Fermilabyrinth

- Fermilabyrinth : Entrance

Law 'n Order

- Fermilabyrinth : Law 'N Order
- Story: Ideas: Nature's Laws
- Baryon Intro
    - Baryon Bonanza
    - Baryon Bonanza (playing)
    - Baryon Information
    - Double Bucks
    - Correct
    - Show Einstein Bucks
    - Wrong
    - Double Bucks (alt1)
    - Double Bucks (alt2)
    - Double Bucks (alt3)
- Particle Families- Intro
    - Particle Families- Level 2
    - Particle Families- Level 4
    - Explanation of the Color of Quarks in Baryons
    - Explanation of the Charge on Baryons
    - Explanation of Quarks in Baryons
    - Explanation of Quarks in Mesons
    - Explanation of the Colors of Quarks and Antiquarks in Mesons
    - Explanation of Quarks in Mesons
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- Nature's Scale
    - Nature's Scale - Shockwave
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    - Nature's Scale - End
- Basic Forces Between Particles
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- Four Forces (Shockwave -Intro 1)
- Four Forces (Shockwave -Intro 2)
- Four Forces (Shockwave -Intro 3)
- Four Forces (Shockwave - Force Fiend)
- Four Forces (Shockwave -E&M 1)
- Four Forces (Shockwave -E&M 2)
- Four Forces (Shockwave -E&M 3)
- Four Forces (Shockwave - E&M last)
- Four Forces (Shockwave - Weak 1)
- Four Forces (Shockwave - Weak 2)
- Four Forces (Shockwave - Weak 3)
- Four Forces (Shockwave - Weak last)
- Four Forces (Shockwave - Strong 1)
- Four Forces (Shockwave - Strong 2)
- Four Forces (Shockwave - Strong 3)
- Four Forces (Shockwave - Gravity 1)
- Four Forces (Shockwave - Gravity 2)
- Four Forces - More Info
- Four Forces - Chart
- Four Forces - Strong
- Four Forces - Electromagnetic
- Four Forces - Gravity
- Four Forces - Weak
- Double Bucks
- Four Forces - Show Answers

Students **-** ***Educators*** **-** ***Lederman Science Center***


E=mc2
Law 'n Order
IDEAS: Scientists Discover Nature's Laws
Warp Speed
Ghost Bustin'
New Player
Code Crackin'
Diggin' Deeper
Baryon Bonanza
PARTICLE FAMILIES
NATURE'S SCALE
FOUR FORCES
Read the Story
Read the Story

Ideas: Discovering Nature's Laws $E=mc^2$

There is an amazing beauty and symmetry in nature. Think of snowflake, a daisy or a honeycomb. The shapes of these and all other natural objects depend on an underlying structure of matter. For centuries scientists have wondered what this structure might be. Their studies have led to a search for particles that are the smallest, simplest building blocks of matter, and for the forces that control their behavior. The particles are quarks and leptons; the forces are gravity, electromagnetism, the weak force and the strong force. Fermilab scientists are leading this international search to learn how the universe works.

When scientists study the subatomic particles and forces that bind them together, they also learn about the early history of the universe and how it began with the "Big Bang." When the universe was very young, atoms didn't exist, because it was too hot for them to form. The only form of matter was a sort of "primordial soup," consisting of the most basic particles, such as quarks and electrons. At Fermilab, scientists use the Tevatron to make the ingredients of primordial soup by smashing together protons and antiprotons at very high energies. The earlier we look in time, the fewer and more basic the particles become, and the fewer forces are needed to control their behavior. The laws of physics are valid in the whole universe and throughout the whole of time.

Law 'n Order

Can You Make Particles with Nature's Building Blocks?

Physicists developed the Standard Model in the late 1960s and early '70s to explain the particles in the Particle Zoo.

Law 'n Order

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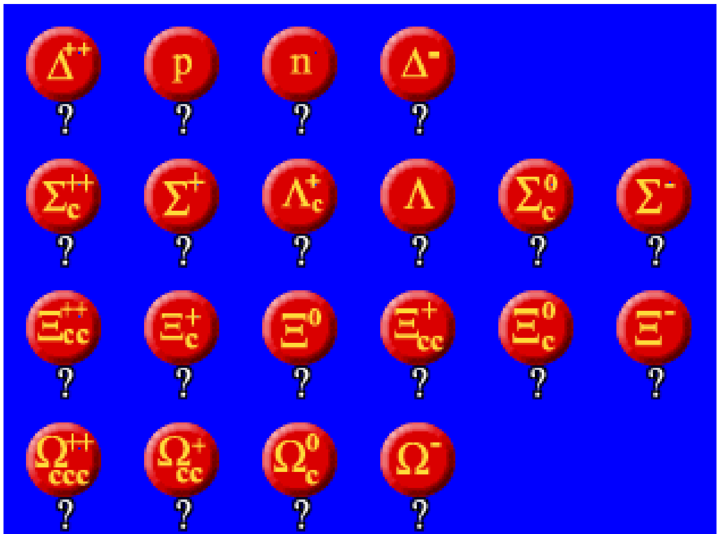
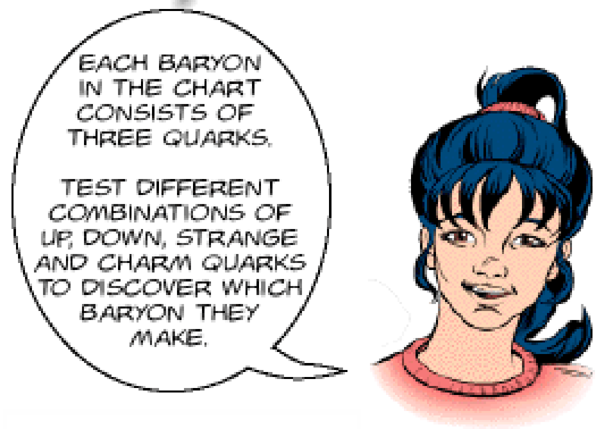
http://www-ed.fnal.gov/projects/fermilabyrinth/games/lawnorder/standard_model/activity.html

Baryon Bonanza





Baryon Name: [ ]

u d c

up | down | charm | TEST

Select three quarks and hit TEST.

You've earned $ 0 Einstein Bucks!

When finished, click below to

Curious? | DOUBLE YOUR BUCKS!

Law 'n Order

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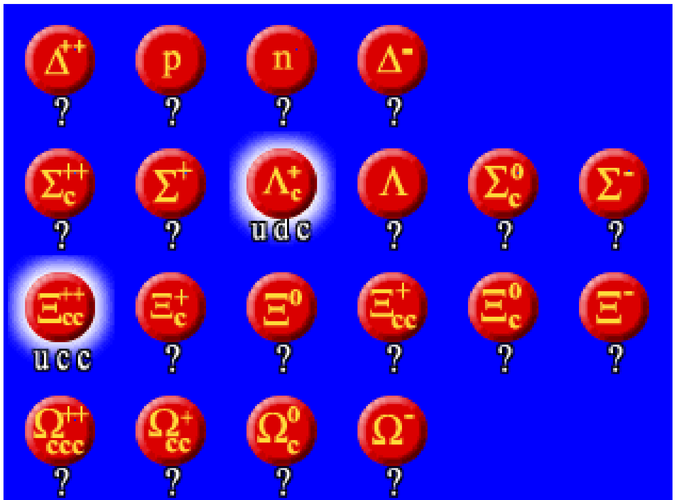
Baryon Bonanza



Baryon Name: Xi cc ++

u c c

up | charm | charm | TEST

Select three quarks and hit TEST.

You've earned $ 100 Einstein Bucks!

When finished, click below to

Curious? | DOUBLE YOUR BUCKS!

Law 'n Order

[Making Baryons] [Matter/ Antimatter] [Antibaryons] [Mesons] [Hadrons]

Making Baryons: Some quark combinations can actually make more than one baryon, but the game only shows one to make it simpler. You could make even more baryons if you combined these four quarks with the bottom quark, but not the top quark. The top quark lives for such a short time that it cannot combine with other quarks to form a baryon.

Matter/Antimatter: For every kind of particle there is a corresponding kind of antiparticle. This almost doubles the size of the Particle Zoo. When a particle and its antiparticle get together, they can annihilate into pure energy or into other particles. This happens at Fermilab when protons and antiprotons collide in the Tevatron. The Tevatron Collider is the only place in the world where physicists can make all the observed particles.

Proton/Antiproton Collision

Antibaryons - Even More Baryons: For every quark combination that makes a baryon, you can make an antiquark combination. For example, if you combine an antidown, antiup and antiup quark, you get an antiproton! But Nature does not combine quarks and antiquarks in baryons.

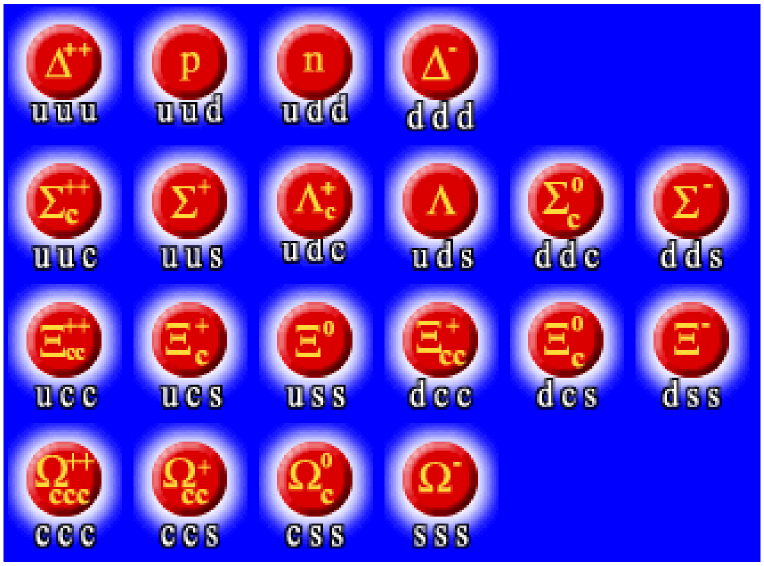
Mesons: Quarks and antiquarks combine to make a whole new set of particles called mesons. For example, up and antidown make a pion; an strange and antiup make a kaon. These quark pairs add many more particles to the Particle Zoo.

Hadrons: are particles made from quarks. Mesons and baryons are hadrons.

[Making Baryons] [Matter/ Antimatter] [Antibaryons] [Mesons] [Hadrons]

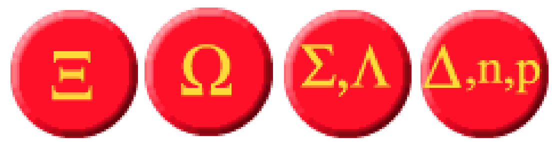
Close this window when you are done.

Welcome to Double Delight where you can go home with double the bucks you came in with by answering a question.



Physicists named baryons with Greek letters like you see on the buttons below. What letter(s) did they give **baryons made of two up or down quarks and one charm and strange quarks**?

Study the chart to see which Greek letters they used and then click below on the matching letter(s).



Xis | Omegas | Sigmas and Lambdas | Deltas, neutron and proton

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Law 'n Order

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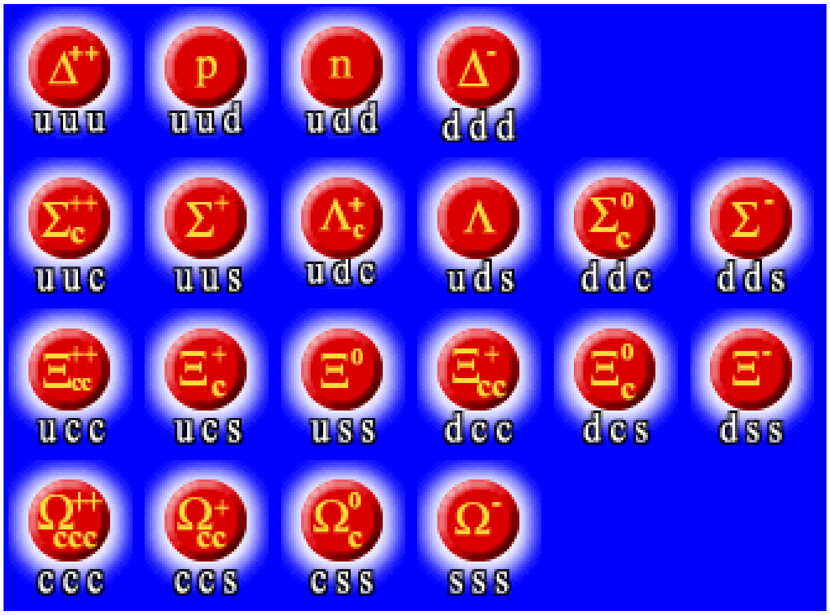
Great! You Made The Correct Choice!
You doubled your Einstein Bucks!!

The sigmas and lambas are made up of two up or down and one strange or charm quarks.



Print Your Bucks

Law 'n Order

Go Back

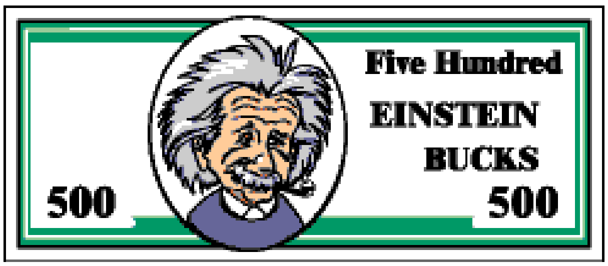
Fermilabyrinth
Batavia,IL 60510

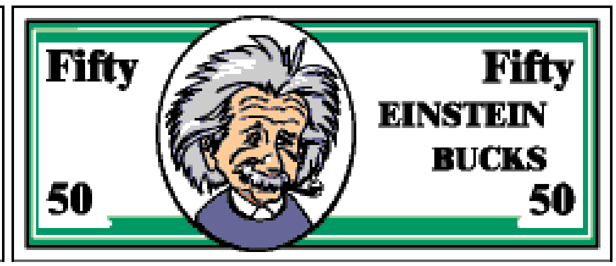
10/5/101

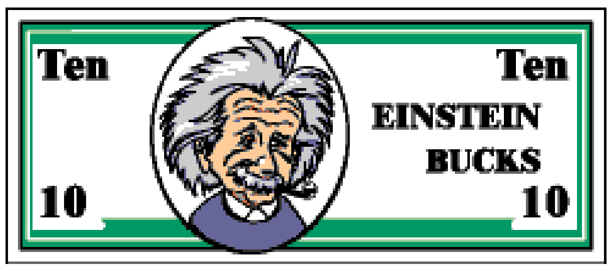
Pay to the order of: Marilyn Fox

560 Einstein Bucks

For: Baryon Bonanza





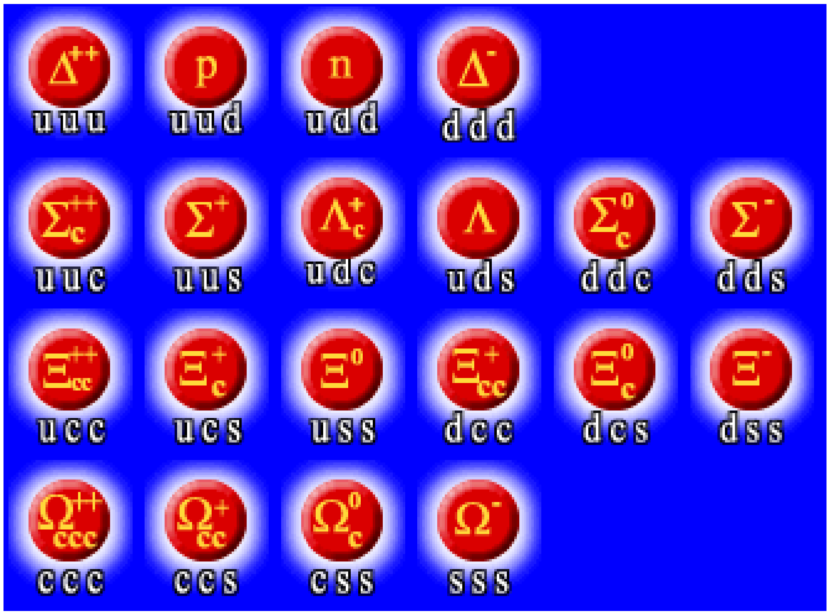


See The High Scores

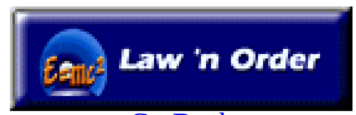
If you do not see your name on the check, try resizing the window. Close this window when you have printed out your Einstein bucks or have looked at the high scores.

Sorry! You made the wrong choice! The correct answer is sigmas and lambdas

The sigmas and lambas are made up of two up or down and one strange or charm quarks.

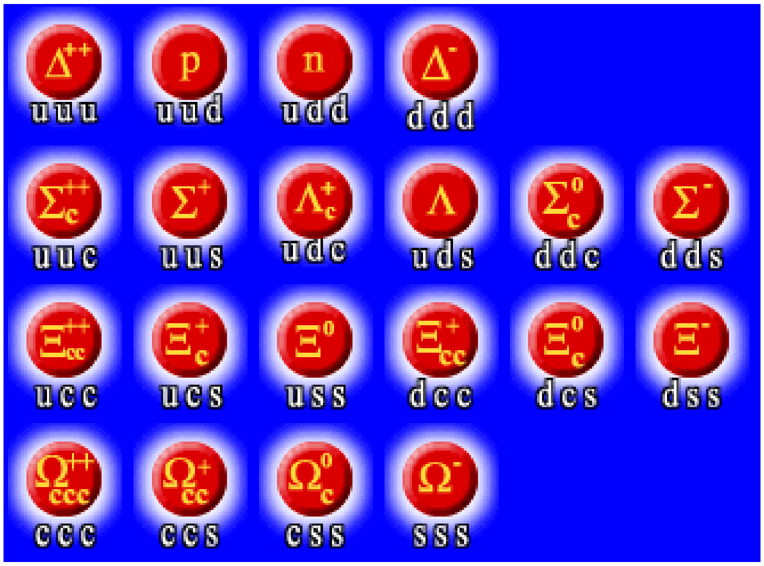


Print Your Bucks



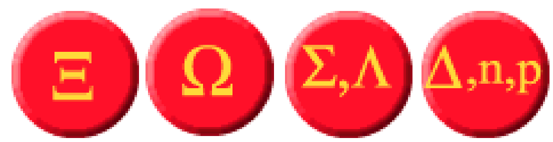
Go Back

Welcome to Double Delight where you can go home with double the bucks you came in with by answering a question.



Physicists named baryons with Greek letters like you see on the buttons below. What Greek letter(s) did they give **baryons made of only up and down quarks**?

Study the chart to find baryons with the right quarks, look at what Greek letters they have and then click on the matching letter(s) below.



Xis | Omegas | Sigmas and Lambdas | Deltas, neutron and proton

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Law 'n Order

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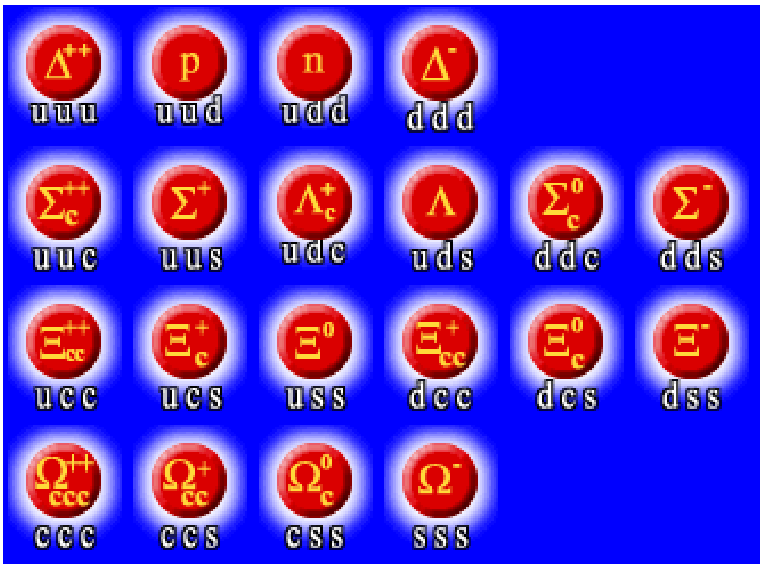
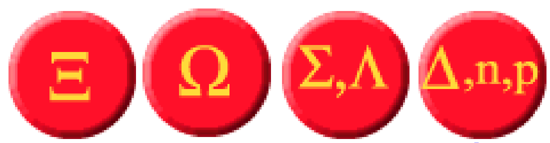
Welcome to Double Delight where you can go home with double the bucks you came in with by answering a question.



- Find the row of baryons made of **only charm and strange quarks** in the chart on the left.
- See the strange letters physicists used to label them? They're mainly letters in the Greek alphabet.
- Click on the matching letter(s) below.



Xis | Omegas | Sigmas and Lambdas | Deltas, neutron and proton

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Law 'n Order

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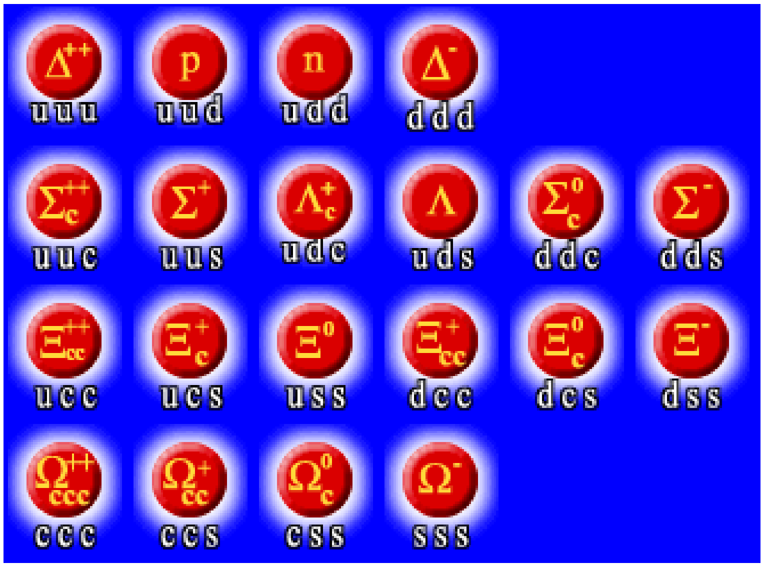
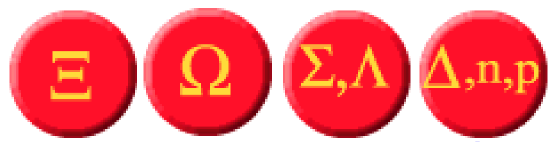
Welcome to Double Delight where you can go home with double the bucks you came in with by answering a question.



Physicists named baryons with Greek letters like you see on the buttons below. What letter(s) did they give **baryons made of one up or down and two strange or charm quarks**?

Study the chart to see which Greek letters they used and then click below on the matching letter(s).



Xis Omegas Sigmas and Lambdas Deltas, neutron and proton

Law 'n Order

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http://www-ed.fnal.gov/projects/fermilabyrinth/games/lawnorder/standard_model/baryon_bucks3.html

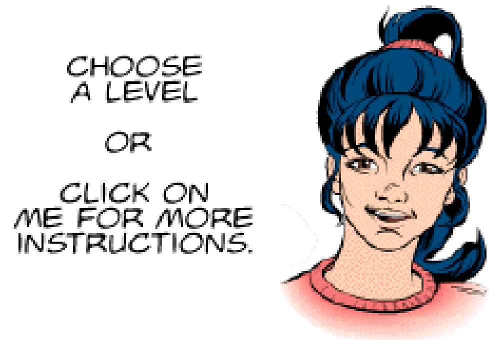
Particle Families

Imaginary Families

Level 1	Introduction	200 Points per Game
Level 2	Geometry 1	400 Points per Game
Level 3	Geometry 2	800 Points per Game

Real Families

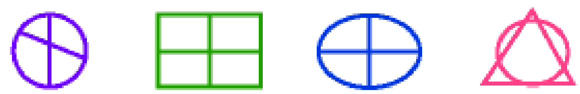
Level 4	Physics	1600 Points per Game



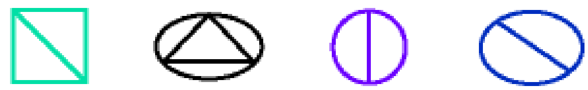
Quit Particle Families | Einstein Bucks: 0 | Next Family | New Level Intro - Geom1 - Geom2 - Physics | Double Your Bucks

Level 2 Game - 100 Einstein Bucks Per Game

All of these are Guinons.

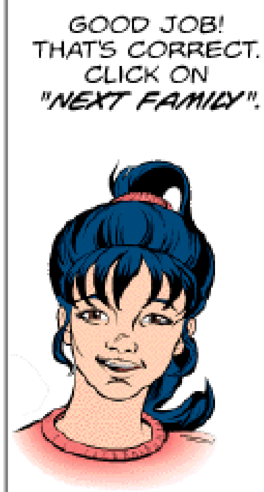


None of these are Guinons.



Which of these are Guinons?

Guinon A	Guinon B	Guinon C	Guinon D
☐	☑	☑	☐



Number of tries: 4

Check Your Answers | Get Answer

Quit Particle Families | Einstein Bucks: 70 | Next Family | New Level Intro - Geom1 - Geom2 - Physics | Double Your Bucks

Level 4 Game - 400 Einstein Bucks Per Game

All of these are Baryons.

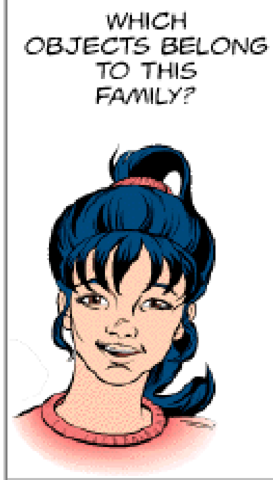
$\bar{s}\bar{s}\bar{s}$ — dds — udd — uds

None of these are Baryons.

$\bar{d}us$ — $\bar{u}u\bar{u}$ — $\bar{d}uc$ — $\bar{d}s\bar{s}$

Which of these are Baryons?

Baryon A	Baryon B	Baryon C	Baryon D
uus	$\bar{u}\bar{u}\bar{u}$	uds	$\bar{u}u\bar{s}$
☐	☐	☐	☐



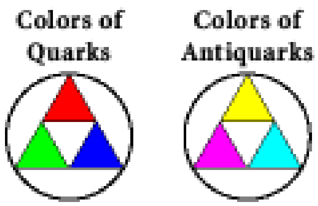
Number of tries: 0

Check Your Answers | Get Answer

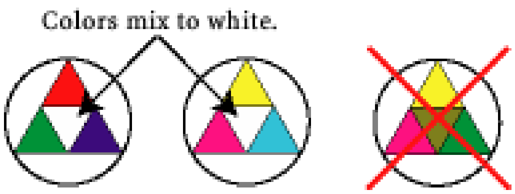
Quit Particle Families | Einstein Bucks: 270 | Next Family | New Level: Intro - Geom1 - Geom2 - Physics | Double Your Bucks

Explanation of the Color of Quarks in Baryons

In this representation, each baryon consists of three quarks or antiquarks shown as triangles within the larger circle.

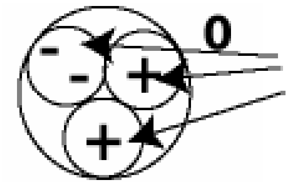


The colors of each quark represent a property physicists call color. The quarks aren't really colored, but it is a convenient way to represent the property. Quarks can be red, blue, or green while antiquarks can be yellow, cyan, or magenta.

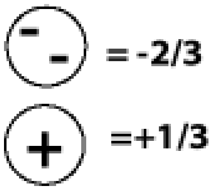


The three quarks or antiquarks in a baryon must have different colors and combine to make white. Baryons cannot be made from a mixture of quark and antiquark colors. For example, a mixture of two antiquark colors (yellow and magenta) and one quark color (green) would not mix to make white so it is illegal.

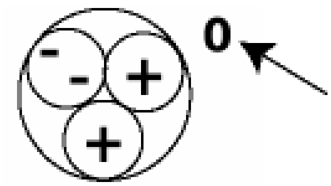
Explanation of the Charge on Baryons



Each baryon consists of three quarks represented by small circles within the larger circle.

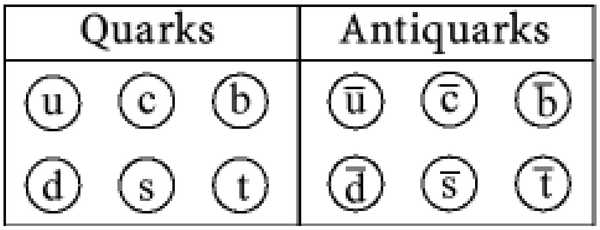


The pluses and minuses in each quark represent the charge of each quark where each plus represents 1/3 of a charge and each minus represents -1/3 of a charge.

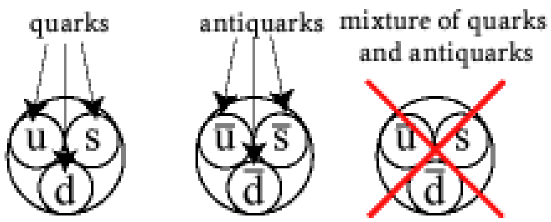


To be a baryon, the sum of all the charges has to equal an integer (e.g.,-1, 0, 1). In the example, the sum is zero shown in the upper right corner.

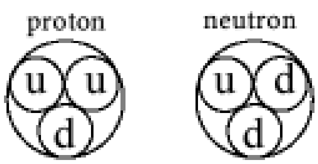
Explanation of Quarks in Baryons



Physicist believe there are six quarks - up (u), down (d), charm (c), strange (s), top (t), and bottom (b) and their antiquarks - antiup, antidown, anticharm, antistrange, antibottom, and antitop. Antiquarks are labeled with a letter with a bar over it.

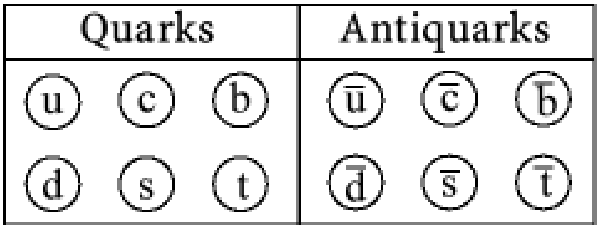


Each baryon consists of three quarks or three antiquarks represented by small circles within the larger circle. Quarks are labeled with a letter. A baryon cannot be made of a mixture of quarks and antiquarks.

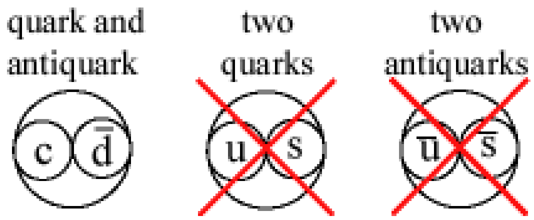


The most familiar baryons are protons and neutrons. They make up the nucleus of atoms and are made up of top and bottom quarks. In fact, everything you see in the world, for example, your computer or your body, is made of top and down quarks and electrons. They are truly the building blocks of matter.

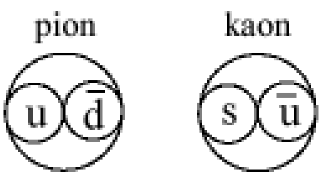
Explanation of Quarks in Mesons



Physicist believe there are six quarks - up (u), down (d), charm (c), strange (s), top (t), and bottom (b) and their antiquarks - antiup, antidown, anticharm, antistrange, antibottom, and antitop. Antiquarks are labeled with a letter with a bar over it.

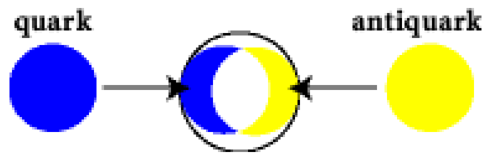


Each meson consists of one quarks and one antiquark represented by small circles within the larger circle. Quarks are labeled with a letter. A meson cannot be made of two quarks or two antiquarks.



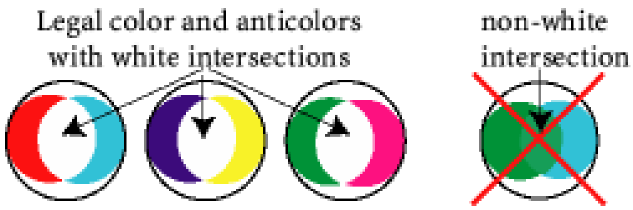
Examples of mesons are the pion and the kaon.

Explanation of the Colors of Quarks and Antiquarks in Mesons

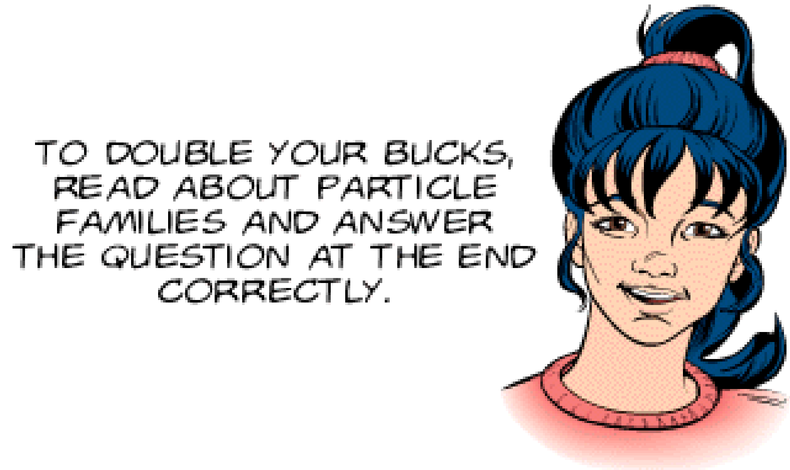


In this representation, each meson consists of one quark and one antiquark shown as intersecting circles within the larger circle.

The colors of each quark represent a property physicists call color. The quarks aren't really colored, but it is a convenient way to represent the property. Quarks can be red, blue, or green while antiquarks can be cyan, yellow, or magenta.



The one quark and one antiquark in a meson must have colors that combine to make white. Only the anticolor of a color combines to make white. Red's anticolor is cyan; blue's anticolor is is yellow; green's anticolor is magenta. The part of the two circles that overlaps represents the mixture of the colors of the two quarks.



What is a Particle FAMILY?

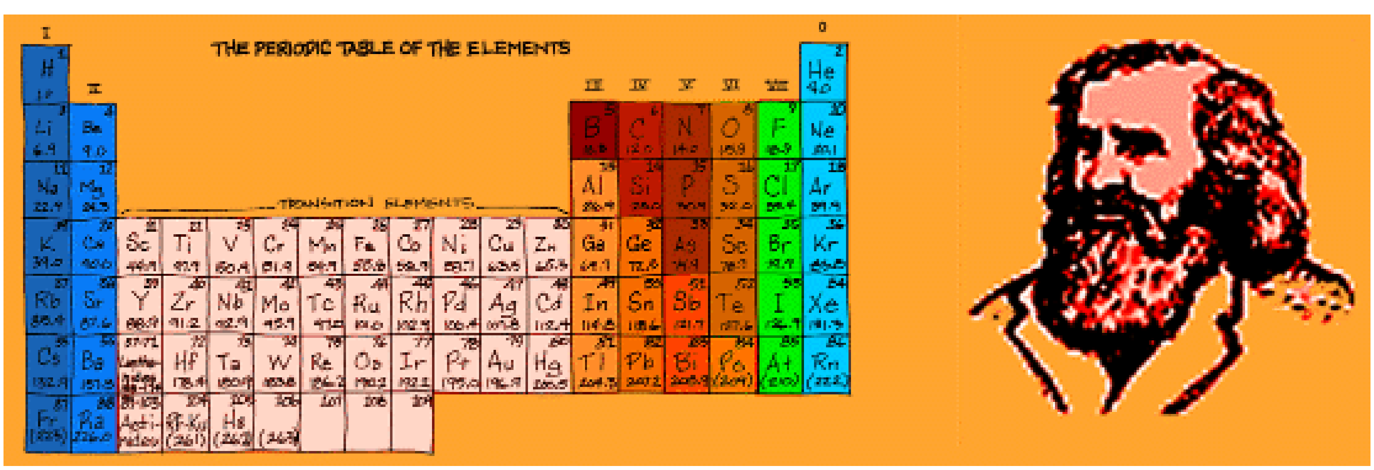
One reason scientists study particles is to find their similarities and differences.

What is a family?

Science often begins by grouping things.

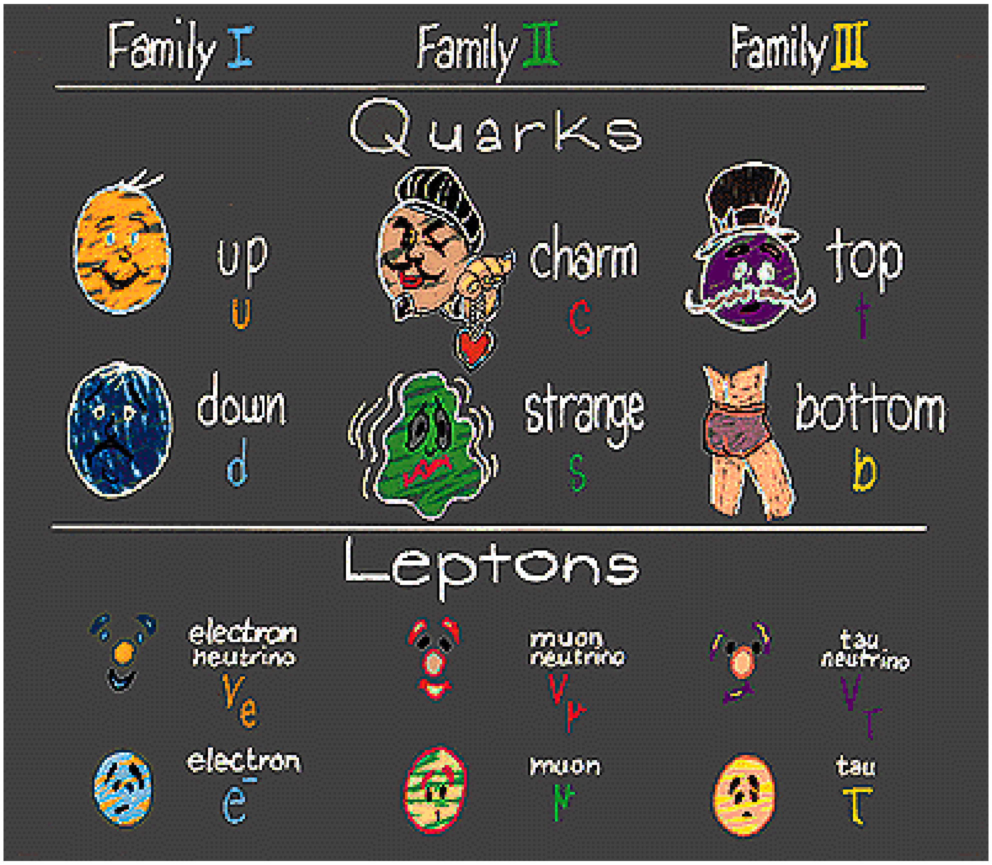
Zoologists classify animals so that tigers, cheetahs, and tabbies end up in the family of "cats" (felines).

The Russian scientist, Dmitri Mendeleev, grouped elements in the Periodic Table according to their chemical properties and atomic weights. It was many years after Mendeleev that chemists understood WHY elements belonged to certain groups.



What is a particle family?

Physicists group particles called quarks and leptons into "families."



Today, physicists are trying to understand WHY quarks and leptons belong to particular groups.

Not so long ago scientists discovered so many new particles (several hundred) they called them a Particle Zoo. The picture was simplified with the discovery of more basic particles - quarks and leptons - that physicists group into families. In the Particle Family Game, you grouped the imaginary particles by identifying common characteristics as physicists do.

QUESTION: Does the electron belong to the Family of Quarks or Leptons?

Quarks - Leptons

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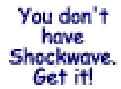
Last Update: June 11, 1998

Nature's Scale

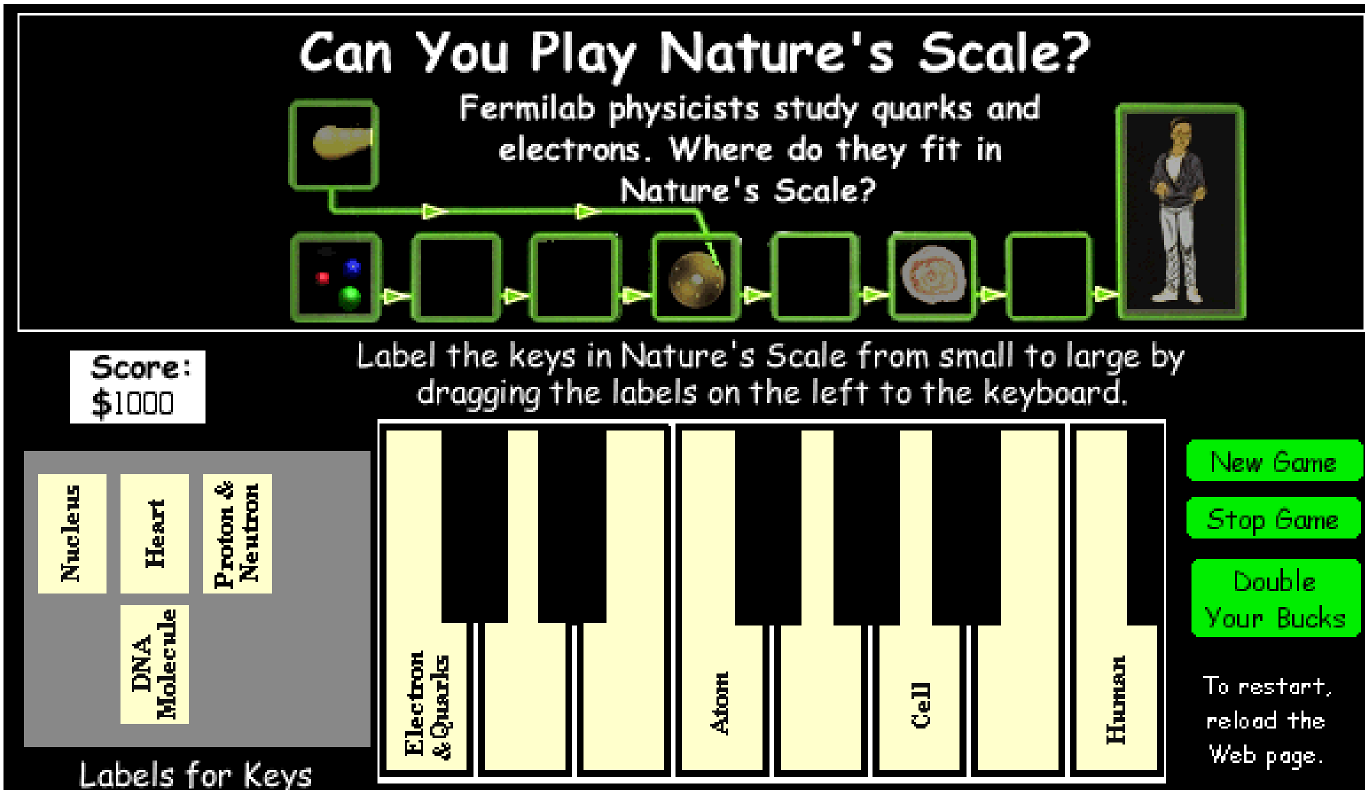


This activity needs Shockwave. If you don't see the animation above, click

Go to Game

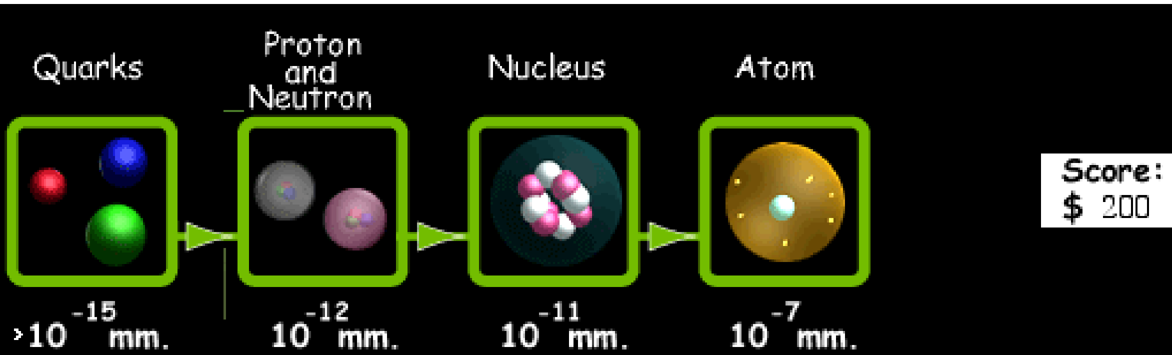
Law 'N Order

Web Maintainer: ed-webmaster@fnal.gov
Last Update: May 11, 2000
http://www-ed.fnal.gov/projects/fermilabyrinth/games/lawnorder/natures_scale/activity.html

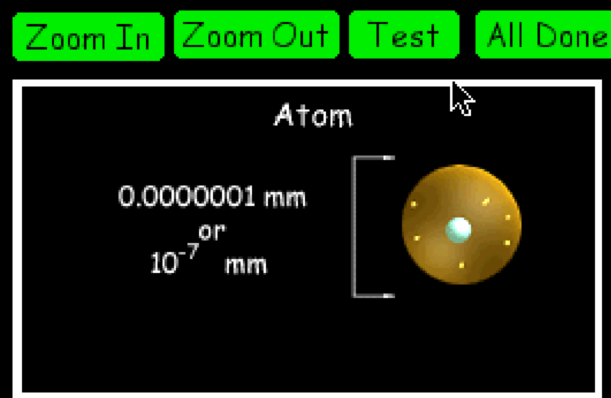


Law 'N Order

Macromedia Shockwave Movie by: Liz Quigg - liz@fnal.gov
Web Maintainer: ed-webmaster@fnal.gov
Last Update: May 16, 2000
http://www-ed.fnal.gov/projects/labyrinth/lawnorder/natures_scale.html



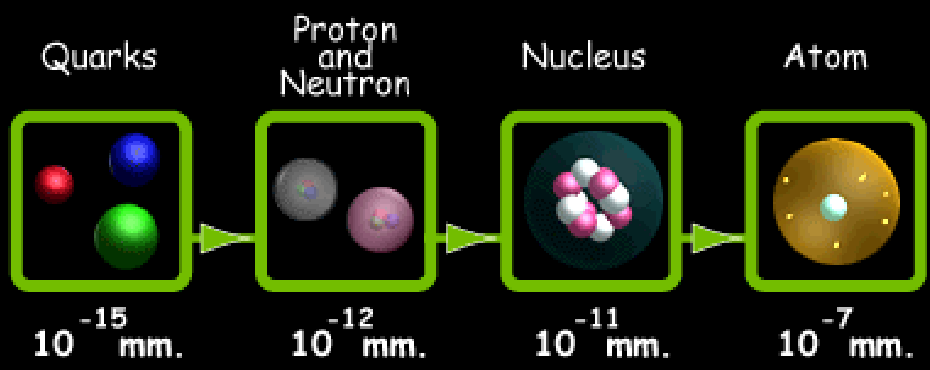
Fermilab scientists explore quarks, objects more than one hundred million times smaller than an atom! Click the **Zoom In** button to move from an atom to a quark. (Each click of the button lets you look at an object 10 times smaller than the previous object.) Once you think you've reached the quark size, click **Test**. See if you can double your bucks!



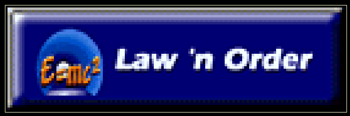
Law 'N Order

Congratulations! You earned Einstein Bucks in Nature's Scale!!

Quarks are the smallest objects physicists have discovered.
Are they made of something smaller?
Print out your bucks or go back to Law 'n Order.



Print Your Bucks

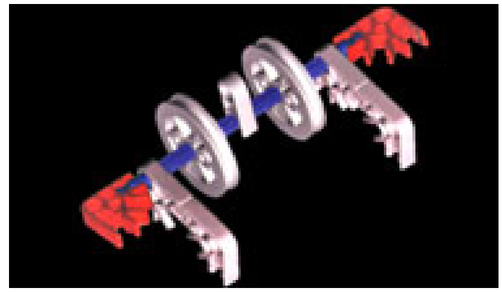


Go Back

Web Maintainer: ed-webmaster@fnal.gov
Last Update: May 16, 2000
http://www-ed.fnal.gov/projects/fermilabyrinth/games/lawnorder/natures_scale/done.html

What are the Basic Forces Between Particles?

The Standard Model describes how the fundamental particles affect each other–how they interact, the forces they feel.



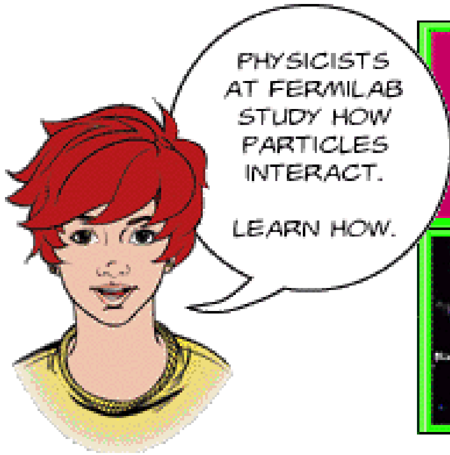
You may think of forces as pushes and pulls. Particle physicists think of forces as **interactions between particles** that produce structure–from protons to galaxies. The Standard Model would not be complete if it did not explain how particles behave together. It would be like having a set of K'nex without the rods–you couldn't build much.

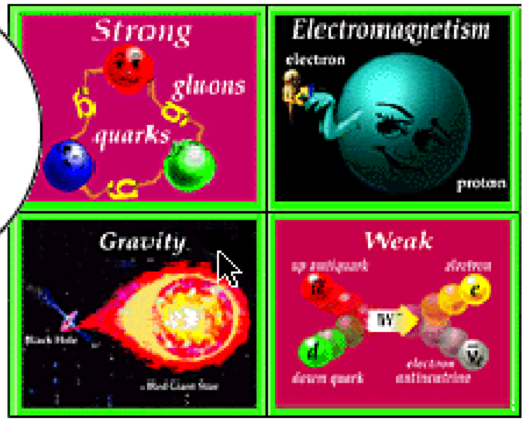
Continue

Law 'n Order

Web Maintainer: ed-webmaster@fnal.gov
Shockwave Movie by Liz Quigg: liz@fnal.gov
http://www-ed.fnal.gov/projects/fermilabyrinth/games/lawnorder/four_forces/intro.html

What are the Basic Forces between Particles?





You have Shockwave

Continue

This activity needs Shockwave. If you can't see the animation, click

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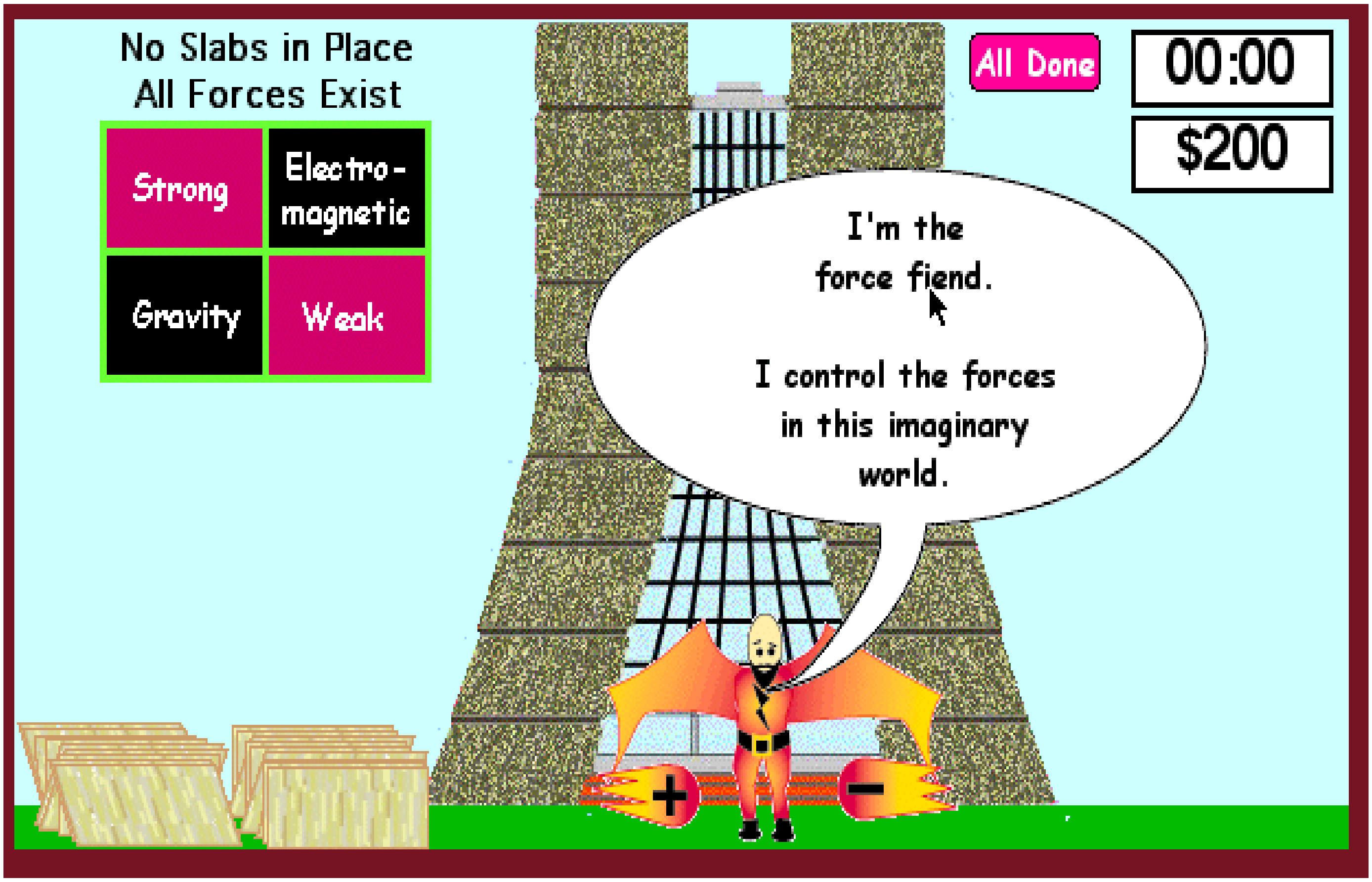
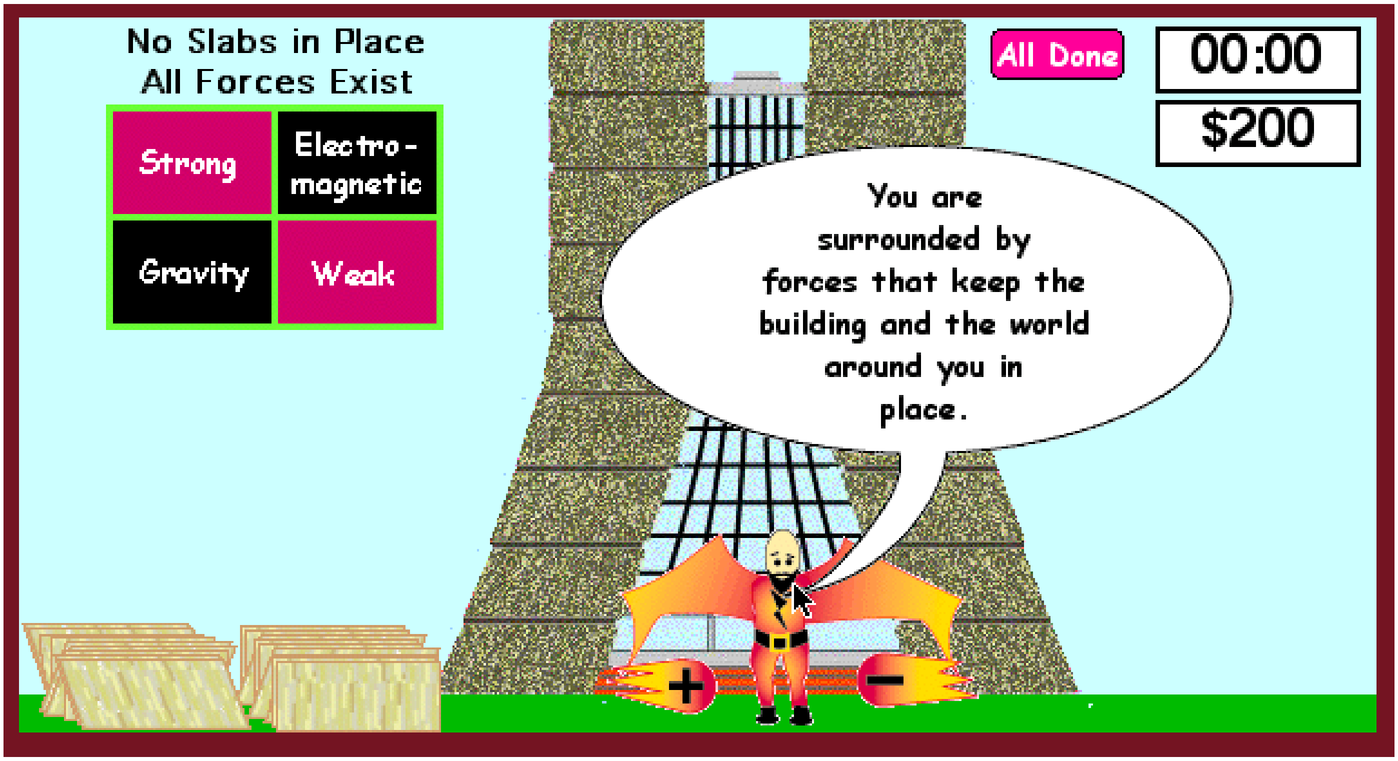
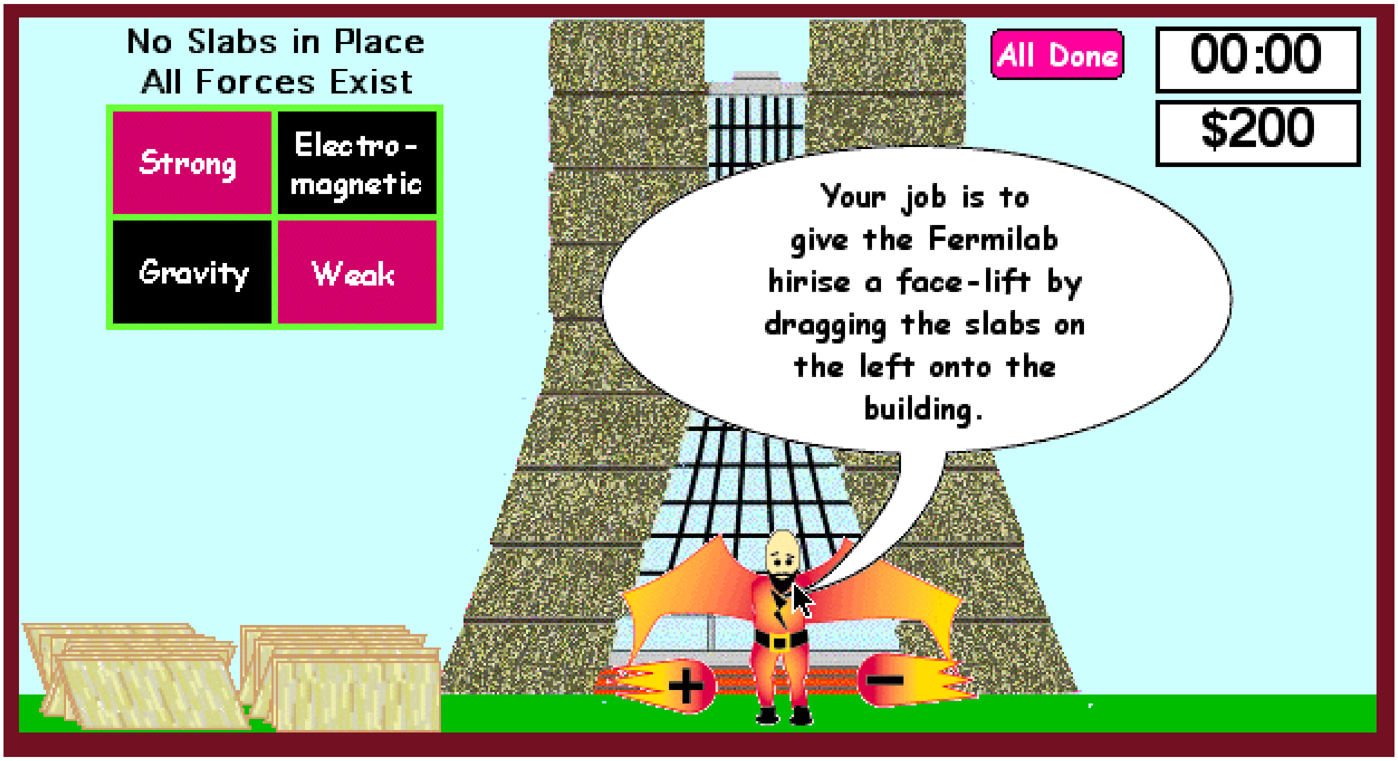
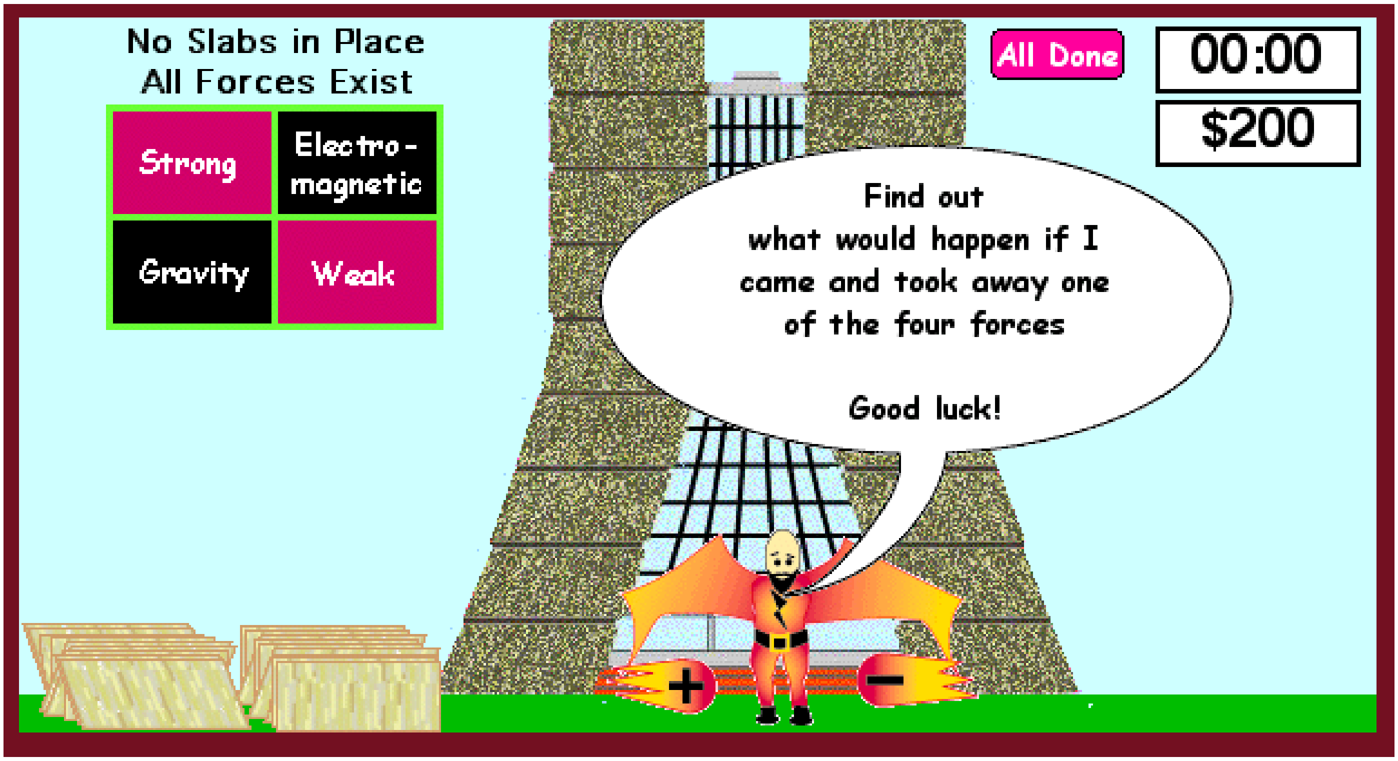
Law 'n Order

ed-webmaster@fnal.gov
e by Liz Quigg: liz@fnal.gov
al.gov/projects/fermilabyrinth/games/lawnorder/four_forces/activity.html

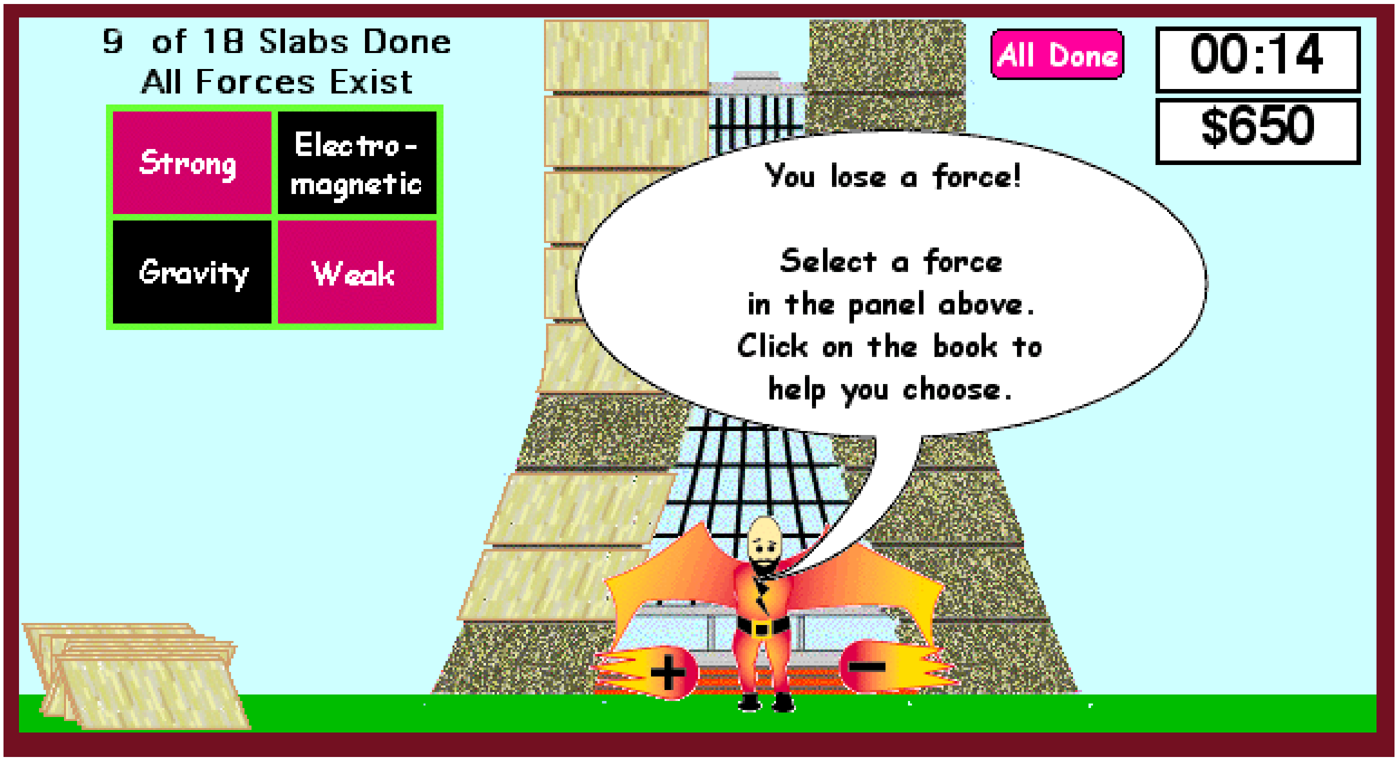

No Slabs in Place
All Forces Exist
Strong
Electro-magnetic
Gravity
Weak
All Done
00:00
$200
I'm the force fiend.
I control the forces in this imaginary world.

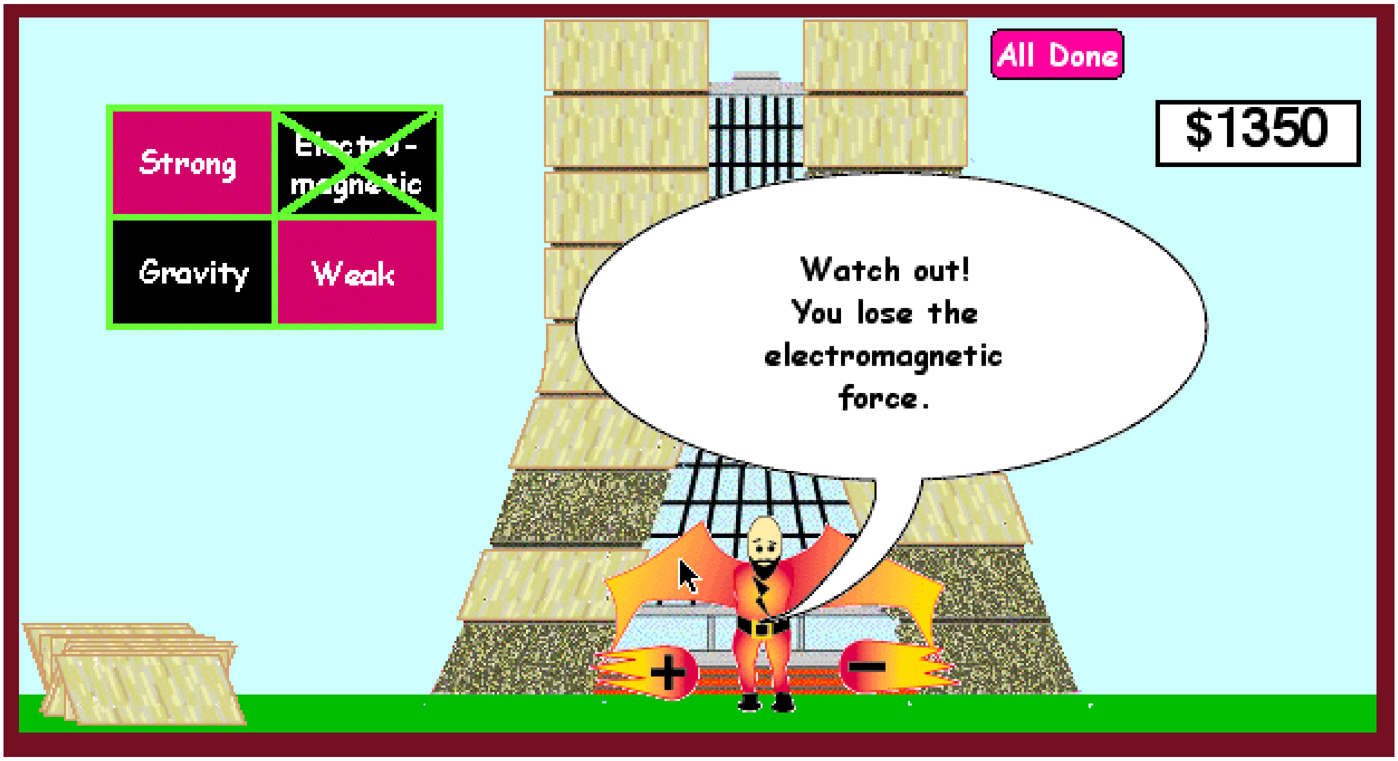

No Slabs in Place
All Forces Exist
Strong
Electro-magnetic
Gravity
Weak
All Done
00:00
$200
You are surrounded by forces that keep the building and the world around you in place.
+
−

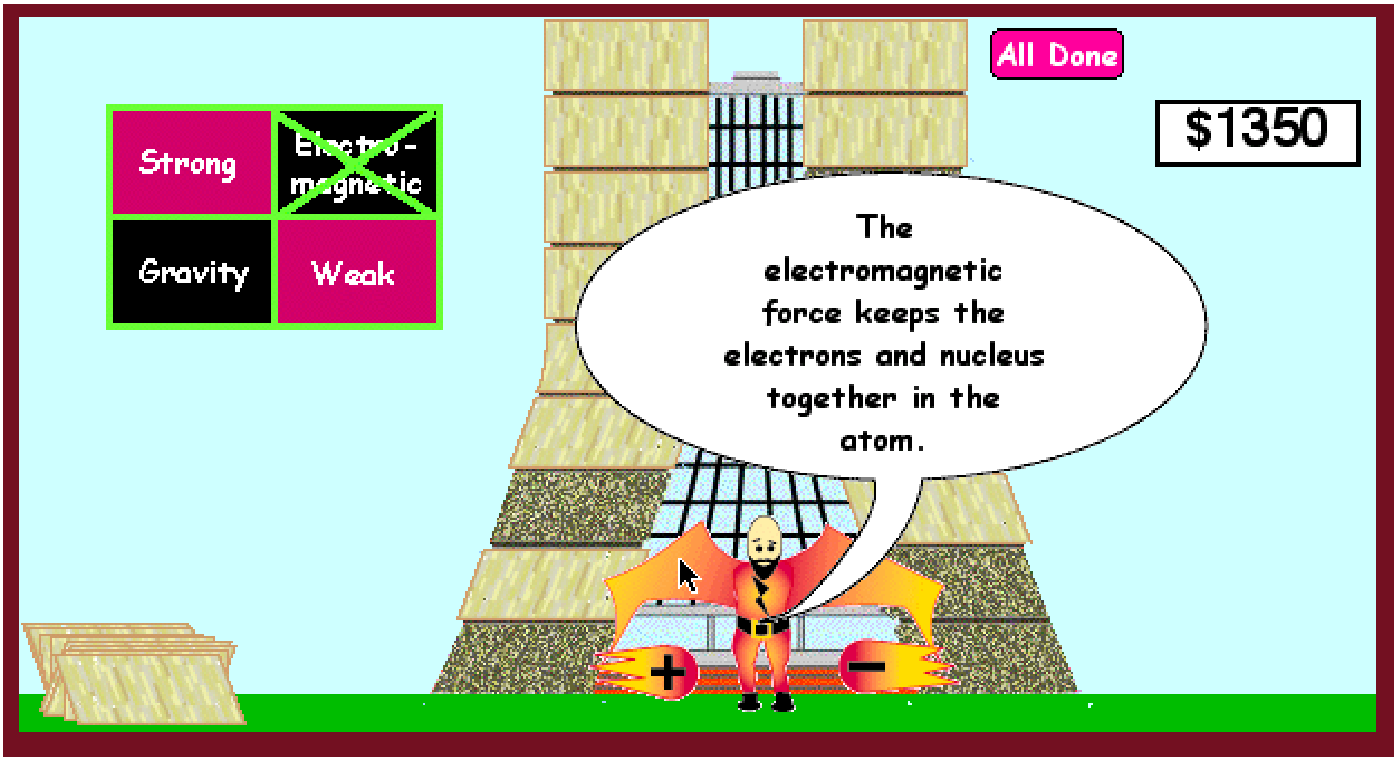

No Slabs in Place
All Forces Exist
Strong
Electro-magnetic
Gravity
Weak
All Done
00:00
$200
Your job is to give the Fermilab hirise a face-lift by dragging the slabs on the left onto the building.
+
−

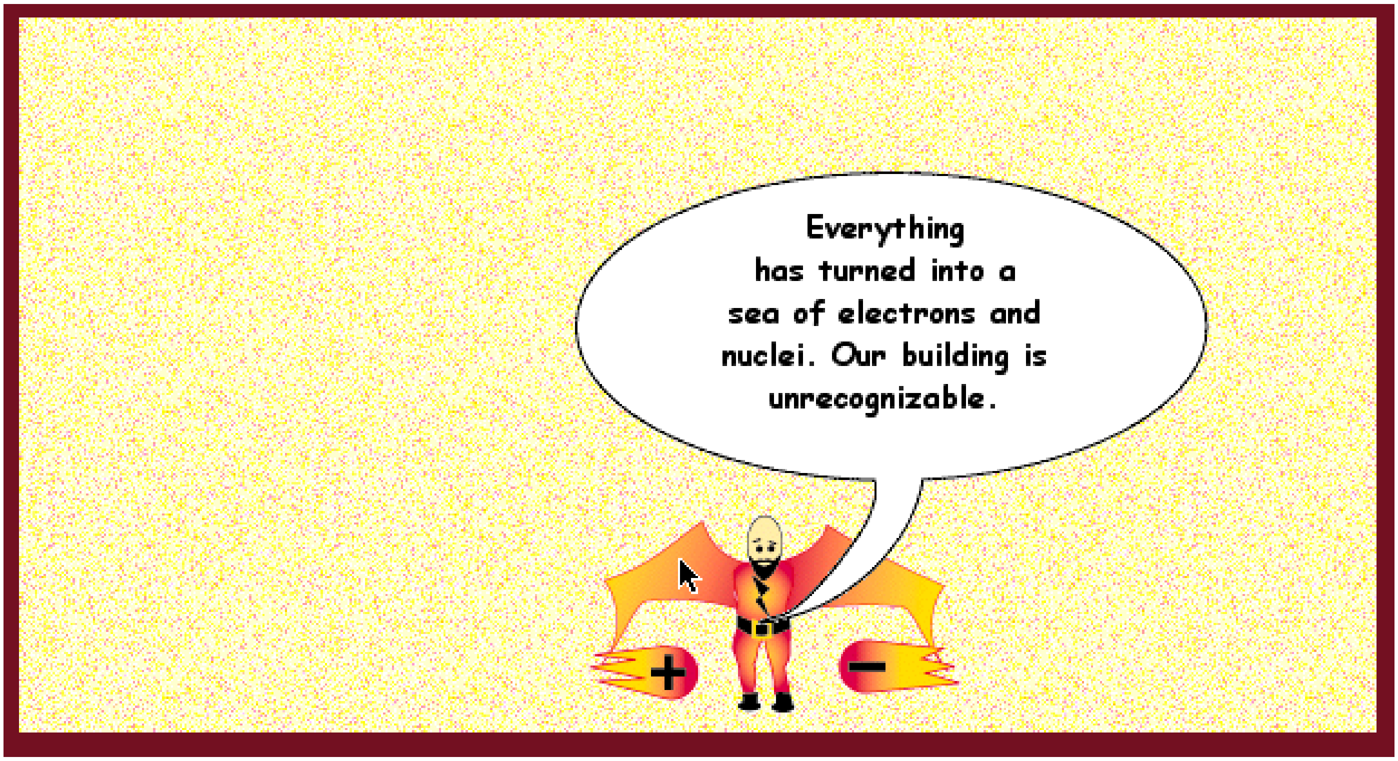

No Slabs in Place
All Forces Exist
Strong
Electro-magnetic
Gravity
Weak
All Done
00:00
$200
Find out what would happen if I came and took away one of the four forces

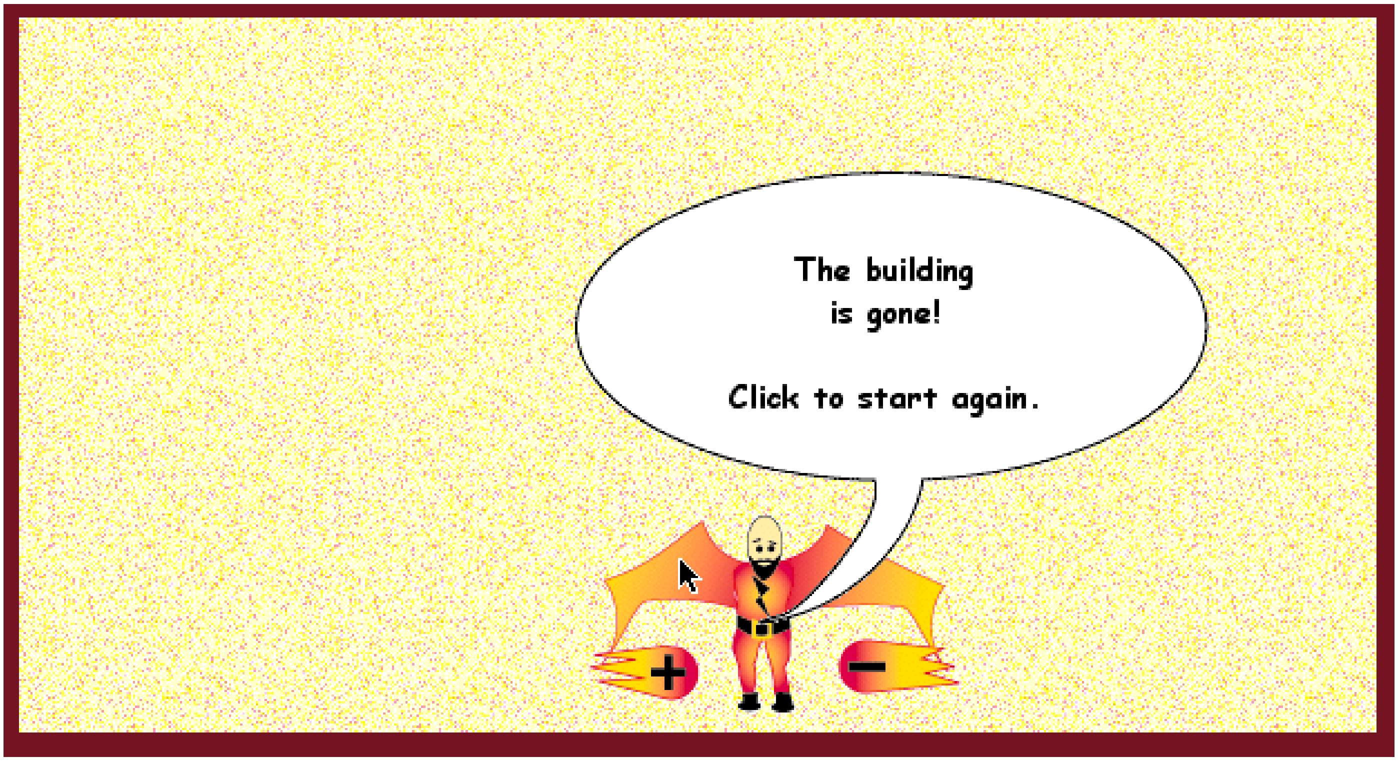
Good luck!
+
−

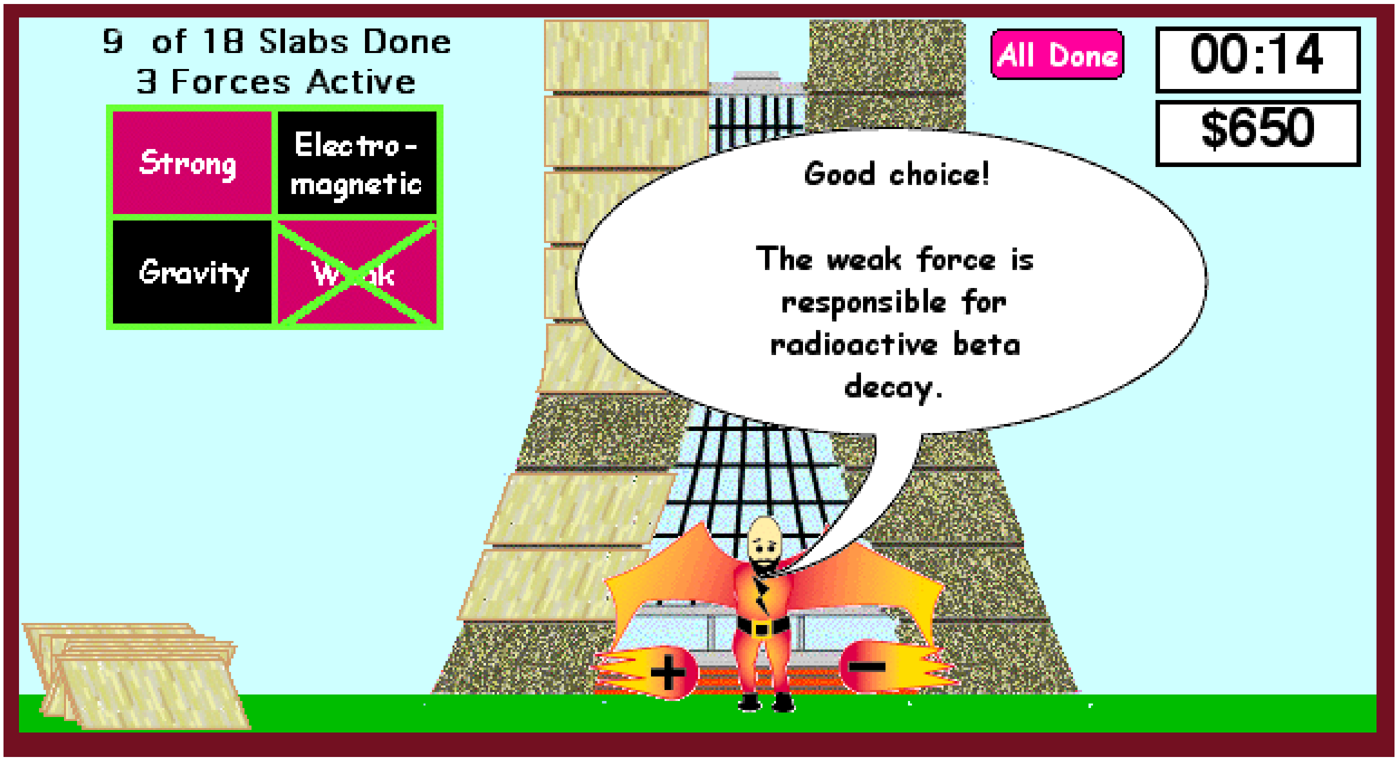

9 of 18 Slabs Done
All Forces Exist
Strong
Electro-magnetic
Gravity
Weak
All Done
00:14
$650
You lose a force!
Select a force in the panel above. Click on the book to help you choose.
+
−

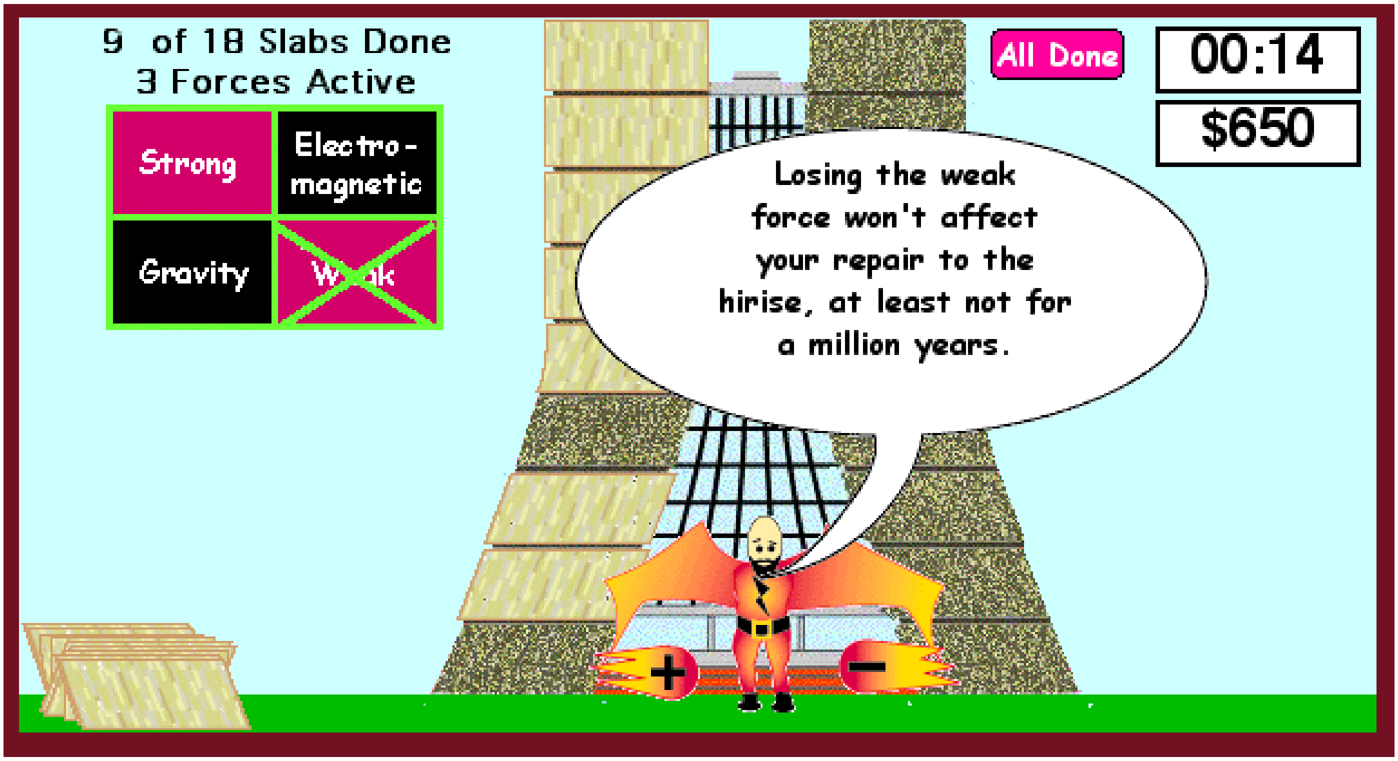

All Done
$1350
Strong
Electro-
magnetic
Gravity
Weak
Watch out!
You lose the
electromagnetic
force.
+
−

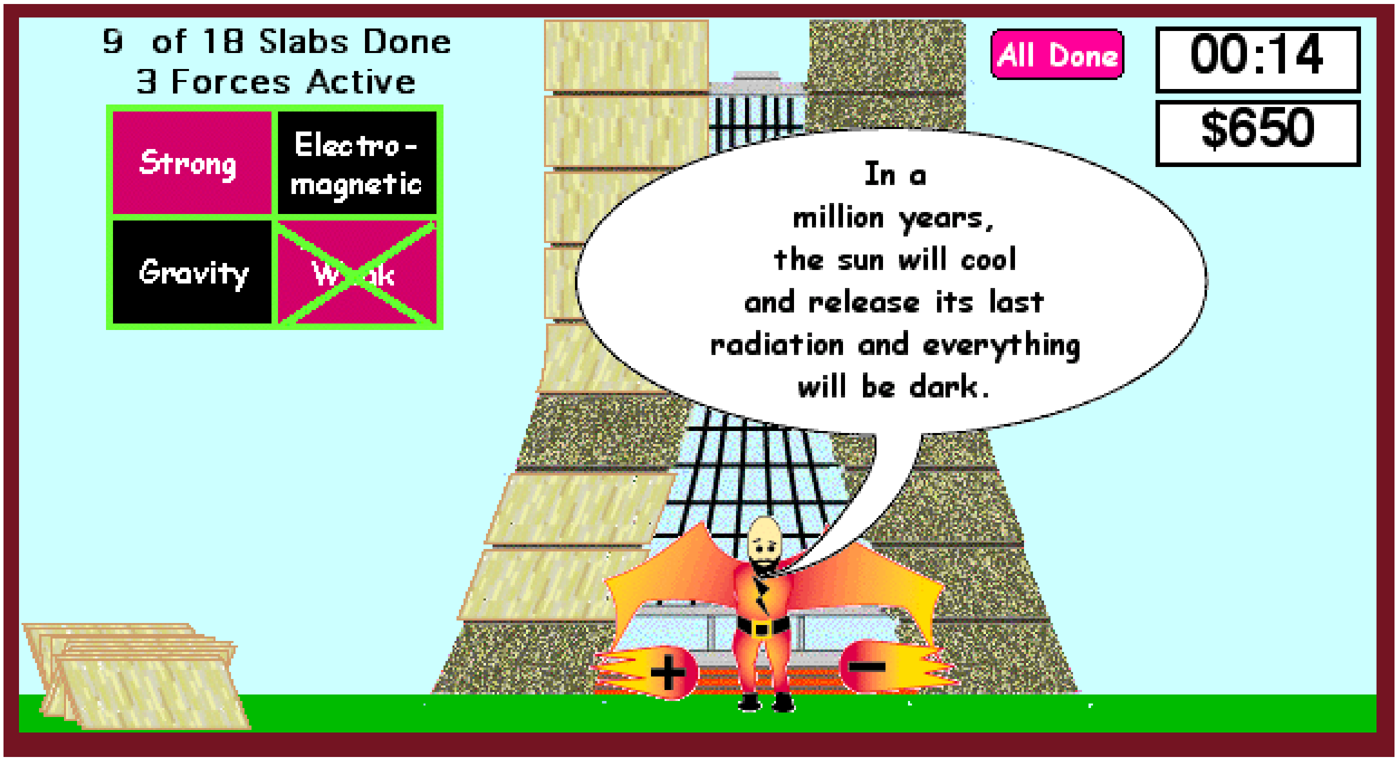

All Done
$1350
Strong
Electro-magnetic
Gravity
Weak
The electromagnetic force keeps the electrons and nucleus together in the atom.
+
−

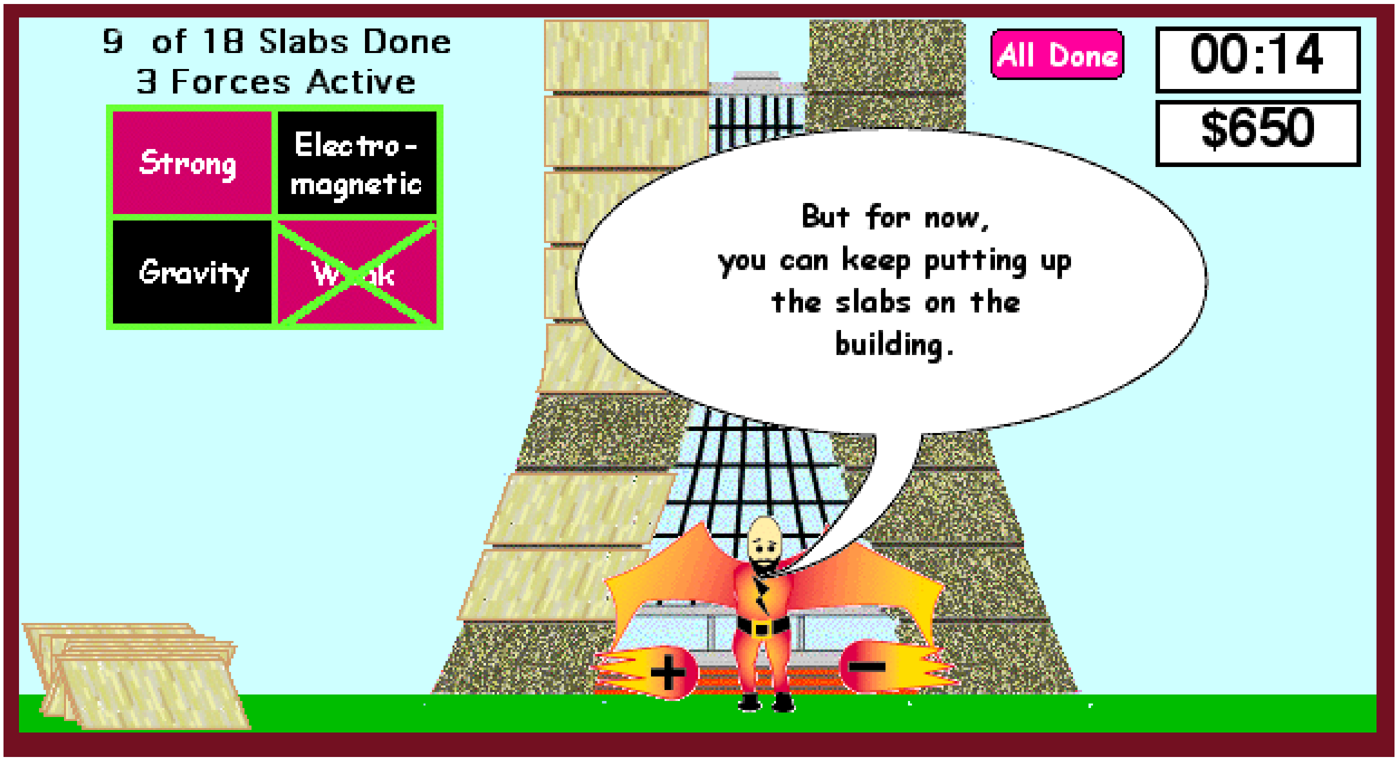

Everything
has turned into a
sea of electrons and
nuclei. Our building is
unrecognizable.
+
−


The building
is gone!
Click to start again.


9 of 18 Slabs Done
3 Forces Active
Strong
Electro-magnetic
Gravity
Weak
All Done
00:14
$650
Good choice!
The weak force is responsible for radioactive beta decay.
+
−


9 of 18 Slabs Done
3 Forces Active
Strong
Electro-magnetic
Gravity
All Done
00:14
$650
Losing the weak force won't affect your repair to the hirise, at least not for a million years.

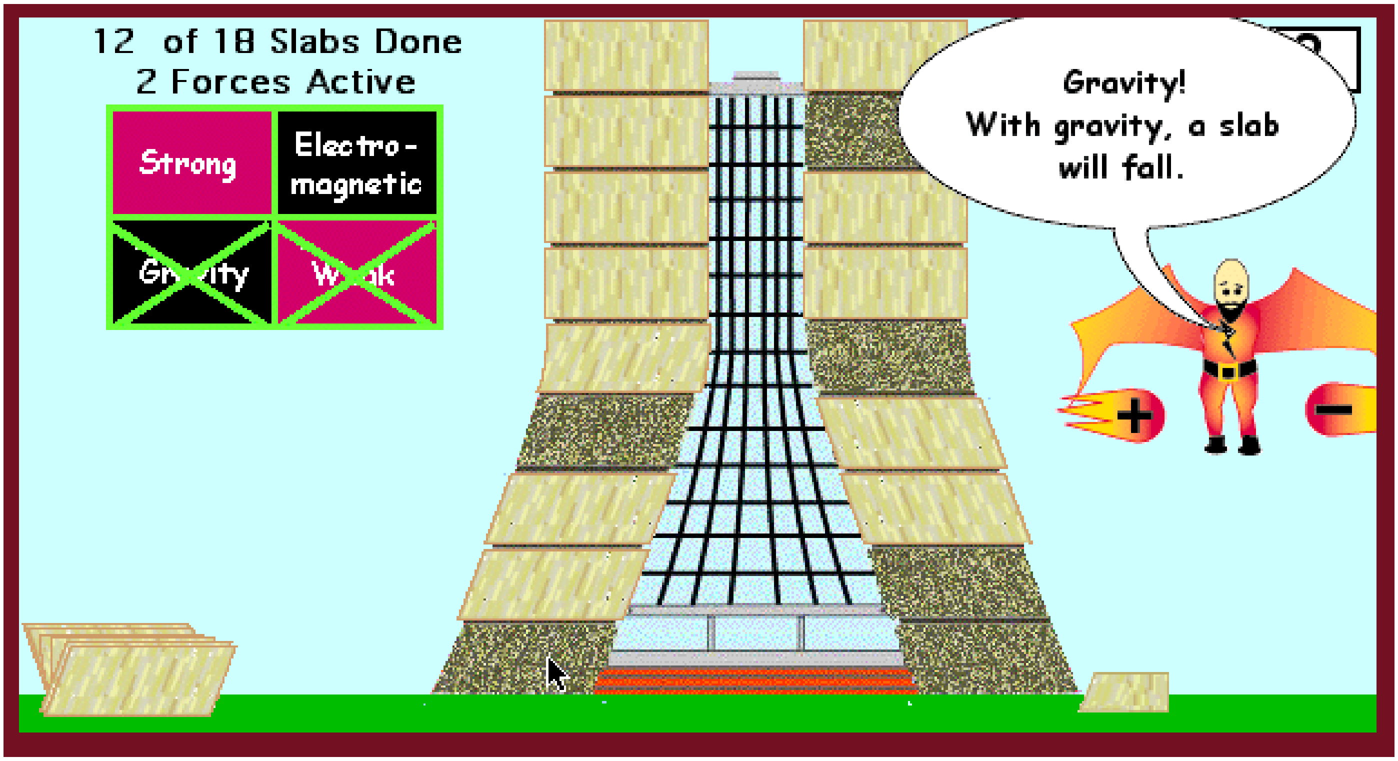

9 of 18 Slabs Done
3 Forces Active
Strong
Electro-magnetic
Gravity
Weak
All Done
00:14
$650
In a million years, the sun will cool and release its last radiation and everything will be dark.

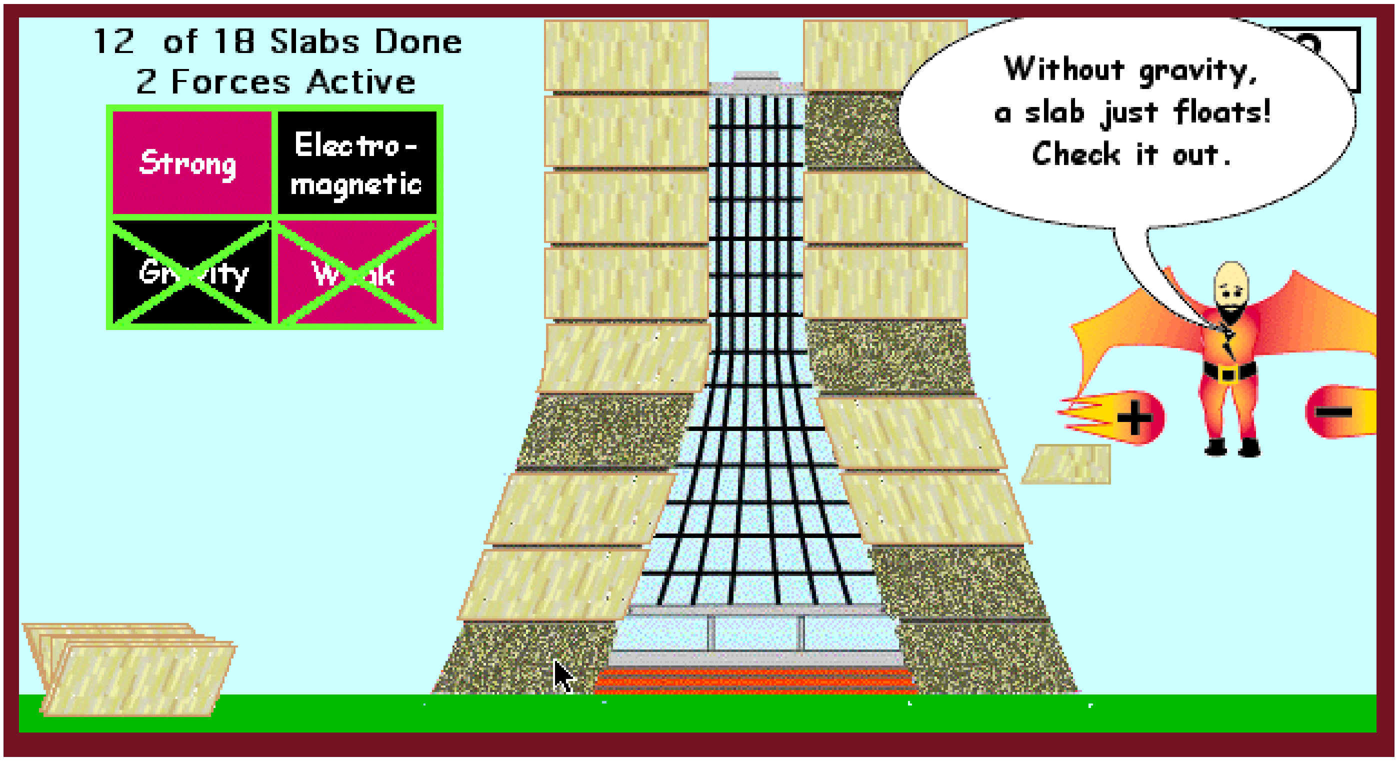

9 of 18 Slabs Done
3 Forces Active
Strong
Electro-magnetic
Gravity
Weak
All Done
00:14
$650
But for now, you can keep putting up the slabs on the building.


Whoa! We need the strong force! It holds the quarks together in protons and neutrons.


The quarks escape
and cause a big flash.
Everything is gone.

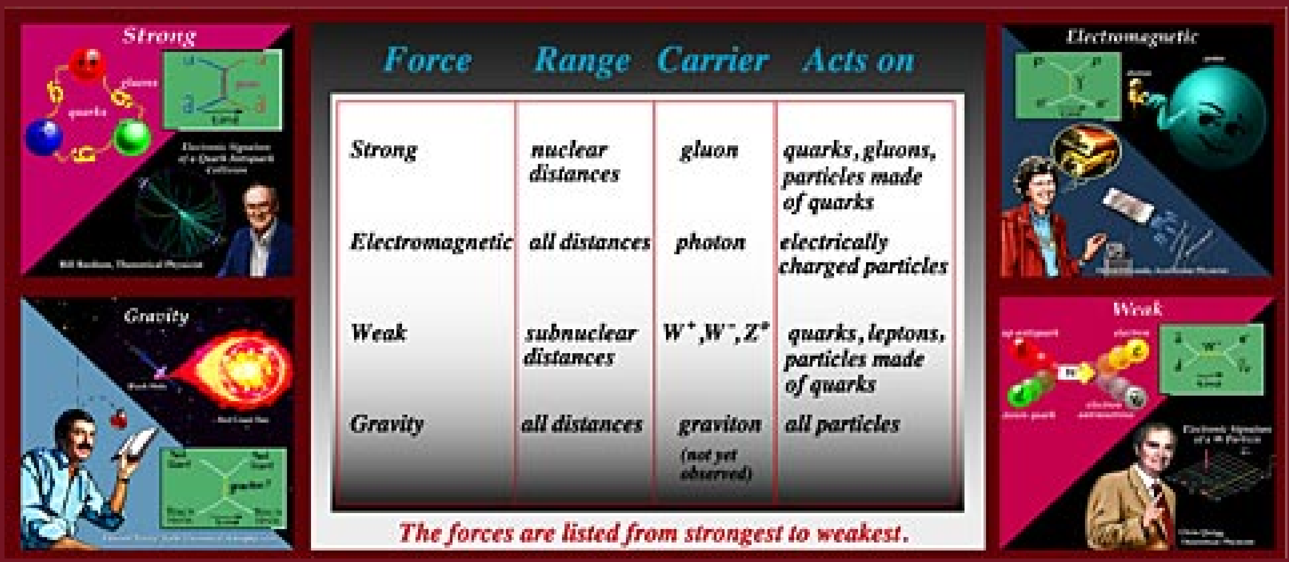

The building
is gone!
Click to start again.


12 of 18 Slabs Done
2 Forces Active
Strong
Electro-
magnetic
Gravity
Weak
Gravity!
With gravity, a slab
will fall.


12 of 18 Slabs Done
2 Forces Active
Strong
Electro-magnetic
Without gravity, a slab just floats! Check it out.

Learn about the four forces and the Fermilab physicists who study them.

Chart - Strong - Electromagnetic - Gravity - Weak - Return to Game



Force	Range	Carrier	Acts on
Strong	nuclear distances	gluon	quarks, gluons, particles made of quarks
Electromagnetic	all distances	photon	electrically charged particles
Weak	subnuclear distances	W^+, W^-, Z^0	quarks, leptons, particles made of quarks
Gravity	all distances	graviton (not yet observed)	all particles

The forces are listed from strongest to weakest.

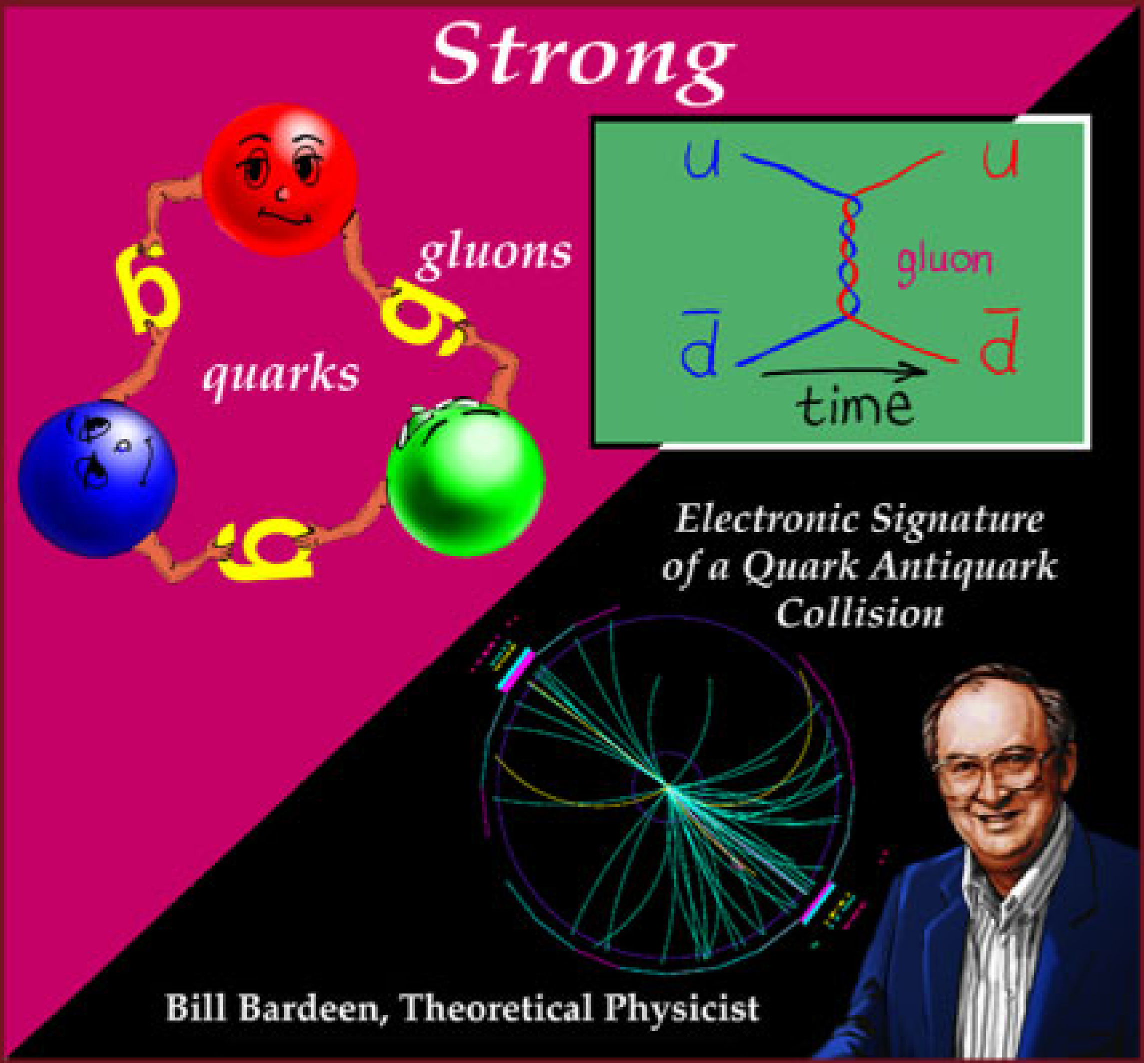
Learn about the four forces and the Fermilab physicists who study them.

All - Strong - Electromagnetic - Gravity - Weak - Return to Game

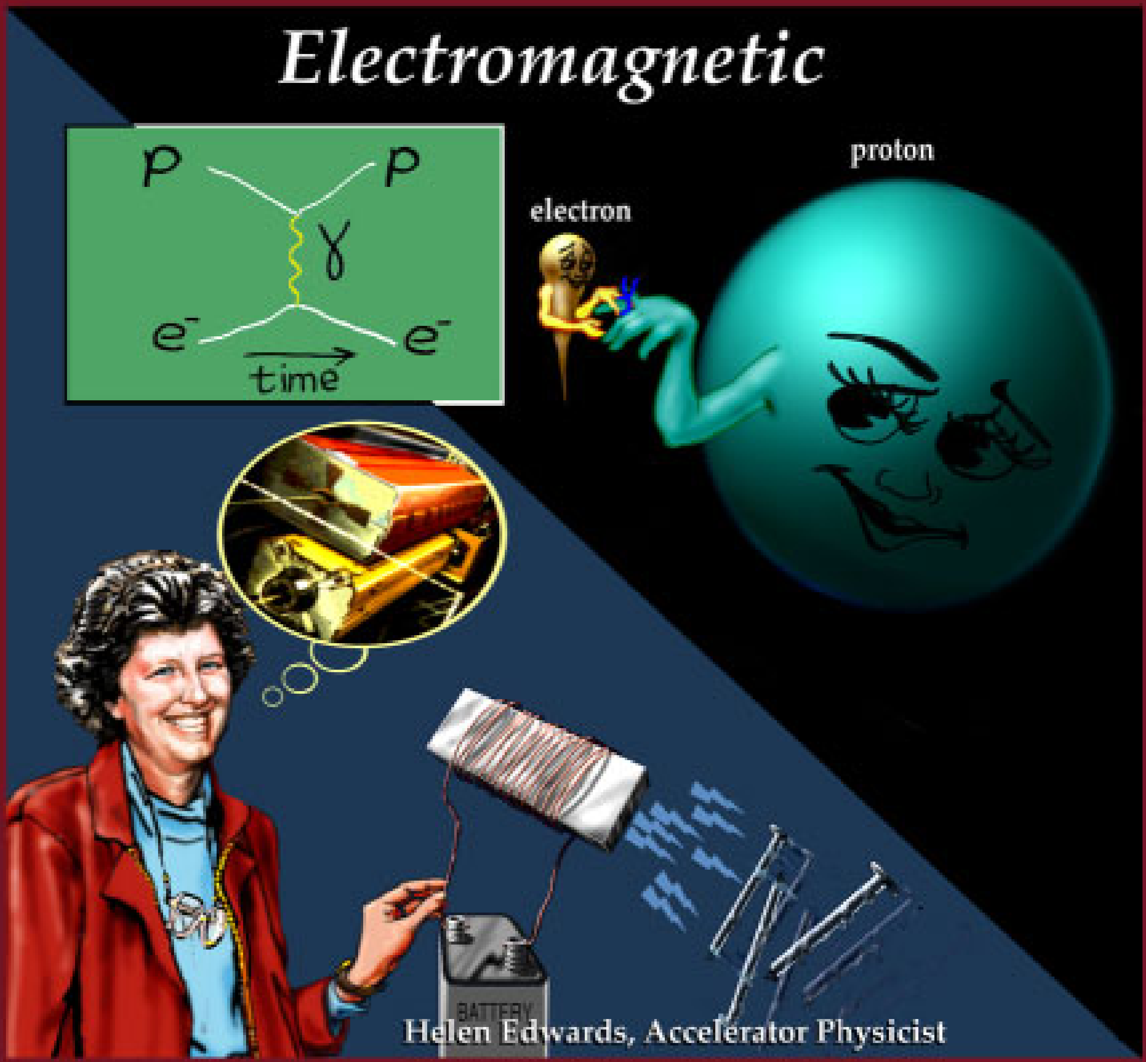
Force	Range	Carrier	Acts on
Strong	nuclear distances	gluon	quarks, gluons, particles made of quarks
Electromagnetic	all distances	photon	electrically charged particles
Weak	subnuclear distances	W^+, W^-, Z^o	quarks, leptons, particles made of quarks
Gravity	all distances	graviton (not yet observed)	all particles

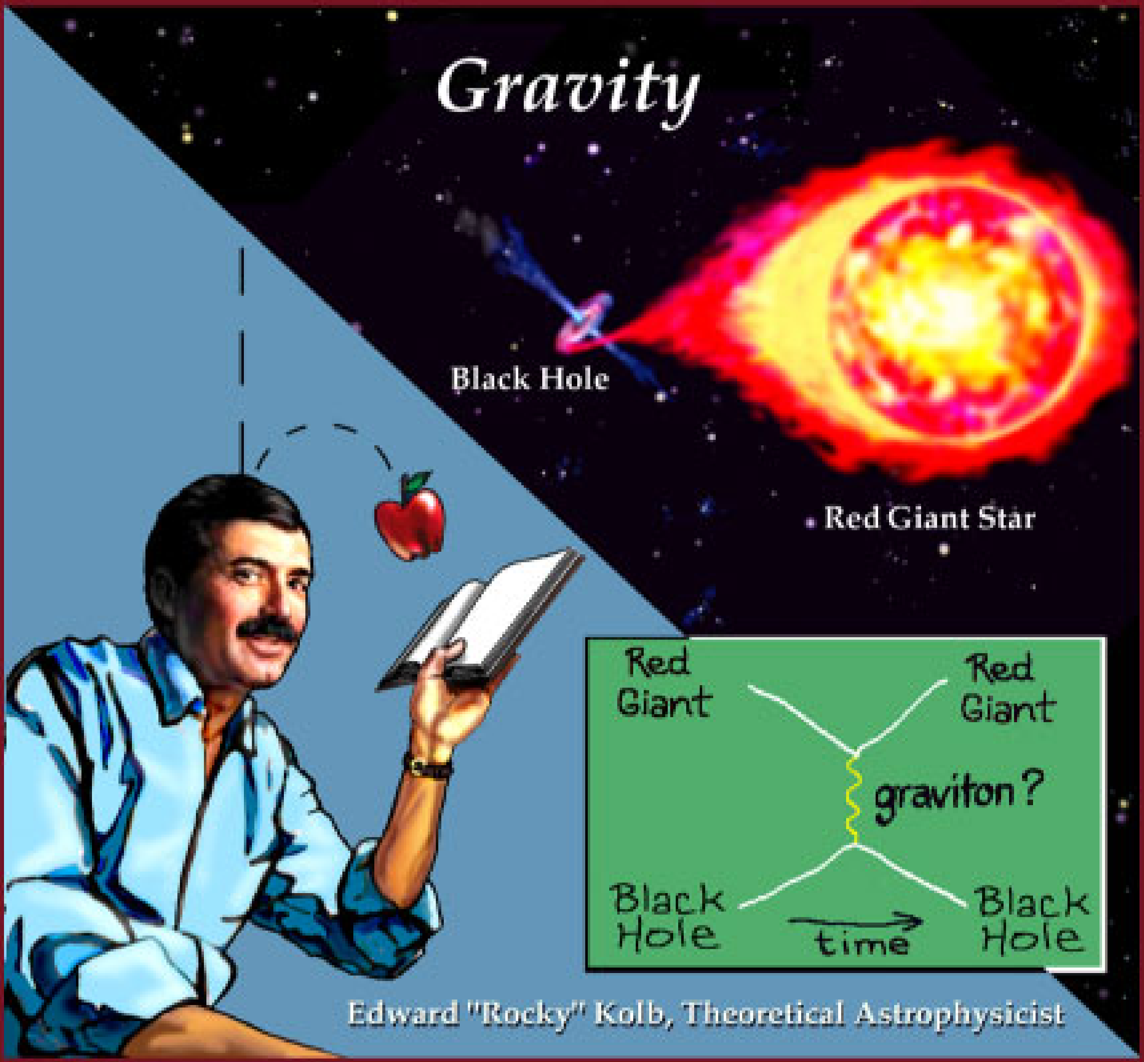
The forces are listed from strongest to weakest.

All - Chart - Strong - Electromagnetic - Gravity - Weak - Return to Game

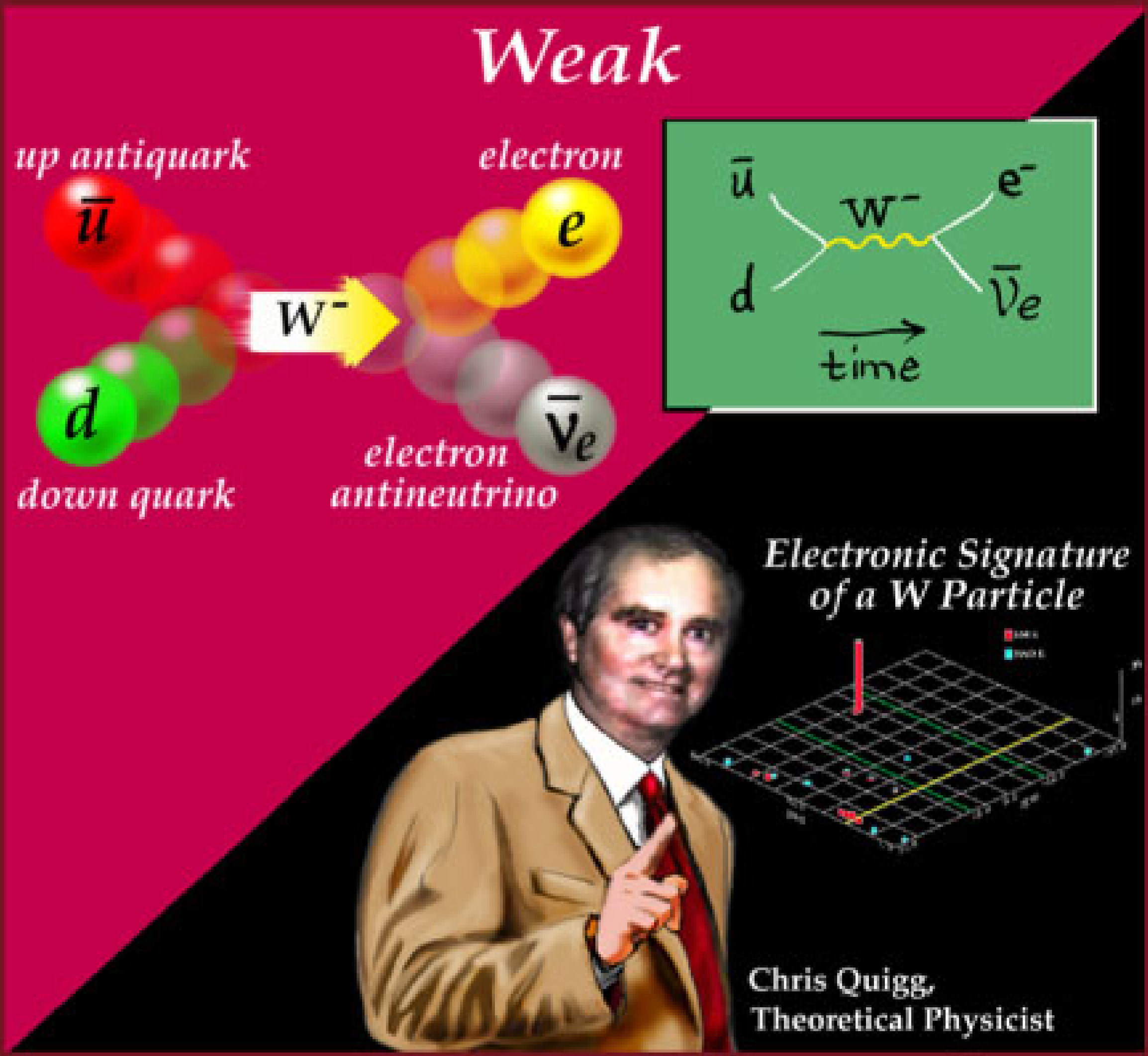


All - Chart - Strong - Electromagnetic - Gravity - Weak - Return to Game




Gravity
Black Hole
Red Giant Star
Red Giant
Red Giant
graviton?
Black Hole
time
Black Hole
Edward "Rocky" Kolb, Theoretical Astrophysicist

All - Chart - Strong - Electromagnetic - Gravity - Weak - Return to Game



Double Your Bucks

Fill out the following chart to indicate which forces affect the particles along the left. Click on the circle next to **Yes** if they feel the force and **No** if they don't. Some of the answers may surprise you, but you can double your bucks if you answer most of them correctly.

Refer to the chart in the other window or the glossary below if you need help.

	Four Forces			
Particles	**Gravity**	**Electromagnetic**	**Weak**	**Strong**
neutron	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No
neutrino	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No
quark	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No
proton	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No
photon	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No
electron	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No	○ Yes ◉ No

Click the button to .

Glossary

electron

A negatively charged particle belonging to the family of leptons. It has mass and combines with the nucleus to make atoms.

neutrino

An elusive particle because it barely interacts with other particles. It has zero or very little mass. Scientists are trying to determine if it has mass. It has no electrical charge and belongs to the family of leptons. There are three types of neutrinos: electron neutrinos, tau neutrinos, and mu neutrinos, corresponding to their lepton partners, the electron, tau, and mu.

neutron

A particle with no charge made up of three quarks,one up and two downs. The neutron and proton make up the nucleus of an atom.

photon

A particle with no mass or electrical charge. Photons are the carriers of the electromagnetic force.

proton

A particle with positive electrical charge made up of three quarks,two ups and one down. The neutron and proton make up the nucleus of an atom.

quark

One of the basic building blocks of matter. There are six types of quarks: up, down,charm, beauty, bottom, and top. Three of them combine to make baryons, for example, the proton and neutron. Two combine to make mesons. They have mass and electrical charge.

You can learn more about different particles in
Particle Families and Baryon Bonanza in Law 'n Order.

Law 'n Order

Web Maintainer: ed-webmaster@fnal.gov
Last Update: May 31, 2000
http://www-ed.fnal.gov/projects/fermilabyrinth/games/lawnorder/four_forces/four_forces_bucks.html

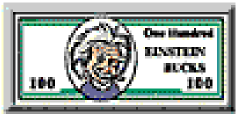
You did not double your Einstein Bucks. You got 6 out of 24 correct. You earned 200 Einstein Bucks in the Four Forces!!

Here are the correct answers. Those with a red background, you answered incorrectly.

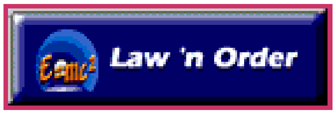
All the particles experience **gravity**. If a particle has energy, it feels **gravity**. The **neutrino** and **photon** do not feel the **electromagnetic force** because they have no charge. You might think that the **neutron** might not feel it, but it does because it is made up of charged particles. All the particles except the **photon** experience the **weak force**. Only **quarks** and **hadrons** feel the **strong force**, so that leaves out the **photon**, **electron** and **neutrino**. Remember to have the structure around us, we need the four forces.

After you study the table, print out your bucks or go back to Law 'n Order.

	Four Forces			
Particles	**Gravity**	**Electromagnetic**	**Weak**	**Strong**
neutron	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No
neutrino	(•) Yes ( ) No	( ) Yes (•) No	(•) Yes ( ) No	( ) Yes (•) No
quark	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No
proton	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No
photon	(•) Yes ( ) No	( ) Yes (•) No	( ) Yes (•) No	( ) Yes (•) No
electron	(•) Yes ( ) No	(•) Yes ( ) No	(•) Yes ( ) No	( ) Yes (•) No



Print Your Bucks



Go Back