Parapsychology's File Drawer Problem

The Pokémon Panic of 1997

Common Myths of Children's Behavior

The Antinoüs Prophecies

Bertrand Russell and the Ideal of Critical Receptiveness

Reflections on a Quarter-Century of Skepticism
NEWS AND COMMENT

arizona.edu/~jscotti/NOT.faked and
piirlwww.lpl.arizona.edu/~scotti/NOT.fak
ed/FOX.html.

—James V. Scotti

James V. Scotti is an astronomer at the
Lunar & Planetary Laboratory at the
University of Arizona in Tucson.

Richard Wiseman
Tries to Tune into
Ever-Elusive ESP

On December 7, 2000, the “Museum of
the Unknown” in London, England,
hosted “The World’s Largest ESP
Experiment,” the brainchild of Richard
Wiseman. The museum was the venue
for a day-long series of ten half-hour
ESP trials. Members of the public were
asked to psychically transmit a series of
images they viewed on a projection
screen to a “receiver” who sat in the
“ganzfeld state” (a mode of sensory
isolation) 200 yards away in a nearby
building, 19 stories above street level.

Wiseman was leading what CNN.com
Europe described as “a sort of brain-wave
blitzkrieg,” getting crowds of “senders”
cooperate as psychic messengers. “By
boosting the signal, by having lots of
senders,” Wiseman told a British ITN
television reporter, “you’d expect that
maybe you can achieve spectacular
results and that’s what we’re trying to
find out today.”

In another experiment that day, while
thirty people sat in a room concentrating
on the projected images of gophers and
other assorted objects, a sequestered
receiver relaxes in the “ganzfeld” state: she
reclines with ping-pong ball hemispheres
taped to her eyes, listening to white noise
and bathing in soft, red light. Her goal is
to empty her mind for ten minutes, then
focus on any psychic impressions that
might be emanating from the people
back at the room in the museum.

If the battery of trials had yielded six
or more hits out of ten, Wiseman would
conclude that the results hint at some
phenomenon other than chance.

Speaking to a reporter from the ITN
Network in the United Kingdom,
Wiseman described the goals of the tests
he had set up:

“It’s very difficult to tell ESP from
chance. I mean, we could do a hun-
dred trials. They could all be hits. It
could still be chance. But what we’re
looking at is saying, ‘Well look, if it
goes to 100 to one, if it goes to 200 to
one, that doesn’t feel so much like
chance, that feels like something else
going on.’ And that’s really how we’re
measuring things.”

The results of the experiment—two
hits out of ten—failed to find any
evidence of a psychic message transmis-

—Kevin Christopher

Faster than Light?
Well, Yes and No

Perhaps you saw the headline from The
Sunday Times (London) on June 4,
2000: “Eureka! Scientists break speed of
light.” Or perhaps you caught mention
on radio or television about research by
Dr. Lijing Wang (of the NEC Research
Institute in New Jersey) involving viola-
tions of one of the most important rules
of physics, namely that nothing can
exceed the speed of light. Several other
“superluminal” experiments have made
the news this last year. What you won’t
evertheless is that the experiments don’t
disprove Einstein, and that causality
has not been violated.

Salon.com carried an excellent analy-
sis by Chris Colin (8/3/2000), who got
to the bottom of the Wang story. After
the initial excitement and confusion, it
had turned out that, “Far from challeng-
ing fundamental rules of nature, the
team developed a method of manipulat-
ing the wavelengths of a beam of light,
thereby altering the way it arrives at its
destination. Because short wavelengths
become longer and long ones become
shorter, the natural fanning outward
that marks a light pulse is eliminated;
consequently the shape of the pulse at
its destination appears the same as at its
origin. This effect, called anomalous dis-

In light of what the Wang experi-
ment did—and didn’t—show it’s amusing
to note the reaction of physicist Russ
Humphreys, a young-Earth creationist
from New Mexico. Humphreys wrote
on the new “speed of light” experiments
for the Answers in Genesis web site
(www.answersingenesis.org), focusing
on Wang’s article in the journal Nature
(Vol. 406, pp. 277–279). Humphreys
wrote “The most puzzling thing to me is
how the authors appear to deny the
obvious implications of their data. They
imply that their results do not suggest
that information could be transmitted
faster than the speed of light in vacuum,
and yet the nearly-now data in their fig-
ure 4 says [sic] just the opposite.”
Humphreys goes on to say “The newspa-
pers actually got that right point right. This
raises the possibility of transmitting
information “backwards” in time. That
would be astonishing!” In other words,
creation physicist Humphreys, like the
Times, completely misunderstood the
Wang research. Causality violation
wouldn’t bother Humphreys anyway; he
also writes “… for millennia the Bible
has been transmitting detailed informa-
tion to us about the future. I haven’t
noticed the world collapsing into non-
causal chaos quite yet!”

Recently, New Mexicans for Science
and Reason (NMSR) heard Dr.
Mohammed Mojahedi, of the University
of New Mexico Physics Department,
speaking on his “superluminal” research.
Mojahedi works at the University of New
Mexico’s Center for High Tech Materials
(CHTM), and his group’s fascinating
experiment was reported in the October
2000 issue of Physical Review E. In
Mojahedi’s work, pulses have been mea-
sured as traveling faster than the speed of
light in vacuum, some 300 million
meters per second.

In Mojahedi’s experiment, a beam of
microwaves was split into two, and the path lengths for the two beams calibrated. Then, a special array of plastic window panes was inserted into one of the beams. One might expect that the array of windows might slow down the pulse, delaying the arrival of that beam. But just the opposite happened. Mojahedi’s group consistently measured the window-path beam’s main pulse as arriving half of a billionth of a second before the pulse from the vacuum-path beam; for the small distances involved on the lab table, this amounted to a speed of 2.38 times the speed of light!

The effect is due to quantum tunneling effects in the window materials, dielectric photonic crystals. Mojahedi exploited a curious property called Evanescent Mode Propagation to achieve his surprising results.

But how surprising were the results? Was Einstein causality violated? Mojahedi said “No.” The faster-than-light-speed (“superluminal”) propagation was observed only for the main part of the pulse signal. This is the large-amplitude part of the pulse that is easy to measure. It’s much harder to measure the very beginning of the signal—the “forerunner” or “precursor”—because those signals have very small amplitudes. Yet the forerunner signals are the ones that obey the cosmic speed limit of the universe, the speed of light.

Mojahedi used an analogy involving race cars. The forerunner signals correspond to the sharp front edge of the race cars, while the main section of the race cars, containing the driver, correspond to the main pulse of the signals. In both the “normal” and “superluminal” paths, the forerunner signals arrive at the same time—both travel at the speed of light, no faster. (See points labeled A and A’ on the diagrams.) However, the main pulse is accelerated in the photonic crystals, with the result that it arrives earlier in the superluminal path (going through the special windows) than through the vacuum path. (See points labeled B and B’ on the diagrams.)

The figure shows signals like the ones Mojahedi’s group measured. The Sommerfeld forerunner signals arrive at the same time for both the normal path (A, top) and “superluminal” path (A’, bottom). The Brilloin forerunners arrive next, with the superluminal path’s signal winning that race by a small amount. The main envelope of the superluminal pulse arrives earlier (B’) than the envelope for the normal pulse (B). And so the velocity of the forerunner pulse does not exceed that of light, but the “group velocity” (for the main pulse envelope) does.

Mojahedi described how his work challenges some of the earlier thinking in this field, such as comments by Borne and Wolfe, and Brilloin, that superluminal group velocities had no physical significance or meaning. Does this work suggest that faster-than-light communications might be possible?

Unfortunately, no. While the superluminal pulse (B’) might arrive before its vacuum counterpart (B), it will never precede the arrival of its precursor (A’). That would be like the driver of the race car reaching a point before the leading edge of the car does. However, the work may hold promise for speeding up detection of pulses in applications such as computing.

With other interesting experiments being conducted, such as slowing light down to a crawl inside a special medium, the speed of light continues to be an entertaining subject. Rumors of the demise of Einstein and causality are still a bit premature.

—David Thomas

Dave Thomas, a physicist, is president of the New Mexicans for Science and Reason and a SKEPTICAL INQUIRER consulting editor.