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A circulating beam of light as a way to time travel

Ronald Mallett's physics career grew from an early fascination with an offbeat concept

By Mary Kuhl

Ronald Mallett has wanted to travel in time ever since, as a boy, he first read "The Time Machine," by H. G. Wells. The science-fiction novel suggested to him the possibility of returning to the past to save his father, who died at 33, when young Ronald was only 10.

Now Dr. Mallett, a physicist at the University of Connecticut at Storrs, believes he has found a way to make time travel possible – on a circulating beam of light.

"I was devastated," Mallett says of the loss of his father. But he did not wallow in his grief – instead he used it to shape his life. His childhood fantasies fueled a distinguished career in physics.

Mallett happened upon the studies of Einstein and realized that he would have to "learn a lot more physics and a lot more math" before he would be able to understand the possibilities of time travel. He studied physics on both the undergraduate and graduate levels, and eventually earned a doctorate in physics from Pennsylvania State University in 1973.

Mallett has acquired scholarly fame recently as his theories on time travel have been published. Time is relative to space and velocity. This concept is difficult to grasp, but it has been supported by experiment. Traveling close to the speed of light will slow a clock, even an atomic clock. Likewise, a clock outside our atmosphere, far away from any gravitational pull, will run faster than a clock on earth. Therefore, if an artificial gravitational force were created, time travel would, in theory, be possible.

Mallett believes he has found a way to make it happen. By trapping light inside a photonic crystal, he can cause it to circulate. The energy of the circulating light will cause the space inside the circle to twist, causing a gravitational force.

This concept can be thought of as a spoon stirring a pot. The light is the spoon rotating around the inner rim of the pot. The space is the liquid being swirled by the spoon. As the space twists, it will coil the normally linear passage of time with it, spiraling the past, present, and future together into one continuous loop. It is this twisting of space and time that Mallett believes will make time travel possible.

Mallett and his partner at the University of Connecticut, Dr. Chandra Raychoudhuri, are seeking National Science Foundation funding for experiments that they hope will support their theories. Their first experiment will be to trap light in a crystal and observe the reaction of a neutron inside the circle.

Mallett will insert polarized neutrons (neutrons that all spin in one direction) into the center of the circulating light. If he sees a change in their spin he will know that space is indeed being twisted inside of the crystal.

Should this experiment prove successful, the team will apply for funding to conduct studies to see if time bending is evident inside the circle of light.

Dr. Mark Silverman at Trinity College in nearby Hartford has suggested a possible way to see evidence of time bending: Two identical samples of a radioactive substance would be prepared with identical half-lives. One would be introduced into the time machine circulating in the same direction as the light, the other in the opposite direction. If, at the end of the experiment, one sample had decayed further than the other, Mallett's theories of time travel would be supported.

Where the experiments will go from there is unclear. There is a vast difference between slowing the decay rate of a radioactive particle and sending a human back in time. Science aside, sending people through time creates philosophical issues as well as physical ones.

Consider the "Grandparent Paradox" in which a time traveler goes back in time and kills her grandparents, thus negating her entire existence. If she were never born, then she couldn't go back in time in the first place. Mallett explains paradoxes such as these with a parallel-universe theory. He believes that with every decision we make, another version of us makes the opposite decision and splits off into a parallel universe. Thus the time traveler was born in the universe where she did not kill her grandparents.

This is where the line between philosophy and physics seems to blur. "All of these things have their root in philosophy," says Mallett. But he explains that the difference between physics and philosophy is experiment. "All of these things would be philosophy without experimentation," he says. True, the parallel-universe theory has not been directly supported by experiment, but Mallett uses the Heisenberg Uncertainty Principle to explain why the parallel universe theory is probable.

Heisenberg's Uncertainty Principle says that we cannot predict both the position of an electron and its spin at any given moment. Without this principle, "the universe should have collapsed immediately after it was formed," says Mallett.

A hydrogen atom, one of the building blocks of our universe, consists of a proton and an electron. Since the proton and electron have opposite charges they should be attracted to each other, collide, and destroy the atom. But if that happened, we would know both the position of the electron (the point of impact with the proton) and its spin (none); therefore it is impossible for them to collide.

Similar to the Uncertainty Principle, quantum mechanics works on the theory that one can't make a definite prediction about anything that will happen next. Therefore the parallel-universe theory works well. What will happen next can't be predicted because in fact, everything happens next.