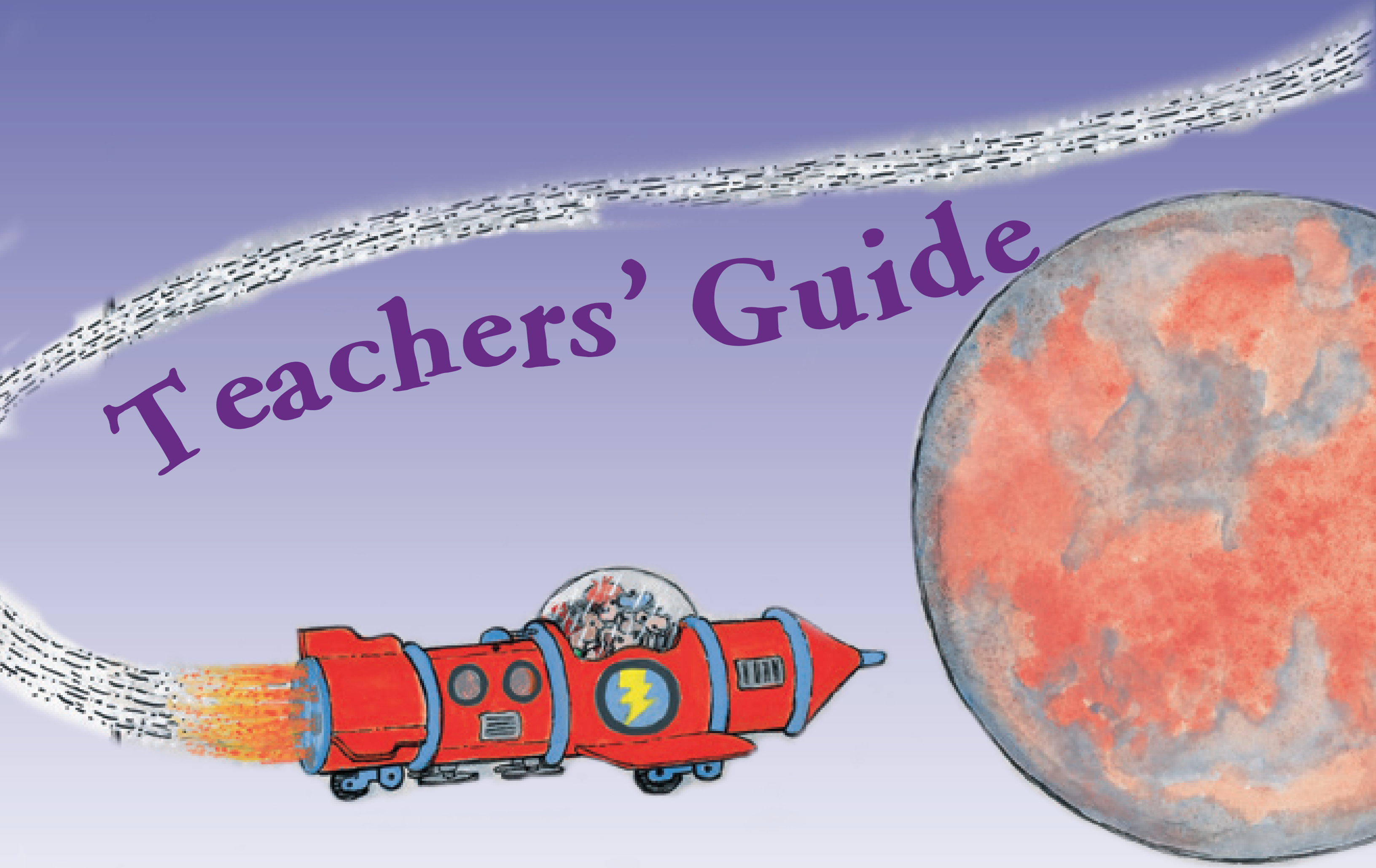
WELLS OF KNOWLEDGE SCIENCE SERIES

Teachers' Guide



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Wells of Knowledge Science Series by Robert E. Wells

Introduction

Welcome Robert E. Wells's books into your classroom, and you'll find most of your science curriculum covered. The twelve volumes – engaging and informative, educational and inviting – provide second through fifth graders with lessons in science and math from astronomy to weather; from biology to measurement. Beyond the solid information that is the core of each book, Wells also introduces concepts that offer students deeper understanding of the subjects at hand. His conversational tone and thought-provoking questions will lead children to questions of their own. And that is the beginning of all scientific learning.

This guide for your classroom begins with a curriculum index to enable you to pinpoint subjects you want to cover using the books. The approach in each book is to focus on a single subject, but to touch upon many subjects in order to bring a broad comprehension to the young learner. Animal Life is a common curriculum area, and you'll find animals covered in many of the books from a variety of angles. Similarly, measurement and relative size are key subjects in elementary school classrooms; they are explored in several books. The index is there to help you find these connections quickly.

The activities in this guide not only provide hands-on projects to reinforce the main topics in the books, but also extend the curriculum connections. You'll find activities that involve reading, writing, oral presentations, research skills, cooperative learning and more. There are even a few take-home suggestions to get your students' parents involved.

About Robert Wells

Robert E. Wells is the author and illustrator of many intriguing and award-winning science books for children. He lives with his wife in Wenatchee, Washington.

This guide was prepared by Clifford Wohl, Educational Consultant.

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*The asterisk in front of a title designates its main area of concentration.

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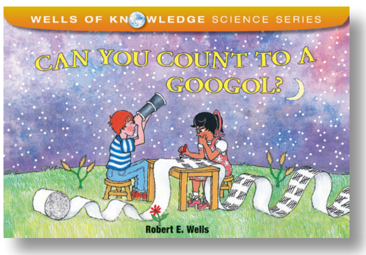
*The asterisk in front of a title designates its main area of concentration.

Activities

Vocabulary
Robert E. Wells's books introduce new vocabulary words and scientific terms to readers. As your students read the books they should note unfamiliar words and terms that are new to them and place them on a science word wall. When they have finished the books they can turn the word wall into a glossary of terms for the entire series. Each student should have a copy of the glossary.



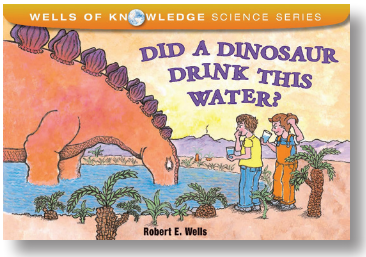
Can You Count to a Googol?

Robert E. Wells has readers imagine huge amounts of money. He asks, "What would you do with one billion dollars?"

Take that question down a notch or two and have your students write essays about what they would do with a million dollars. Brainstorm with your class before they begin to help them understand the costs of things (large and small items). And guide them to realize that part of the money should be used to help others.

For a take-home activity your students can do with their parents, ask the question: If someone offered to give you $10,000 every day for a month or offered to give you one penny then doubling the amount each day for a month which would you choose? For example: Monday, one cent; Tuesday, two cents; Wednesday, four cents; Thursday, eight cents, etc. Develop with your students how much they would have after the first week to help them make their choices. ($10,000 per day will yield $70,000, while doubling a penny will yield $0.64.) Have them vote which they would rather have. Then send them home to do the math for a 30 day month with their parents.

(Just to let you know: doubling a penny every day for 30 days will yield $10,737,418.24, and if it was possible to do it for an entire year it would be **$\$3,757,668,130 \times 10^{100}$** almost 4 billions times more than a googol.)



Did a Dinosaur Drink this Water?

"Where does water come from? The sink of course!" After reading *Did a Dinosaur Drink this Water?* your students are sure to take water more seriously. Ask each student to come up with his or her list of the five best things about water – from the fact that it quenches your thirst to it's fun to swim in. Create a list of all of their responses and tally the results. What is the class's number one pick? Which is the least popular? Create a class chart of the top ten responses and have them illustrate it. Next do an experiment with the class to see how easy it is to waste water. You'll need access to a sink, a measuring cup, and a timer.

Let the water form the tap drip ever so slightly. Place the cup under the dripping water and start the timer. Time how long it takes to fill up the cup to the one-cup line. You can now calculate how much water is wasted per day and per year.

For example:
If it takes 12 minutes for the cup to fill up, in one hour 5 cups will have dripped out. Multiplying that by 24 hours in a day then dividing by 16 cups in a gallon equals 7½ gallons per day. Multiplying that by 365 days in a year yields a whopping 2737½ gallons of water wasted in one year from just that little drip in just one sink. Your students should be amazed by the results. They should then go home and perform the experiment for their families.

These formulas will be useful:

Cups/day = (60 x 24)/Time in minutes to fill one cup

Gallons per day = Cups per day/16 cups in a gallon

Gallons per year = gallons per day x 365 days in a year

NOTE

A SIMPLIFIED FORMULA FOR CALCULATING GALLONS PER YEAR IS:

(90 x 365)/Time in minutes to fill one cup

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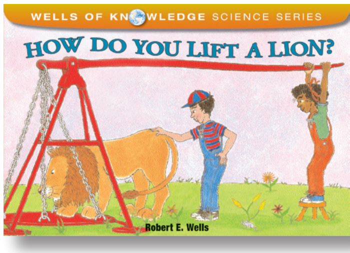
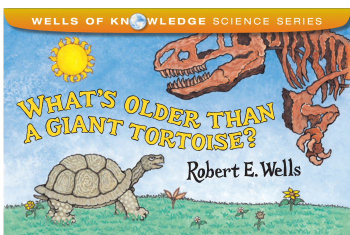


How Do You Lift a Lion?

Whether it is the seesaw in the playground or the pencil sharpener in the classroom, there are thousands of simple machines that make work easier in everyday life. After reading, *How Do You Lift a Lion?* and identifying the six different types of machines, send your student on a "Simple Machine Hunt." First they should survey the classroom, then look in and around the school building, and finally in their homes. Their lists should include the object, the type of simple machine, and where they observed it. See who comes up with the biggest list.



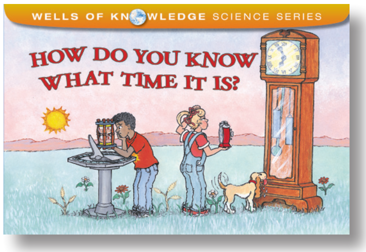
What's Older than a Giant Tortoise?

Readers of *What's Older than a Giant Tortoise?* are introduced to a wide spectrum of subjects – from animals to plants, from ancient civilizations to outer space. It provides a perfect center for research projects and for oral presentations.

Divide your class into groups – each representing one of the following subjects:

- **Giant Tortoise**
- **Giant Sequoia Tree**
- **Pyramids of Giza**
- **Arizona Meteor Crater**
- **Mammoth Fossils**
- **The Himalayas**
- **Tyrannosaurus Rex**
- **Planet Earth**
- **Our Universe**

Have each team research their subject to find three interesting facts about it. They should present their findings to the class in oral reports. The format of their report can be as creative as the teams wish – in costumes, with posters, with music – the object is to make the information memorable to the entire class.

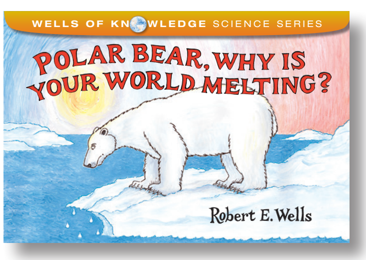


How Do You Know What Time It Is?

You can make a sundial with your class and tell time the same way the ancients did. Here are the materials you'll need:

- **Stick about 24 inches long**
- **Enough clay to mount the stick in so it stands up straight**
- **Chalk**
- **Piece of string 24 inches long**
- **13 small stones**
- **Watch**

1. Find an area in the schoolyard with full sun.
2. Using the chalk, mark a spot on the ground for the center of a circle.
3. Tie the string around the piece of chalk. Use the chalk and string like a large compass by holding the chalk in one hand and the loose end in the other. Hold the loose end down on the spot, pull the string taut and trace out a circle.
4. Mount the stick in the clay and place it in the center of the circle making sure it is stable and won't fall over.
5. The stick will cast a shadow on the ground.
6. At each hour of the day place a stone on the ground where the shadow crosses the circle. Number each stone with the hour.
7. When all of the stones are in place you're ready to tell time. With a little practice you should be able to tell time to the nearest 15 minutes.
8. Note that you will have to adjust for time changes due to daylight time and standard time.

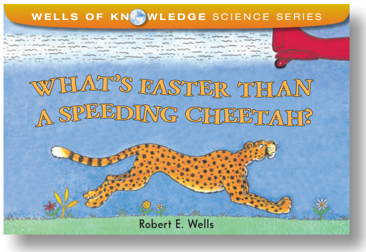


Polar Bear, Why is Your World Melting?

After reading *Polar Bear, Why is Your World Melting?*, your students should be acutely aware of what the world-wide consumption of fossil fuels is doing to change the climate. They will realize, too, that it is not just the polar bear's habitat that is threatened, but theirs as well.

Encourage your students to discuss the issue. They can go to the government website: http://www.epa.gov/climatechange/wycd/index.html to find out more about what they and their parents can do to reduce energy consumption. Then have them mount a campaign to educate their fellow students and urge members of the community to take action. They can:

- **Make posters**
- **Make public affairs announcements**
- **Write letters to the local newspapers**
- **Write and act out plays that highlight the issue**



What's Faster than a Speeding Cheetah?

Your students learned in *What's Faster than a Speeding Cheetah* that an ostrich can run about 45 miles per hour and a cheetah can reach speeds of up to 70 miles per hour. But how fast could an ostrich run backwards or a cheetah run holding its back leg with its front paws? We don't think they'll tell you. But your students will. Here are a couple of tests to see how fast your students are. You can set this up as a field day. The events are: running backwards, duck walking, crawling on hands and knees, walking heel toe, skipping, and hopping on one foot.

Measure out fifty yards in your schoolyard or field for your track and you're set to go. Time each event. The recorded time will be how many seconds it takes to go 50 yards. Here's the formula to use:

Speed(s) is equal to the distance(d) travelled divided by the time(t) it takes to get there.
$s = d(\text{yds.})/t(\text{sec.})$

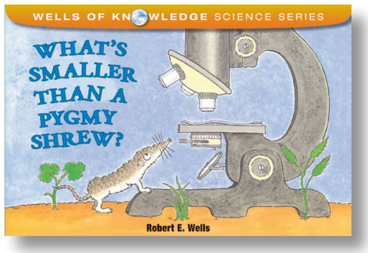
We've added how long it would take the cheetah and the ostrich to run the track to the chart as a point of reference. Give each athlete a chart to record his/her results:

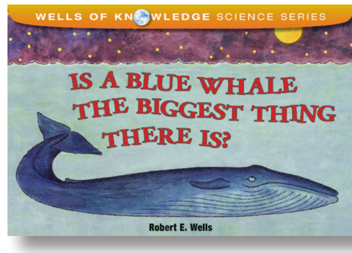
50 yard Events

Students Name____________________

Event	Time in seconds	Speed: Yards per second	Miles per hour
Running Backwards			
Duck Walking			
Crawling on All Fours			
Hopping			
Skipping			
Cheetah Running	1.46	34.25	70
Ostrich	2.27	22	45

To convert the results to miles per hour, you'll have to do some calculations. First since the recorded speed is in yards per second, multiply the speed by the number of seconds in one hour. (3600). Then divide that amount by the number of yards in a mile. (1760). You now have the speed for each event in miles per hour.



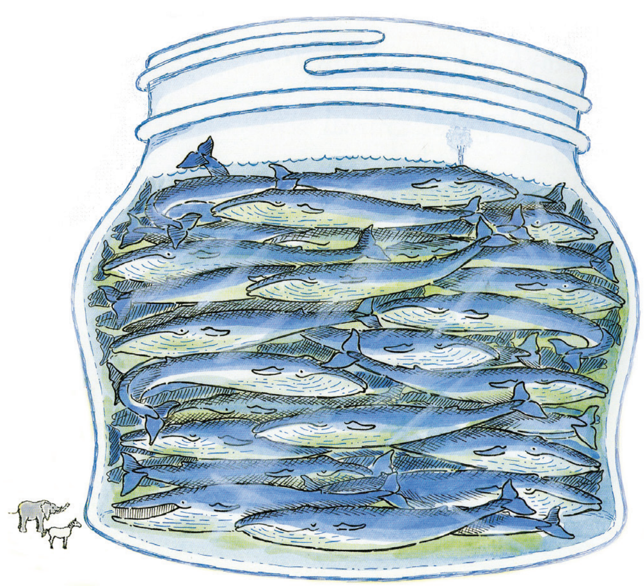


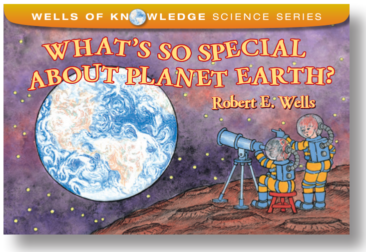
What's Smaller than a Pygmy Shrew?
and
Is a Blue Whale the Biggest Thing There is?

Both these books introduce scientific ideas and stimulate imaginations. Robert E. Wells asks children to picture things so small or so large that they are beyond a child's experience. Students must use their imaginations.

Writers, filmmakers, and scientists have always wondered what it would be like to be incredibly small, and they have explored the idea in such works as *The Fantastic Voyage, Honey I Shrunk the Kids, The Incredible Shrinking Man,* and *The Magic School Bus Inside the Human Body*. Using *What's Smaller than a Pygmy Shrew?* as inspiration, have your students imagine what it would be like if they where temporarily shrunk down to the size of a lady bug. What would be the advantages? What would be the disadvantages? After discussing this with them, have them write stories of an adventure they went on as a teeny tiny person.

Paul Bunyan and his blue ox Babe, the Cyclops, Goliath, Abiyoyo, the giant in Jack and the Bean Stalk, and other larger-than-life creatures have fascinated writers and piqued the imaginations of readers for thousands of years. After reading *Is a Blue Whale the Biggest Thing There is?* read some of these stories with your class. Then have them create their own super large characters to write about. Have them illustrate their stories and present them in a read-around.





What's So Special About Planet Earth?

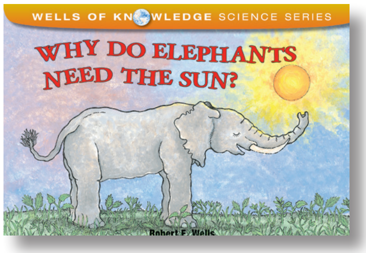
Children, even most adults have difficulty visualizing large numbers and distances especially when it comes to the solar system. A great activity to help your students visualize the size of the solar system is to construct a scale model relative to the distance the planets are to the sun. This can be done in the hallway outside the classroom door or in the schoolyard or field. You'll find all the statistics you need in *What's So Special About Planet Earth*.

For the hallway, you'll need to measure out a line 100 feet in length. Make signs on oak tag for each of the planets and the sun. Place the sun at the zero point, or the beginning of the line and Neptune, the eighth planet at the end of the line. All the other planets will go somewhere in between. Using the numbers in the book create a chart similar to the one below (We've provided the scaled distance for you, but you might want to develop it with your class. The formula used is the ratio of the distance of Neptune from the Sun divided by 100 equal to the distance of another planet is divide by "**X**", the unknown distance in feet. Simplified, the scale in feet is the distance a planet is from the sun divided by 27,950,000. For example the Earth is 93,000,000miles from the sun. 93,000,000 divided by 27,950,000 equals 3.33 feet or 3ft.4in.):

If you have a school field, from a starting point pace out 100 large steps, about 100 yards and use the same ratio. Have a group of children stand at point zero where the sun would be and send a group to the furthest point and be Neptune (approx 100yds.). Convert the scaled distance into yards, and your students should now be able to visualize the vastness of the solar system.

100 foot scale from the sun to Neptune

Body	Distance from the Sun (miles)	Approximate Scaled Distance (feet)
Sun	0	0
Mercury	36,000,000	1.29 (1ft. 3 1/2in.)
Venus	67,000,000	2.40 (2ft. 4 3/4in.)
Earth	93,000,000	3.33 (2ft. 4in.)
Mars	142,000,000	5.08 (5ft. 1in.)
Jupiter	484,780,000	17.35 (17ft. 4in.)
Saturn	886,700,000	31.75 (31ft. 9in.)
Uranus	1,784,000,000	63.83 (63ft.10in.)
Neptune	2,795,000,000	100



Why do Elephants Need the Sun?

After reading *Why do Elephants Need the Sun?* your students should see that plants use the energy from the sun to manufacture the food that animals eat to survive. Below is a simple experiment your students can do to show how the sun affects the growth of a plant. Here your students will grow plants with different levels of sunlight and observe the different growth patterns.

Take three small plants approximately the same size and label them: Plant "A", Plant "B", and, Plant "C". Place each in a different location within the classroom. Plant "A" on the windowsill in full sun; "B" away from the window where it does not receive direct sun light; and "C" in a closet in total darkness. Water each plant on a regular basis the same amount of water each time. Discuss with your children why it is important to be consistent in caring for the plants. Every Monday observe the condition of the plants. They should note:

- **The size of each plant as a whole**
- **The size of the leaves**
- **The number of leaves**
- **The color of the leaves**

They should write down their observations and draw pictures of each plant. At the end of a month they should be able to draw conclusions on the effects the sun has on the growth of their plants.

As a final activity, all three plants should be placed on the windowsill in full sun. They should be watered and tendered with the same amount of care. Again every Monday they should record their observations, and after one month come to some conclusion about the sun and the growth on their plants.