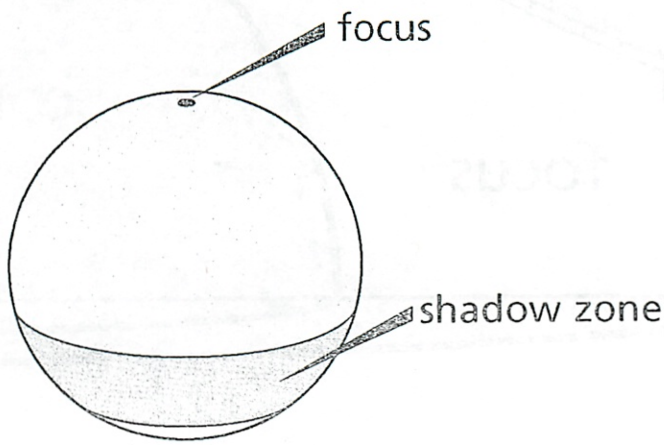
Seismic Wave Refraction and the Earth's Interior Structure



Use with *Our Dynamic Planet* Investigation 2: The Interior of the Earth

P wave Shadow Zone

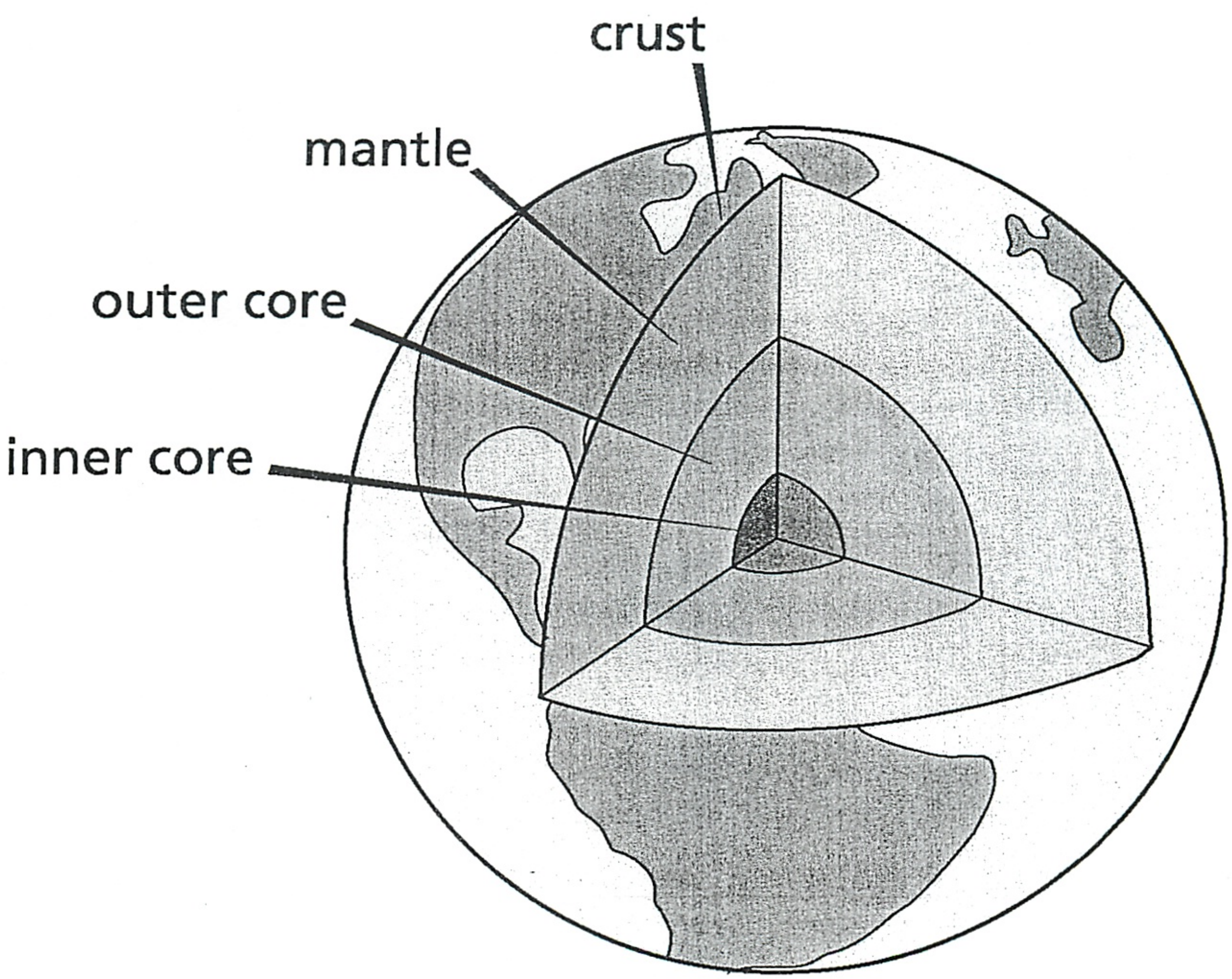




Use with *Our Dynamic Planet* Investigation 2: The Interior of the Earth

Blackline Master *Our Dynamic Planet* 2.6

Earth's Interior Structure



Use with *Our Dynamic Planet* Investigation 2: The Interior of the Earth

A.V

Table 1 10/14/04

Maria (Michael) + Cristabel ?

37/B

Pages 16 + 17

1. Compressinal waves occore when the wave puses against a materal, compressing it. The force of the expansione makes the wave travels. Shear waves shear back and forth, taking longer.

2. Large masses of rock slide past each other, making powerful vibrations known as seismic waves.

(Michael Only) 10/24

3 Wave refraction is when waves change the direction of which they are headed. It is like a marching band turning corners.

√ 10-26-04

4 The focus of the earthquake is where it starts.

5 Earthquake waves are detected using seismograph

6 Scientists can figure this out because S waves can only go through solids. They go through the mantle, so it must be solid.

7. Scientist know that Earth has a core because waves had a shadow zone so their must be a part of the Earth where the waves curved, so their must be a different material down their.

Investigation 3

Forces that Cause Earth Movements

Student Journal Cover Sheet
Investigating Our Dynamic Planet

Name: Michael Plasmeier

Group Members:

1. Mark Clinton
2. Mellisa Mc Gowan
3. Catie Coxdl
4.

Teacher: D'Andria

Class: Science - PD3

Dates of Investigation:

Start 10/26 Complete

Background Information
Investigation 3: Forces that Cause Earth Movements

In this investigation you are asked to consider whether or not the Earth's mantle moves. You will conduct a small-scale, hands-on investigation into the process of convection. You will observe a teacher demonstration of convection using a heated beaker of water, a cup of oatmeal, and food coloring. You are asked to consider these two activities as models of how convection operates in the Earth by mapping the elements of your experimental setup onto the layers of the Earth that you have studied in prior investigations.

At the conclusion of this investigation you should have A working understanding of the process of convection, and how convection within the Earth causes plates of the rigid, outer shell of the Earth (lithospheric plates) to move and leads to volcanism and the formation of crust at mid-ocean ridges (underwater mountain ranges).

You will explore convection cells in two different kinds of fluids (syrup and water) and relate these convection cells to the uneven heating and cooling within the Earth's lithosphere and asthenosphere. asthenasphere - A reigon of the Earth's interior immediaty bolow the earth's lithosphore where mantle rocks, are hot engoogh and undor enough pressure to deform, change shape and flow.

3 Key Question

Yes, it is true that it moves because the contents of the Earth moved from Pangea and mountoins and volcanos and undersea ridges formed

3 Data Sheet

10/27

2. Prediction: The 2 cardbord will start moving apart in the process of convection because the heat will go up and push the 2 apart

Observations:

4. The 2 pieces are move apart from each other about 1 cm. They were apart .1 cm when we started. Approx. 4 min gone by

The corn syrup is starting to burn

6 min gone by - The pieces have not move in last 2 min

A layer of ash is forming on the botten of plate

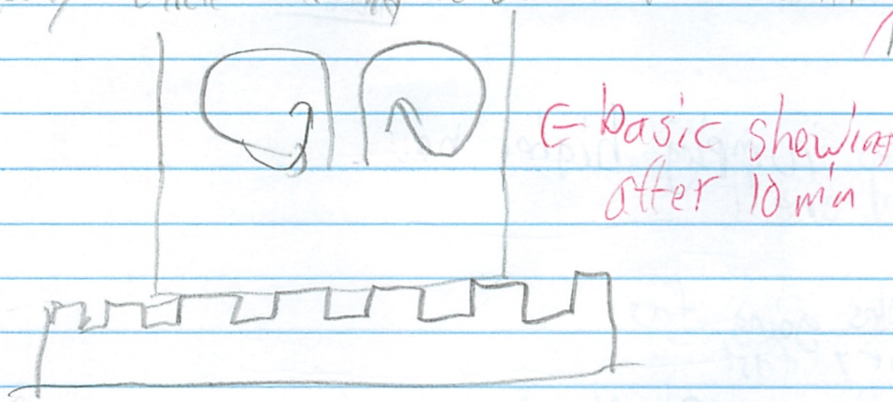
8 min - The pieces have not moved anymore corn syrp burned more

The cardbord should move as the syrup heats up.

3 Investigation

Part 2

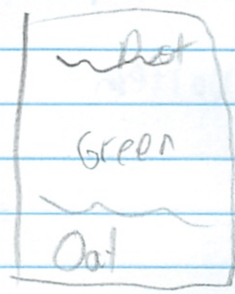
#5. I think they (all of stuff) will move twords the out side and slowly circle around because of convectition/ Saw dust may stay at top

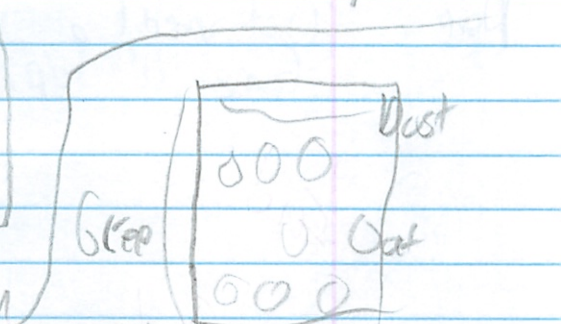


b Observation:

When put in oat meal went to bottom, saw dust sorted at top.

Food color circulate

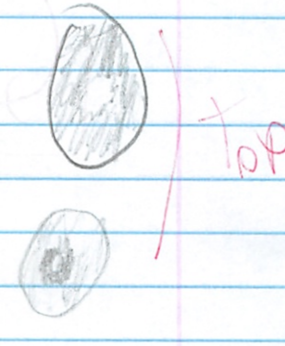




1min - Oat meal moving up and down

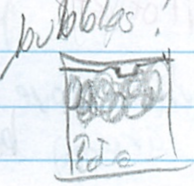
2min - Bubbles, foam at top
Most oat meals now at top

3min Almost no oat meal at bottom
Steam cumming out
On top their is part w/ no sawdust



4 min Saw dust go twords center but not hole
Glass fogging up
Steaming more
Dye is darker at top

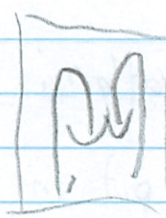
6min small pieces at bottem
All oatmeal at top



7min pieces jumping higher now
burnt smell

8min bubbles going fas
Very fast
Moving oatmeal around.

9min bubbling at top
most oat meal swirling around
lots of bubbles at top



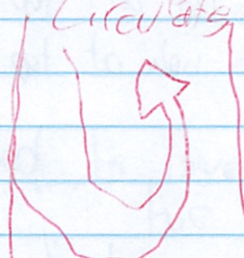
Motion correct?

Done Oat meal at bottem
Some at top.

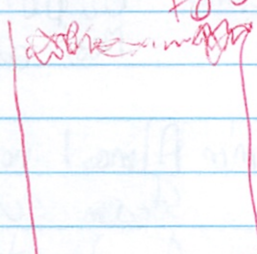
End

Oatmeal Circulates

Food Coloring Circulates



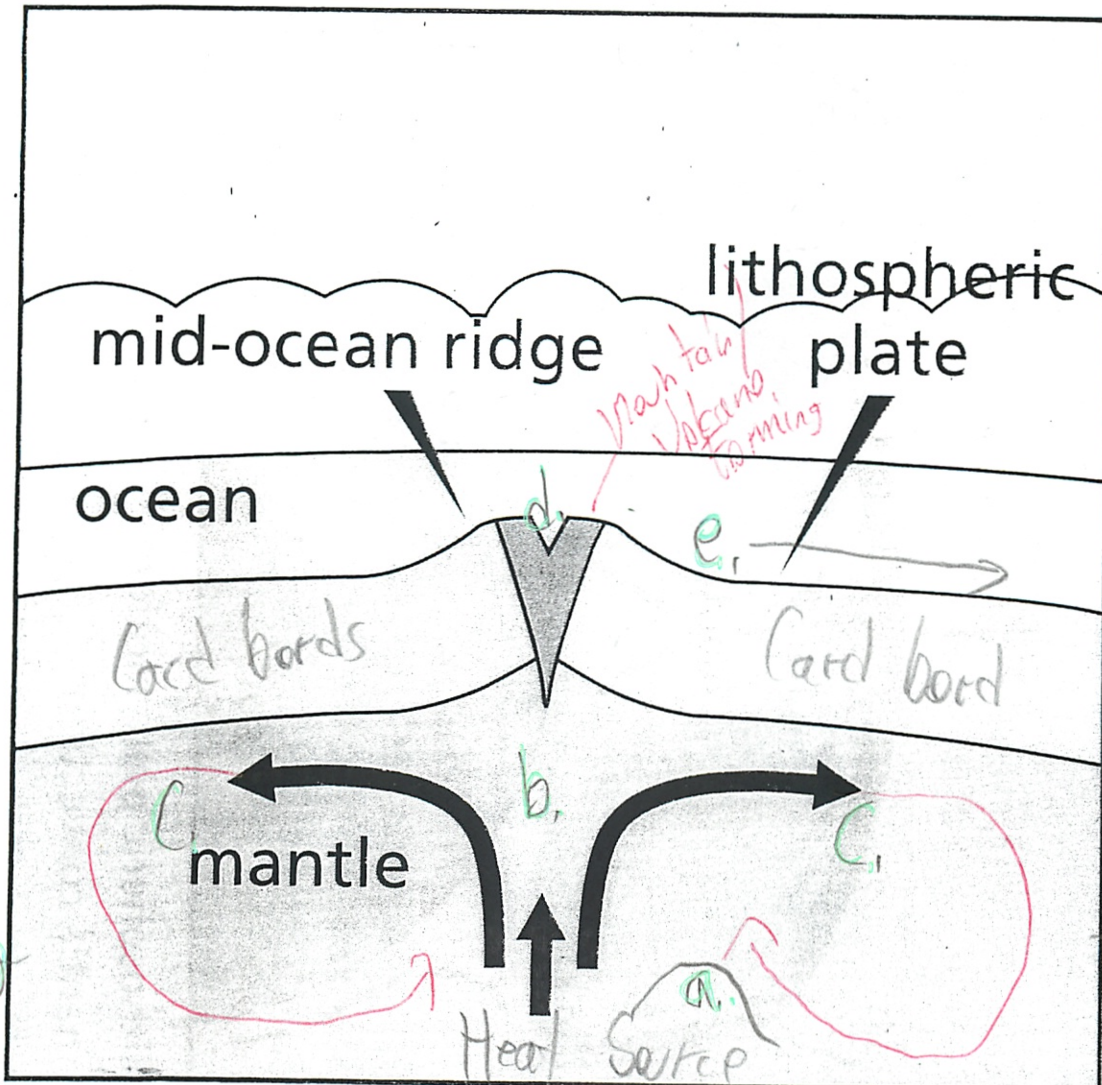
Sawdust Flots on top, to side



(12)

In this picture, the arrow in the mantle show a motion of mantle materal. like the motion of the oatmeal, food coloring and syrup. The cardboard moved accross the syrup like the lithospirch plates move accross the top of the mantle. The core is hot like the candle flame, and the hot plate in the demastration and is heating the mantle from below

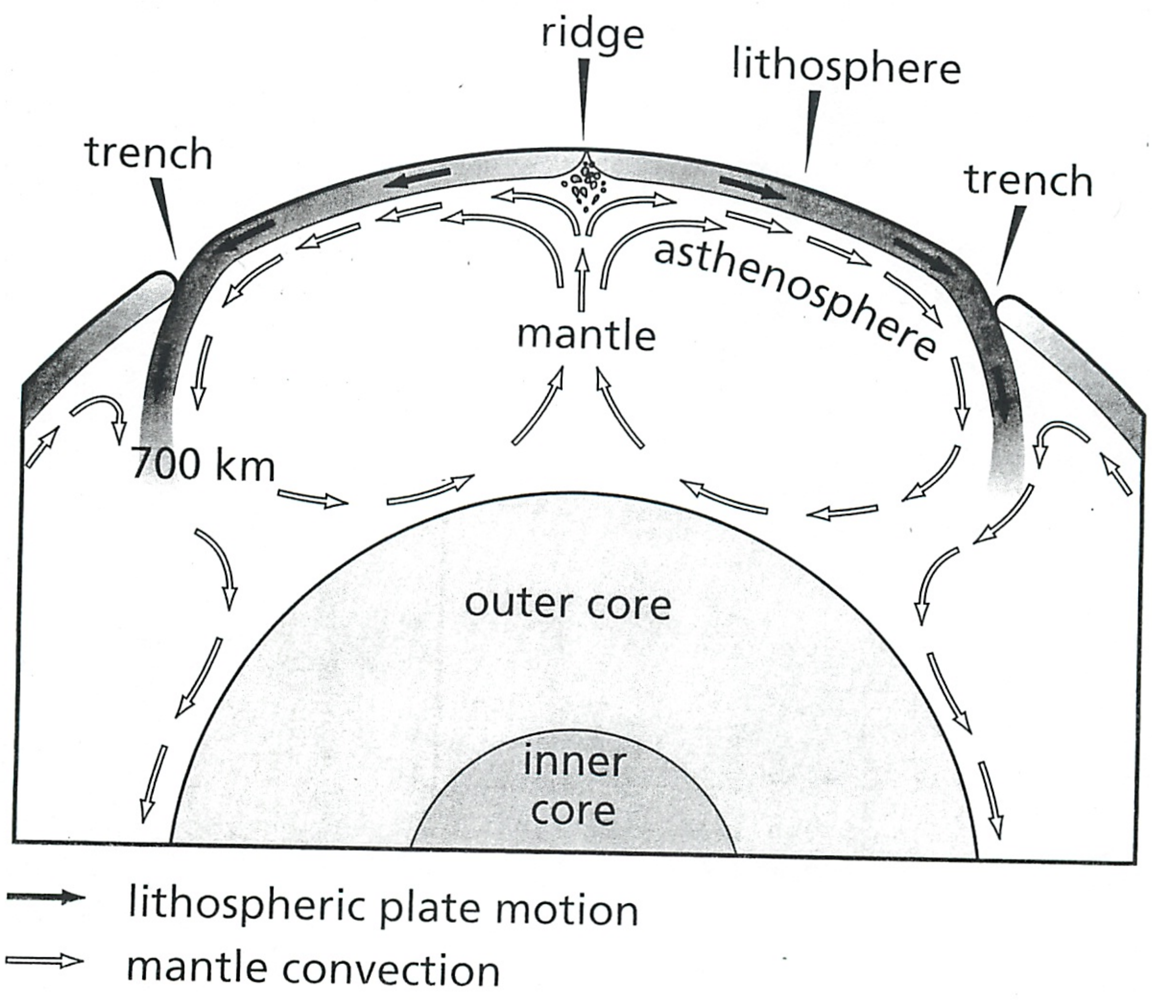
Convection Cells



6. There is force is moving up and out sideways. This shows how the corn serup moral when heated from below. The lithospeic plate are like cardbord when it mores apart. Mid-Ocean ridge is like white in the oat meal and the space between cardboard The Ocean is like the air above the experments

#7

Notes


ridge
lithosphere
trench
trench
asthenosphere
mantle
700 km
outer core
inner
core
lithospheric plate motion
mantle convection

Invest 3 Digging Deeper

Michael Plasmeier   p25-28   11/4

1. Convection is caused when a liquid is heated from bellow and cooled from above

2. It convects because even solid things are not completely solid. They flow a very small amount each year.

3. The typical speed is the speed which our fingernails grow; a few CM a year.

4. The reason for activity in mid ocean ridges is that hot molten rock is pushing up between the cracks in the cometal plates and making the rock expand

5. The forces that drive the sea floor spreding is that the rocks are heating and the convection is forcing the contents away.

Invest 3 Review   11/4

1. Yes, the mantle does move becase it is heated from below and parts are less dence then others and they rise.

2. The mid-ocean ridge is made of over

volcanic rock because the molton rock which is less dence rises between the cracks in the contentol plate and harden to volcanic rock.

4. A kettle over a fire is another example of convection. The fire under it heats it and the air above cools it.

5. No, It can't because when it is heated it becomes less dence and roses. It won't happen in reverce.

3. It is yong in relation to it's place. However matter never leaves the earth, it just changes form.

45

Invest 3

Movement of Earth's Lithosperic Plates

Student Journal Cover Sheet
Investigating Our Dynamic Planet

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3. Pat
4.

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Class: Science PD 3

Dates of Investigation:

Start 11/5 Complete

BACKGROUND INFORMATION
INVESTIGATION 4
THE MOVEMENT OF THE EARTH'S LITHOSPHERIC PLATES
Part A

In this investigation you will model what happens at plate boundaries. There are three basic kinds of plate boundaries: **divergent boundaries** at spreading ridges; **convergent boundaries** at subduction zones and sites of continent-continent collision; and **transform boundaries** where plates are sliding past each other.

In Part A you will first hypothesize about how mountains, volcanoes, and earthquakes might occur where lithospheric plates meet. You will then model the collision of two plates (plate convergence) using simple materials. Next, you are asked to relate your observations of the model you made to a world map of lithospheric plates.

The evidence you collect during this investigation includes:

a. The Earth's crust consists of thick, less dense continental crust and thin, more dense oceanic crust.
b. the lithosphere is not one continuous piece, but instead exists as large and small pieces or plates.
c. Plates can be moving apart from one another (diverging), moving toward one another (converging), or sliding past one another (transforming).
d. Plates with ocean crust are more dense (more mass per volume) and slide under plates with continental crust when they converge.
e. Earthquakes, mountains, and/or volcanoes can often occur at the boundaries between plates.

Key Quest, What happens when Lithospric plates meet,

It depends how they meet;

- collison: the form a mountain 
- Slide apart: form earthquake
- go apart: form a trench

? might form volcano?

When? ??

?, when trench, magma

When a plate is pushed down it is a subduction zone

Study