

USC physicist authors new wave theory

From Staff Reports

In a revolutionary step in the world of quantum physics, a USC physicist is showing that the elusive waves of subatomic particles actually exist and could soon be observed in experiments.

Although wave theory has been a part of physics for more than 50 years, a glimpse of the actual wave function, which is associated with particles like electrons, would be remarkable. Most physicists have believed that the wave doesn't actually exist in a physical sense.

Yakir Aharonov, already well-known in physics for his Aharonov-Bohm Effect, has proposed a new interpretation of wave theory that describes subatomic particles and atoms as having an energy-like "intensity" that would be revealed and measured in experiments.

A professor at USC and Tel Aviv University, Aharonov has been a nominee for the Nobel Prize.

Up to now, wave theory has been a convenient way to deter-

mine the likelihood of an atomic particle being in a certain location at a particular time. Physicists express that likelihood with mathematical tables containing wavy lines that describe the varying probability of a particle being a particular place.

But, most physicists view the wave as something that's derived from the mathematics of probability, not as something that's real.

Aharonov and two colleagues, Jeeva Anandan of USC and Lev Vaidman of Tel Aviv University, now say the wave doesn't exist as a mathematical table of probabilities, but it exists in a real and physical sense.

"We are proposing an experiment where a single electron in an atom would be described as a single structure around the nucleus," Aharonov said. "It's an intensity surrounding the nucleus, and you can see the intensity of this wave."

A theoretical physicist, Aharonov also has proposed a set of experiments that he expects will soon be performed by experimental physicists to reveal the wave func-

tion.

"This is a very important step in the sense that it changes our description of quantum physics completely," Aharonov said. "We've shown that there is a new type of experiment, which we call a protective experiment, in which these waves can actually be seen existing in space. They're actual, physical waves you can observe."

The new interpretation also helps give deeper meaning to the wave aspect of particles like electrons, protons, photons and others. One puzzling aspect of physics has been that particles behave like a particle and a wave at the same time.

For example, if you shoot electrons toward one another in a lab under certain conditions, each particle will exhibit the wave characteristics of refraction and reflection.

Without this wave aspect, you would expect particles to bounce off one another like pool balls without showing any wave characteristics.

What's different about the experiments that Aharonov and his col-

leagues propose is that they look at a single particle and protect its wave function to keep it from collapsing.

Every previous method of looking at the wave function of a single atom and its particles collapsed the wave. After a collapse, what remains looks like a particle, and that supported the view that the wave function didn't exist in a physical sense.

Aharonov's protective experiment would measure the wave function of isolated particles with far less energy than previous attempts have used.

Together with Anandan, Aharonov has proposed showing the wave or the "intensity around the nucleus" through an experiment that would simultaneously shoot several probes at a particle. All of the probes would bounce off the wave or would be altered by its charge and energy, according to the two physicists. The probes would encounter higher charges and energy in the center of a wave than would be found at its edges.

Hepatitis B vaccine available to students

From Staff Reports

Many college students and young adults are at high risk for contracting hepatitis B, a serious sexually transmitted disease with no cure.

The good news is there is an effective vaccine available to protect against acquiring the virus.

The Thomson Student Health Center has just begun offering the vaccine to USC students and employees, and officials urge those at high risk to become vaccinated.

Hepatitis B is often referred to as a "silent disease" because symptoms may be similar to a stomach virus and often disappear without treatment, said Dr. James Turner, student health center director.

But 10 percent of those who contract hepatitis B will develop a chronic infection, he said. These carriers, who may not know they are infected, can spread the disease for decades. The persistent presence of the virus can lead to liver failure, cirrhosis of the liver and cancer.

"This disease is potentially very serious and life-threatening, and it is well-worth the expense to become vaccinated against it," Turner said.

The current vaccine, made synthetically rather than from human blood, was first made available in the late 1980s. Last year, public health groups and medical societies recommended that all infants receive the vaccine.

In the past six months, the National Centers for Disease Control and Prevention and the American College Health Association have recommended the vaccination for young adults

— the group most at risk — and campus health centers around the country have been urged to encourage college students to become vaccinated.

Statistics show that about 300,000 people in the United States acquire the hepatitis B virus each year and that about 5,000 people die from complications annually.

The disease is highly contagious through sexual contact. Hepatitis B is 100 more times infectious than HIV, the virus that causes AIDS, said Karen Shelly, USC's staff nurse in charge of hepatitis B training and immunization.

While anyone is susceptible to hepatitis B, young adults are at greater risk if they are sexually active, have unprotected sex or multiple partners, have another sexually transmitted disease, share needles for injecting drugs, or work in health care.

"Since many college students engage in high-risk sexual behavior, it's really important for them to become vaccinated," Shelly said.

The vaccine is given in the arm in three doses over a six-month period. It rarely produces side effects, except mild soreness in the arm, and it is not possible to contract hepatitis from the vaccine.

The vaccine is relatively expensive, however, and is not covered by most insurance plans. The vaccine costs \$142 at the USC student health center and may be paid in three increments (at the time of each shot).

For information on the hepatitis B vaccine, college students should call their campus health center. Others should contact the county health department in their area.

Fire at hotel kills 13, injures more than 20

By The Associated Press

Fire ripped through a Chicago residence hotel Tuesday, killing 13 people, including two who jumped to their deaths rather than face the flames and smoke. Other residents tied sheets together and climbed out upper floors.

When firefighters arrived, dozens of panicked residents were gathered at windows or dangled from them as wind-whipped flames rose 15 feet in the air above the roof and blazed out other windows.

Twenty people, including one firefighter, were taken to hospitals, and others were treated at the scene, authorities said.

"The smoke was so intense, I couldn't see the flames, and it was driving people out the windows,"

said 45-year-old resident Minnie Byrd, who was reading in her third-floor room when she smelled smoke from the early morning fire. "I thought I had to jump, too."

"I was praying real hard. I got one leg out the side and a fireman said, 'Wait! Wait!' and got the ladder to me."

Some of the roughly 130 residents registered at the four-story Paxton Hotel were not accounted for by Tuesday afternoon.

Rescuers used heavy equipment to search the rubble because the partially collapsed building was too dangerous to send searchers inside.

Victims were on the ground, some shouting in pain, while firefighters concentrated on rescuing people rather than fighting the blaze.

Robert Crowder, 61, said bars on the windows of his first-floor apartment prevented him from escaping.

"There was no way to get out," Crowder said. "So I had to yell until I could attract the attention of firemen. They came up with a saw to saw through the bars. By this time, flames were coming through the door, and smoke was curling under the door."

Some residents tied sheets together and climbed out upper floors while others jumped.

Authorities found 10 bodies inside the building. One person pulled from a window was later declared dead. Some people apparently were overcome by smoke as they slept. Several died after being trapped on upper floors and one body was found in a closet.

The fire was under investigation because it traveled quickly up two of three stairwells in the building, 14 miles north of the downtown Loop, blocking escape for dozens of people, said Chicago Fire Department spokesman Mike Cosgrove.

Hospitals reported treating most victims for burns and smoke inhalation while some suffered broken bones.

About 200 firefighters battled the blaze, the first five-alarm fire in Chicago in two years, Cosgrove said.

About 130 people were registered at the single-room occupancy hotel, and authorities said many apparently were driven from the scene to other residences hotels or shelters.



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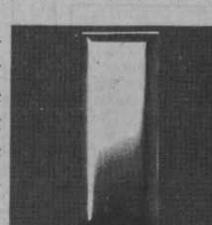
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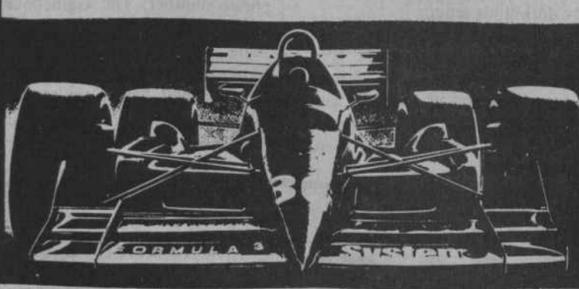


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