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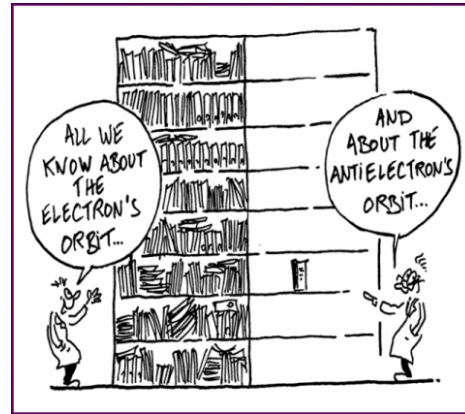
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This cartoon, from CERN, distinguishes between what scientists know about matter (for example, an electron) and antimatter (for example, a positron which is the antimatter equivalent of an electron). Click on the image for a better view.

Matter is the “stuff” of our world. We see it everywhere we look because everything we see is made from it.

Matter has mass. It takes up space. It’s comprised of tiny particles called atoms which, in turn, are made of sub-atomic particles so small they can’t even be seen with powerful microscopes.

Even though these building blocks of our world are so minute they cannot be directly seen, physicists can theorize about (and are beginning to understand) their structure. Experiments, by Nobel laureates and other scientists, provide us with the means to indirectly observe how these particles behave.

Once we know how they behave, we can develop more theories (such as the "Higgs boson" - sometimes referred to as the "God particle" - predicted by Peter Higgs, building on work by Satyendra Nath Bose and Albert Einstein, among others) and more experiments (resulting in astonishing discoveries) about particles.

One startling theory has had some proof in recent years.

In 1928, Paul Dirac predicted that for every particle which exists, there is a corresponding anti-particle. That antiparticle, he reasoned, would be identical to the particle in every way except for one major difference: its charge.

For example, an electron (which is negatively charged) should have an “anti-electron” twin (which is positively charged). The negatively charged electron is matter; the positively charged electron (called a positron) is antimatter.

In other words, reasoned Dirac, there could be a whole universe of antimatter waiting to be discovered.

The problem, which scientists deduced after experimenting with Dirac’s theory, is that antimatter seems not to exist in its natural form (if it ever existed that way at all). To obtain antimatter, one must create it.

To create it, one needs a really huge laboratory and equipment so expensive that a single country, on its own, could not afford it. That's why CERN (the European Organization for Nuclear Research), located at the French-Swiss border near Geneva (and the birthplace of the world wide web), was formed.

And there’s one more, really significant problem: When matter, and antimatter, come in contact with each other, only one result is guaranteed: annihilation of both, in a burst of light-filled energy.

Operation: Annihilate!



That, at least, is the theory (as depicted in the CERN illustration, above).

See Alignments to State and Common Core standards for this story online at:

<http://www.awesomestories.com/asset/AcademicAlignment/ANTIMATTER-WHAT-IS-IT-Angels-Demons>

See Learning Tasks for this story online at:

<http://www.awesomestories.com/asset/AcademicActivities/ANTIMATTER-WHAT-IS-IT-Angels-Demons>

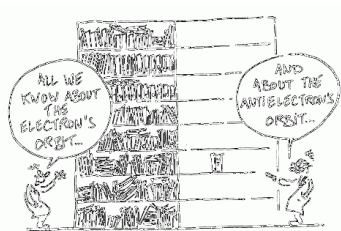
Media Stream

Operation: Annihilate!



Antimatter and Matter Collide

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ANTIMATTER - WHAT IS IT?

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Atoms and Molecules - What Are They

Video clip from *Our Friend the Atom*, a 1957 Disney production, online courtesy banyt's channel at YouTube.

Quoted passage from *Edgar Cayce on Vibrations*, by Kevin J. Todeschi, page x - online, courtesy Google Books.

View this asset at:

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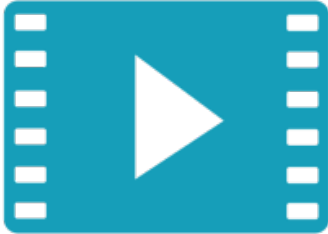


Subatomic Particles - What's Inside an Atom?

Video clip from *Our Friend the Atom*, a 1957 Disney production, online courtesy banyt's channel at YouTube.

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Quarks - Inside the Atom

Video clip online, courtesy YouTube.

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Higgs Boson - Animated Explanation

Video clip - with narration by [Professor Daniel Whiteson](#) and animation by [Jorge Cham](#) (of PhD - "Piled Higher and Deeper" Comics) - online courtesy PhD Comics and Daniel Whiteson.

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Video - based on "What's in the Data? The Higgs Boson Explained" - provided here as fair use for educational purposes.

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Satyendra Nath Bose - Namesake of "Boson" Particles

Video biography of Satyendra Nath Bose, by the Government of India, online courtesy YouTube.

View this asset at:

<http://www.awesomestories.com/asset/view/Satyendra-Nath-Bose-Namesake-of-Boson-Particles>



Large Hadron Collider - Where Antimatter is Created

Video clip online, courtesy CERN channel at YouTube.

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Antimatter - Creating It in the Large Hadron Collider

Video clip online, courtesy CERN's channel at YouTube.

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