



Meet Auto Repair Business Owner and Outdoor Enthusiast



Dwane Dardis

Elk shot by bow

Dwane owns and operates Black Canyon Auto Repair in Montrose. His two favorite things are puzzles and helping people find solutions to their puzzles. The best part of the job is figuring out just why this car won't work (puzzle solving) and then fixing it (helping people). Whenever Dwane purchases something new, the first thing he does is take it apart and then puts it back together. Another puzzle!

His true passion, however, is being outdoors and solving the puzzles of animal behavior. Dwane uses the science of wind thermals to be an invisible scent, and thus invisible to the animal. From this vantage point, he observes herd behavior and their politics, interprets what they are communicating, and talks to them, especially when he is calling in a bull.

He loves to hunt, but it is figuring out the puzzle of herd dynamics that he finds most enjoyable. Dwane is becoming something of a legend in how he hunts, and people come to the "elk whisperer" to learn how to better call in a bull. Each elk is an individual; that means each puzzle is different and needs to be solved.

Dwane lives in Montrose with his wife, and has 2 grown daughters. He graduated from Central High School in Grand Junction. He enjoys science, full of big puzzles, especially zoology.



ST[EMpower]

Pop Can Stove Plasma and the States of Matter

BACKGROUND

Hunting season is here, and this month's activity is making a pop can stove (courtesy of Mr. Dardis). **PARENT SUPERVISION IS A MUST!** It is dangerous, so do not do this activity without parent approval, supervision, and help.

This is a perfect example of a chemical's physical change as you add energy (heat). The isopropyl alcohol is liquid. It **evaporates** to gas, and there is more energy in those atoms (they move faster). The flame is in a **state of matter** called **plasma**, and has the most energy. In fact, there is so much energy that the electrons of the atom zip away and are no longer part of that atom but free!

Liquid, therefore, has the least amount of energy, and plasma has the most energy stored in those molecules. Atoms and molecules **phase change** depending on how much energy is in the atoms. FYI: there are described and hypothesized 27 different **states of matter**, some more and some less energetic than liquids, gases, and plasma.

ACTIVITY

Materials: clean pop can, locking blade pocket knife, scissors, can opener, thumb tack, 95%+ isopropyl (rubbing) alcohol, matches, clean soup can (caution: the top edge is extremely sharp)

- **CAUTION—ALUMINUM EDGES ARE EXTREMELY SHARP!** With the locking pocket knife, cut the pop can mid-way between the top and the bottom. With the scissors, cut the can in two. Cut both the top and bottom parts of the can so that they have very smooth, even edges. Only the top half is further modified.
- Cut off the top of the can (the pop-top part) with a can opener. Poke a hole with the thumb tack where the can starts to arch to the top (see 2nd photo with red thumb tack).
- Flute the bottom edge with the knife blade, from the bottom opening to the can to where it angles in towards the top. Two reasons: allows you to insert the top half into the bottom half, and the flames from the alcohol will jet out here.
- **SAFETY CONCERNS:** When the alcohol is lit, you cannot see the flame. The can will be VERY HOT. If it tips over, the lit alcohol will continue to burn, and could catch things on fire. Use fire safety techniques—clear the ground of debris, make a fire circle with rocks, be sure that the can is stable and level. Do not wear synthetic fabrics, no jewelry or anything that dangles, and hair tucked back. Never light this indoors or in your tent.
- Place the top into the bottom of your pop can stove. Add about 1/2 inch of isopropyl alcohol and ignite. Allow the stove to heat and begin to jet flame. Cooking pot sits on top of the pop can!
- To extinguish, put soup can over the pop can stove to snuff fire.

How it works: Isopropyl alcohol (a liquid) is added to the bottom chamber of the stove and lit. As the flame burns in the center of the chamber and heats the fuel, it **vaporizes**. As the gas expands (which happens when you heat any gas) it increases the pressure inside the chamber. The pressure pushes the ignited **evaporated** fuel out the flutes on the stove, forming a ring of flames.

POWER WORDS

evaporate or vaporize: change state of matter from a liquid into a gas

phase change: change state of matter for example solid melts to liquid and liquid evaporates to gas

plasma: atom is so energetic that it can't hold onto the electrons; most common state of matter in the universe *i.e.* stars

states of matter: matter existing in solid, liquid, gas, plasma depending on amount of energy absorbed by the atoms

