

"You can never tell where the winds will blow you, what fantastic. good fortune they can lead you to. Long Live Balloons!"

# Making Our Great Escape!

To the Wild Blue Yonder

"painting with paper"

Let's see what we see when we see the sea scene upon arriving!

*Discuss: Explain the system of family names on Krakatoa. How many families are there? How many people are in each family? What are the children called?*

*Who was the first person to inhabit the island? How did he get there? How did the other families come to make their home on Krakatoa?*

*Does Mr. F. explain what the families told their relatives when they left San Francisco? Is it believable that they could leave without some explanation? Could your family move to an island without telling others where you were going?*

*Each family was required to bring two things to be chosen to live on Krakatoa. What were they, and why were they important?*

*For how many years did the families live on Krakatoa? If you were a member of one of the families, how would you feel living on this island?*

*What might it have looked like on the island every day? Can we imagine it?*

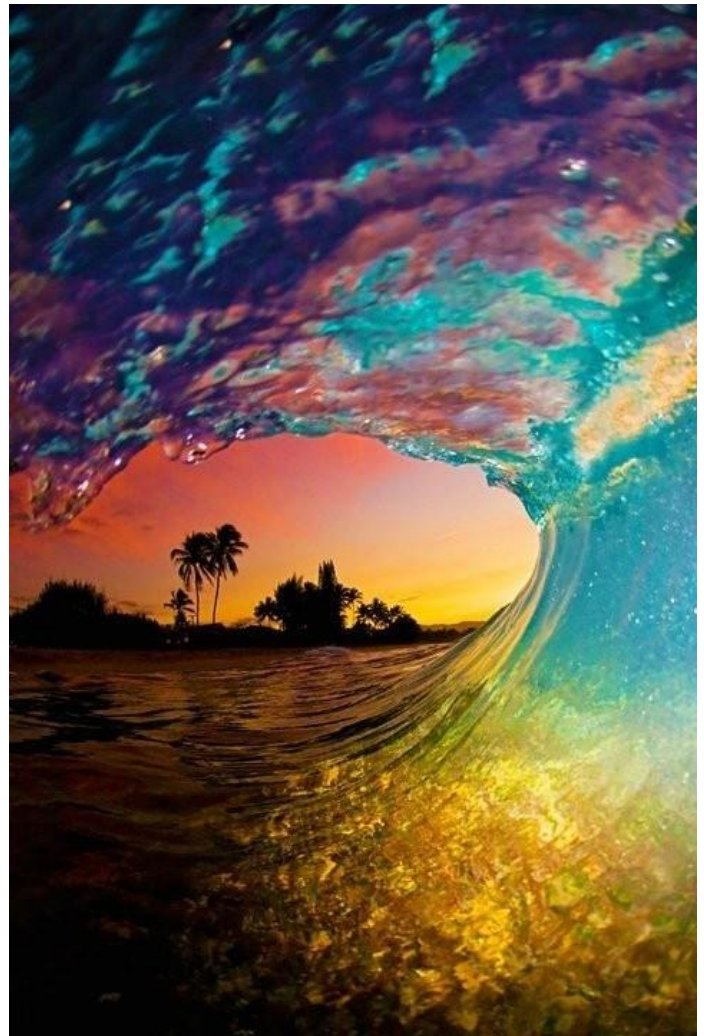


Landscapes are works of art that depict different views of natural land. This can include mountains, fields, and forests, just to name a few. Landscapes often include a body of water in their compositions. When we think of landscape, we think of the natural world.

Artists typically create landscapes of places they've visited like the countryside where they spent a summer vacation, or something more familiar like a rural area near one's home. Sometimes artists make landscapes of places they've never seen before or areas they invented in their mind, which is what we're going to do. Taking Laura Parker and Megan Coyle's landscape collages for inspiration students will create Krakatoan collages and include the Professor's balloon arriving in the sky.

### Materials:

- Papers of all kinds, ex. torn magazine papers, construction paper, copy paper, tissue paper, wallpaper samples, old photographs, sheet music, bits of tinfoil, ribbon, crossword puzzles (make great windowed buildings) paper bags, newspapers, old maps, found papers, etc
- Glue sticks
- Acrylic matte varnish (Liquitex)
- Brushes
- Backing material: While a paper or cardboard backing is the usual choice, the backing can be anything you consider will work well, like cardstock or thick watercolor paper.
- Consider adding embellishments. While not essential, embellishments can take the collage up a notch by adding depth, interest and sparkle. Use ribbons, buttons, beads, string, feathers or fabric in the paper collage.
- Display artist's sample collages from these pages and/or photographs of islands, nature-related storybooks, and/or landscape art examples for students to look at and be inspired by. Ex. Do a search online for National Geographic Island photos.



*Tip: Create an example of the project before the lesson. Even if you choose not to share the work with students, a lot can be learned if you create an example.*



Collage means “to glue” in French and is created using torn We’re going to use torn magazine papers, sheet music, bits of foil, ribbon, crossword puzzles (make great windowed buildings) paper bags, newspapers, old maps, found papers, etc. as our "palette of paint" working the image by adding and subtracting tonal values of paper until we create the desired effect. Words, phrases, and imagery from the magazine papers appear almost magically between the edges of the torn paper adding to the meaning of the pieces students create.



Torn paper collages are made using small pieces of paper which are glued onto a surface to create an image. In this case we’ll be making landscapes using old magazines, which will provide the colorful palette they’ll need. They can also go black and white by using newspapers, old sheet music, etc.



By cutting the paper into shapes depending on color and texture, she pulls the paper away from the context of being associated with magazines or whatever they originally were.

## How do you start a collage?

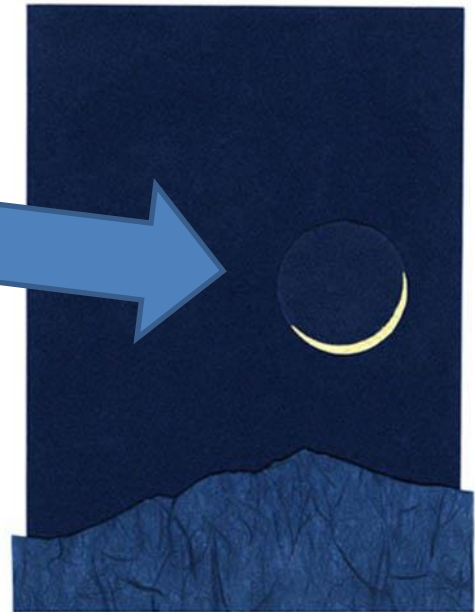
Each student's collage will begin with a sketch, or multiple sketches, from which they choose their favorite. Depending on the subject matter, the sketch may be a rough sketch or a more detailed one. The final collage may look a lot different than the sketch that but using a rough sketch gives the student an idea of the composition.

Create the background first. An image children select for inspiration may help with some basic direction in colors, composition and proportions, but they shouldn't expect to duplicate it. It's simply to provide a starting point, which they can then take in any direction.

Next students should comb through magazines (and every other kind of paper available) looking for specific colors and different textures and

Fun way to create a moon shape in the sky! Cut a circle out of the paper and glue it down off center to the hole to create a moon!

[http://www.stardogstudio.com/collage\\_landscapes.html](http://www.stardogstudio.com/collage_landscapes.html)



<http://www.flickr.com/photos/lacapretta/6900394236/>. Powhatan First Grade Auction Project. Hand painted paper collage, 2012.

tearing or cutting out the main colors you will be using e.g. sky, sea, beach, land, houses, balloon, people, etc. Students should cut out different shapes of color depending on the shape of the highlights and shadows they want to include in the collage. Then glue down the different pieces of paper on top of the drawing. Have them use a glue stick so they can easily go back in and move the pieces around before the artwork is complete.



They may want to fill in the background of their sketch first, or move back and forth with gluing down pieces of paper in the background and foreground. Have students block in the large color shapes first and then work on adding in more detail with smaller strips of paper, shaping the figures and details as they go along.

Once part of the landscape or sky is in place, they'll find it's easy to begin working on the other areas as well. Larger pieces can be used for the background, with smaller pieces added on top. Torn paper collages can involve a lot of layering, so encourage students to just keep adding paper and details until they feel it's finished.



Option: You may want to have students assemble the pieces before they glue them. Although optional, it's recommended that in experienced artists, once they have everything they want to put on their collage, spread it to design the collage before proceeding. They can lay it out on a large surface like a table or floor. Build the items in layers, starting with the background and moving forward. This should

give them a good idea of what their end product will look like before they commit to any gluing, but it also slows down the process and makes it less organic.

Discuss how literature can give artists ideas for art making. How did literature give them ideas for art making? Ex. *The 21 Balloons*. Help students make connections between the story, their art, and their own experiences.

Discuss the benefits and drawbacks of using collage when compared to other art materials students have used.

What can collage do that other mediums can't? Sample answer: When you paint a picture, every brushstroke of acrylic, oil, or watercolor paint you put down is more or less permanent. It sticks to the page or canvas, and you're stuck with that mark until you can paint over it.

Collage is much more flexible than paint. It involves a lot of layering, and even if you use paint with your collage, you can always peel or cut back previous layers. It's almost like an "undo" button on your computer. You can easily "undo" previous layers or sections.

How flexible a collage is depends on the materials you use. Making collages out of magazine strips with a pair of scissors and glue stick is pretty flexible as an acid-free glue stick lets you peel back previous layers pretty easily. You can also pull up different sections and move them around if need be. The type of glue you use can determine this flexibility. If you use a strong glue, it will be more difficult to peel off other layers. A glue stick is a pretty temporary type of glue – it's not very permanent and doesn't strongly adhere to objects like superglue or craft glue would.

## Label Me?

Just like collage people are made up of many different things and traits. Some good, some better, and some not so good. On Krakatoa the people have been chosen for specific attributes indeed! What did families have to have in order to be invited to Krakatoa? **Page 84 in the novel**. What was the sailor/Mr. M's reasoning for those traits?

What positive and negative traits do they have? Everyone living on the island is innovative, creative, and talented. These qualities set the people apart. They are wealthy, greedy, smart, clever, and resourceful, but secluded and hidden from the rest of the world.

How might you describe Professor Sherman? For example, even as an older man, has a sense of adventure. He longs to travel and explore the world. He is impulsive and passionate about things that he loves such as balloons, inventions, food, and so forth.

What kinds of people would you want to live on an island with you? Ex. confident, self-expressive, liberal, upbeat and open to change. Would you want to be a leader or a follower? How did all those different traits and abilities help the islanders, ex. on page 96-97 of the novel.

Draw a portrait of your ideal Krakatoan Island dweller, or yourself, on Krakatoa! How could you represent their/your creativity or other traits? What country would you want to represent and serve food from? Have students write the character traits of their island dweller on the back of their "canvases".

## Game: It's All in the Family

You can discover more about a person in an hour of play than in a lifetime of conversation.-  
Plato

This is a hilarious improv game to play that you'll need a lot of creativity for--definitely something you'd want to get on camera! Have about 4 people for this one. Students are going to act out Krakatoan family portraits.

Have students make a list of terms and descriptions they might use for the different families in the books. How would you describe family F? Family A? List the families and terms on the board. Then, it's time to play! The teacher is the "photographer" that calls out the type of family portrait to everyone should make, like Family...on their.... While the director counts down from 10 slowly, the students arrange themselves in a "family portrait" related to the suggestion. Students should look at each other and make a strong character choice within that world, freezing in a tableau at the end After the countdown, we freeze the portrait and have the other kids/teacher state what they think the characters all are. Students then un-freeze and explain who their character actually was.

Silly and creative are fun! Because isn't that the way? You try to take a nice family picture and get goofiness.

Tips: The emphasis should be on finding unique, believable characters within the suggestion, and contrasting or complimenting the characters being created by the other students. *Tell the players you will want to see who's who in the family. We also want to see who gets along with who, who's the black sheep of the family, and so on. This only works if players watch each other closely.*

This should lead to discoveries within character/genre worlds beyond stereotypes. For example, a mobster family probably has a bunch of tough guys in it, but maybe they have a sweet little mother, too? Or perhaps a skinny, mathematician brother who's not in the business? By using powers of observation instead of just speaking character choice, students can find new ways of approaching characters and descriptions.

## Extension: Slide Show

### **Some Basic Rules (or Principles) of Improv**

- (Always say) Yes And (agreement, acceptance)
- Stay Present (focus, concentration, be in the moment, avoid over-planning)
- Support ("I Shine-You Shine", make your team members look good)
- First Thought, Best Thought (commitment, make decisions and go for it)

This activity is similar to Family Portraits, but takes the group to the next level. Give one player a “big” activity (you can ask for student suggestions), like the Professor’s trip in the hot air balloon, or the construction of a home. This player will present a “slide show”, and the other players will be what’s inside the slides (ex. some students could act like a basket, others could be the birds, one could be the Professor). The idea is that the story is built by both the presenter, and by the images the other players present in the slides. As students gain more practice encourage the players not to simply just “build” what the narrator has described, but to extend it, to build/show the sequel or next step in the story. Also, the presenter should feed off of what he or she sees and describe the slides in further detail.

## Foundations of Stone, Actually Diamonds!

The word diamond comes from the Greek word meaning unbreakable. As we’ve learned since we’ve arrived on Krakatoa, the island has an expansive diamond mine right under the volcano Krakatoa. According to Krakatoan history (as narrated by Mr. F), a sailor got shipwrecked on the island and discovered its treasures. As soon as he was able to return to America, he handpicked 20 families of diverse talents and interests. Each family was renamed with a letter of the alphabet, e.g. Mr. A, Mr. B, A-1, and A-2 and so on until the Ts, and the small nation lives a leisurely life financed by discreetly selling a small load of diamonds each year. There are loads of

diamond mines which on 18 miles of land, there is as much wealth as the United States. But wait, how are diamonds formed in the first place and how did they get inside an island?

**What did Mr. F say about nature on page 67 of the novel? How does that apply to the following?**

Diamonds are formed deep within the Earth about 100 miles or so below the surface in the upper mantle. Obviously in that part of the Earth it's very hot. There's a lot of pressure,





the weight of the overlying rock bearing down, so that combination of high temperature and high pressure is what's necessary to grow diamond crystals in the Earth. As far as we know, all diamonds that formed in the Earth formed under those kinds of conditions and, of course, that's a part of the Earth we can't directly sample. We don't have any way of drilling to that depth or any other way of traveling down to the upper mantle of the Earth.

## How do diamonds travel to the surface of the Earth?

The diamonds that we see at the surface are ones that are brought to the surface by a very deep-seated volcanic eruption. (Hmm, Krakatoa is a volcanic island!) It's a very special kind of eruption, thought to be quite violent, that occurred a long time ago in the Earth's history. We haven't seen such eruptions in recent times. They were probably at a time when the earth was hotter, and that's probably why those eruptions were more deeply rooted. These eruptions then carried the already-formed diamonds from the upper mantle to the surface of the Earth. When the eruption reached the surface it built up a mound of volcanic material that eventually cooled, and the diamonds are contained within that. These are typically the sources of many of the world's mined diamonds.

One of the things we know, therefore, about any diamonds that were brought to the surface is that the process of the eruption bringing the diamonds from the upper mantle to the surface of the Earth had to happen very quickly, because if they were traveling too long and too slowly they would have literally turned into graphite (the stuff that is in your pencil) along the way. And so by moving quickly--rates of 20 to 30 miles per hour--they essentially got locked into place as diamonds. Once the diamonds have been brought from high temperature to low temperature (cooled) very quickly—and by quickly, we mean in a matter of hours—their atoms are locked into place and there's just not enough energy to now start rearranging them into graphite.

## What is carbon's role in forming diamonds?

Diamonds are made of carbon so they form as carbon atoms under a high temperature and pressure; they bond together to start growing crystals. Because of the temperature and pressure, under these conditions, carbon atoms will bond to each other in a very strong type of bonding where each carbon atom is bonded to four other carbon atoms.

That's why a diamond is such a hard material because you have each carbon atom participating in four of these very strong covalent bonds that form between carbon atoms. So as a result you get this hard material. It's the hardest known naturally-occurring mineral.

As other carbon atoms move into the vicinity they will attach on. That's the way any crystal grows. It's the process of atoms locking into place that produces this repeating network, this structure of carbon atoms, that eventually grows large enough that it produces crystals that we can see. Each of these crystals, each diamond, one carat diamond, represents literally billions and billions of carbon atoms that all had to lock into place to form this very orderly crystalline structure.

# Let's Get Cracking on Diamonds!

Now, we won't be able to make diamonds, we don't have that kind of time!, but we can make crystals and experiment with how they grow. So, to work around this conundrum, we're going to use an invention from Krakatoa, the Magic Growing Krakatoan Diamond (well, kinda). This special diamond

is just as beautiful and unique as a diamond from the dirt, but it won't take millions of years or put us under so much pressure! The Magic Krakatoan Diamond uses some fun hands-on chemistry and makes a perfect Island experiment.

Doing crystal experiments is very common, and everyone can get different results based on what kind of material they use. Some use pipe cleaners/chenille sticks, others eyelash yarn, the results vary when you add variables! Makes sense, right?

## Materials

- Pipe cleaners (white, if possible) or eyelash yarn & floral wire
- String
- Wide-mouthed jar
- Borax (check your local grocer's laundry section)
- A pencil
- Boiling water
- Food coloring (optional)
- Scissors
- Adult supervision

Bring a pot of water to a boil and pour into the jar. Add 3 tablespoons of borax per each cup of water a stir. It's alright if some borax settles to the bottom of the jar. If you want a colored diamond (they exist in nature!) stir in some food coloring.



-Tie the string or wire around the center of a popsicle stick. Allow a few inches to hang down into the water. Bend the pipe cleaner or floral wire into a star, circle, or shape you prefer. Make sure that the shape can fit through the mouth of the wide-mouthed jar without having to squeeze through. If it can't, trim the sides down. -

Crystal and eyelash yarn image credits go to: <http://tammyvwp.wordpress.com/2010/09/26/making-eyelash-yarn/>

If using eyelash yarn and floral wire, wrap the yarn around the wire and bent it into a circle. Attach the shape to the wire hanging down from the popsicle stick.

Pour the solution into the jar and place the popsicle stick across the top of the jar so your shape hangs into the borax water. Make sure that you've added enough water to completely submerge the shape. Place in a location where it is undisturbed. Seriously! You don't even want it to be bumped! Let it stay there overnight. for the crystals to grow.

**What did you notice?** You might have seen that the concentration of borax affected the size of the crystals that formed. The more borax there was the faster the crystals formed and the smaller they were. Less borax = larger crystals but a longer wait time. Both are pretty though, don't you think?



.Borax is an example of crystal - "a solid with flat sides and a symmetrical shape because its molecules are arranged in a unique, repeating pattern."

Every crystal has a repeating pattern based on it's unique shape. They may be big or little, but they all have the same "shape". Salt, sugar, diamonds, and Epsom salts are all examples of crystals. Salt crystals cube-shaped, diamond crystals form triangular prisms, while snow crystals form a six-sided structure.

How do the Borax crystals grow?

Hot water holds more borax crystals than cold water. That's because heated water molecules move farther apart, making room for more of the borax crystals to dissolve. When no more of the solution can be dissolved, you have reached saturation. As this solution cools, the water molecules move closer together again. Now there's less room for the solution to hold onto as much of the dissolved borax. Crystals begin to form and build on one another as the water lets go of the excess and evaporates.



Compare this process to diamonds where, under extreme pressure and high temperatures, the carbon molecules move closer together and form bonds.

For video helps and support for this discussion go to:

<http://www.pbs.org/wnet/nature/lessons/performing-well-under-pressure/video-segments-diamonds/1456/>

*These brief video segments can be used alone or in combination, to introduce a topic or to spark discussion among your students. The video segments can be adapted for any grade level – suggested focus questions are provided. Stream the video segments from the playlist on the top, or scroll to the bottom of the page to find downloadable QuickTime versions of the videos.*

# As Common as ~~Dirt~~ Diamonds

**How much was Professor Sherman's share of the mines worth? Why did Mr F say that taking them would be a horrible mistake? P. 74 of the novel. They each owned a fortune how big? Why were the diamonds not valuable on Krakatoa itself?**

Diamonds were actually quite rare in the past but not anymore. While it's true that the process of extracting diamond is quite laborious (mines move many tons of dirt per carat of diamond found) and that gem-quality diamonds are relatively few (only about 1 in 1 million diamonds are quality one carat stones, only 1 in 5



million are 2-carat; and 1 in 15 million are 3-carat), diamonds are not rare in an economic sense because supply exceeds demand. To maintain the high prices of diamonds, De Beers (*The most powerful diamond company in the world. In the early days, De Beers controlled about 90% of the world's diamond supply. Today, its monopoly on diamonds has been significantly reduced. It is estimated that the cartel in 2008 controlled about 60 to 75% of the world's diamond trade*) has historically created an artificial scarcity: they stockpile mined diamonds and sell them in small amounts. Though with the growth of the middle class world-wide, that has become less necessary. **Learn more about them with this fascinating short (2 minute) informational illustrated video (data visualization) about the diamond process and where they go to find their diamonds** <http://vimeo.com/55222607>

**Why is there no active after-market for diamonds?**

Do diamonds make good investments? Unless you're a certified diamond seller, the answer is no: you won't ever be able to sell a diamond ring (or other jewelry) for more than what you pay for it.

In 1982, Edward Jay Epstein wrote an intriguing article for The Atlantic, titled "Have You Ever Tried to Sell a Diamond?" In it, he wrote about an experiment to determine a diamond's value as an investment.

*The [Money Which?] magazine conducted another experiment to determine the extent to which larger diamonds appreciate in value over a one-year period. In 1970, it bought a 1.42 carat diamond for £745. In 1971, the highest offer it received for the same gem was £568. Rather than sell it at such an enormous loss, Watts decided to extend the experiment until 1974, when he again made the round of*

the jewelers in Hatton Garden to have it appraised. During this tour of the diamond district, Watts found that the diamond had mysteriously shrunk in weight to 1.04 carats. One of the jewelers had apparently switched diamonds during the appraisal. In that same year, Watts, undaunted, bought another diamond, this one 1.4 carats, from a reputable London dealer. He paid £2,595. A week later, he decided to sell it. The maximum offer he received was £1,000. (Different appraisals of the same diamonds varied widely dependent on what the prospective buyer thought he could sell them for.)

It is estimated that the public holds about 500 million carats of gem diamonds - if a significant portion of the public begins selling, then the price of diamond would plummet. Just like in the Krakatoa cartel, diamond companies don't want this to happen. To prevent this from happening, the diamond industry has spent a huge sum on advertising to convince people diamonds are "heirloom" properties to be passed down for generations, keeping the price of diamond artificially high (so people wouldn't be tempted to unload them for fear of losing money) and discourage jewelers from buying diamonds from the public.

Did you know? It's all because of an ad . . .

Source: <http://www.neatorama.com/2008/12/01/10-facts-about-diamonds-you-should-know/>

The Most Brilliant Advertising Campaign of All Time? A Diamond Is Forever

The 1930s was a bad decade for the diamond industry: the price of diamond had declined worldwide.

Europe was in the verge of another war and the idea of a diamond engagement ring didn't take hold. Indeed, engagement rings were considered a luxury and when given, they rarely contained diamonds. In 1938, De Beers engaged N.W. Ayer & Son, the first advertising agency in the United States, to change the image of diamonds in America. The ad agency suggested a clever ad campaign to link diamonds to romance in the public's mind. To do this, they placed diamonds in the fingers of Hollywood stars and suggested stories to newspapers on how diamond rings symbolized romance. Even high school students were targeted:



*N. W. Ayer outlined a subtle program that included arranging for lecturers to visit high schools across the country. "All of these lectures revolve around the diamond engagement ring, and are reaching thousands of girls in their assemblies, classes and informal meetings in our leading educational institutions," the agency explained in a memorandum to De Beers. The agency had organized, in 1946, a weekly service called "Hollywood Personalities," which provided 125 leading newspapers with descriptions of the diamonds worn by movie stars. [...] The idea was to create prestigious "role models" for the poorer middle-class wage-earners. The advertising agency explained, in its 1948 strategy paper,*

*"We spread the word of diamonds worn by stars of screen and stage, by wives and daughters of political leaders, by any woman who can make the grocer's wife and the mechanic's sweetheart say 'I wish I had what she has.'"* ([Source](#))

In 1948, an N.W. Ayer copywriter named Frances Gerety, had a flash of inspiration and came up with the slogan "A Diamond is Forever." It's a fitting slogan, because it reminds people that it is a memorial to love, and as such, must stay forever in the family, never to be sold (remember, we talked about that). Ironically, Gerety never married and died a spinster. ([Source](#)) But equating diamonds with romance wasn't enough. Toward the end of the 1950s, N.W. Ayer found that the Americans were ready for the next logical step, making a diamond ring a necessary element in betrothal:

*"Since 1939 an entirely new generation of young people has grown to marriageable age," it said. "To this new generation a diamond ring is considered a necessity to engagements by virtually everyone." The message had been so successfully impressed on the minds of this generation that those who could not afford to buy a diamond at the time of their marriage would "defer the purchase" rather than forgo it.* ([Source](#))

Then the clever ad agency went one step further. N.W. Ayers noted that when women were involved in the selection of the engagement ring, they tended to pick cheaper rings. So De Beers encouraged the "surprise" engagement, with men

picking the diamond on their own (with the clear message that the more expensive the stone, the better he'll look in the eyes of a woman). They even gave clueless men a guideline: American men should spend two months wages, whereas Japanese men should spend three. Why? Because they can:

*But the guidelines differed by nation. A "two months' salary" equivalent was touted in the United States, whereas men in Great Britain got off the hook with only one month. Japan's expectation was set the highest, at three months. I asked a De Beers representative why the Japanese were told to spend so much compared to the Americans or the English. "We were, quite frankly, trying to bid them up," he*



answered. (Source: [The Heartless Stone: A Journey Through the World of Diamonds, Deceit, and Desire](#) by Tom Zoellner)

In 1939, when De Beers engaged N.W. Ayer to change the way the American public view diamonds, its annual sales of the gem was \$23 million. By 1979, the ad agency had helped De Beers expand its sales to more than \$2.1 billion.

Whether you love or hate them, diamonds are endlessly fascinating.

Let's Get Cracking! Mine, all Mine!

## What is mining?

Now, most of the time these desirable diamonds don't sit around in lovely chunks on top of the earth, or in the river, ready to be picked up, they have to be mined or panned which means sifting them out. Mining is the extraction (removal) of minerals and metals from earth. Manganese, tantalum, cassiterite, copper, tin, nickel, bauxite (aluminum ore), iron ore, gold, silver, and diamonds are just some examples of what is mined.

The purpose of this activity is to give the player an introduction to the economics of mining. Each player buys "property," purchases the "mining equipment," pays for the "mining operation," and finally pays for the "reclamation." In return, the player receives money for the "ore mined." The object of the game is to develop the mine, safeguard the environment, and make as much money as possible.

**Option: Have students watch a fun adventure from one of the following shorts:**

**Blue Zoo Miners by Blue Zoo:** <http://vimeo.com/16315936>

**The crazy adventures of of a miner on his way home from work...**<http://vimeo.com/67901697> Or, <http://vimeo.com/11090515>

Have students watch selected clips of a fascinating (short) documentary about the real-world complicated and impressive process of diamond extraction Diamond extraction (Alrosa) from Nils at <http://vimeo.com/36838281> before or after they complete their own mining activities. 250 km to the north of arctic circle, open pit mines 2.5 km in diameter, about 1 km under the surface of our planet gigantic engineering structures, mighty machines, sophisticated workflows united to get a precious symbols of infinite love - diamonds.

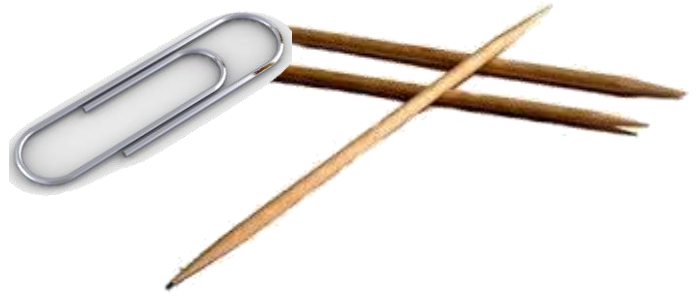


## Materials

- play money (\$19 for each student)
- grid paper (1 sheet for each student)

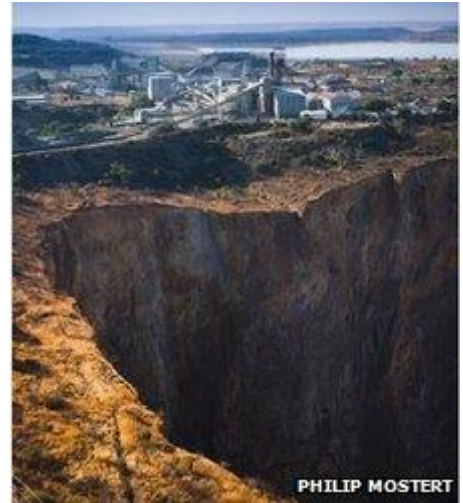


- granola bars with choc chips (**only 1 bar per student**)
- toothpicks (flat and round)
- paper clips
- paper towels (for clean-up)



1. Each player starts with \$19 of play money.
2. Each player receives a Granola Mining spread sheet and a sheet of grid paper.
3. Each player must buy his/her own "mining property" which is a single granola bar or oatmeal raisin cookie. Only one "mining property" per player. Two to three types of cookies should be "for sale"; one cheaper one with fewer chocolate chips than the other and another more pricey bar with more chocolate chips or raisins. For example, sell "Krakatoan Delicious Duds/Store Brand" bars for \$5.00 and "Krakatoan Miner's Deluxe/Quaker Chewies" for \$7.00.

Players choose their "properties" knowing that the more chips they harvest, the more profit they make.



4. After buying the granola bar, the player places it on the grid paper and, using a pencil, traces the outline of the bar. The player must then count each square that falls inside the outline, recording this number on the Granola Mining Spreadsheet along with the properties of the cookie. Note: Count partial squares as a full square.
5. Each player must buy his or her own "mining equipment." More than one piece of equipment may be purchased. Equipment may not be shared between players. Mining equipment for sale is
  - Flat toothpick — \$2.00 each
  - Round toothpick — \$4.00 each
  - Paper clips — \$6.00 each
6. Mining costs are \$1.00 per minute.
7. Sale of a chip mined from a bar brings \$2.00 (broken chocolate chips can be combined to make one whole chip).
8. After the bar has been "mined," tell students to put their bar back together. The fragments and crumbs should be placed back into the outlined area on the grid paper. This can only be accomplished using the mining tools — No fingers or hands allowed.



9. Reclamation costs are \$1.00 per square over original count. (Any piece of granola bar outside of original rectangle counts as reclamation.)

### Granola Mining Rules

1. Players cannot use their fingers to hold the bar. The only things that can touch the bar are the mining tools and the paper on which the bar is sitting.
2. Players should be allowed a maximum of five minutes to mine their granola bar. Players who finish mining before the five minutes are used up should only credit the time spent mining.
3. A player can purchase as many mining tools desired; the tools can be of different types.
4. If the mining tools break, they are no longer usable and a new tool must be purchased.
5. The players that make money by the end of the game win.

All players win at the end of the game because they get to eat the remains of their **one** bar!



### Post Activity Class

#### Discussion:

- Was the granola mining activity messy? How was the mine owner responsible for the mess?
- Was making a profit easier or harder than they expected? How accurate is this simulation in illustrating the challenges of making money in the mining industry? What costs or possibilities for profits were not included in this exercise?

- Did this activity help you to understand the way a real mine works? What would happen if one student had only peanut butter chips in his granola bar and another had chocolate chips in hers? How would they work out a way to share their "resources?"
- How does this activity relate to real-life diamond mining? How about mining on Krakatoa?
- Do they think that a real mine or the mine on Krakatoa would produce a lot of excess material that would need to be cleaned up? [Each player should have learned a simplified flow of an operating mine. Also, each player should have learned something about the difficulty of reclamation, especially in returning the granola bar to the exact size that it was before "mining" started.]
- Can they think of any ways that a mine owner could be made responsible for the impact made on the environment?
- Do they use anything that comes from a mine? How did they use the diamonds they mined on Krakatoa? Do we use diamonds the same way they do? Ex. for cufflinks for buttonholes (p. 63), foundations (p. 79), and what else?
- What do we use diamonds for? *Diamonds have many uses. About 20% of diamonds found are used for jewelry. The other 80% are used in industry. Did you know? The Earliest Use of Diamonds: Polishing Axes*





## Granola Mining Spreadsheet

1. Type of Granola Bar \_\_\_\_\_

2. Price of bar = \$ \_\_\_\_\_

3. Size of bar \_\_\_\_\_  
squares covered

4. Equipment used

\_\_\_\_\_ x  
flat toothpicks \$2.00 = \$ \_\_\_\_\_

\_\_\_\_\_ x  
round toothpicks \$4.00 = \$ \_\_\_\_\_

5. Cost of removing chips \_\_\_\_\_  
minutes mining x \$1.00 = \$ \_\_\_\_\_

**6. Total cost of mining (add #2-5)** = \$ \_\_\_\_\_

**7. Total value of chips** \_\_\_\_\_ x \$2.00 = \$ \_\_\_\_\_  
chips

**8. Reclamations costs** \_\_\_\_\_  
\_\_\_\_\_ squares X\$1.00 = \$ \_\_\_\_\_

---

**How much  
did I make?**

\$19.00

-

Total cost  
of mining

\$\_\_\_\_\_

+

Total value  
chips

\$\_\_\_\_\_

-

Reclamation  
costs

\$\_\_\_\_\_

---

**Profit or  
loss**

=

\$\_\_\_\_\_



## Flying High: Making 21 Balloons!



<http://papermatrix.wordpress.com/2012/02/25/mobile-001-balloon/>

In honor of the children of Krakatoa's airy-go-round and the islander families' amazing escape from Krakatoa have students practice their math skills and create these tiny balloons to construct their own Imaginary-Go-Round!

During the activity Discuss:

- Despite the dangers of living on a small island with an active volcano, why do you think the Krakatoans chose not to leave? How much time did the citizens of Krakatoa expect to have to prepare to leave the island?
- According to Mr. F, what were some of the reasons why the Balloon Merry-Go-Round could not be seen from either Java or Sumatra?
- Explain the physics of F-1's explanation, on p. 122, about why flying over the volcanic crater means a short trip for the Balloon Merry-Go-Round.
- Why would "sulphurous fumes" be emitted from a volcano?
- Describe the effects of volcanic activity on the waters and islands nearby.
- Describe the flying platform, the invention that the citizens of Krakatoa designed to take them away from the island, and tell how it worked. Why wasn't it ever tested? Would you trust an untested balloon?
- Why was the balloon platform so bright and attractive in contrast to the Balloon Merry-Go-Round?
- What factors influence the lifting power of balloons? How did Mr. F. explain the total weight the balloon could lift?
- How did Mr. F. explain the way in which the balloon could lift off the ground in ten minutes?

- Each family member was given a responsibility in keeping the balloon afloat. Why was this balloon better suited for a quick escape than a freighter?
- What was meant by a “family parachute”? Describe one and tell why it was important to have?
- What was involved in keeping the huge platform level? Why were the children given this task?
- How were the parachutes in the escape balloon similar to the sailboats in the Balloon Merry-Go- Round?
- Was the flying platform a success? Reread the getaway scene. What words did the author use to create the excitement and danger they found as the platform hovered over the volcano’s crater?
- Where was the platform when the island blew up?
- Why couldn’t the families jump off the flying platform in Belgium so that Professor Sherman could land the platform in the English Channel?
- Why was it necessary for Professor Sherman to stay with the flying platform? Why was it necessary for a family to stay with him? Which family volunteered to stay with him? Were you surprised? Why or why not?
- Where did the last family parachute? Find it on the map. Find the places the other families jumped and mark them on the map.

Materials:

- Colored printer paper
- Template
- Scissors
- Glue
- Tweezers
- String or fishing line (for hanging)
- Small beads

For each balloon cut two sheets in the colors students prefer. You print the template on colored paper and cut the forms out by hand with scissors.

All strips are joined already and you only need to weave as described below. When you weave tight the shape of the arms will make it 3D and close the form by itself. You only need a little glue to fix it when you have done all the weaving.. Use the glue stick to fix the strips at the edge when finished.

In general you should NEVER use glue while weaving. Only for fixing the last row. When gluing as you go along, however tempting, you lose the opportunity to line up for a pretty result. This is why the paper clips are so important.

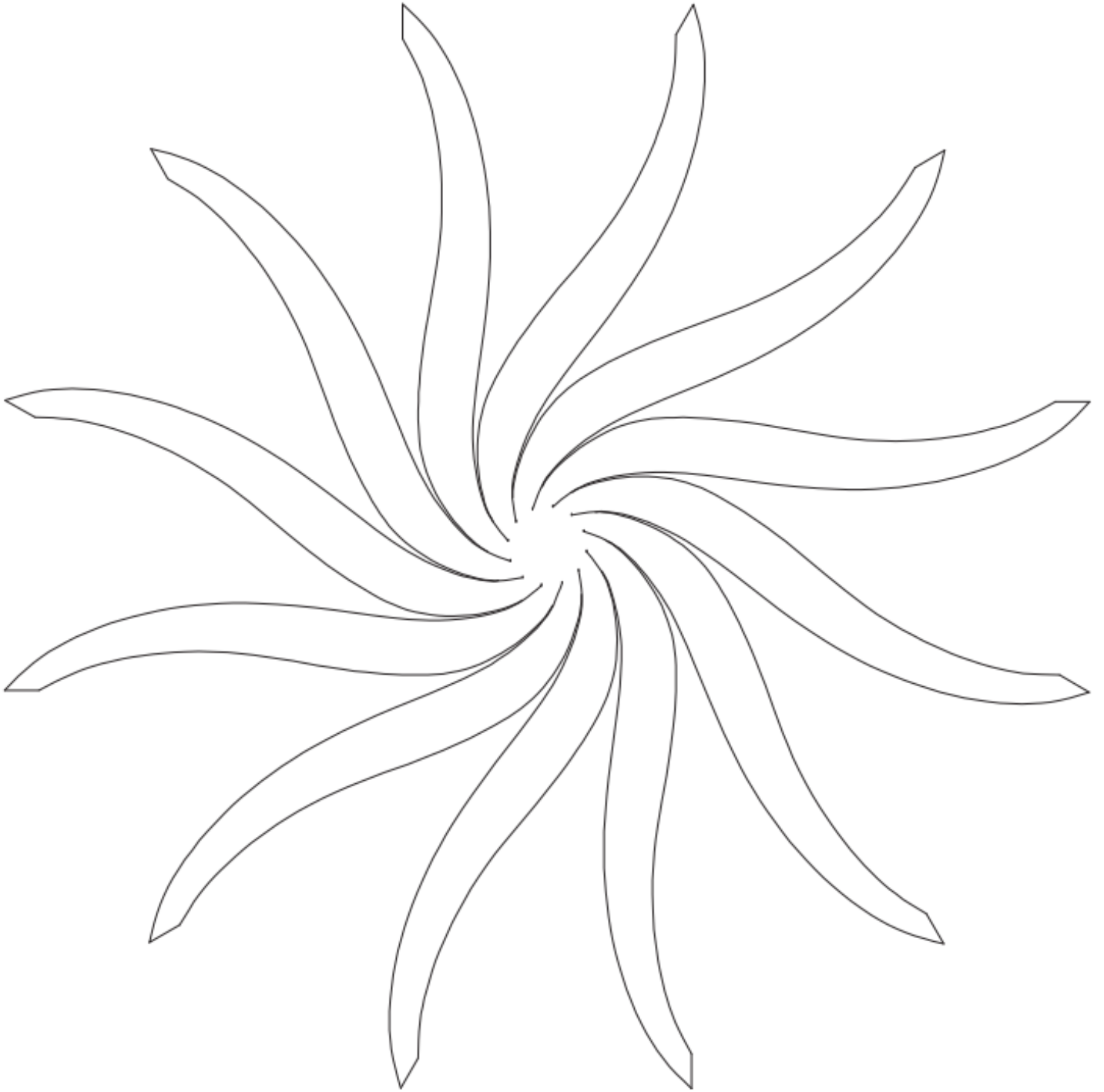
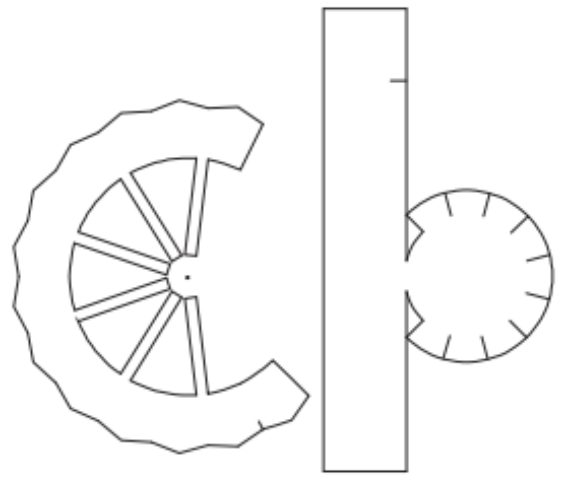
To weave: Place one form on top of the other, same center, so that the arms swirl in opposite directions. Now take one arm from the upper form and put it behind one from the lower form. Turn everything a little and do the same with the next set of arms. Work you way around the center, till you have made all 12. And then make the next row. After the third row you start using paper clips to keep the arms



together. This is because the balloon starts going 3D and will unwind if you do not. Weave firmly and tight. Use a pair of tweezers to weave the last tiny squares.

For the basket: Choose the basket pieces from the same color as the top center of the balloon. Make the small circular basket by gluing together bottom and sides. Form a circle from the wheel like shape and fix to the small basket as shown on the pictures. Now smear glue on both inner side of 'wheel' and outer side of lower edge of the balloon. Press gently together. Any inaccuracy will be fairly hidden. To hang the balloon make a small hole in the center of the top and fix a piece of string tying a pearl or like to the end inside the balloon.

This can be challenging yet it is a very forgiving project. If students make a wonky little balloon—the mistakes add to the charm. To help you, you can find an extended and a condensed version of the video tutorial here: <http://www.youtube.com/user/PaperMatrix> With a bit of training weaving a small balloon takes about 15 minutes.



## Government: A Tasty Adventure?

"*Non Nova, sed Nove*"--"Not New Things, but New Ways." **P. 76 in the novel**

"*We have an unusual Constitution. It's sort of a Restaurant Government. There are twenty families on the Island, each running a restaurant. We made it a law here that every family shall go to a different restaurant every night of the month, around the village square in rotation. In this way, no family of Krakatoa has to work more than once every twenty days, and every family is assured a great variety of food.*" [...]

"*What a wonderful place this Island is!*" I exclaimed." –*The 21 Balloons*

Take students from the deli to Delhi and criers of "gross!" to gourmands by holding a Krakatoan feast, or at least a Krakatoan snack! Just like the citizens of Krakatoa were chosen for their qualities, our Krakatoan foods should be selected according to their traits, and not necessarily "easy" foods that we might like right away!

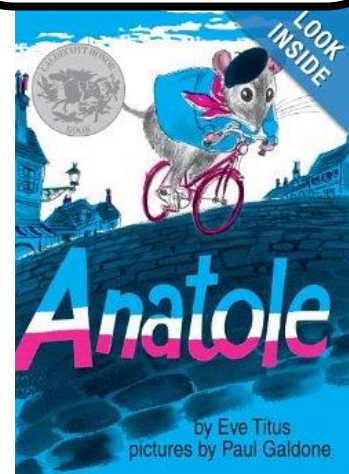
Examples of Krakatoan nations (and cuisines) to choose from:

- Britain
- France
- Egypt
- United States
- Krakatoa
- Turkey
- Holland/Dutch
- Swedish
- Russia
- Italy
- Morocco
- China

Why was the Gourmet Government successful? **Page 91 of the novel.** Why didn't the Professor have to change his name or start a restaurant? **P. 93** What would his name have been?

Taste is thought to be the most important sense when eating, particularly to enjoy your food, but it isn't so. When we eat we use our five senses: sight, hearing, touch, taste and smell. These five senses are tools that help us evaluate our food and from this we draw conclusions as to our likes and dislikes. Yes, we love the taste of what we eat, but how about its smell: stop thinking about the aroma of fresh baked cookies! Let's think about the textures and tactile sensations you feel in your mouth when eating an ice cream or the satisfaction you feel while biting into a crisp apple, which is also attributed to the hearing.

Note: A fun introduction to the topic of taste tests can be found with the Caldecott Award winning (and very charming) book *Anatole* by Eve Titus



And sight? It is surely the first thing that catches our attention; we analyze foods' characteristics to decide if they look "normal." With sight we also evaluate the aesthetics of our food, for example fruit or cheese can seem attractive or ugly. Those who taste as a profession, such as sommeliers or coffee-tasters, use their senses to judge the quality of food. There are preliminary clues such as the color of a fruit that can indicate its age and ripeness, or the texture of cheese can be judged rubbing it between the fingertips. Smell provides even richer information, details and stimulants about the food we eat.

Sensations that refer to our senses involve different areas in our brain, but then merge at the frontal cortex where a cerebral "image" of the taste is processed, this is what we call flavor.

Did you know? Some people are paid to taste! These people are trained, just like you train athletes and you have to be someone with aptitude, whose tongue works a little bit better than average. The visual aspect of food is important as well as smell and taste, so taste testers can't be color blind—or have food allergies. The job is more intense than it sounds. Professional taste testing is very different than being a part of a focus group—it's much more scientific and there's even (gulp) math involved. "It's not just, "Tell us what you love about this product!" It's about coming up with a mathematical score for every granular aspect of a food or drink.

One such person is **Godiva** taster Jennifer Koen, the company's director of innovations. Though Koen came to the position as a self-professed chocolate lover, she learned to pick up the confection's complexities when she was sent to "chocolate school" in Montreal and later trained on the job at Godiva.

Since tasting involves all the senses, Koen said she first looks at the chocolate to "make sure it has a good sheen and a nice shine." She also checks for bubbles and blemishes and analyzes the design for its aesthetic value.

The next step is to take quick "bunny sniffs" of the piece while cupping one hand over it so the scent doesn't escape.

"Eighty percent of taste is smell," Koen said. "You want to capture the aroma." The freshest chocolates have the most intense, rich smells.

Finally, she closes her eyes and takes a small bite of the piece — but it's not just any bite.

"You have to feel the bite as you take it," Koen said. "You want to move it around all areas of the mouth because there are different tastebuds in different areas of the mouth. You want to get sweet, sour and bitter, so you move it all around to get the full intensity of flavor."

The most complex chocolates are bursting with several different tastes, she said.

"Similar to wine, a chocolate piece often unfolds in different layers of flavor," said Koen. "You might start out with a cocoa hint, then get a hint of vanilla, then maybe a coffee or nut flavor and then a finish."

Tasters often do their jobs alone in sensory labs, with controlled lighting and air and no outside disturbances (though Koen does some of her tasting in boardrooms or her office, too). Professionals need to be discerning eaters who take their time with food, according to Caporaso.

"You want someone who is conscientious," he said. "It's a lot more than tasting. They're using all their senses."

Food and beverage companies need two kinds of tasters before their products hit the market.

Professional eaters run the gamut with their salaries. Since most work in food science or product development, those who taste for a living can be entry-level employees earning between \$30,000 and \$60,000 or senior execs raking in six figures, according to industry insiders.

Generally, tasters are only used for about an hour a day total — often only for a few minutes at a time. Not all tasting projects are as appealing as Godiva tasting, however. Some product-testing requests are a little more ... unusual. A taster might be asked to test dog food (for qualities like tartness, since "humans can give us an answer but the dog is just going to bark"), microwave meatloaf, medicine flavors, ice cream, crackers, jelly, or mushrooms every day for weeks on end.

No matter what they make, food and beverage companies and restaurants rely on tasters to ensure that their products come out just right and help predict what will sell the best. But if you're good at what you do, it can mean a lot to a company, John D. Harrison is a professional ice cream taster for Dryers and The Salt Lake Tribune reported that the ice cream company has insured Harrison's taste buds for \$1 million.

Companies need food tasters to verify their products are the same today as a week ago and the same from plant to plant. A consumer wants to know that a package of potato chips bought today in Phoenix tastes the same as the ones they bought yesterday in New York."

## The Test

The rule for any taste test is "you don't have to like it, but you have to taste it." **What did Mr. F say to Professor Sherman when he was nervous about trying the Chinese food? Page 135 of the novel.**

Create a chart of the different countries and the different foods, and the five senses (tastes, smells, looks, sounds, feels), leaving spaces for adjectives that students use to describe each sense's sensations.

Try a small sample of food from each country and have students write down, privately and without comment, on a sheet, their thoughts.

- America
- Britain (ex. biscuits)
- China
- Dutch/Holland (ex. thick hot chocolate, curried rice)
- Egypt (ex. sweet dates)
- France (ex. cheeses)
- Greece
- Italy
- Krakatoa (ex. coconut water)
- Morocco (ex. kabobs)
- Russia (ex. rye bread)
- Swedish
- Turkey

Have students collect the data and then let them create a graph of the results of the taste test and use the information to answer questions such as the following. Which country's food was most popular, least popular, highest ranked for flavor, new to the most people, etc?



## Sources and Resources

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