

Demjanov's Error

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Victor Demjanov is a Soviet scientist at the Ushakov State Marine Academy in Novorossiysk, Russia. In the current year, 2010, he has published a number of papers on interferometry¹, these relating in particular to the Michelson-Morley experiment. The papers refer back to experimental discoveries allegedly made by him in the period 1968 - 1975. General publication at an earlier date, he writes, was not possible.

Demjanov claims to have found the fault that led to the "negative" (or zero) results obtained by Michelson (1881), Michelson-Morley (1887) and Miller (1926), to have corrected this fault and to have thereupon

- 1) verified the existence of the ether; and
- 2) obtained a new - far higher - value for the velocity of the earth in space.

I came across Demjanov and his work in early August 2010. At first I was very taken with his claims, but on reading them more closely the first errors and contradictions soon became apparent.

This paper addresses, in particular, one of these errors.

But first let's take a bit of steam out of the above claims. When Demjanov speaks of verifying the existence of the ether, all he really means is that he has obtained a level of shift of the magnitude sought by Michelson in the *latter's* attempts to verify the ether. In other words, we can rephrase the first of the above claims as stating that Demjanov has:

- 1) derived a level of shift in the bands of light that Michelson would have accepted as being a significant result for his experiments.²

As for the second claim, this is a result based not on the orbital velocity of the earth around the sun, as was Michelson's result, but on the velocity of the earth around the galaxy! In other words, the implied comparison cannot be upheld.

¹ *What and how does a Michelson interferometer measure?*, aeXiv: 1003.2899v2 [physics.gen.ph], and, *Michelson-type interferometer operating at effects of first order with respect to v/c*, viXra:1007.0038

² Shortly we will make another, very important point relating to Demjanov and the ether.

So what *did* Demjanov actually discover? Here is a numbered list of some of the claims made by him (since his English is often difficult to follow, I "quote" in my own words):

- 1) In general:
 - 1a) he claims to have proved, in the years 1968-1975, that interference rings really do exist
 - 1b) by reproducing the 1881, 1887 and 1926 experiments and results,
 - 1c) this work being "unexpectedly suspended" in 1974.

- 2) In the process he soon discovered:
 - 2a) that no shift in the interference fringes is recorded in a vacuum,
 - 2b) and that it is therefore only natural that experiments conducted in a vacuum lead to "zero" fringe shifts.

- 3) He investigates
 - 3a) air, as the "light carrier" for the 1881, 1887 and 1926 experiments,
 - 3b) adding that failure to take account of the dielectric permittivity of air (ϵ) resulted in a hundred-fold underreporting of the velocity of the "ether wind", and goes on to claim that
 - 3c) as ϵ approaches 2, the interferometer loses its sensitivity to the "ether wind",
 - 3d) as is also the case when ϵ approaches 1 [from above³].

- 4) He claims:
 - 4a) that shift only occurs when light carriers have a refractive index⁴ (n) that is greater than one ($n > 1$),
 - 4b) that the Michelson interferometer is only sensitive to ether wind for a refractive index of $n > 1$,
 - 4c) and that he has examined refractive indices from $1 < n < 1.8$.

- 5) He states:
 - 5a) that the amplitude of the shifts must exceed the noise level many times over, and
 - 5b) that his experiments show that a signal/noise ratio of more than 10 can be reliably achieved.

- 6) He calculates:
 - 6a) the velocity of the earth as being several hundred km/s, namely
 - 6b) 140 - 480 km/s,
 - 6c) mentioning that, if Michelson had recognized this in 1881 (e.g. ~ 300 km/s as compared to ~ 30 km/s), he would have obtained an estimate of not 0.04 bandwidths, but of 4.0 bandwidths, i.e. a fringe shift of 4 bandwidths.

³ [my addition]

⁴ = *index of refraction*: the ratio of the velocity of light, or other radiation, in the first of two media, to its velocity in the second as it passes from one into the other, the first medium usually being taken to be a vacuum. Notice that $n = \sqrt{\epsilon_r} = \sqrt{\epsilon/\epsilon_0}$, where ϵ = dielectric permittivity [3b], ϵ_r = relative permittivity and ϵ_0 = electric permittivity of free space.

Let's begin by taking a positive look at Demjanov's work.

His confirmation of the existence of interference rings in his reproduction of the 1881, 1887 and 1926 experiments [1a + 1b] serves to further verify Michelson's theoretical approach.

His discovery that no interference fringes can be detected for light in a vacuum [2a + 2b] counters claims that such attempts a) represent an improvement in the experimental conditions, and b) verify Michelson's zero result. This discovery also lends strength to the argument that, in space, light behaves as particles, whereas only in other media (air, water, etc.) it behaves as waves. *And* it actually effectively disproves the ether theory!⁵

His claim that Michelson's failure to take proper account of the dielectric permittivity of air resulted in a hundred-fold underreporting of the velocity of the "ether wind" [3b] more than suggests a non-negative result for even the 1881 experiment. If verifiable, this would be quite a sensation!

His findings on refractive index, in connection with the Michelson interferometer [4a-4c], are important in that they give an indication of how to obtain better results with other media than air (e.g. water).

His underlining the importance of the ratio of the amplitude of the signal to the "noise" in the experimental system [5a + 5b] serves a) to explain why Michelson's results were so difficult to distinguish, and b) to affirm that improvements in the system - or in "filtering out" the noise - can overcome this difficulty.

And given his above-mentioned experimental successes, it is not difficult to accept Demjanov's findings when it comes to identifying the velocity of the earth in space [6a + 6b] as being of the order of 480 km/s, i.e. of approaching 500 km/s.

All in all, quite an impressive achievement!

Things are obviously not quite as straightforward, however, as they have been depicted here.

Throughout his papers Demjanov worries about the possibility that others, in attempting to repeat his experiments, might arrive at the wrong conclusions and even come to believe that they have verified a zero result!

⁵ This point is perhaps too important for a footnote, but the argument goes as follows. The ether, as conceived by Lorentz and others, was a media through which light could travel in waves. This media was omnipresent. It was present in space, and it was present in a vacuum, the nearest thing on earth to space. No ether = no waves = no shift. So in demonstrating that no shift can be measured in a vacuum, Demjanov is implying that it cannot be measured in space, which in turn implies that there are neither light waves *nor ether* in a vacuum, or in space.

He warns that there are many pitfalls and offers his help to anyone wishing to repeat such experiments. He even suggests that it might be more worthwhile simply not to repeat the old experiments, but to concentrate on new methods.

It remains to be seen, therefore, whether others will indeed be able to verify his claims.

But now to the error we wish to address.

The first thing to be said in this connection is that, when it comes to relativity, Demjanov seem uncertain of quite where he stands.

At one point he criticises relativists for supporting the belief that Michelson's findings represent a "negative" - or zero - result. The reason for this belief, of course, is the associated conviction that, without such a zero result, the very basis of relativity would be suspect.

Those who need such a zero result are obviously also contra "shift".

On the other hand Demjanov appears to want to appease supporters of relativity by giving assurances that, in his calculations, he has integrated such aspects as *length contraction*⁶, the *relativistic Lorentz factor* and the *relativistic Doppler effect*. He also states that it was important to do so.

Now, for someone whose main field of work is that of the experiment that gave rise to so many of the foundations of relativity, Demjanov should know:

The only reason for initially postulating *length contraction* was the zero result!!!⁷

So on what basis can he claim to have integrated this in his equations, which themselves give rise to a non-zero result even without it? This makes no sense!

It's not as though he is claiming that it is this integration that makes the result "non-zero". Quite the contrary, in fact. Demjanov's believes that Michelson's experiments themselves gave non-zero results, without any need for *length contraction*!

This is a contradiction he will have to resolve.

And whichever way he argues, he will find it difficult to retain his "shift" *and* his belief in relativity.

⁶ He calls it "Lorentz contraction".

⁷ This applies to both Lorentz and FitzGerald.