

A Definitive Test¹

In the standard model, matter collides by a basic substantiality that light does not have, so:

"Two photons cannot ever collide. In fact light is quantized only when interacting with matter."²
(Wikipedia, 2010)

In contrast, quantum realism predicts that under certain conditions *light alone will collide in empty space to create matter*. Lest this seem fanciful, consider that:

1. *Photons confined have mass*. A photon is massless when free but if confined in a hypothetical 100% reflecting mirror box it will have rest mass, because if the box accelerates, unequal photon pressure on its reflecting walls will create inertia (van der Mark & t' Hooft, 2011). In theory, photons tangled in a grid node will have mass.
2. *Einstein's formula*. The equation that matter is energy works both ways. If nuclear bombs can turn mass into energy, photon energy can create mass. In the Breit-Wheeler equation, high energy photons create electrons and positrons.
3. *Particle accelerator collisions* routinely create new matter. Protons that collide and stay intact give new matter that didn't exist before. If this matter comes from the collision energy, why can't pure energy photons do the same?
4. *Pair production*. High-frequency light near a nucleus creates electrons and positrons that self-annihilate back to the vacuum itself. If empty space can create matter, why can't photons?
5. *Light collides*. When high-energy photons at the Stanford Linear Accelerator Center hit an electron beam accelerated at almost the speed of light, some electrons knocked a photon back with enough energy to hit the photon behind it to give matter pairs that a magnetic field pulled apart to detect (Burke & et al, 1997).

That light alone makes matter is a testable prediction of quantum realism, but the definitive experiment isn't yet done. When pure light collides in empty space to create mass, the boson-fermion divide of the standard model will be breached. The future of physics lies not in smashing things apart but in combining them, in creating not destroying. In the future the mass of an electron will be derived from a computer simulation based on its photon structure, not just retro-fitted. When physics stops colliding matter and starts merging light, how matter evolved will be revealed.

Burke, D. L., & et al. (1997). Positron Production in Multiphoton Light-by-Light Scattering. *Phys. Rev. Lett.*, 79, 1626–1629.

Van der Mark, M. B., & t' Hooft, G. W. (2011, May 22). Light is Heavy. Retrieved from <http://www.tardyon.de/mirror/hooft/hooft.htm>

¹ This is section 4.5.8 from Chapter 4 [The Matter Glitch](#), of the book Quantum Realism by Brian Whitworth, currently under development. The link gives a free early access to the whole chapter. This work is ©Brian Whitworth 2014 but shared under a [Creative Commons Attribution-Noncommercial license](#).

² Accessed August, 2010 from http://en.wikipedia.org/wiki/Two-photon_physics