The Phantom's Portrait Parlor
Paper Cutting

Guess What?

The Phantom wants to create life sized models of atoms, and he wants your help! Help the Phantom investigate the world of the very small by cutting a 28 centimeter strip of paper in half as many times as you can. If you can cut the strip of paper in half 31 times you will end up with a piece of paper the size of an atom.

What you'll need:

1 strip of paper 28 centimeters long (11" inches)

1 pair of scissors

What to do:

Take your strip of paper and cut it into equal halves.

Cut one of the remaining pieces of paper into equal halves.

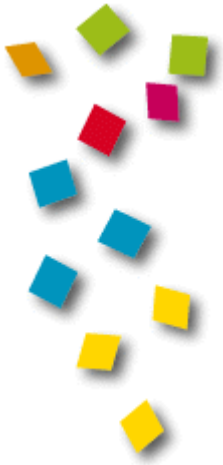
Continue to cut the strip into equal halves as many times as you can.

Make all cuts parallel to the first one. When the width gets longer than the length, you may cut off the excess, but that does not count as a cut.

So what?

How far did you get? Here are some comparisons to think about!			
Cut 1	14.0 cm	5.5"	Child's hand, pockets
Cut 2	7.0 cm	2.75"	Fingers, ears, toes
Cut 3	3.5 cm	1.38"	Watch, mushroom, eye
Cut 4	1.75 cm	.69"	Keyboard keys, rings, insects
Cut 6	.44 cm	.17"	Poppy seeds
Cut 8	1 mm	.04"	Thread. Congratulations if your still in!
Cut 10	.25 mm	.01"	Still cutting? Most have quit by now
Cut 12	.06 mm	.002"	Microscopic range, human hair
Cut 14	.015 mm	.006"	Width of paper, microchip components
Cut 18	1 micron	.0004"	Water purification openings, bacteria
Cut 19	.5 micron	.000018"	Visible light waves
Cut 24	.015 micron	.0000006"	Electron microscope range, membranes
Cut 31	.0001 micron	.0000000045"	The size of an Atom!

Now what?



Is there anything smaller? Yes, the size of an atom nucleus would take about 41 cuts! Scientists use advanced technology to explore the world of electrons and quarks that are at least 9,000 times smaller than a nucleus.

We can not see anything smaller than an atom with our eyes, even with the electron microscope. Physicists study much smaller things without seeing them directly.

Is there an end to the quest for the smallest and most basic elements in our world? The search began with the Greeks and continues as scientists search for the Building Blocks of the universe. These things are far beyond the range of sensory perception but not beyond the range of human understanding.