

STUDY GUIDE & SUPPLEMENTAL INFORMATION FOR:

BubbleMania: Science, Art & Comedy!

With Casey Carle, Comic Bubble-ologist

A Reproducible Study Guide for Teachers. This study guide was co-developed by staff at Discovery Theater, The Smithsonian Institute, Washington, D.C. It is designed to help you and your students prepare for, enjoy and discuss *BubbleMania!*. This guide contains background information, discussion questions and activities. Appropriate for grades K-6.

SUBJECTS COVERED IN THIS STUDY GUIDE

- * The Science of Bubble-ology
- * Pre and Post show activities
- * Bubble creations as an Art Form
- * Vocabulary of Bubble-ology
- * Homemade bubble solutions
- * A Bubbliography (books & web sites)

WHO IS CASEY CARLE?

One of 10 children, Casey grew up in Greene, NY. He graduated cum laude from S.U.N.Y. Geneseo with a B.A. in Drama and also from The Ringling Bros. Clown College with a B.F.A. (Bachelor of Fun Arts). Casey has worked professionally in theatre since 1985, going solo with *BubbleMania* in 1990.

Casey's humor and skill appeal to every age. He has astonished audiences at schools, shopping malls, science centers, regional theaters and corporate events nationwide. He has performed on cruise ships, and taken his bubbles on the road to Singapore and Mexico. Casey's act brought a "new dimension" to Ringling's 3-ring and has been presented at The Smithsonian Museum's Discovery Theater.

Giving more than 350 shows per year, Casey is one of the world's greatest bubble experts. Not only has he performed on TV and created his own award-winning video on the wonder and beauty of bubbles, but he's also co-authored a new hands-on science book, *Bubbleology*. Published by Innovative Kids and distributed by Chronicle Books, this fun, educational book comes with a laboratory for conducting over 30 experiments—and reveals the secrets of many of Casey's most amazing bubble tricks!

Mr. Carle lives in East Haddam, CT with his talented wife, a frisky cat and basement full of bubbling gadgets.

BUBBLE BASICS

Teachers: *You may choose to facilitate the following discussion with actual soap bubbles. However, please save student bubble-blowing until post-show activities.*

How many kinds of bubbles can you name? There are bubbles from bubble gum, bubbles in soda pop, bubbles in your tub and bubbles in the sink. Balloons and basketballs are also bubbles. What do they have in common? **They are all trapped gas.**

Soap bubbles are trapped gas, too. The gas is the same air we breath and that fills the room around us. What's trapping it? A thin skin or **film** of soapy water. This film holds the air in because liquids have an interesting property: **surface tension.**

SURFACE TENSION

If you've ever watched a leaf float on a puddle, you've experienced surface tension. **Surface tension** occurs because the **molecules on the surface of a liquid stick tightly to each other**, forming a kind of skin. When you dip your hand into a sink full of water, you're forcing some of the surface molecules apart, breaking the surface tension.

Have you ever tried dipping a bubble-blowing wand into plain water? What happened? The **water can't stretch across the hole in the wand, because its surface tension is too strong**—the “skin” of the water snaps back against itself. **Adding soap** to the water doesn't break the surface tension, but does weaken it. **Chemicals in the soap loosen the “grip”** the water molecules have on one another just enough that they will form a stretchy film.

What's the next step? **You blow air—a gas—against the soapy film.** The molecules have to move outward as the air presses against them, but surface tension still holds them together. If you get the air pressure just right, **surface tension will wrap that film all the way around that breath of air.** Congratulations! **You've got a bubble!**

POP! GOES THE BUBBLE

What happens if you poke your dry finger through a bubble? You guessed it.

Why do bubbles pop? Remember, surface tension is what makes bubbles possible. So what happens when you **break** that surface tension? Right. You've put a hole in the bubble wall and popped it!

Can you think of **other reasons** that might make a hole form on the surface of a bubble?

- * The water evaporates
- * Gravity pulls soap and water toward bottom
- * The bubble hits a dry object (which absorbs water from the bubble)

ALL THE COLORS OF THE RAINBOW

If you look closely at a soap bubble or soap film, what do you see? Lots of **shimmering colors**. What causes them?

Just like a prism, soap film causes white **light to separate** into its component colors. Oil in a water puddle has the same effect. A **rainbow** is created in a similar way when water droplets in the air break up sunlight passing through them.

PRE- or POST-SHOW ACTIVITIES

BUBBLES ON PAPER (a “dry” activity)

Casey Carle makes sculptures out of bubbles. **What bubble sculptures would you make?** Would you “bubble-ize” your best friend? How about your favorite animal? What about a bubble dinosaur, or a bubble building?

Use your imagination! **Draw your fantasy bubble sculpture.** Use lots of colors to reflect the colors that move over the bubbles’ surface. (Remember, real-life bubbles have some limitations—but your imagination doesn’t, so anything goes!)

THE ULTIMATE BUBBLE-MAKER (a “dry” activity)

What kind of gizmos did Casey use to make his bubbles? What kind of bubble-makers have you used?

Imagine you are the world’s greatest inventor--or magician! **What would be your Ultimate Bubble-Maker?** Would it be a machine? A volcano? Would it make the biggest bubble ever seen? Or the most bubbles ever created at one time?

Draw your Ultimate Bubble-Maker. Share your idea with your friends!

POST-SHOW ACTIVITIES

Teachers: *These bubble-making activities should be only be used after seeing **BubbleMania**. This will allow students to experience the full excitement of viewing bubble artistry and then returning to class eager to try it.*

EXPERIMENT WITH BUBBLES *Suggestions to Get You Started*

Teacher tip: *If you keep creations small and emphasize observation over recreation, most of your students' work will remain over a desk/table. If, however, you set no limitations on size and movement, be prepared for a mess! Either way, learning will be combined with fun.*

You will need:

- * pipe cleaners
- * individual pie pans OR group dish pans OR cake pans
- * plastic drinking straws (refer to them as “bubble blowers” to remind the very young not to suck in)
- * bubble solution (recipe below)
- * newspaper or paper towels for the mess

Casey Carle's “secret” homemade solution:

- * 1/2 gallon (64 ounces) **distilled** water (tap water is usually not as good)
- * 1 tablespoon Glycerin (Available in pharmacies. Slows evaporation—not needed on muggy/humid days).
- * 14-16 ounces New Ultra Joy or New Ultra Dawn (or 10-12 ounces non-ultra, good quality dish detergent). **Please Note:** When possible, search for the “old” Ultra Dawn and Joy products, or use good quality, non-ultra dish washing products.
- * **OPTIONAL:** 16 ounces Commercial Bubble-Blowing Solution
- * **OPTIONAL:** 2-4 more ounces dish detergent (but not more)
- * **OPTIONAL:** 1 more tablespoon of Glycerin (but not more)

Mix well. Use a **clean** mixing bucket to avoid damaging chemicals. Keep in airtight container until ready to use. If outside, avoid **direct** sun and **dusty** or **dry** air. Wet, humid days are great bubble days. Long exposure to soap can damage grass. Avoid foam, which makes bubble-making more difficult. Keep **bar soaps** away from your hands and the solution.

Now try this...

Using only the “**bubble-blower**” (**straw**) make bubbles **just on the surface** of the solution in the dish or pan. Emphasize breath control and keeping surface free of foam. Try blowing **a)** one big bubble dome, **b)** a bubble inside the dome. Try sticking different size domes together until they look like a snow person, ladybug, flower, etc.

Bend the **pipe cleaner** to make a wand at one end. Wet the wand and while holding over dish use the straw to blow a bubble on the underside of the wand. Start with a plum-sized bubble and work up to tennis and softball size. Now use the straw to **create sculptures** in, on, over and

under the bubble on the wand. Try some of the shapes and forms seen in *BubbleMania*, or invent your own. Don't forget to give them names!

Words and Concepts

Bubble-ology	Bubble-ologist	Sphere/spherical	Surface Tension
Gas vs. Liquid	Evaporation	Molecules	Gravity
Cube	Elasticity	Prism & Spectrum	Solution
Atoms	Physics	Water Adhesion	H ₂ O
Soap Film	Forces	Humidity	Detergent vs. Soap

BUBBLIOGRAPHY (FOR FURTHER READING)

K thru 2nd Grade:

- * *Bubbles, Rainbows and Worms* by Sam Brown
- * *Soap Bubbles: A Science Concept Book* by Seymour Simon

3rd thru 6th Grade:

- * *Bubbleology* by Casey Carle & Jim Moskowitz. Comes with hands-on laboratory. Available through www.bubblemania.com.
- * *Soap Science* by J. L. Bell
- * *Experiments with Bubbles* by Robert Gardner
- * *Bubbles: A Children's Museum Activities Book* by Bernie Zubrowski
- * *Bubble Festival: Bubble Activities in a Learning Station Format* from G.E.M.S., Lawrence hall of Science, Univ. of California at Berkeley
- * *The Unbelievable Bubble Book* by John Cassidy

6th thru 8th Grade:

- * *Soap Bubbles: Their Colors & the Forces Which Mold Them* by C.V. Boys
- * *Universal Foam: From Cappuccino to the Cosmos* by Sidney Perkowitz

- * *Bubble 1: Bubble Activities in a Learning Station Format* from G.E.M.S., Lawrence hall of Science, Univ. of California at Berkeley

BUBBLE-LINKS

www.bubblemania.com – Casey Carle’s official website. Photos, links, tips, science fair suggestions, book purchase and much more!

www.exploratorium.edu/ronh/bubbles/bubbles.html - San Francisco's Exploratorium bubble page – science for older students, plus lots of bubble links for all ages.

www.cleaning101.com/sdakids/bubbles/ - The Soap and Detergent Association web page. Kid-friendly and fun.

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