

## PANCAKE PARTICLES: THE ELECTRON

Hey there! I'm a Pancake Particle. We're kinda like those "Flat Stanleys" – whimsical, 2-D representations of some of the subatomic particles that make up our universe. Cut me out, stash me in your bag or backpack and take pix of me in different scenarios inspired by my profile (see below). Then post me on social media [#SubatomicSmackdown](#) and [#PancakeParticles](#) – and follow me and my other particle friends!



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# ELECTRON

### MY PROFILE:

- I'm negatively charged.
- When I move, I become electricity.
- When I move, I also create a magnetic field around me.
- I can also move through special materials called superconductors without any friction, creating a perfectly efficient kind of electricity called superconductivity.
- I was the first subatomic particle discovered by scientists.
- You need me to make electronic bonds, which make solids possible. Without them, everything would be a gas or a liquid.
- In atoms, I orbit around neutrons and protons, which make up the nucleus of atoms.

To learn more about subatomic particles, go to [NationalMagLab.org/subatomicssmackdown](http://NationalMagLab.org/subatomicssmackdown) or [www.symmetrymagazine.org/article/subatomic-smackdown](http://www.symmetrymagazine.org/article/subatomic-smackdown)

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## PANCAKE PARTICLES: THE PROTON

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p+

p+

PROTON

p+

### MY PROFILE:

- I'm positively charged.
- I'm found in the nucleus of atoms, along with neutrons.
- Hydrogen, the most abundant element in the universe, only has a proton in its nucleus – no neutron!
- The word "proton" comes from the Greek word for "first."
- I'm a kind of particle called a hadron.
- Protons are the hadrons used in the amazing Large Hadron Collider (LHC) at CERN in Europe.
- Us protons were famously used to discover the Higgs boson.
- We're also used in medicine for applications including fighting cancer.
- We are made up of other particles called quarks and gluons.

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## PANCAKE PARTICLES: THE PHOTON

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# PHOTON

### MY PROFILE:

- I have energy and momentum, but no mass!
- I am a quantum of light.
- Radio waves, UV rays, X-rays and gamma rays are all made of photons.
- I travel at the speed of light!
- I carry the electromagnetic force.
- Scientists use us photons to study materials in particle accelerators called synchrotrons.
- We photons carry communication signals in fiber optics, microwaves and radiofrequency wireless signals.

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## PANCAKE PARTICLES: THE NEUTRON

Hey there! I'm a Pancake Particle. We're kinda like those "Flat Stanleys" – whimsical, 2-D representations of some of the subatomic particles that make up our universe. Cut me out, stash me in your bag or backpack and take pix of me in different scenarios inspired by my profile (see below). Then post me on social media [#SubatomicSmackdown](#) and [#PancakeParticles](#) – and follow me and my other particle friends!



### MY PROFILE:

- I'm found in the nucleus of atoms (except for hydrogen!), along with protons.
- I'm neither positive nor negative: I have no charge.
- I am the heaviest subatomic particle.
- Scientists aim beams of me at materials then watch how we scatter in order to learn more about the material.
- Neutron stars are made up almost exclusively of neutrons.
- The universe's heavy elements, such as gold, are created when neutron stars collide.

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