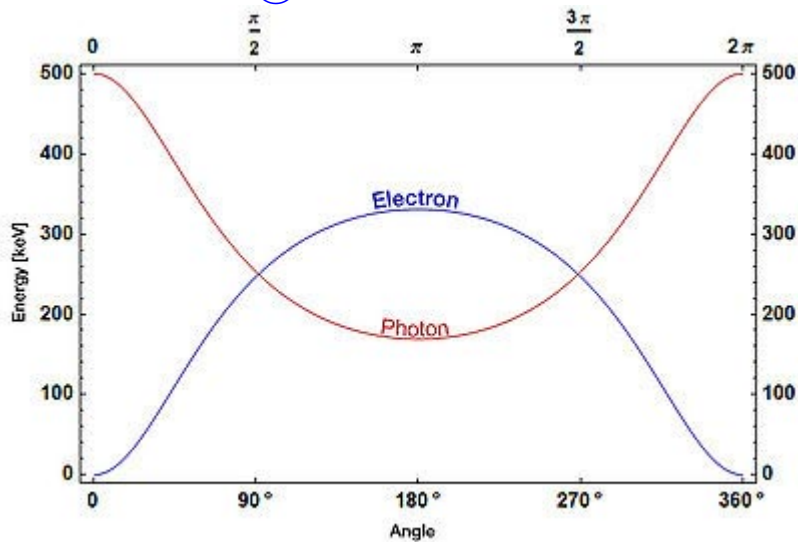


The COMPTON EFFECT, DUALITY *and the Klein-Nishina Formula*

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Abstract: I will show that the Compton effect has been incompletely explained due simply to the Copenhagen interpretation, and the failure to explain duality. I will complete the mechanical explanation and show the genesis of the field and the wave. I will then correct the Klein-Nishina formula by importing my new value for the electron radius. This will give us the same result as before, but with a vastly improved and more transparent derivation.

The Compton Effect is an inelastic scattering of high-energy photons by electrons. It was observed by Arthur Compton in 1923, in an experiment with X-rays. Like the photo-electric effect, it has correctly been interpreted as proof of the photon theory of light. That is, it is proof of the “particle” half of duality, and of Newton's corpuscular theory. This effect led directly to the Copenhagen interpretation of light, where Bohr insisted that light was both particle and wave, but also insisted this duality could not be understood mechanically or logically.

To show how he reached this flawed conclusion, we may return to a historical sidestreet called the BKS theory. This is the Bohr-Kramers-Slater theory, compiled mainly by Slater to convince Bohr the Compton effect could be explained rationally. Slater put it together in 1924, but Bohr had already dismissed it within the year. In short, the theory was a dual theory, with photons being emitted as particles, then guided by a classical E/M field of spherical waves. This field was pre-existing, created by matter, and containing all frequencies. The mediator of the field was not the motion of electrons or photons, but was a virtual field of virtual oscillators.

You can see why the theory was ditched, since that last part about virtual oscillators is a dodge. Bohr understood that if you are going to try to be mechanical, you have to show some convincing mechanics. If you can't show some convincing mechanics, you might as well dodge all mechanics from the beginning, staying with the math. He had learned this from Maxwell. Maxwell had done the same thing 60 years earlier. In the 1860's, Maxwell had tried to create vortices to explain the field mechanics, but, finding himself under heavy fire from Kelvin and others, he decided to give it up and go to fancy maths like quaternions instead. As you can see, Bohr and his pals did the same thing in the 1920's. They tried a few half-hearted efforts at mechanics and then gave it up for fancy maths.

But what is most interesting is that although we are told the BKS theory was ditched, we find that it is *still* the only existing pseudo-mechanics of the charge field. Now, almost 90 years later, we have no better explanation of the charge field or mechanism of quantum interaction. In fact, we have the *same* explanation: the field is now said to be virtual. Having nothing else, the mainstream has decided to embrace the worst part of Slater's theory.

To be fair, it is only alternative theories that now call this virtual field a field of oscillators. Thinking themselves revolutionary, many alternative theorists now propose some sort of mystical and undefined oscillators as the foundation of the charge field and the quantum field. They may use fancier shapes for their oscillators than Maxwell or Slater used, but their theories suffer from the same squishiness Maxwell's suffered from 150 years ago: the vortices, oscillations, shapes, or other motions do not really explain the data in a rigorous manner. On the other hand, mainstream theory is not even as mechanical as these alternative theories: the current standard-model explanation is a virtual field of virtual photons, these photons acting not by oscillation but by messaging or texting.

In either case, these virtual theories stop well short of a sensible explanation. No theory that contains the word virtual is sensible, since a virtual field is a hamhanded dodge of physics itself. If you are going to have virtual physics, you might as well have no physics, and at least Bohr understood that. He thought that if you can't explain something with mechanics, you had best dodge the issue with high-sounding philosophy or authoritarian fiats, and cover it over with as much math as you own. That is always preferable than being caught talking about virtual fields, while calling yourself a physicist or claiming to do physics.

Although current theory on Compton scattering and Thomson scattering is much more filled out than current theory on Rayleigh scattering, it is still very incomplete. It is incomplete because no one has been able to say how the duality expresses itself. It is well understood that Slater's field doesn't work, since the data can't be fit to photons carried that way by field oscillations. Slater was trying to explain interference and polarization and so on with the field, and the Compton effect with the photon, but when it came to explaining how the particle interacted with the field, he was at a loss. Particle physics is still at a loss, which is why they stick with the math and dodge all mechanics.

But I can explain the mechanics. The problem is that everyone from Newton and Huygens to Maxwell and Slater and Einstein has tried to express the wave as a field wave. But the wave of light is not a field wave. The wave belongs to each photon itself, and this is what solves the problem (as I have shown in [several papers](#)¹). All these theorists could not get out of the rut of thinking of light as an analogy to sound or other field waves. Because all the waves they had been taught in school had been field waves, they naturally thought light must be a field wave, too. So when it was proved by Einstein that light was not traveling via an ether, they were stumped. If there was no field, how could there be a wave? No one has gotten past that apparent dilemma.

The dilemma is a false one, though, since it never required a field to show a wave. Any spinning particle can show a wave, and you do not need a field to create spin. You need collisions, yes, and a field of particles to create these collisions. But once we attach the wave to the spin of the individual particle, we do not need a field to *express* it. In other words, the field *causes* the spins on the particles by collision, but the field does not *transmit* the wave or carry it. The wave is not a shape on a background of particles, as with sound. The wave is the spin of each particle, and is carried by each particle.

To clarify, I will give you an example. In a football stadium, you can find two different types of waves, both caused by people. In the stands, you will see a wave caused by groups of people holding their hands up and then dropping them. That is a field wave, like a sound wave. But in the aisles, you will find individual people creating waves just by walking. Their legs create wavelengths, since each step creates a gap. If you mapped a person walking by following the gap between the legs, you would get a wave. This second example is the analogy to a photon. A photon doesn't have legs, it has spin. If we map the spin over time, this spin will create a wave. The photon has a local wavelength that is determined by the radius of this spin, and that local wavelength is

stretched out by its linear motion. That stretched-out wavelength is the one we see and measure.

This immediately explains many things. It explains why individual photons can carry a wavelength, as in the [two-slit experiment](#)². It explains [superposition](#)⁴, since individual photons can stack spins. It explains simultaneous longitudinal and transverse waves, since, again, the photon can stack spins. The [electron](#)³ can also stack spins. And it explains the Compton effect because we now have a way to connect the photon to the field. The photon is not carried by the field; the photon *is* the field. The electromagnetic waves are carried by the photons, not the reverse. The charge field is a field of photons to start with, and the photons tracked by Compton devices and other devices are traveling in a field of other photons. There are photons in the field before the tracked photons are emitted, and that explains all the field mechanics in a direct way.

Particle physicists will say that this doesn't conserve energy, but it does, since quanta larger than photons can recycle photons. We already know that quanta can absorb or emit photons. What we have not understood is that they are absorbing and emitting constantly, and that Compton effects and other effects are just emissions and absorptions *above* this baseline recycling of the charge field. Even electrons in stable orbits are emitting the charge field. Every existing spinning quantum is recycling the charge field all the time.

This mechanism of spin also explains inverse Compton scattering, since we only have to turn our photons upside down to explain it. Spins are reversed just by a pole reversal. Photons can be spinning CW or CCW relative to electrons, and in one case the angular momenta will add in collision and in the other it will subtract. A subtraction will increase the wavelength of the photon, and an addition will decrease the wavelength.

The mainstream resists this simple spin interpretation for two reasons: 1) because they were not able to see that spins could stack, or how they should stack. I have shown [the rules](#)⁴ for stacking spins, and they are just gyroscopic rules, the same ones we have in the macro-world. These rules give us four stacked spins and [five variances](#)⁵, which explain all the data that is now explained by quarks. 2) If we give the photon a radius and a mass equivalence, we will have to redo or throw out a lot of gauge math, including a lot of finessing like [symmetry breaking](#)⁶ that has taken the mainstream decades to pile up. This piling up has garnered a lot of Nobel prizes and such, and so no one wants to let it go.

But I have already developed a [simple spin equation](#)³ that unifies the proton and electron, as well as all the [mesons](#)⁷. I have gone down the wish-list, answering all the embedded mysteries, as well as many that were not even known to exist. The best thing the standard model can do at this point in history is suck it in and move on. Any more foot dragging will just make them look worse than they already look.

Now, the specific math of the Compton effect is called the Klein-Nishina formula, and it is known to be a very good predictor of data. It overthrew the Thomson formula, which not only had the wrong radius for the electron, it also didn't properly incorporate Planck's constant and the quantization. Unfortunately, the Klein-Nishina formula, although much better as a heuristic equation, is still a mess. One way that it is a mess is in its use of the Compton radius for the electron. Although the Compton radius is now written in terms of the fine-structure constant, it is still the same *value* as the old classical electron radius used by Thomson. I have shown in my paper on the [Bohr radius](#)⁸ that this value is too large by 100 times.

The current derivation dodges this by admitting that the Klein-Nishina formula “may also be expressed in terms of the classical electron radius r_e

$= \alpha r_c$, but that classical quantity is not particularly relevant in quantum electrodynamics. [Wiki]” What they don't admit is that by that equation, the Compton radius is actually 137 times larger than the classical radius, making the Compton radius about 3.9×10^{-13} m. It is unclear how giving the electron a radius that large is “relevant” to QED, since it implies that the electron is only 100 times smaller than the Bohr radius itself. Basically, the Klein-Nishina formula matches data by giving the electron a radius larger than the proton.

So we need to rewrite the Klein-Nishina formula in a more logical way, keeping its result the same. Since [I have shown](#)⁸ the effective diameter of the electron is more like 9×10^{-17} m, that gives me a bit of work to do. [We use the electron diameter, not the radius, since the whole width of the electron is scattering; and we use the diameter with all spins, because the spins, having energy, also interact in scattering].

Let us see if we can make the correction simply by looking at the first term in the Klein-Nishina formula:

$$\alpha^2 r_c^2 / 2$$

The current numerical value of that term is about 4×10^{-30} . If we correct the radius of the electron, using my new value, we have

$$r_e^2 = 8.1 \times 10^{-33}$$

So we only need to raise that by a factor of about 490 to match current results. How can we do that? Well, let's study the other constant in the term. If we write the fine-structure constant in cgs, we have

$$\alpha = 2\pi e^2 / hc = 1/137$$

If we express α in terms of h instead of \hbar ($\hbar = h/2\pi$), and thereby drop the 2π , then α has a value of $1/22$ instead of $1/137$. Since $22^2 \approx 490$, we have a match. This means we can rewrite the first term of the Klein-Nishina formula as

$$r_e^2 / (e^2 / hc)^2$$

Or, if we write α in terms of h instead of \hbar , then we can write that as

$$\alpha = e^2 / hc$$

$$r_e^2 / \alpha^2$$

The rewrite turned out to be fairly simple, as you see. Current theory had the wrong value for the electron radius, so they got the wrong value for the fine-structure constant, too. If we correct both of them, we can correct the Klein-Nishina formula without changing its result.

You will say that if we change the value of the fine-structure constant, we mess up other equations, but all the equations of quantum math are already messed up. I have shown in another paper that the [fine-structure constant](#)⁹ is a big fudge, so changing its value or its expression doesn't matter. We were going to have to ditch it anyway, no matter what we did here in the Klein-Nishina formula. The same goes for \hbar . Dirac's constant (\hbar) is written as an expression of angular frequency, but all the current angular equations are faulty. Because $v \neq r\omega$, every [angular expression](#)¹⁰ ever used has to be rewritten. On top of that, I have shown that π is false in kinematic situations, and since we have a spin here, the situation is kinematic. [We have to replace \$\pi\$ with 4](#)¹¹. For that reason, all we really care about here is that $e^2 / hc \approx 1/22$ in cgs. Whether we call that α or make up some new constant is immaterial. The important thing is not the constant; the important thing is that we correct the radius of the

electron. Up to now, the fine-structure constant has only prevented us from doing that.

This is one way to correct the equation, but another is to recognize that the Klein-Nishina formula uses the ratio of photon energy before and after the scattering $[P(E_\gamma, \theta)]$. Therefore the first term we have been looking at could also be written that way. We notice that the term has a constant value (4×10^{-30}) very near the mass of the electron (9.1×10^{-31}). We only need to multiply the mass of the electron by about 4.4 to achieve the value of the term. If we assume the term is expressing an energy change in the electron to go with the energy change in the photon, then we could write the term this way:

$$E = \frac{1}{2}m_e(c/v)^2 = 4 \times 10^{-30}$$

That gives us a ratio of the speeds of the photon and electron, so that what the term is telling us is that the electron is going about 1/3rd the speed of the photon in this experiment. But by writing the term this way, we also get a velocity in the equation, so that we can see how a variance in the electron velocity affects the scattering.

Some readers will find both those solutions tenuous, but I can show they are correct by setting them equal to each other and solving more problems.

$$\frac{1}{2}m_e(c/v)^2 = r_e^2/(e^2/hc)^2$$

$$m_e/v^2 = 2h^2r_e^2/e^4$$

$$h = E/f$$

$$m_e/v^2 = 2E^2r_e^2/f^2e^4$$

$$E_e = \sqrt{(m_e/2)}f e^2/vr_e$$

This gives us a way to calculate the energy of the electron without

Relativity, by finding the frequency of the particle. Currently the frequency and wavelength are not known to change with an increase in electron velocity, but they must. The current equation for the Compton wavelength is

$$\lambda = h/mc$$

Which is a constant for any given quantum. For the electron this equals 2.4×10^{-12} m. But the wavelength of the electron should be dependent on its velocity. Current physics hides this obvious fact because they have no way of calculating this dependence. They hide it under the Relativity transform

$$K_e = (\gamma - 1)m_e c^2$$

I have already [shown that gamma is false](#)¹² in that and every other transform, but that last equation also hides the fact that the electron must be increasing energy due to increasing velocity and increasing frequency. I have shown that although Special Relativity is true, it is misused in cases like this to cover energy increases due to other causes. Just as Relativity has been misused in the atmospheric [muon problem](#)¹³ and the gravitational [blueshift problem](#)¹⁴ and a thousand other problems, it is misused here. We are told that the electron mass increases 100,000 times in an accelerator, all due to Relativity. That is false, and the falsity is all due to that false equation.

Logically, it cannot be just the relativistic mass that increases in an accelerator. The kinetic energy of the electron is increasing due to increasing speed and increasing energy input from the field. A large part of this energy can go into increased frequency, so we do not have to give it all to mass. But the last equation above hides this, because it has neither a velocity variable nor a frequency variable. We have no way of knowing

how much the spin energy of the electron is increasing, since that equation seems to imply that all the new energy is going into mass.

If we use my new equation here, we can calculate an approximate electron frequency in the accelerator. If the maximum energy is about 50 GeV, and we assume the velocity is almost c , then the frequency is about $1.2 \times 10^{37}/s$. And the wavelength is therefore $2.5 \times 10^{-29}m$. That's the *local* wavelength of a high-energy photon, so we may assume that the accelerator has turned our electron into a photon, by stripping it of outer spins.

You will say that wavelength is way below the radius of my electron, which disqualifies my spin explanation. But, again, we have no indication that the electron at the end of such acceleration is still an electron. All we currently measure is the final energy of the particle. It is my belief that the accelerator has stripped the electron of its outer spins, so that it is no longer strictly an electron. Without its full complement of spins, the particle is now a photon. I have unified all the quanta, including the proton, electron, mesons, and photon, the only difference being the number of stacked spins. So it is quite easy to strip an electron down to a photon, by removing these spins. I have even done the math, showing the electron is 1821 times smaller than the nucleon, and that the charge photon is 1821^2 times smaller than the electron. In other words, the electron is 4 spin levels below the proton, and 8 spin levels above the photon.

For this reason, I believe that Relativity has prevented us from understanding what is really going on in accelerators. My explanation here is incomplete, but it is a step in the right direction. We must recognize that even at non-relativistic speeds, the wavelength of the electron must be dependent on its speed. Therefore the Compton wavelength cannot be correct.

The Compton wavelength, as currently derived, is not analogous to photon wavelengths, since when we measure photon wavelengths, we are measuring them at the macro-level: *as how we see them*. But [I have shown](#)¹⁵ that the local wavelength of the photon is much, much smaller, being on the order of 10^{-23} m (for infrared light). Therefore, the Compton wavelength of the electron must be a local wavelength of the electron, or the attempt at such. Since the local wavelength is just a particle radius, the Compton wavelength is the attempt to calculate the electron radius from Planck's constant. But, as I have shown, it fails in this, since the electron radius cannot be anything like that large, even if we include all the spins. The Compton wavelength is off by a factor of almost 10^5 . The local wavelength of the electron is about 10^{-16} m, and the wavelength we would “see” would be stretched out by v^2 . This is what I mean when I say that the electron wavelength is dependent on its speed. If we could accelerate the electron to c while the electron kept all its mass and spins, its “seen” wavelength would be something like 1m. Since we can't, we can instead calculate the “seen” wavelength of the electron at $.25c$: about 5cm. Therefore, we would expect an electrical field created by electrons moving that fast to either interfere with or augment microwaves of that wavelength, depending on the direction. Current physicists know that fields affect one another like this, but they aren't able to predict which fields will affect which, and to show why this affect is dependent on velocity. My new equations here will help them do that.

Conclusion: I have shown that my new radius for the electron fits the Klein-Nishina formula like a hand in a glove. If my new number hadn't been very close to correct, we would not have been able to simply move the square constant from the numerator to the denominator.

¹ Mathis, Miles. [Plank's Constant and Qunatization](#). 2008.

² Mathis, Miles. [The Double-Slit Experiment](#). 2008.

³ Mathis, Miles. [Unifying the Proton and the Electron](#). 2008.

- 4 Mathis, Miles. [*Superposition*](#). 2005.
 - 5 Mathis, Miles. [*Hidden Variables*](#). 2008.
 - 6 Mathis, Miles. [*A Disproof of Asymptotic Freedom*](#). 2008.
 - 7 Mathis, Miles. [*Unifying the Mesons*](#). 2008.
 - 8 Mathis, Miles. [*The Bohr Magneton*](#). 2008.
 - 9 Mathis, Miles. [*The Fine-Structure Constant*](#). 2009.
 - 10 Mathis, Miles. [*Angular Momentum*](#). 2008.
 - 11 Mathis, Miles. [*Bye-Bye Pi*](#). 2009.
 - 12 Mathis, Miles. [*A Refutation of Gamma*](#). 2001.
 - 13 Mathis, Miles. [*The Mysterious Muon*](#). 2009.
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