

The Interferometry Puzzle

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In August 2010 I posted a short paper on Victor Demjanov¹, a Soviet scientist who has recently reported earlier experimental work on Michelson-type interferometry. This work claims to have found a significant shift even for Michelson's experiments, once certain properties of the environmental media are taken into account. The error I wished to point to in Demjanov's findings was his inclusion of *length contraction* in the calculations he does.

The history of physics is closely associated with confusion on this point. Michelson's experiments - particularly the famous Michelson-Morley experiment - were conducted to verify the existence of the ether. Michelson finally pronounced that the experiments had failed to achieve such verification. Refusing to accept this, the Dutch mathematician and physicist Antoon Lorentz proposed an *alternative* solution to save the ether theory, *length contraction*.

Then came Einstein who, seeing no need for the ether, simply dismissed it - but kept *length contraction*, despite the fact that the only reason for its existence in the first place was to verify the ether theory!

Then came Demjanov, who claimed by contrast that the Michelson results were *not* zero results, but did give rise to significant shift. This, in the context of Michelson's theory, also meant that they confirmed the existence of the ether. The fact that this claim makes both the derivation of *length contraction* and the need for it redundant, however, went unnoticed by Demjanov.

In the meantime I have also come across a paper written by Professor Reginald T. Cahill of Flinders University, Adelaide, Australia which is, in many respects, similar to the works of Demjanov.

Reading Professor Cahill's paper² was no easy task, not least because of his preference for the use of terms like *dynamical 3-space* (different from the "older dualistic space and aether ideas ... only a dynamical 3-space, which at a small scale is a quantum foam system without dimensions and described by fractal or nested homotopic mappings"), *light speed anisotropy* (various values for the speed of light when measured along axes

¹ *Demjanov's Error*, Rothwell Bronrowan, General Science Journal, 15.08.10

² *Combining NASA/JPL One-Way Optical-Fiber Light-Speed Data with Spacecraft Earth-Flyby Doppler-Shift to Characterise 3-Space Flow*, Reginald T. Cahill, PROGRESS IN PHYSICS, October 2009, pp 50-64

in different directions), *spacetime ontology* (aspects of existence and abstract entities permissible in a language with respect to spacetime), etc.

What struck me first was that, like Demjanov, Cahill also argued that Michelson's work had given rise to a non-zero result, thereby confirming the ether theory - though he also retained *length contraction*, including it in his calculations.

All puzzling enough. But the puzzle continues.

On the basis of these similarities I felt sure that they must have worked together at some time in the past. A quick search in the Internet, however, suggested that this was not the case. To confirm my impression I also took a look at a number of other works by Professor Cahill, only to find that - on my check - he makes no mention whatsoever of Demjanov, even in his latter works.

This is actually further confirmed in the Cahill text from 2009 referenced here, in which the professor claims that the design flaw due to which the early and vacuum-type Michelson experiments failed to gain better results (i.e. the refractive index of the media used) was first discovered in 2002, whereas Demjanov claims to have made this discovery in the late 1960s or early 1970s.

Returning briefly to *length contraction*, Professor Cahill even claims that it was because Michelson was unaware of this concept at the time of his experiments, that these were thought to have failed, and he goes on to say: "Indeed the null results from the resonant vacuum cavities experiments, in comparison with their gas-mode versions, gives explicit proof of the reality of the contraction effect."

To explain this quickly, Professor Cahill had conducted interferometry experiments in various environments, including a vacuum environment. Whereas in most of these environments a significant shift was recorded, no shift was recorded in a vacuum.

Michelson's initial experiments were conducted in air. Because Michelson thought that these experiments had failed, however, he claimed he had obtained a zero result - which was later fully compensated for by the Lorentz theory of *length contraction*.³

This interpretation by Professor Cahill is a completely new one: we now have him claiming that the zero results recorded in a vacuum constitute *proof* of length contraction!⁴

As already suggested in my paper on Demjanov, there is a much more obvious and more interesting explanation of the zero results obtained in a vacuum: these indicate

³ For an explanation as to why length contraction could never be a solution to the Michelson-Morley result anyway, see *Faults in Michelson-Morley*, Rothwell Bronrowan, General Science Journal, 20.05.10.

⁴ Professor Cahill is indeed quick to claim that length contraction has been proven to exist. Now we know what he means by this.

that, in a vacuum as in space, there are no light waves to be found; which in turn indicates⁵ that there is no ether.

Professor Cahill, by contrast, *explains* the absence of any waves in a vacuum as being due to a "subtle cancellation effect", i.e. Fresnel drag and length contraction exactly cancel each other out (aspects also considered by Demjanov, incidentally).

Professor Cahill believes that these interferometer experiments prove the existence of the ether, which is why he has no problem in speaking, for example, of EM (electromagnetic) waves in a spacetime context. On the other hand, use of spacetime formalism, he claims, is responsible for "an unexplained earth-flyby Doppler shift anomaly," because such formalism requires the speed of EM waves to be constant. Or in other words, applying special relativity theory does not give the desired Doppler-shift results in connection with earth flybys, but Professor Cahill has developed and applies a subsequent mathematical technique, after which the resulting Doppler shift does comply, *and* supports his dynamic 3-space theory!

He then goes on to explain that combining the data from two high-precision experiments - a one-way speed of light experiment using optical fibres, and spacecraft earth flyby Doppler shift data - gives the "solar-system galactic 3-space average speed [for the earth] of 486 km/s (as compared to a maximum speed of around 480 km/s allegedly discovered by Demjanov and calculated by him to be as much as 500 km/s).

Professor Cahill also claims that NASA data enables independent calibration of detectors for use in light speed anisotropy experiments and related gravitational wave detectors, these waves being turbulence effects in flowing 3-space essentially due to gravitational waves.

Now to the best of my knowledge the search for gravitational waves has meanwhile been going on for many years - at very high costs - without any successful detection. But Professor Cahill knows better here, claiming that such waves were also apparent in the data obtained in the Michelson-Morley experiment (1887). There was a time when scientists waited for confirmation of a theory before employing it to develop further theories. Those days are apparently now a thing of the past.

Michelson believed his results to be inadequate to justify his theory and pronounced his experiments to have failed. Professor Cahill, as already said, knows better. With the correct mathematics applied to his 3-space concept, together with adjusted length contraction and adjusted Doppler shift - and quite a lot more - we at last have *the* solution.

Or put another way, after pronouncing the Michelson-Morley experiment a success, the results allegedly obtained by the experiment for the earth's motion are simply "mathed" from 11-12 km/s to 486 km/s.

⁵ since the definition of the ether is something like, "a media in space in which light can travel in wave form".

Professor Cahill indeed gives the impression of being an infallible mathematician. However, looking at an ether website under the title "detecting aether", in which the first two short reports relate to works by Demjanov and by Cahill & Kitto⁶, I found an approving assessment of Demjanov's work, whereas the following was said of the work by Cahill & Kitto, "Processing the experimental observations with their model $c/n \pm v$ (that is by and large incorrect even in the sign!) ...", i.e. not everyone is convinced.

The professor's article, on the other hand, takes account of many aspects not dealt with by Demjanov:

- quantum foam
- galactic flows
- flows caused by the supermassive black hole at the galactic centre
- flows associated with local galactic cluster
- inflow caused by the sun
- inflow associated with the earth
- turbulence due essentially to gravitational waves
- clock-slowness effects
- cosmic microwave background

All important aspects, one assumes, since they would otherwise hardly have been mentioned.

But this raises yet another puzzling question.

Why, when so much more has been meaningfully taken into account, is the result for the velocity of the earth obtained by Professor Cahill almost exactly the same as that allegedly derived by Victor Demjanov?

⁶ *Michelson-Morley experiments revisited ...*, R. T. Cahill and K. Kitto, *Apeiron*, **10**, No. 2, 104-117 (2003)