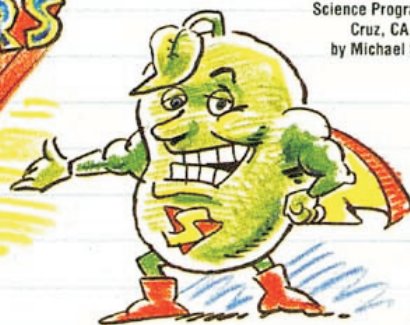


# TAKE-AWAY SCIENCE

Science to do in the kitchen, on the playground, in the park—hey, even in class!

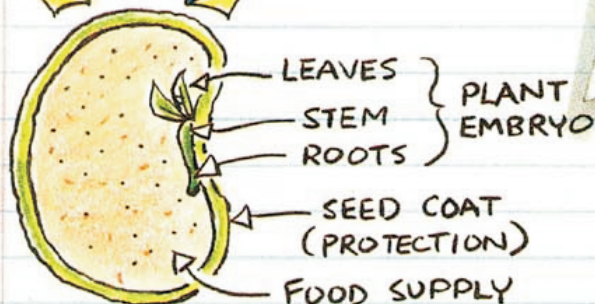
Adapted from THE GROWING CLASSROOM, a Garden-Based Science & Nutrition Curriculum for 2nd through 6th Grades developed by Life Lab Science Program, Santa Cruz, CA. Adapted by Michael Schneider

## THE SECRET POWERS OF SEEDS



We think of tiny seeds as just 98-milligram weaklings, but they're a lot more. Some seeds are very nutritious, rich in proteins, minerals, fats, and vitamins. And all seeds have amazing forces and alert sensors waiting inside of them. With just some lima beans, peas, nuts, grains, or kernels, you can discover the secret powers of seeds.

### OUR HERO



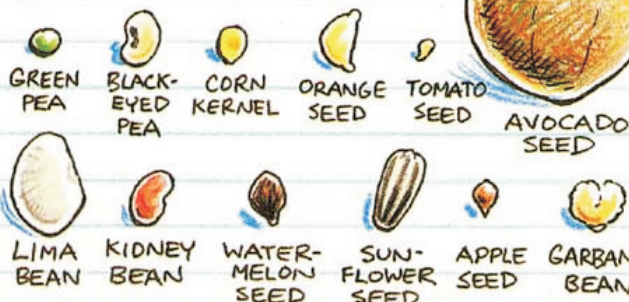
**DID YOU KNOW..?**  
THE FIRST SEEDS  
APPEARED IN PLANTS  
ABOUT 345 MILLION  
YEARS AGO!

#### Try This:

- (1) Soak lima beans overnight.
- (2) Gently open seeds lengthwise.
- (3) Find the seed coat, food supply, and plant embryo.

NOT A SEED—  
BUT A HOLE  
FOR YOUR  
NOTE-  
BOOK!

## SEEDS WE SEE



### Record-Book Seeds

Largest: Coconut. As heavy as 40 pounds!  
Smallest: Orchid. As light as 1/35,000,000 of an ounce!

Fact: One Giant Sequoia seed weighs only 1/6,000 of an ounce, but can become a 6,000 ton tree!

**WHAT YOU SEED  
IS WHAT YOU GET!**

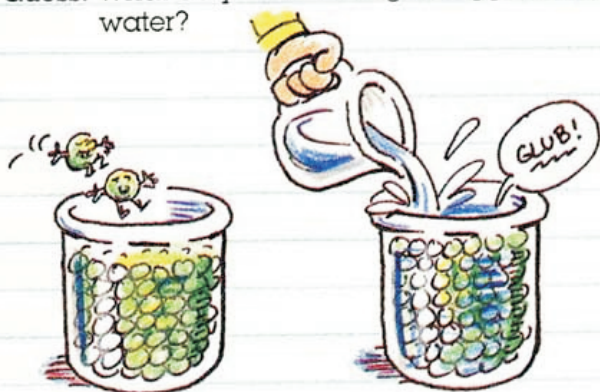


# A SWELL EXPERIMENT



**W**ater wakes seeds up! What's the first thing a seed does when it wakes? Try this experiment and find out. You're sure to have a swell time! First be sure to write your **Guess**, then do the **Test**, and finally **Tell** what happens!

**Guess:** What do you think might happen to a closed container filled with seeds and water?



**Test:** Try this—  
Fill a plastic container with dry beans or peas.

Fill all spaces with water.



Fit plastic lid (non-screw) on tight.  
Note the time....



Wait a few hours....

**Tell:** (1) Describe what eventually happened:  
(2) When did it happen?  
(3) How did it happen?

## DID YOU KNOW?

WATER MOVES INTO A SEED THROUGH THE SEED COAT, SWELLING THE FOOD SUPPLY, IN THE SAME WAY THAT WATER INCREASES THE SIZE OF A SPONGE. THIS PRINCIPLE WAS USED TO STRETCH A TIGHT PAIR OF LEATHER SHOES YEARS AGO.



SEEDS OF WISDOM—  
THE SMALLEST SEED CAN  
CRACK THE HARDEST  
SIDEWALK. WHY?

## For scientists who really want to flip their lids:

Which seeds swell fastest? Repeat the experiment with different kinds of seeds in identical containers. (Make sure they're all filled to the same level!) Start them at the same time.

First write your **Guess**: In what order will the lids pop?

Do the **Test**, writing down when you started.

Then **Tell** (write) the time at which each popped.



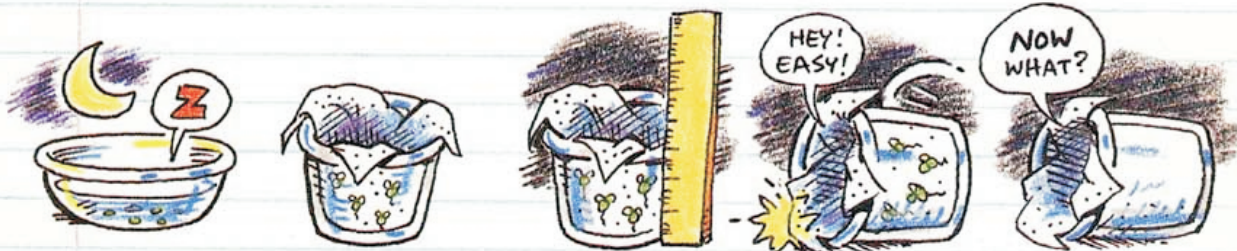
# WHICH WAY DID IT GROW?

## USING SEEDS AS GRAVITY SENSORS



**K**nowing which way is "up" and which way is "down" is easy for people. But seeds can't know...or can they? No matter how it gets planted, a seed's **secret gravity sensor** tells it which way is down...and which way is up! If you ever want to know the way to the center of a planet, just watch some seeds. They'll show you!

**Guess:** What might a seed do to point the ways up & down?



**Test:** Try this—

First soak radish seeds until they begin to sprout.

Line a jar with wet paper towels. Put the seeds between the towels and the glass sides.

Grow in the dark until stems are one inch long. Make sure they have water.

Look at jar, then put back in dark on its side.

Wait 24 hours. Draw what happens.

**Tell:** (1) Which way did the roots grow? Why?  
(2) Which way did the stem grow? Why?  
(3) Why does this experiment only work in the dark?

**USE YOUR BEAN!**  
HOW DOES A SEED'S GRAVITY-SENSOR HELP IT TO SURVIVE?

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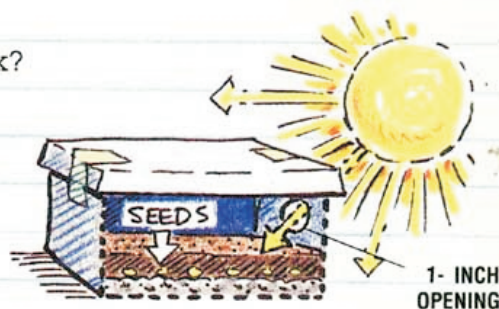
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**Guess:** Are seeds light sensors, too?

**Test:** Use this set-up—

- Cut a one inch circle at the end of a shoe box.
- Pour in a layer of gravel and a layer of soil.
- Plant bean seeds, and water to moisten.
- Put lid on box. Don't peek except to water.



**Tell:** In a week, open box. Is the new plant growing toward the dark end of the box, or toward the light?



WHICH WAY MIGHT ROOTS AND STEMS GROW IN SPACE, WITHOUT GRAVITY?



# DO SEEDS HAVE WATER SENSORS?

When people are thirsty we go to water. Plants can't walk, of course. But can they move toward water they aren't touching?

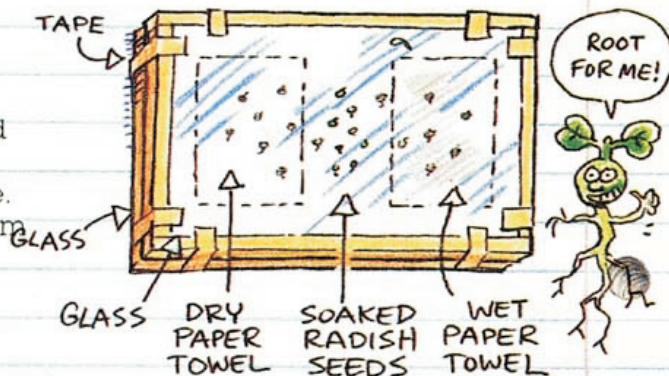


**Guess:** How would seeds show that they sense water from a distance?

**Test:** Make this "Glass Seed Sandwich."

Soak radish seeds until some are sprouting—two or three days. Find two pieces of glass (or plastic), such as glass from a picture frame. Get two paper towels and fold them both several times. (Make sure they're the same thickness.) Then soak one. Place the towels on one piece of glass with 1/2 inch between them. Carefully dry the seeds.

Then sprinkle them on both paper towels and in between. Tape the other piece of glass on top. Wait and watch a couple of days.



**Tell:** (1) Draw what eventually happened.

(2) Which seeds grew?

(3) Were the ones not touching the wet paper towel able to find the water? How would it have looked if they were?

**DID YOU KNOW?**

A SINGLE CORN PLANT CAN GROW OVER 80 MILES OF ROOTS!

AW, SHUCKS!



## MASTER THE POWERS!

Write an adventure story using all the secret powers of seeds:

- (1) Survival package ready to travel.
- (2) Incredibly strong.
- (3) Gravity sensors.
- (4) Can "sleep" until touched by water.
- (5) Can grow miles of roots!



**ALL LIFE NEEDS WATER!**