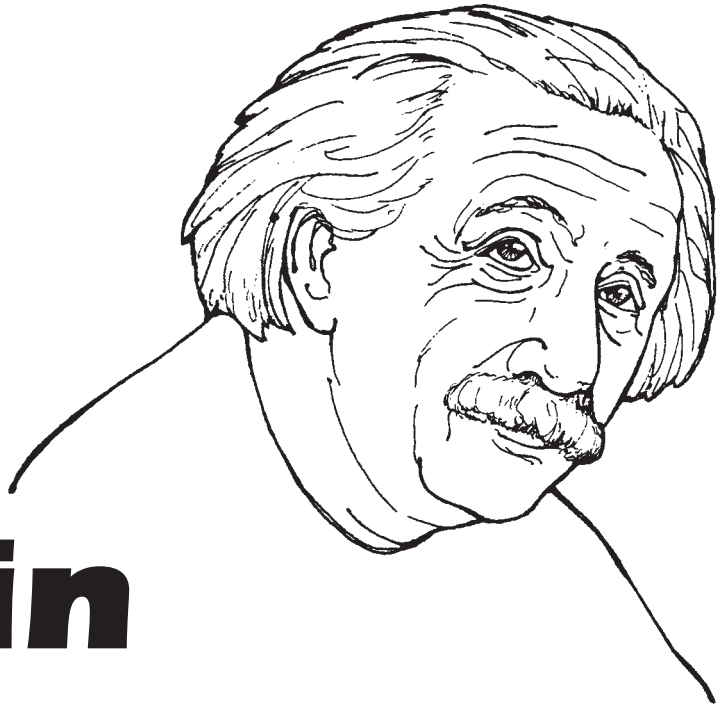


Albert Einstein



Physicist

As a student, Albert Einstein showed little intellectual promise. He was so slow to learn verbal skills that his teachers predicted he would never be successful at anything. Albert went on to the Swiss Polytechnic Institute in Zurich, Switzerland where he was brilliant in math and physics. However, he refused to study anything else.

Nine years later, in 1905, Albert wrote five papers describing his own ideas about math and physics. Three of these papers were of major importance: one that described the photoelectric effect, a second which worked out a mathematical analysis of Brownian motion, and a third outlining the theory of relativity. By 1916, Albert Einstein had completed work on his Special Theory of Relativity and General Theory of Relativity. These theories were concerned with physical properties such as mass, energy, time, and space. Previously, scientists held that these forces were separate and could not be changed, but Einstein proved that they were related. In 1921, he received the Nobel Prize for physics.

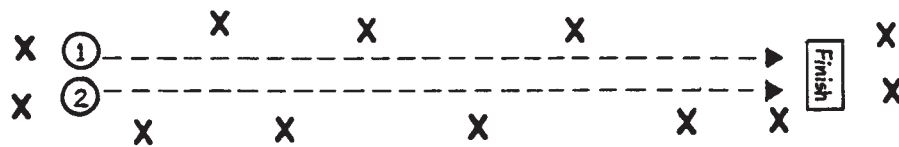
While Einstein was visiting the United States in 1930, Hitler came to power in Germany. Since he was a Jewish pacifist, Einstein decided not to return to his homeland. Instead he set up permanent residency in Princeton, New Jersey. He became a United States citizen in 1940. Einstein accepted a position at Princeton University where he continued to work on his theories until his death on April 15, 1955.

Einstein has been described as an absent-minded man, interested only in his work, classical music, and playing the violin. His ideas, so far ahead of their time, went mostly unproven during his lifetime. Since his birth on March 14, 1879, many new advances in technology have been made which are allowing scientists to rediscover this scientific genius.

Suggested Activities

1. **Frame of Reference.** Einstein's Theory of Relativity reflects the fact that all motion is measured relative to some observer. Furthermore, Einstein said that measurements of time depend on the frame of reference of the observer.

To help students understand the concept of frame of reference, stage an activity and position students randomly so the event is viewed from a variety of angles. For example, direct two students to run towards a finish line. Have some students view the race from the back, front, and sides of the runners. Afterwards, discuss what was seen from each point of view.



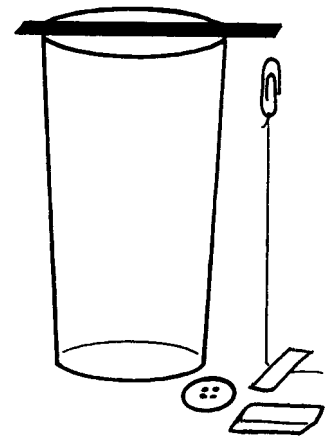
(The x's stand for students as they watch two runners race to the finish line.)

For a concise explanation of Einstein's theories, read David Fisher's *The Ideas of Einstein* (Holt, Rinehart and Winston, 1980).

2. **Defying Gravity.** Einstein's theories about gravity are both astounding and controversial. Here is an antigravity experiment that will amaze students.

Materials: strong bar magnet; clear glass (may be plastic); paper clips; thread; tape; assorted objects such as coins, plastic chips, paper, another paper clip, etc.

Directions: Place the glass on a flat surface; lay the magnet across the top of the mouth of the glass as shown. Attach thread to one end of a paper clip. Bring the paper clip up to the magnet and allow it to stay in that position. Loosely apply a piece of tape over the free end of the thread and onto the table. Pull on the free end of the tape until the paper clip is still attracted to the magnet yet leaves a space between the paper clip and the magnet. Firmly press the tape onto the table to keep the paper clip suspended. Predict what will happen when an object is placed in the space between the paper clip and the magnet. Experiment with a variety of objects.



Teacher References

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Student Reading

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 Wood, Robert W. *Physics for Kids: 49 Easy Experiments with Mechanics*. TAB Books, Inc., 1989.