The Lake Nyos Demo

From RODNEY'S HOMEPAGE for Earth Science Teachers
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This is a fun demo that demonstrates differences in the density of gases. I show it to the students the day after they have done the "What happened at Lake Nyos? Lab". The lab is available in a kit from **WARD's Natural Science Establishment**. Both the lab and/or this demo will fit nicely into a unit on density, water quality, or volcanism.

Materials
clear plastic box or similar container, vinegar, baking soda, funnel, empty one gallon jug, 3 birthday candles (1 inch, 1 inch, and 2 inches tall)

Procedures
1. Position the candles in the bottom of the box as shown in the TeacherTube video.

2. Put 1.5 cups of vinegar into the empty jug.

3. Using a funnel, add .25 cups of baking soda to the jug containing the vinegar. Let it set for about 30 seconds or so until the reaction has finished. In the meantime, light the candles.

4. Ask the students to predict what will happen as you pour the carbon dioxide gas into the plastic box near the end where the tall candle is. Since my students do the "What happened at Lake Nyos? Lab" on the previous day, they can predict that the candles will be "snuffed out", and they know which one will quit burning first, second, etc. Next, carefully pour the gas from the jug into the plastic box.

Explanation
Since carbon dioxide is more dense than air, it fills the plastic box from the bottom up (just as water would). As a res the shortest candle is snuffed out first even though it is farthest from the source of gas (jug). . . then the medium can and finally the tall candle. This is very similar to what happened near Lake Nyos in Africa, causing the deaths of abou 1,700 people. Read on.

Volcanism, steam explosions, dissolved gases, gas densities. . . Take your pick. The story of a unique environmen disaster at Lake Nyos can motivate your students to learn about any of these.

"A Volcanic Lake"
Located in the west African nation of Cameroon, Nyos is one of several "volcanic lakes", formed centuries ago as rising plumes of magma encountered groundwater. Heat from the plumes triggered steam explosions, forming craters that would become the lakes. Since their violent birth, the lakes have been tranquil, keeping secret the strange volcanic danger hidden in their depths. Legends tell of past disasters, and in 1984 a neighboring lake kille 37 people. . . But these pale in comparison to what happened at Lake Nyos in 1986.

The Tragedy
On the evening of August 21st, the quiet waters of Nyos awakened violently, as a lethal cloud of carbon dioxide g erupted from its depths, killing over 1,700 people in a valley below. Most experts believe that tremendous amount of the gas, dissolved in the cold, deep waters of the lake, were released as this water was brought to the surface. A the water rose, decreasing pressure caused bubbles to form just as they do when a bottle of cola is opened. The eruption spewed a column of water and gas over 80 meters into the air, expelling so much gas that the level of wa in the lake was lowered by over a meter. Because carbon dioxide is more dense than air, the invisible gas descend

into the populated valley, causing the deaths.

Teaching Tool

Although it happened 13 years ago, the tale of this disaster is strange enough to capture the attention of even your sleepiest students. . . Then, as they try to make sense of this horrible night, you will find their intrigue especially helpful in teaching them about two important concepts. For one, Nyos provides a memorable introduction to the concept that water contains dissolved gases, and will help them understand the influence of pressure and temperature. This provides the basis for understanding such phenomena as the bends, carbonation, radon in groundwater, and dissolved oxygen content (an important consideration in water quality). Secondly, the downwar flow of carbon dioxide from the lake will bring the realization that gases vary in density just as aluminum and lea do. This explains why ammonia and helium "float" in air, whereas carbon dioxide and propane "sink". Still anoth use of the Nyos situation, would be to have students propose ways that future eruptions could be prevented as the storage of gas refills the deep waters of the lake.

National Geographic

To gain a general understanding of the disaster, read the article featured in the September 1987 National Geograp Magazine . . . "Silent Death at Cameroon's Killer Lake", by Curt Stager. The magazine, which devotes over ten pages to the event, includes several photos, illustrations, and maps. Stager also examines the link between the gas and the lake's volcanic past, and presents ideas about what may have triggered the upwelling. Several other magazines have also featured articles.