THE FLAME

HI, EDNA!
HI, ANNIE.
WHAT'S GOIN' ON?
WE'RE TRYING TO BUILD A FIRE WITH THESE STICKS.

REALLY? WHY NOT JUST HAVE ANNIE BREATHE ON 'EM?
WHY WOULD I DO THAT?
DUH, YOU'RE A DRAGONFLY.
I CAN'T BREATHE FIRE, YOU GOOF.

FINE, WHATEVER, USE YOUR LASER VISION THEN.
THAT'S NOT THE WAY IT WORKS, WILBUR.

OH, REALLY? SO, WHAT'S YOUR BRILLIANT PLAN?

EXCELLENT QUESTION!
TO UNDERSTAND HOW A FLAME IS MADE, WE MUST FIRST UNDERSTAND THAT THE OXYGEN IN THE AIR AROUND US IS A highly reactive MOLECULE.

GIVEN THE CHANCE, OXYGEN WOULD REACT WITH THE MOLECULES OF THESE STICKS TO IGNITE A MIGHTY FLAME.

BUT, IT CAN'T DO THAT UNTIL TWO THINGS HAPPEN.

OXYGEN MOLECULES*

* not actual size**

** thank goodness
To start, we need to rub small bits of the sticks off into the air so that oxygen can get easier access to the wood molecules.

At the same time, we need to generate enough heat to start the reaction between the wood bits and the oxygen.

As I rub the sticks together, the friction makes the wood get hotter and hotter while the small bits are thrown up into the air.

Small wood bits

Oxygen

Wood bits

Under these conditions, the oxygen will react with the wood molecules...

HEAT

...and unlock the energy trapped in their bonds! Energy!

More energy releases it possible for more oxygen molecules to react with more wood bits.

Holy Joseph Priestley!

It's a vicious cycle!

We're not even to the good part yet, Squirt.
IN ADDITION TO HEAT, THESE CHEMICAL REACTIONS RELEASE INVISIBLE GASES THAT DANCE UP FROM THE WOOD.

IN THESE SUPER HOT GASES, MOLECULES CONTINUE TO SWIRL AROUND AND REACT WITH THE OXYGEN. THE HEAT GENERATED IS SO INTENSE THAT SOME ELECTRONS IN THESE REACTING MOLECULES ABSORB SOME OF THE ENERGY.

BUT THE ENERGY THEY ABSORB IS TOO MUCH FOR THE MOLECULES TO HANDLE AND THEY RELEASE IT AS HIGH-ENERGY PARTICLES OF LIGHT CALLED PHOTONS.

I THINK ONE HIT ME IN THE EYE!

THESE PHOTONS ARE WHAT MAKE THE GASES VISIBLE—GLOWNING BLUE WHERE THEY'RE HOTTEST AND ORANGE OR YELLOW WHERE THEY ARE COOLER.

THE RESULT IS A BEAUTIFUL FLAME.

HUN THAT SEEMS PRETTY COMPLICATED.

WON'T IT JUST BE EASIER FOR ANNIE TO BREATHE FIRE ON THE STICK?

I CAN'T BREATHE FIRE!!

IT'S NOT MY FAULT SHE'S FULL OF HOT AIR.

O.K., I'M LEAVING.

WHAT? I'M JUST GETTING WARMED UP.

O.K., WHAT A HOT HEAD.

DO NOT START WITH THE SILLY WORD PLAY.

THE END.