The "greenhouse effect in a bottle" parlor trick

By Carl Brehmer, November 2017

There exists a particular science experiment that is done within primary, middle and secondary schools that purports to prove that there actually is a carbon dioxide and water vapor caused "greenhouse effect" in the greater atmosphere that is causing global warming. For some examples of this experiment do a YouTube search for "greenhouse effect in a bottle experiment."

Although these experiments vary one from another the general set up is this. Two bottles are used, one filled with room air and the other filled with CO_2. The bottles are placed in front of a heat lamp and their respective temperatures are recorded throughout the experiment. Invariably the temperature inside of the CO_2 filled bottle is seen to be higher than the bottle with just air in it.

The teacher then triumphantly declares to his/her students that this experiment proves the validity of the atmospheric "greenhouse effect" hypothesis. To paraphrase, he/she says, *"As we can see, carbon dioxide traps more heat than does regular air. Thus it is scientifically proven that rising atmospheric levels of carbon dioxide cause global warming."*

Let's review some problems that exist with this experiment and its conclusion.

Problem #1—Specific Heat

In physics, specific heat (c_p) is the amount of heat in joules (J) required to raise the temperature of one gram (g) of a given substance one degree centigrade (°C).

The specific heat parameters of air and CO_2 in J/g/°C are:

Air – 1.005
CO_2 – 0.709

All things being equal, a bottle filled with CO_2 will always warm faster and to a higher temperature when heated than does a bottle filled with regular air because the specific heat of CO_2 is lower than that of air. Consequently, less energy is needed to to raise one gram of CO_2 one °C than one gram of air one °C. Ergo, this experiment demonstrates nothing more than the principle of physics called "specific heat". It does not confirm the notion that CO_2 at 0.04% of the atmosphere is causing global warming via a "greenhouse effect". Just as an aside, the effect of doubling the current concentration of CO_2 on the specific heat of air would be minuscule - it would decrease it by 0.0002°C.

Problem #2—None of these table top "greenhouse effect in a bottle" experiments test CO_2 at 560 ppm vs. CO_2 at 280ppm

The big debate about CO_2's effect on global surface-level air temperatures is what will happen when atmospheric CO_2 doubles in concentration from pre-industrial times, i.e., increases from 0.026% (280 ppm) of the atmosphere to 0.056% (560 ppm). Yes, 0.056% is a "doubling" of the amount of CO_2 in the air from pre-industrial times but it is still a minute amount. None of these table-top "greenhouse effect in a bottle" experiments test the effect of a CO_2 level of 0.056% vs. a CO_2 level of 0.026%. They all test CO_2 levels of 50-100% compared to regular air and even then on average they still only get a temperature rise of several degrees due to CO_2's lower specific heat.

Based on computer models, the "climate sensitivity of carbon dioxide" hypothesis asserts that a doubling of CO_2 levels from pre-industrial times, from ~260 ppm to ~560 ppm, will result in 2-6 °C of global warming. These table top "greenhouse effect in a bottle" experiments demonstrate that the atmosphere would have to be 50-100% CO_2 (500,000 – 1,000,000 ppm) to get that much warming but even then the extra warming would not be from a "greenhouse effect", but rather would be a result of CO_2's lower specific heat value.

Problem #3—glass is said to be opaque to IR radiation

These experiments purport to be measuring the ability of CO_2 to absorb IR radiation compared to air, yet they are often done in containers that are said to be opaque to IR radiation by advocates of the "greenhouse effect" hypothesis.

Here is a definition of the "greenhouse effect" that is currently being taught to students at Chicago's Elmhurst College. *"**Greenhouse Analogy:** Energy from the sun in the form of some ultraviolet and visible light (short wavelength) passes through the glass of the greenhouse. As the light strikes various surfaces in the greenhouse and they are heated. These surfaces in turn re-radiate the heat in the form of infrared radiation (long wavelength). However, the **IR radiation is blocked from escaping by the glass.** IR is not able to pass through the glass, hence the greenhouse air heats up fairly dramatically."* [1]

If what they believe is true—IR radiation is blocked by glass—then what is physically happening in these experiments is that the heat lamp is simply heating the container itself which in turn heats via conduction the gases inside of the container and again, the CO_2 gas warms faster and to a higher temperature than the air because its specific heat is lower.

Problem #4—Water vapor (H_2O) causes a "swamp cooler" effect, not a "greenhouse" effect

The biggest problem that these "greenhouse effect in a bottle" experiments have is this. H_2O—said to be the most potent "greenhouse gas"—doesn't cause warming in the open atmosphere; rather it drops the temperature of surface level air; it acts like an evaporative cooler (commonly called a "swamp cooler") rather than a greenhouse. [2]

1) H_2O cools the surface when it is evaporated into water vapor
2) H_2O in the form of water vapor increases the emissivity of the air and thus enhances the ability of heat to move up the atmospheric column via IR radiation
3) H_2O when cooled at altitude condenses into clouds which shades and thus further cools the surface.
4) H_2O within clouds precipitate rain and snow, which further cools the ground
5) Ground water is then evaporated again as the water cycle repeats and repeats and repeats.

Again, the H_2O molecule, far from causing a "greenhouse effect", causes a "swamp cooler" effect that manifests itself as cooler surface-level air temperatures. As such, water vapor should be called a "swamp cooler" gas and not a "greenhouse" gas. The good news is we don't have to rely on flawed computer models to observe this "swamp cooler" effect because the surface-level cooling of H_2O can be seen by anyone, anywhere within publicly available temperature and humidity records.

Just compare the average yearly temperature of humid climates with their arid counterparts that lie along the same latitude, e.g., the average yearly temperature in Mississippi is cooler than in Las Vegas, Nevada, the average yearly temperature in Malaysia is cooler than the Sahara Desert.

Needless to say, that which causes regional cooling cannot possibly cause global warming.

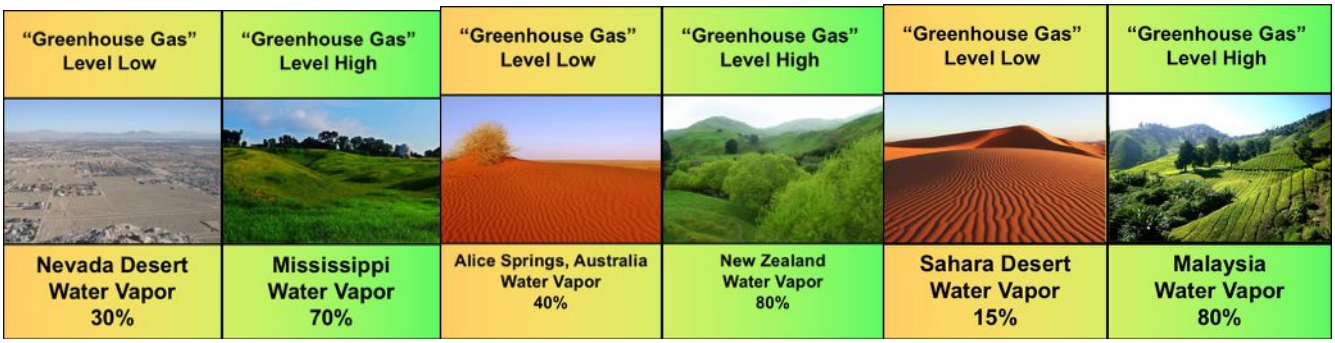
But here is even better news; "humidity" has no upper limit at which it becomes a detriment to the natural environment. From the perspective of the Earth's flora and fauna it can never be "too humid." Everywhere on Earth that the humidity is the highest—Mississippi, New Zealand, Florida, the Congo, the Amazon rainforest, Malaysia—the flora is not only vibrantly green and flourishing, but supports a diverse array of fauna as well.

On the other hand, everywhere that the humidity is low, i.e. desert regions—Phoenix Arizona, the Sahara Desert, the Australian out-back, Las Vegas Nevada—the sparse life that does exist struggles to survive.

The climate catastrophe called a "drought" happens when the humidity level drops below what is normal for a region. When a "drought" is relatively permanent within a region we called it a "desert".

One cannot find even one example anywhere on Earth where high humidity has caused a drought or expanded a desert, nor anywhere on Earth that high humidity has degraded the natural environment in any way, has inhibited plant growth, or put animals at risk for starvation, much less threaten them with extinction—things that are currently being asserted by certain self-proclaimed scientific "experts".

For you benefit, here are some pictures of the actual, real world effect of high humidity on the Earth's natural environment:



The deception of children is easy; many of them believe in Santa Claus and the Easter Bunny. You can perform a parlor trick in the classroom, e.g., show them an experiment that demonstrates the scientific principle called "specific heat" and call it a "greenhouse effect," and they will believe you.

When one grows up though one is supposed to stop believing in fantasies.

References:

1. *chemistry.elmhurst.edu/vchembook/globalwarmA5.html*

2. *tech-know-group.com/essays/SURFRAD_Data_Falsifies_GHE.pdf*