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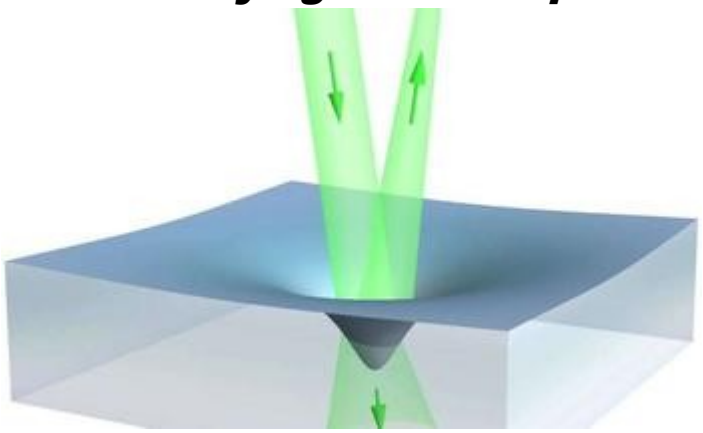
The Pushing Force of Light

and why light cannot pull



by Miles Mathis

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On June 2, Physorg published an announcement of mainstream experiments in China and Israel that confirmed the pushing ability of light. The paper itself is in the *New Journal of Physics* (and it is open access at iopscience.org). Since I am more interested in the mainstream interpretation of this experiment for the moment rather than the actual results, we will start by studying the Physorg announcement.

As usual, the announcement is mostly misdirection. The bulk of the article concerns the old disagreement between Hermann Minkowski and Max Abraham about whether light should push or pull on a medium. I will show this disagreement is manufactured, so why are they manufacturing it? They are manufacturing this disagreement to keep you away from more important questions. This experimental confirmation of the pushing ability of light blows decades of mainstream theory, but they don't wish to admit that. Because light has now been confirmed to have pressure, most important mainstream equations have to be rewritten from the ground up, including all quantum equations and all equations of celestial mechanics. As I have shown in dozens of papers, the Lagrangian has to be rewritten to include this light pressure, which not only requires a rewrite of Newton's and Laplace's equations, it also requires a rewrite of the Schrodinger equation. The Schrodinger equation is based on the Hamiltonian, remember, which is based on the Lagrangian. Not only that, but since light pressure also confirms a non-zero radius for the photon, all the current gauge math is also blown. Nothing should stand.

But the mainstream doesn't wish to admit that, because they don't know *how* to rewrite all these equations. It is too much for them. So—in this announcement as in all other recent announcements—they just blow smoke. They report the findings as briefly as possible and then fail to inform you what these findings must mean for the future of physics. What they mean is a complete collapse of all the standard models.

If you don't know what I am talking about, you need to take the link above and study my addition to the equations of celestial mechanics, where I basically rewrite and expand the Lagrangian to include this ability of light to create both pressure and drag. In unifying the charge field with gravity, I was able to create a new unified field equation, one that I later realized looks a lot like the Lagrangian. But it has some important differences from the Lagrangian, including a degree of freedom in the field the Lagrangian lacks. In short, because charge is mediated by real photons and gravity isn't, the two fields don't scale to one another in the same way at all sizes. Size matters. As we go down to the size of the photon, the importance of that field rises—due to the real size of the real photon. As we go up to the size of stars and galaxies, the importance of gravity rises. Regarding the relative sizes of the fields, the mainstream already knows that, of course, but they have never included it in the field equations in the right way. Once I include it in the right way, the new term can be read as a drag coefficient in many problems, including the Galactic Rotation Problem.

I have shown that this addition to and correction to the Lagrangian also solves the Dark Matter problem in a simple way, by revealing to us that Dark Matter is really charge. It is the so-far unweighed and misunderstood light/charge spectrum, which is far more important than has ever been imagined.

I will be told that the light spectrum—even if it includes charge—cannot be as ubiquitous and powerful as I have claimed, since all these new experiments are showing is drag through a medium such as water. I will be told that light traveling through space can't show this drag because space is not a medium. There is nothing to push against. Not enough drag would be caused to explain the Galactic Rotation Problem, much less the problem of Dark Matter. But that has always been no more than an assumption, and it turns out it is a false assumption. It turns out that space is a lot less empty than we have thought, especially inside galaxies. We are coming to realize that in our own Solar System, where we have discovered not only a very strong Solar Wind, but also a system-wide field of heavy charge. That is to say, even when few ions are present, we have seen incredible resonances, perturbations, and other direct effects between bodies, unexplainable in terms of gravity. As it turns out, these resonances and other effects match my new equations perfectly, as do larger effects like the Galactic Rotation Problem. I have fit my equations and fields to a broad range of data, all the way up to the gigantic Dark Matter data holes, filling them with very little effort and fairly simple math.

To understand better exactly how this new admission of light's ability to push must affect the field equations—and how it intersects the Galactic Rotation Problem—you may wish to remind yourself that we don't even need to argue about how much pressure or drag light would create when moving through "empty" space. For the fact of the matter is, a galaxy is not empty space. Compared to the areas outside of galaxies, the areas inside galaxies are simply stiff with matter (including, of course, plasma). When the motion of light through a galaxy is considered, it is normally considered as taking place between stars and around them. But neither light nor charge moves *around* stars. In either case, it must move *through* them. And as it moves through them, the light will act as we are seeing light act in these new experiments. Only *moreso*. Light and charge recycling through stars will create real effects—effects that have never been incorporated into the field equations. If you don't wish to countenance light drag in space between stars, ask yourself how you can also write off as negligible this interaction of light and charge with stars and other dense matter in galaxies. Obviously, compared to areas of space outside galaxies, you cannot write it off. You have to include it in the equations. And you have to admit that it never *has* been included in the equations, which is why they have failed in so many high profile problems (see not only the Dark Matter problem, but the Vacuum Catastrophe).

Once you admit that, you also have to admit that this light drag must apply not just to light or charge recycled through stars, it must apply to light traveling through all other non-stellar matter in a galaxy,

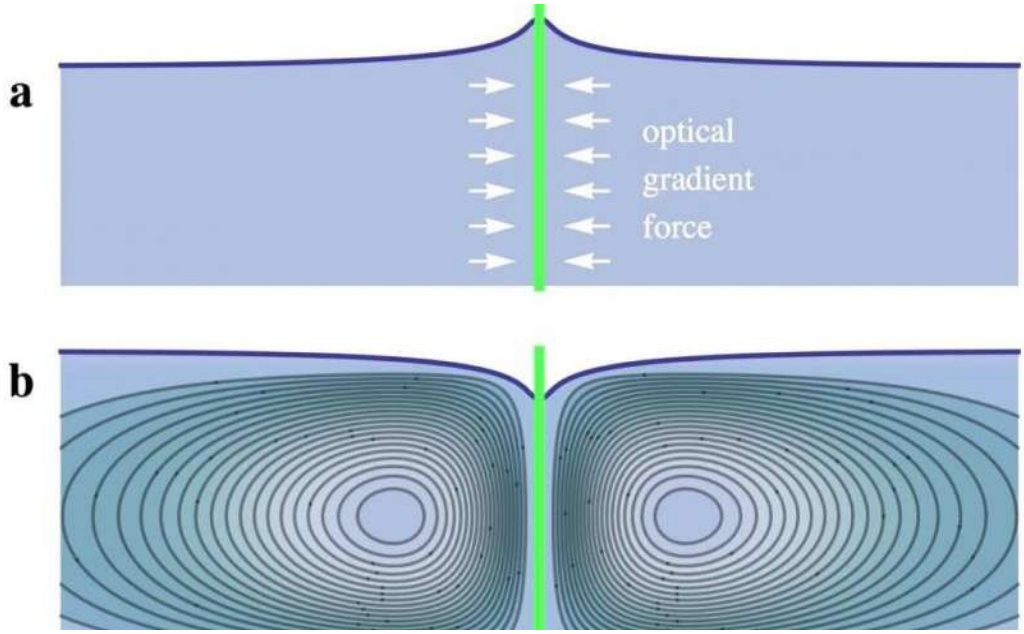
which, again, is far from negligible. In recent mainstream papers [see Clowe's bullet cluster papers, for example], we are told stellar matter is only 1-2% of a galaxy, which means above 98% is something other than stars. So even when light is moving around stars, it isn't moving through empty space. And once you admit that, you have to admit that the same light and charge must create the same drag on *any* matter in a galaxy, even free ions. Yes, in limited areas, that drag may be negligible, but summed over an entire galaxy, it must be far from negligible.

I will now be asked how this blows gauge math or confirms a photon radius. Well, how else is light pushing on anything? This is supposed to be physics we are talking about, remember, not magic. As with the photoelectric effect, the only way light can be pushing on matter is by hitting it physically. And a point particle can't hit anything. That being so, the photon must have some real radius.

I will be told this is a wave effect, but that is just more misdirection. Waves can't hit anything, since waves are just patterns in a field. Patterns in a field have to be *caused* by something, and that something is the motion of a particle. In this case, that something is the motion of a spinning photon, and the spin of the photon causes the appearance of waves. I have proven that a century of data, including "mysterious" superposition and entanglement data, can be explained simply as two or more stacked spins of a real photon. But in order for the theory or math to work, the photon has to have a real radius. Without a real radius, no stacking is possible. A point particle cannot spin. A spin radius of 0 isn't useful in *any* sort of math. Which is just one more reason all gauge math should be tossed.

Now, about the misdirection into Minkowski and Abraham. The announcement at Physorg tells us that in some situations light is pushing, and in others light is pulling. This, if true, would confirm both Minkowski and Abraham, we are told Unfortunately, not only is this dodge into the old argument continued misdirection, it is also false. Light cannot pull on anything, because pulls are non-mechanical. Light may cause the *appearance* of a pull in some situations, it is true, but no real pull is possible. How would light pull on a medium or on matter? To make this physical, light would have to throw out some sort of grappling hook to do so, and we have no indication that is happening (and lots of indication it isn't). Rigorously, there are no pulls in Nature: there are only field results that *look* like pulls.

To see what I mean by that, we have to study the diagram published with the new article.



The first part (a) is supposed to show a pulling force by light on a liquid surface. But of course that reading is naïve in the extreme, since it is quite easy to cause such a hump in a liquid without a pull. Rigorously, what we see is a **displacement** up near where the light beam enters. A displacement is not a pull. You can *see* a displacement, but you cannot see a pull. You can only *infer* a pull. I will show that this inference of a pull is a poor inference—poor and completely unnecessary.

Once again, all you need is spin. Let us propose that our light beam is made of photons that are all spinning. What is more, let us propose that our light is coherent, so that all the photons are spinning the same direction. If they then impact a medium that has any sort of structure, the structure of that medium will be determined by its internal charge field. That is what structure is: *charge field* structure. Since all liquids and solids have this structure, we can take for granted that our medium will also be charge coherent in some way. It may not be coherent in the same way or to the same degree as our laser, but it will exhibit a large amount of spin coherence no matter what. Just being in the Earth's charge field will give it this coherence, supposing it didn't have much to start with. These new experiments were run on the Earth, as far as I can tell, and the Earth's own charge field is moving up at all times, which will create spin coherence in any liquid. The smaller the container, the more usable coherence it will create.*

Beyond that pre-existing coherence, the incoming light beam will act to cohere matter in its immediate vicinity. It will do so by acting like a charge field itself. Light and charge are basically the same thing: charge is just light recycled through the nucleus and electron. And, indeed, the light in this experiment will do exactly that. We are told some is reflected and some transmitted, but by "transmitted," the mainstream just means light that passes through the material. They don't yet understand exactly *how* it is transmitted through the material. But my readers and I now know that light and charge is transmitted through the nucleus itself. In doing so, it may add coherence to the medium in this way. The streams of charge through the substance may align, and when looking at liquids, the probability is high they *will* align. Not being in a solid structure, they are able to turn to provide better charge paths, and, nothing else preventing them (such as ambient electrical or magnetic fields), they will do so.

Given all that, we then only have to look at the specific spins, and the meeting of those spins. If the light is spinning "left", for example, while the ions in the liquid are also spinning left, then at the light/matter boundary we would expect a spin match—one that would cohere any interaction. [It may help to think of the light and liquid as cogs. If the cogs meet edge to edge in one way, we get augmented motion in one direction. If the cogs meet the opposite way, we get motion in the other direction.] Since the spins match and the light is moving down, any matter the light interacts with physically will also be pulled down with it. This gives the appearance of a push, since the liquid would then fall where the light entered. But if the spins are opposite, the reverse is true: the motion of light down causes a motion of the liquid *up*. In this case, we get a hump in the liquid with no real pull.

In both cases, the liquid is simply displaced by the light. But since a displacement is always rigorously a push, no pull ever takes place. In one case the liquid is displaced down and in one it is displaced up, but nothing like an attraction ever occurred.

As you begin to see, what we are witnessing here is one more analogue of magnetism. Magnetism is explained in a similar way. So we could call the effect of light here a magnetic effect. It would be better to call it a *sub*-magnetic effect, as I have shown in previous papers, since the effect concerns photons instead of ions. It is a *charge* effect, not an electrical or magnetic effect proper. But since all magnetic effects are the results of charge effects, the difference is sometimes a subtle one.

This is also an analogue of the attraction now known to be caused by blackbody radiation. In an article from just two years ago in the same magazine by the same author [Physorg, Lisa Zyga], it was reported that researchers in Innsbruck, Austria, had shown a pulling force by blackbodies. Since blackbody radiation is photons, not ions, we see a similar effect to what we are seeing when light pulls on a liquid. Although these authors and researchers are not making the connection—as far as I know—they should. The reason they don't is because the equations are different. In one, they use blackbody equations and the other they use Lorentz 4-vectors and so on, but you can see at a glance that the results are very similar. In a paper from 2013 addressing that research from Innsbruck, I showed that the effect is caused by the same basic mechanism: spinning photons. I predicted that either an attraction or a repulsion could be found with blackbodies, depending on how energy was fed into the blackbody and how it reacted with the ambient field. The mainstream doesn't yet know much about antiphotons, but it is possible to build a laser with either photons or antiphotons. For that matter, they could reverse the effect in these newer experiments as well, in the same way. I expect them to figure that out very soon.

Now, before we move into the next section, you should have already seen we have a lot of problems with this new paper, and the entire subject of photons it addresses. But I beg you to consider another basic problem, one that doesn't require much analysis. Simply ask yourself why it took a century to get data on this fairly simple question. Ask yourself why it took until the year 2015 for anyone to get around to shining a light on the surface of a liquid. Yes, in the past few years we have finally gotten some experiments showing a pull, but it took until this year for anyone to think of widening the beam a bit to show a push? How believable is that? It isn't that they didn't have machines capable of seeing the indentation, or of focusing the light. So how could it be that this is the first time mainstream physicists have noticed that light pushes on a surface? Remember, they are telling us in these announcements that this is a first. This is the first time Abraham's equations have been confirmed, we are told. Again, the title of the announcement at Physorg is "**Physicists make first observation of the pushing pressure of light".** How can that be?

We have been privy to many decades of debates and articles and mainstream propaganda on subjects like black holes and the first three second of the universe and dark matter and the twin paradox and so

on, but no one thought to shine a light on the surface of a liquid, to see what happened? You should find that very curious. We saw a similar thing recently when someone finally thought to put normal salt under high pressure to see what happened. As with this experiment on light, what happened is that we got data that contradicted all mainstream theory back to the 19th century. I suggest that is why you haven't seen simple experiments like these before, and why you continue to be assaulted with manufactured debates on theoretical entities like black holes. Mainstream physics is all about protectionism, and has been since at least the 1920's.

But back to the problem at hand. We now have evidence of both a push and a pull, and I have shown you it is a sub-magnetic effect, caused by spin. You will say, "Well, in that case, we can still say that both Minkowski and Abraham were correct. We have seen both effects in experiment, so both men are vindicated." No, anyone who says that is just continuing the long lie.

Let's start with Minkowski. I have shown many other ways Minkowski was wrong, so I don't feel like any protector of his. His star isn't one I need to polish. Remember, he didn't predict a pulling effect from light due to any mechanical analysis like I just did. He predicted it based on a lot of unnecessary juggling of Lorentz 4-vectors, as you can see by studying this recent paper from Changbiao Wang. A much briefer analysis can be seen at Wikipedia, and you really only have to read the second paragraph on the Abraham-Minkowski controversy to see the lay of the land:

> Both define the momentum of an electromagnetic field permeating matter. Abraham's equation suggests that in materials through which light travels more slowly, electromagnetic fields should have lower momentum, while Minkowski suggests it should have a greater momentum. "Using relativity, Feigel found that the Abraham definition accounts for the momentum of the electric and magnetic fields alone, while the Minkowski definition also takes into account the momentum of the material".[5] More recent work suggests that this characterization is incorrect.[6]

As you see, both men were trying to solve using old field equations—with or without Relativity—which is a pretty pathetic dodge. Although I believe in Relativity, the problem has absolutely nothing to do with Relativity. It has to do with straight mechanics. It also has to do with charge, so stripped down field equations won't work, with or without Relativity. But because they couldn't solve it with straight mechanics, both dodged into these dense Relativity equations—which is why the problem is still being bandied about today as more misdirection. Even more math has been piled on top of the original math by those who came after, to bury the obvious fact that none of the original math was to the point.

For proof of that bold assertion, just consider the fact that—using field equations—the answer must one or the other. Using the field equations, the momentum of the light should be either lower or higher. It cannot be both. You can't just run the equations one way to find one answer and run them upside down to find the other answer. [In fact, this is basically the argument of the paper linked just above, at scirp.org. The author (Wang) shows that both equations can't be right, since one of them must contradict the Lorentz 4-vector. Although he throws out the wrong one, he is basically correct in his first postulate: they both cannot be correct.] Relativity doesn't allow some sort of magnetic answer, does it? Relativity is based on the **gravity field**, and explicitly does not include E/M. So the very fact that we now have data for *both* Minkowski and Abraham must mean that they were *both* wrong.

Logically:

1. They can't both be right using the field equations.
2. Both used the field equations
3. We have data that confirms both of them.

Therefore, the problem cannot be solved using the field equations. **Therefore**, both men are wrong. Despite the confirming data, both men must be wrong. And all those who use field equations or Relativity to solve this are also wrong.

Even Wikipedia (sort of) admits that. Like many of the most recent experiments, these new experiments with light are causing the entire field to convulse. Physicists are being driven mad by all the contradictions they have to address daily. Just reread the last sentence at Wiki:

More recent work suggests that this characterization is incorrect.

You will say that just means Feigel's characterization is incorrect, but it should apply to the paragraph more generally. The characterization that is incorrect is the characterization of light moving through materials using the current equations. Those equations don't work because they are based on Lorentz 4-vectors or other math of the time that are themselves compromised. Although many of Einstein's equations and ideas are roughly correct, they have been badly misinterpreted and misapplied. I myself have shown that Minkowski was one of the worst at misapplying them.

Notice, for instance, that *neither* a lower *nor* a higher momentum for an electromagnetic field through a medium implies anything about that medium being pushed or pulled. You will say that by the law of equal and opposite reactions, if the medium acts on the light, the light must act on the medium; but by the current theories, that action on the medium can be dissipated in any number of ways. As just one example, photons could be absorbed by the medium, adding to its mass rather than its velocity. Momentum is mass times velocity, so if the transfer takes place in the mass variable, no velocity change need take place. Pushing and pulling of the medium implies motion, which is velocity. Therefore, you could have equal and opposite reactions, conservation of momentum, and no motion of the medium at all. The mainstream currently does stuff like this all the time, as when photons are absorbed and emitted in Raleigh scattering, or in thousands of other fudged answers. If all motion is being directly transferred here as motion, they need to tell us why it is transferred in one way when they need it to, and another when they need the opposite.

For another example, the medium could be heated by the light. This would be an energy transfer, instead of mass, but in either case no velocity change of the medium as a whole would be necessary. The velocities would all be internal. More overall heat (which is internal motion), but no motion of the medium as a whole.

Neither Minkowski's nor Abraham's solutions allow us to see why momentum or energy is transferred in the way or the direction that it is, so both are useless. They are useless because they are not unified field equations, and they take no account of charge interactions. The field equations are gravity equations, and none of these problems have anything to do with gravity. Since these problems concern light, they are charge problems, and charge problems cannot be solved with manipulated 4-vectors or with Relativity. As I have shown, they are best solved by throwing the Relativity field equations out and looking only at poolball mechanics and spin. In the current problem, we are looking at light impinging a stationary liquid, so how does Relativity come into it at all? Einstein invented Relativity

to apply to long distances and fast speeds, and we have nothing like that here. Yes, light is going very fast here, but Relativity doesn't even apply to light. See Einstein, Special Relativity proof, postulate 2. We should be able to solve this without Relativity at all. As you have seen, we don't need any 4-vectors, we just need spin mechanics and a real charge field.

That said, Abraham's basic equation for momentum is preferable to Minkowski's, if only because it follows logic in the variable assignments. Abraham finds that light moving through a medium has a lesser momentum. Since the overall speed of light is known to fall in a medium, that makes sense. Momentum is mass times velocity, and if the mass stays the same and the velocity falls, momentum must drop. Minkowski's basic equation—being upside down to that logic—has no hope of addressing any data. His equation is preferred only because it leads to "interesting" paradoxes, such as the possibility of a reactionless drive—which is still being pursued to this day via his asinine equation with the refractive index in the wrong place. But rather than see this as a mark for Minkowski, you should see it as a mark against. Any equation that leads to an "interesting paradox" like this is likely to be a bad equation. We have seen that with Einstein's equations that lead to the twin paradox (which Einstein never believed in), and the same sort of thing is happening here. Minkowski's bad equation is pointing at something from nothing, and that is simply because it is a contradiction from the start.

That small nod to Abraham aside, the truth is again on a third path. Neither the equations of Minkowski nor Abraham are useful or correct. Ignoring heat changes—as the current experiments are trying to do—the momentum of the light should *never* change. Richard Feynman solved these problems with path integrals, which was a step in the right direction. Although Feynman kept his solutions at the level of the math, his solution was pointing at the correct *mechanical* solution. The velocity of light through a medium only *appears* to change, and that only because its path has become longer. A longer path implies nothing about the momentum.

If we follow a single photon instead of some abstract beam or wavefront, we find that neither the mass nor the velocity changes in the medium. If neither the mass nor the velocity changes, the momentum cannot change. Momentum only appears to change because velocity is distance over time, and we are ignoring distance. We assume the light travels back to front in the medium just as it traveled outside the medium, so we assume a distance that isn't the real distance traveled. This throws off the velocity, which then throws of the momentum.

So the solution to this problem is to quit measuring momentum the way we do. We either have to figure out a way to track the real photons through the material, finding the length of an actual path (as I try to do in my nuclear diagrams); or we have to solve these greater field problems in another way, without manipulating naïve representations of momentum.

For instance, if we look at the Abraham momentum equation, we see the naivete in several places.

$p = hv/nc$

One, the refractive index n itself begs the question, since it is measured down from the time or the velocity. In other words, to measure the index of a given substance, we measure the time it takes for light to pass through a given width of the substance. We then represent that time as some slant, and that slant stands for the angle of refraction. But since we know light doesn't travel like that, that representation must be highly misleading.

You will say that we can see light being bent certain angles by given substances, such as water. Yes,

but again, that is misleading. That is exactly why we write the equations as we do, but that sort of refraction is limited to certain situations and substances, and is special. Besides, even in that special case, we aren't *seeing* the light pass through the substance. We aren't seeing the path itself. Obviously, we are seeing photons that are coming to our eyes, and the photons that are coming to our eyes can't also be following some straight slant through a substance. Yes, we must be seeing some sort of line of interaction, but nothing implies that our introduced light has to be moving right down that slant. In fact, *it can't be*, because if it were it would have dropped below c. There is no reason to assume any photon is actually slowing below c, and many reasons to assume none are. The mechanical assumption should be that each photon is always going c.

This reminds us of another problem with Minkowski's analysis. If the momentum of light rises in a medium, how does that rise occur? It can't take place in the velocity variable, since the velocity is already at c. The light can't be speeded up. That leaves only the mass variable. Is Minkowski suggesting the medium adds mass to each photon? Or do new photons from the medium join the existing beam, raising the total mass that way? If the medium added mass to each photon, the medium would have to lose mass or energy. We would expect light entering a medium to cool it, which is opposite to data. If new photons joined the beam, we would expect to see the beam increase in size and brightness. This is also opposite to data, since we seem to see beams dissipating. Nothing about Minkowski's equation makes any physical sense.

But let us return to my own analysis of momentum. If c cannot change, even in media, then we only have the mass of the photon to study. Why would interaction with a substance change the mass of any photon? You will remind me of my own theory, where photons can be spun up by fields into larger photons. If a photon stacks on another spin, it becomes more energetic, which is the same as an increase in mass equivalence.

Yes, that can happen and does happen, but there is no indication it is happening every time light passes through a normal liquid. Spin ups like this happen at energetic boundaries, like in the Solar Corona, a planetary ionosphere, or at the nuclear boundary of an energetic ion. A normal liquid doesn't have these energies, which is why light passing through water doesn't create X-rays or electrons or other spun-up particles. What we have here is just normal matter creating field densities that cause more deflections and more recyclings through the nuclei, which create longer paths. The longer path then reads as a slower velocity. Therefore, strictly speaking, light suffers no momentum changes at all, neither greater nor lesser, simply by entering a substance. Light can only enjoy a momentum change if it is spun up into a larger photon, but if that happens the energy for that spin-up has to come from the field in some way. If light were being spun up by water, the water would lose energy.

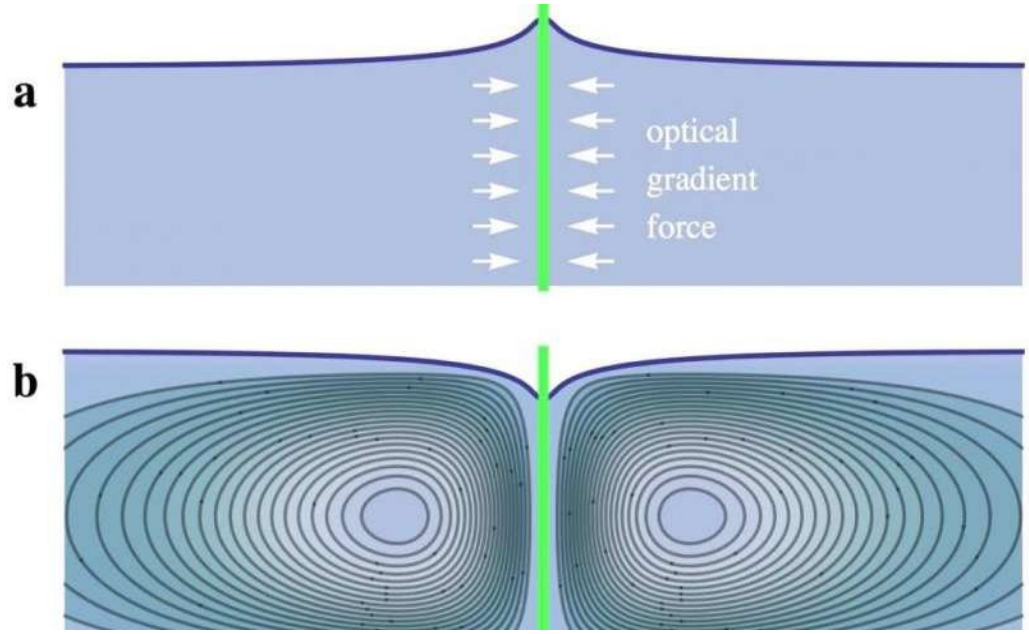
You will say, “Well, then turn that upside down. We know sunlight heats up water, so by your theory the light must be transferring energy to the water via spin *downs*. Wouldn't this create a loss of momentum?” It would, but again, this isn't usually what we are seeing when sunlight heats water. Just as spin-ups require extraordinary energies, so do spin-downs. The bulk of heating in water doesn't happen that way. It happens simply due to increased charge densities, or photon densities. If you hit any substance with more photons, then more photons will be *in* the substance at any time. With a lot of photons available to transfer spin energy, a substance can be heated without any one photon losing an entire spin level, you see.

You will say, “Still, to transfer energy into the substance, each photon has to lose some energy. That energy loss implies a momentum loss. So whether we are tracking individual photons or a larger wave packet, there must be *some* momentum loss.” Yes, that much is true. But notice how this differs from

mainstream theory: the momentum loss is due to an angular momentum loss on the spinning photon, not in the linear velocity of either the photon or the wave packet. And if we track any "electromagnetic field" through the substance, it will be impossible to separate the E/M field of the introduced light and the E/M field of the affected substance. Every loss to the original light will be transferred to charge already in the substance, and the charge already in the substance is *also* an electromagnetic field. The only way we could say the momentum of the light had fallen is to keep it separate from light already in the substance, and there is no possible way to do that.

Another difference between my theory and mainstream theory is that the momentum loss we just discussed is caused by the heating of the material. But as we have seen, the old equations of Minkowski and Abraham calculate momentum changes without including heat transfers or anything like that. The old momentum changes are simply outcomes of field equations. We see this very clearly when Relativity is applied to the problem, but it was true before that. The old equations predict momentum changes irrespective of heat or energy transfers. But without heat transfers, I would predict *no* momentum changes. The momentum changes could *only* occur with heat transfers. If we had only poolball deflections, of the sort that would cause overall motion of the substance, we would see no momentum changes at all. We would only see a redirection of the light. And in that case, the only motion we could hope to see would be a push. No pull could ever be caused by poolball or snooker mechanics. Have you ever seen a pull from a snooker ball? I haven't, but that doesn't stop one of the current researchers from trying to explain the current experiments with snooker balls (see below).

We also see the same sort of naivete in the frequency variable in the equation above. That stands for the frequency of the light outside the substance, so how are we going to measure the momentum inside the substance from the frequency outside? Again, the refractive index is expected to do all the work there, but the refractive index isn't telling us anything about the substance or the light. It is just a back-calculated constant. Since the path is unknown, we are just calculating in circles here. Such equations can tell us nothing about the mechanics. Since these equations are circular, they can't possibly allow anyone to predict anything about whether light will push or pull a surface. To predict that, you have to know or at least theorize something about the path of the light, and about its real interactions with the substance. Since the mainstream has never gotten down to doing that, they have no hope of explaining these new experiments. Just think about it, if the mainstream had any idea what was going on inside the substance, would they publish such ridiculous diagrams as the two above, where, in the first one, they explain a pull by an "optical gradient force" along a central line, or where in the second they explain the push as a setting into motion of the fluid in circles?



They actually try to tell us that (b) occurs when the light can push the liquid, and (a) occurs when light cannot put the liquid in motion (as when the light is too focused or when the liquid is too shallow). My guess is no one actually believes that, the researchers least of all. If (a) occurs when the light cannot put the liquid in motion, then how is it that the liquid moves upward? Is upward no longer a motion? None of this makes any sense. Shouldn't focusing light make it more powerful, not less? Shouldn't a shallow liquid be easier to put into motion than a deeper liquid? Go tap two containers of a liquid with your fingertip, one shallow and one deep, and see which one is set into greater motion. Why would light act differently than your fingertip? This entire pretend analysis is arrant nonsense.

Still, the question might be asked, "Why has it been easier to show an apparent pull than a push in experiments like these?" Once again, the mainstream has no answer, but I do. Since we are dealing with light being sent into a liquid, the easiest thing to do is put the liquid in some container and set the container on a table of some sort (or on a floor). If you do that, the liquid already has a field running through it even before you shine your light on it. What field? The charge field emitted by the Earth. This field is moving straight up in every lab on the Earth, and so it will be moving up in any given liquid. Well, since your liquid is sitting on a table or floor, the open surface will be the top surface, right? And so, the light will naturally be shone on this surface from above. In other words, the light will be moving *down*. With the charge field of the Earth moving up through the liquid, and the light moving down, the spins of the two fields will be opposite. As we just saw, this will cause the reverse-cog effect, which will cause the surface of the liquid to move in the opposite way the light is moving. We will have the appearance of a pull.

Conversely, to create a push, you would need to reverse this bias somehow. The easiest way would be to shine the light from below, but that encounters other problems, the greatest of which is that the lower surface is not as free to move as the upper surface. So instead, let us look at how the current researchers did it. They used a wider beam and a larger container. How would that that reverse the bias?

To show you, I will simplify by looking only at the wider beam. We are told the wavelength of the light was 5.3×10^{-7}m, and the width of the beam was 1.7×10^{-4}m. We are told this width was much

greater than the previous experiments showing a pull, so we already see the width is crucial. What is happening is that the effective beam width is exceeding the effective wavelength, so the light is no longer able to penetrate the surface cleanly (that is, with a single wavelength—or should I say wave*width*, in this case). The math is somewhat difficult, in that we have to look at the Gaussian laser they are using and the transverse wave involved, but I can greatly simplify the math for this purpose by either squaring the beam width or taking the squareroot of the wavelength, as so:

$\sqrt{}(5.3 \times 10^{-7}\text{m})/8 < (1.7 \times 10^{-4}\text{m})$
$9.1 \times 10^{-5}\text{m} < 1.7 \times 10^{-4}\text{m}$

That shows you—*very* roughly—how the numbers relate to one another in this problem, without getting into all the larger equations. If we continue to think of the light as spinning cogs, it tells us that our entering beam is no longer acting like one spinning cog. So we can no longer just imagine the light as a cog spinning left and field of the liquid as a cog spinning right. If fact, the Gaussian laser itself, used at this wavelength and beam width, is reversing the bias of the light relative to the liquid.

How? Well, the current researchers call it a flow pattern in the liquid, but it isn't a flow pattern. It is a *spin* pattern, and it is mainly created in the laser itself, before the light ever gets to the liquid. This spin pattern in the laser can then create a spin pattern in the liquid, but the spin pattern in the liquid is secondary and unimportant. It *causes* nothing. What causes the push on the upper surface in the liquid is the reverse bias in the laser.

The easiest way to think of it is again with spinning cogs. If our beam is one photon-spin wide, then the problem is simple, since we just look at the spin direction of that photon as it hits the surface of the liquid. But if the beam goes over one photon in width, how do we analyze the beam as it hits the surface? How do we find a spin direction? Well, obviously, if the beam is over one photon wide, more photons will try to fit on the beam front as they can.

So let's look at what happens if the beam becomes wide enough to allow one photon to fit on each side of our original photon. The three photons then exist edge-to-edge on the beam front, like three spinning cogs. *However*, those two new photons can't be spinning the same as the first one. If the first one was spinning left, the two to its sides must be spinning *right*. That is how cogs work, you know. So in order for those two photons to fit at the head of the beam, they have to flip. Since *they* are now on the outside edge of the beam, it is these right-photons whose spin we have to track relative to the charge spins in the liquid. Since we have already defined the spin of our liquid as right, and have now reversed the bias of our outer photons in the beam to right, we now have a spin match. This then causes the appearance of a push into the liquid.

That was a huge simplification, admittedly, but it is just this sort of explanation that is required to understand the mechanics here. Those who wish to do the full math will have to expand the simple equations I did above, calculating the wavelength relative to the beam width, while incorporating what I have shown them concerning spins. But before they do that, they would be well advised to study my other papers on the photon, showing how it expresses this wavelength with stacked spins. For instance, it not currently understand how the single photon can have such a high energy or take up so much space, given its tiny radius. My method of spin stacking begins to explain that.

But let's return to the mainstream analysis. We have seen them misdirecting again and again, and we see it even in the footnotes at Wikipedia. If we go back to the last sentence I quoted:

More recent work suggests that this characterization is incorrect.[6]

We find it has a footnote. The footnote says,

[6] Dacey, J. (9 January 2009). "Experiment resolves century-old optics mystery". *Physics World*. Retrieved 4 Mar 2010.

As you see, they are saying the same thing about that 2009 experiment that they are saying about the newer 2015 experiment. We are told the old Abraham-Minkowski problem has been "resolved." But not only is data in both directions *not* a resolution, it is a standard-model meltdown. They keep spinning positive what is horribly negative data for mainstream theories and equations. They try to convince you progress is being made, but none is. All the theories and equations are crashing into rubble. As I have just shown, the only resolution to come about is the resolution that both Minkowski and Abraham used the wrong equations, which is not much of a resolution. It means that not only did they not solve the problem, they didn't even address it properly. They didn't even define it in terms that allowed for any eventual resolution. In this way, both men have turned out to be further bricks in the wall. As long as new data continues to be discussed in terms of Minkowski and Abraham, no progress on the problem will ever be made.

To see more of this sort of misdirection, I send you back to our original announcement at Physorg. After trying to misdirect you into the Abraham-Minkowski problem, we get a long quote from Ulf Leonhardt, one of the authors of the new paper. He says,

"Imagine a snooker game," he explained. "The player kicks one ball and this ball kicks another one. In all these kicks, the momentum the player initially gives to the cue stick is setting things in motion. Light may kick materials as well, just like the snooker balls, but these kicks are minuscule. In some circumstances, however, the kicks of light make a dramatic appearance. One example is the tail of a comet. Johannes Kepler speculated a long time ago that comet tails are caused by light pushing material off the comets, because they always point away from the Sun; we know now that he was partly right (the rest of the pushing is done by the solar wind). The ability of setting mechanical objects into motion is called momentum. It is not the same as energy, but often closely related to it."

I doubt many readers found that quote helpful, since it is a mishmash of squishy thinking, poor definitions, and transparent misdirection. For instance, Leonhardt's definition of momentum isn't even correct. "The ability to set objects into motion" isn't momentum, it is force. Force sets them into motion, and once in motion, they have momentum. His linking of momentum and energy is also not helpful, since he brings it up but does nothing to clarify it. The reference to a comet is also squishy, since it clarifies nothing. Leonhardt talks like he is lecturing to children, but forgot his notes. He wanders all over the place, without seeming to have a point. But my guess is he does have a point: the wandering is not an accident, it is his type of misdirection. He knows down deep that these new experiments have destroyed all the standard models, but he can't admit that. To keep that off the table, he must dance around, dropping mentions of Kepler and comets and snooker balls and misdefinitions of momentum, to keep you properly confused. If he can make you as confused as he obviously is, you may forget to ask him all the questions I have posed above, demanding sensible answers.

We see this same confusion in his short paper at iopscience, which I will now briefly analyze. We saw above that the researchers completely ignore the ratio of wavelength to beam width, passing it by

without comment. Since they aren't addressing any spin or wave mechanics, there is no reason for them to look at that ratio, but that is where the gold is here. They likewise ignore any analysis of the Gaussian beam: either how it is created or how it is composed. Instead, we are misdirected in two long appendices first into a calculation of the depth of the indentation in the surface of the liquid, and second into a calculation of the interplay between optical forces and the mechanical response of the fluid. I hope you can see that neither calculation is of any interest in the question at hand, and that all the math is added to pad out a rather slender paper.

Personally, I had been expecting some math as to how the depth of the liquid could cause reverse results here, but although a lot of math is presented, none of it answers that question. We only get this in appendix B:

> Presumably, in this experiment (and possibly also in the experiment by Sakai *et al* [13]) the container was too shallow for developing the flow pattern described by equations ((B.4)–(B.8)). Instead, the fluid resorted to the trivial solution (B.3) that gives rise to the Minkowski pressure, as was observed in the experiment.

The authors have to use the word "presumably" there, because all the equations above that quote do not indicate anything along those lines. They show you the equations that *might* be used to prove that, but then do nothing to prove it. *For what reason* would the fluid resort to the trivial solution at one depth and not another? We don't even get the beginning of a theory. We just get some math plopped down and then the assurance that these experiments confirm both Minkowski and Abraham (which they do not and cannot).

But this confusion and misdirection was signaled even more strongly earlier, by this strange paragraph:

> Consensus has been reached on the meaning of the two principal momenta of light. Our derivation of equations (1) and (2) indicates that the Minkowski momentum corresponds to the wave, the Abraham momentum to the particle aspects of light [23]. Barnett [28] pointed out that the Minkowski momentum is the canonical, the Abraham momentum the kinetic momentum. From a geometrical perspective [29], the Minkowski momentum is the covariant and the Abraham momentum the contravariant momentum with respect to the geometry of light in media [30]. However, as Brillouin [31] wrote in 1925, 'it is not ultimately the density of momentum which matters, but rather the *flux of momentum*'.

That is paragraph 4 of the paper. To start with, no consensus has been reached, and we have seen that even at Wikipedia, which admits that Wang's paper at scirp.org has blown a big hole in Barnett's claim.** Beyond that, the authors' derivations indicates nothing of the sort about this split into wave and particle. How can the Minkowski momentum correspond to the wave and the Abraham momentum correspond to the particle, when the only difference is the position of the refractive index n? If you put it in the numerator, the equation becomes a wave equation?

$p = hvn/c$

While if you put it in the denominator, you have a particle equation?

$p = hv/nc$

You have to be kidding me!

Even more to the point, perhaps, is that the wave and particle characteristics *of the same light* cannot cause opposite reactions. Are they suggesting the wave of some light moves backwards to its own

particles? How could the wave cause a pull and the particle a push?

And let's study again Barnett's claim: that one momentum is canonical and the other is kinetic. Let's look at it without the commentary of Wang. Let's look at it just based on the definitions of canonical and kinetic. The canonical momentum is just the momentum conserved in charge situations, and it includes the charge term qA. As in

$p_c = mv + q\mathrm{A}$

But if Minkowski's momentum is canonical, shouldn't he have included the charge and the magnetic vector potential in his equation or proof? Here it is again:

$p = hvn/c$

Do you see any charge or magnetic variables there? I don't. And again, how exactly could making Minkowski's momentum canonical reverse its effect on the liquid? Adding the term qA doesn't reverse the overall direction of motion or force of a light beam, does it?

And the third claim is just as ridiculous as the first two: that one momentum is covariant and one contravariant. Hmmm. I didn't realize that the covariant momentum of light was a pulling force, while the contravariant momentum was a pushing force. You know why I didn't realize that: *because it isn't!* This is just "say anything" physics. Even if the light could be shown to have two different momenta with opposite force-carrying abilities, we would have to be shown why it exhibits one in one situation and one in another. Notice that the authors aren't getting anywhere near doing that.

You have to realize that covariant and contravariant are vector terms, and they have to be related to some base. If the momenta are covariant and contravariant, we have to ask "relative to what?" We are told "with respect to light in the media." But that is imprecise. The momenta have to be covariant or contravariant with respect to a stated parameter, not just "to light." So they should say "with respect to *the motion* of light in the media." But if we force them to put it that way, it means we are looking at the momentum of light in the media as our base. The Minkowski momentum is then covariant to that, and the Abraham momentum contravariant. See the problem? Both the Minkowski momentum and the Abraham momentum *already refer* to light in the medium. These are the increased or decreased momenta of our light after it has passed the upper surface. So I don't know what they are trying to say. I don't think *they know* what they are trying to say.

You will say they mean covariant or contravariant to charge in the medium, or E/M in the medium. But even that doesn't help, since if that is what they mean, they are just restating what we already know in fancier terms. They are saying that in the Minkowski equation, we have vectors in parallel, while with the Abraham equation, we have vectors anti-parallel. But we already knew that without any of these tensor terms, since with Minkowski the medium is supposed to be augmenting the momentum of the introduced light. To augment it, it would have to push it along in the direction it is already going. But the question remains, "*Why* would it be doing that, and *How*?" Restating this in vector terms tells us nothing. It is both misdirection and padding.

But it is even worse than that: if the Minkowski momentum is covariant to the charge vector already inside the medium, how on earth does that create a pull on the surface? If *both* vectors are down, how do we get motion up at the surface? You see that when we pull apart this mainstream jargon, it just doubles the problem. It doesn't solve it; it doubles it.

Finally, needing a quote even more meaningless and less to the point than these first three, the authors give you Brillouin's "it is not ultimately the density of momentum which matters, but rather the *flux of momentum"*. Please ask yourself what the density of momentum is. Answer: there is no such thing. Density applies to particles per area, or something like that. Velocity cannot have a density. What would a less dense or a more dense velocity be? For the same reason, you cannot have a flux of momentum. Flux is a density change, but if you don't have a density, you can't have a flux. You can only have a momentum change, not a momentum flux. So the quote could and should be whittled down to this: "it is not ultimately the momentum which matters, but rather the change in momentum." That makes physical sense, but applied to this problem it is a pretty empty statement. Yes, we are studying momentum changes here, but that is just a given. It is not some sort of pithy statement or quotable quote. Like the rest of this paper, it tells us nothing useful. The paper, like most other modern physics papers, is just some number of pages of padding and misdirection.

*See my papers on pressure flow in plants and on structured water for more on this.
** Wikipedia uses Feigel's claim rather than Barnett's, but they are pretty much the same.