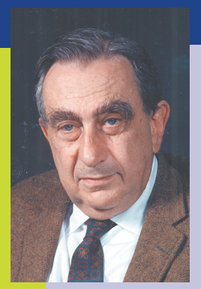


Edward Teller

He was born in 1908 in Budapest, Hungary, and came to the United States in 1935. He was a physics professor at George Washington University.

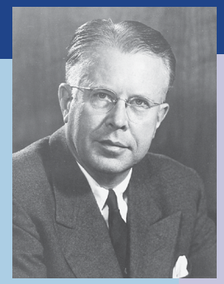
Teller, along with other extraordinary scientists of his time such as Albert Einstein, helped lay the foundation for nuclear physics during the first decades of the 20th century, when there occurred many scientific breakthroughs. At Los Alamos National Laboratory in New Mexico, Teller helped develop the first atomic bomb. His efforts were instrumental in establishing in 1952, what is now known as Lawrence Livermore National Laboratory. He served as director at Livermore for two years and then as associate director for physics.

Teller believed that students of all ages should learn about and appreciate science. He received numerous awards for his contributions to physics, his dedication to education, and his public life. ◆

Physics & the Lab

Why is the Laboratory celebrating the Year of Physics? Because so much of the science that is studied here comes from the theories and ideas that Albert Einstein first envisioned 100 years ago. And, physics plays an important role in every field of science the Lab conducts.

In addition, we must not forget the Laboratory's co-founders, Ernest O. Lawrence and Edward Teller, who were prominent physicists. ◆



Ernest O. Lawrence

He was called the "Atom Smasher." He was the man who "held the key" to atomic energy. This "giant" of physics is Ernest Orlando Lawrence, known to the world as the inventor of the cyclotron, a Nobel Prize winner, and the namesake of the Lawrence Livermore and Lawrence Berkeley national laboratories. Lawrence saw physics as an adventure. He wanted to do 'big physics" — the kind of work that could only be done on a large scale with a lot of people involved. The invention that made Lawrence famous started out as a sketch on a scrap of paper. The idea behind the cyclotron was to produce very high-energy particles required to smash atoms, something that had never been done before. It was important to smash atoms because smashing atoms produced energy.

The first actual model of Lawrence's cyclotron was made out of wire and wax and only cost about $25 in all. This just goes to show that even the best ideas and the greatest people start small. Maybe you will one day achieve a great scientific breakthrough. All you need to do is start with a small idea and build from there! ◆

Let's hear it for Albert Einstein: Inventor, scientist, physicist

Einstein's early years

You've probably heard of Albert Einstein. Say the name "Einstein," and what comes to mind? Scientist? Genius? The man behind the famous equation, $E=mc^2$? Einstein is all of these and more.

Born on March 14, 1879 in Ulm, Germany, Einstein was a quiet child, and scarcely talked until age 3. He was mostly self-taught during his formative years. Instead of playing soldier, he would build tall houses of cards. Einstein liked to tell about his childhood "wonder" – a magnetic compass he first saw when he was 4 or 5 years old. The needle's northward swing, guided by an invisible force, profoundly impressed him. The compass convinced him that there had to be something behind things, something deeply hidden.

Einstein the student

At the age of 12, he became fascinated by a geometry book. The certainty and proof involved in the intersections of triangles made a great impression on him.

Although he received good grades and was outstanding in mathematics, Einstein did not like the academic high school he was sent to in Munich, where much depended on memorizing facts and obeying authority. His real studies were done at home with books on mathematics, physics and philosophy. At 15, he quit school to join his parents, who had moved to Italy. Once there, he went to study at a Swiss school where individuals' ideas were encouraged.

At age 16, Einstein was sure that he wanted to study mathematics and physics. He entered the Institute of Technology in Zurich. After graduation, he tried to get jobs at several universities but was not successful. Instead, he got a position at the Swiss Patent Office. Throughout this period, he devoted his thoughts to the most basic problems of physics and began to publish scientific papers.

A miraculous year — 1905

The year 1905 was a busy one for Einstein. It is often call the "miracle year." As he put it, "A storm broke loose in my mind." He wrote several papers explaining theories that would change the scientific world.

In March 1905, he submitted a paper to a leading German physics journal about the structure of light. Einstein's theory stated that light can act as though it consists of discrete, independent particles of energy, much like particles of a gas.

In May 1905, Einstein wrote another paper explaining in detail botanist Robert Brown's theory about visible particles suspended in liquid. Einstein laid out clear evidence that all matter — whether solid, liquid or gas — is made up of atoms that are in constant motion and that become hotter the faster they move.

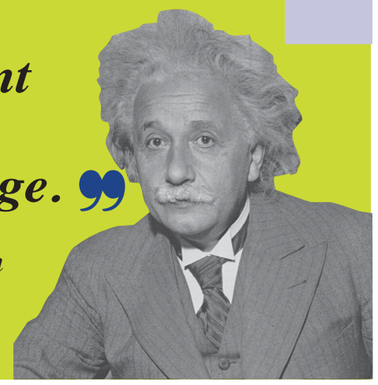
In June 1905, Einstein submitted his most profound proposal on the nature of space and time, better known as his theory of relativity. Einstein suggested that both time and space vary with circumstances instead of being absolute concepts. To further explain his thoughts, he devised the now famous equation – $E=mc^2$ – to explain that energy is equal to mass (m) times the speed of light (c^2).

Gaining fame

In 1909, Einstein had gained respect with his published papers and soon was appointed associate professor at the Unviversity of Zurich. He began to present his theories at conventions of scientists where he met many well known physicists he'd only known through their writings.

In 1921, Einstein won the Nobel Prize for Physics and became the world's symbol of the new physics. He continued to travel and give lectures all over Europe until he finally immigrated to America in 1933. He was offered a full-time position at the Institute for Advanced Study in Princeton, N.J.

> ***"Imagination is more important than knowledge."***
>
> *Albert Einstein*



Einstein died on April 18, 1955 at age 76. Even now, physicists continue to explore the theories created by his brilliant mind.

Einstein sought in science what artists seek in art. He wanted sense and beauty in the physical world. Einstein will be remembered for his intelligence and for never hesitating to speak his mind.◆

Physics fun, facts

Courtesey of Ology, http://www.ology.amnh.org/index.html

Question:
What did the nuclear physicist have for lunch?

Answer:
Fission chips.

A neutron goes into a restaurant and asks "How much for a hamburger and fries?" The waiter replies, "No charge for you."

Two hydrogen atoms meet: One says, "I seem to have lost my electron."

The other atom asks, "Are you sure?"

The first replies, "Yes, I'm positive."

Test your EQ - "Einstein Quotient"

1. When was Einstein born?
   – 1911
   – 1879
   – 1954

2. Where was Einstein born?
   –Ulm, Germany
   –Zurich, Switzerland
   –Rome, Italy

3. Einstein once worked in a _____ office.
   –Post
   –Patent
   –School

4. What year is called Einstein's "miracle year?"
   –1800
   –1905
   –2000

5 In the equation $E = mc^2$, c is ____.
   – an atom
   – speed of light
   – sound

6. Einstein won the Nobel Prize in:
   –Biology
   –Chemistry
   –Physics

Answers:

1. 1879
2. Ulm, Germany
3. Patent Office
4. 1905
5. Speed of light
6. Physics

What does it mean?

E = Energy
Energy makes things happen, such as making objects move or get hotter. Energy often changes from one form to another. Energy comes in many forms such as heat or light.

c^2 = the speed of light squared.
The speed of light is 670 million miles per hour or mph. That's a big number. Why c? It comes from the Latin word "celeritas," which means swiftness.

m = mass
Mass is the amount of "stuff" an object has. Mass isn't connected to size. Same-sized things can have different masses. A brick has more mass than a box of tissues.

Lawrence Livermore National Laboratory

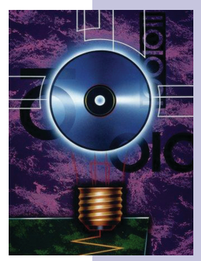
World Year of Physics 2005

It's all a matter of physics

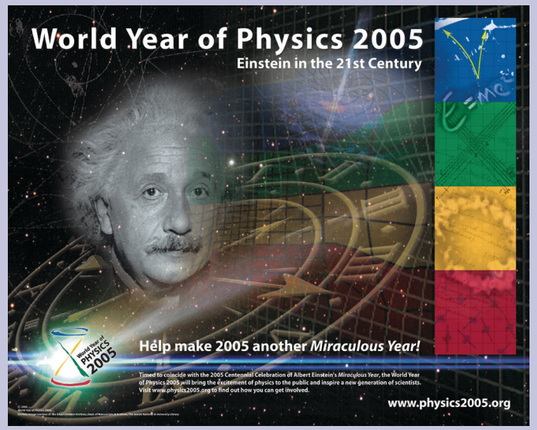
Physics is the science of matter, energy, space, and time. It is the basis of all physical sciences — like chemistry, material science and geology — and is important in such fields as biology, medicine, computing and even sports and electronics.

So you see, physics is pretty important to many areas of our lives.

Can you name some appliances or equipment that we all use every day that relate to physics? How about the electric light you turn on in the morning when you get up? What about the car that your parents drive? How about the CD player that you use to listen to music?



Principles of physics are everywhere. How about the baseball game you play after school or the major league game you watch on TV? Think of it. The type of ball used in any sport — baseball, basketball, football, golf or tennis — and its properties of weight, shape and composition, will affect the distance the ball can soar through the air. These are all physics principles. So, the next time you think "sports" — don't forget the physics connection. ◆



The year 2005 is an exciting year for science. This year has been designated the "World Year of Physics," by the international physics community and the United Nations.

The year-long celebration is designed to help raise worldwide awareness of physics and physical science. And, this year marks the 100th anniversary of the year that Albert Einstein wrote his important papers full of theories and discoveries that changed science forever, so much so that the year 1905 has been called "the miracle year."

This issue of "Super Science" takes a look at the World Year of Physics, the science of physics in general, the strong physics connection at the Livermore Lab, and Albert Einstein — the man, the scientist, the genius. ◆

Mind-boggling physics facts

Consider these physics facts:

- Look at the things around you: your pen, your desk, the trees outside. They are all made of atoms. The atoms are so tiny, it would take billions of them just to dot the 'i' in 'atomic.'
- The universe is so big that light from the most distant galaxies takes over 10 billion years to reach the earth.
- Einstein's studies ranged from the smallest scale (atoms and molecules) to the largest scale (the motion of the universe.)
- Einstein's Theory of Relativity proved that when an object has mass, it bends the space around it. You are bending space right now.
- Light is fast! It's the only thing that can reach the universal speed limit — 186,000 miles per second. Because it moves so quickly, light can seem to appear instantaneously. ◆