Let's blow some stuff up.

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Energy in Everyday Life

Mythbusters I

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“Electricity” is a muddled, catch-all word many meanings.

Unfortunately these meanings are contradictory. There is no "electricity" which is charge, current, energy, power, and a class of phenomena all at once.

But all the meanings are also correct, because"electricity" is commonly used to name all these different things.

The original scientific definition of “electricity” is the the study of charge and the motion of charge.

True or False:

Electrons carry electrical energy.

Batteries and generators create the electricity which flows in wires.

The electricity inside of wires moves at the speed of light.

Benjamin Franklin’s kite was struck by lightning.


MYTHBUSTERS
Crack
MOMENT OF IMPACT
NOT TO SCALE
LAWYER FRAME FOR CORRECT MASS DIST.
56" SHOULDER
SANDBAG ON EVERY TUNA
PRESSURE BOX

Electrons carry electrical energy. Wrong.

Electrons are matter and charge, not electrical energy.

A flow of electrons is not a flow of electrical energy, it is a flow of matter and a flow of electric charge.

Charge is not energy, coulombs are not joules, and knowing the charge does not tell you the amount of energy you have.

A moving electron does not carry electrical energy along with it, any more than a moving air molecule carries a sound wave with it.

Batteries and generators create the electricity which flows in wires. Nope.

Electric currents in copper wires are a flow of electrons, but these electrons are not supplied by batteries.

Generators do not “generate” any electrons.

The electrons come from the copper wire. The electrons in a circuit were already there before the battery was connected.

Batteries and generators do not create these electrons, they merely pump them, and the electrons act like a pre-existing fluid which is always found within all wires.

A battery or generator is like your heart: it moves blood, but it does not create blood.

When a generator stops, or when the circuit is opened, all the electrons stop where they are, and the wires remain filled with a sea of electric charges.

Change the statement to:
“Batteries and generators cause electric charge to flow.”

The electricity inside of wires moves at the speed of light.
Incorrect.

In metals, electric current is a flow of electrons.

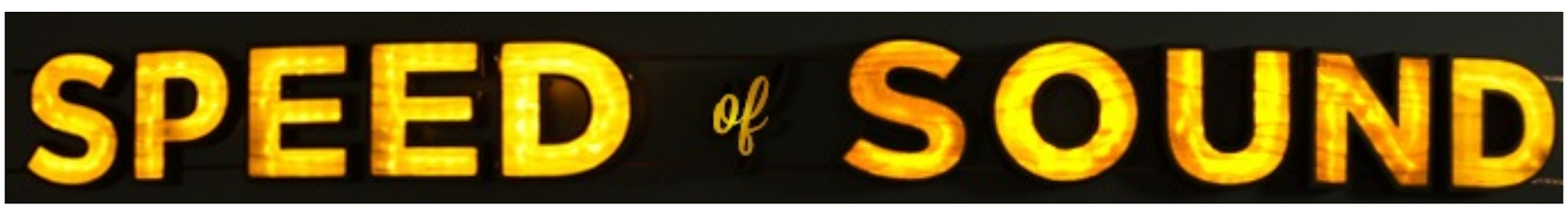
As we've seen, electrons in an electric current move quite slowly; at speeds ~ 1 yard/hour.

In AC circuits the electrons don't "flow" at all, instead they sit in place and oscillate back and forth.

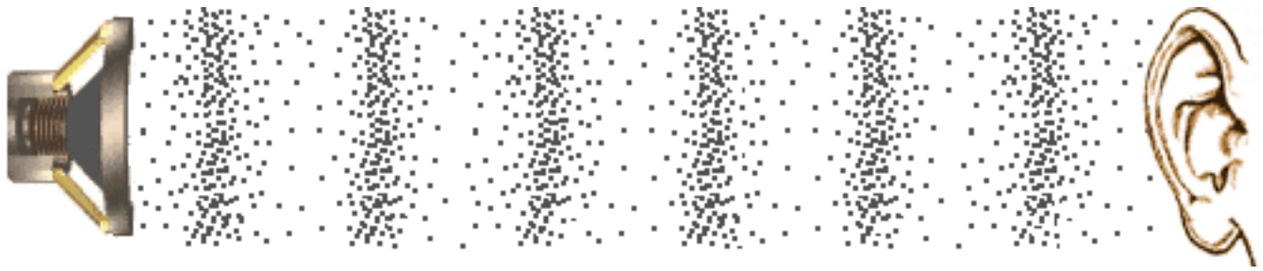
It's the energy which flows fast, not the electrons.

When a battery or generator pumps the electrons in the circuit, electrons in the circuit are forced to move, but the energy spreads almost instantly throughout the entire circuit.

Here is an analogy. When we talk, do our vocal cords do not spew out air molecules at 720 MPH, fly across the empty room, then crash into waiting eardrums? No.



Air molecules are not sound waves. Air molecules do not travel along with sound waves. It's the sound wave energy that moves quickly, not the air molecules.



The air molecules barely move at all, colliding with neighbors, while the sound wave energy races through the air.

The air is the medium and sound is a wave which travels through that medium.

The same is true of AC electric circuits: the wires are already full of electrons just as the room is already full of air.

The electrons in the wire are the medium for electromagnetic waves.

When the electrical energy propagates outside the wires at the speed of light, the electrons do not follow it - they just sit in one place and oscillate.