- **Electromagnetic fields are almost certainly not ether *flow* phenomena** because if they were, it would be difficult to imagine how they could: a) superpose perfectly linearly with no loss of information (as dad says, it's amazing that huge amounts of information can be transmitted wirelessly without being affected by the ocean of background radiation/light through which it passes!) and b) only affect isolated charged particles. This would require a flow with no detectable acceleration.
- Momentum is not an intrinsic property of light – rather, it is a property of the interaction between light and matter. ["Physicists make first observation of the pushing pressure of light", phys.org] No shit! However, one could possibly argue that the light is being reflected and absorbed differently, so its momentum is being redirected or imparted differently??

Relativistic EM

- As far as I can tell, given a purely electric field in one frame, one cannot necessarily find another frame in which the field is purely magnetic For example, suppose $E \parallel B$. Then $\beta \times B$ is always perpendicular to E, so $\beta \times B$ is never parallel to $\boldsymbol{E}_{\perp}$, so one cannot get either of the fields to be 0. (UPDATE: After taking E&M grad course I now know that a field which is purely electric/magnetic in one frame can never be purely magnetic/electric (respectively) in another frame).

$$E_{||}{}' = E_{||}, B_{||}{}' = B_{||}$$

$$\boldsymbol{E}'_{\perp} = \gamma(\boldsymbol{E}_{\perp} + \boldsymbol{\beta} \times \boldsymbol{B}), \qquad \boldsymbol{B}'_{\perp} = \gamma(\boldsymbol{B}_{\perp} - \boldsymbol{\beta} \times \boldsymbol{E})$$

Electric and Magnetic field interchangeability

I still have not settled the issue of whether the electric and magnetic field are 'the same thing' but viewed in different perspectives/different 'coordinates'. Could acceleration perhaps settle this issue, as it does for most other 'relativities' in SR?

- Electric and magnetic fields affect/create each other but (apparently)* not other forces, so they must be physically related somehow. *We should do experiments to test this, or I should find out if any have already been done. **NOTE** Gravity affects light (grav lensing)!! If this is true, then gravity probably affects EM fields as well! This tells us something. See also: Stellar aberration, velocity of light as seen by moving observers, special relativity.

08/15/15: Note that **a pure electric field can never become a pure magnetic field** and vice-versa – otherwise one would have uniform linear motion converting rotation into a linear acceleration, which is impossible. This is why, in the question I asked Bojowald, we necessarily found that the motion of the charge approaches, but never reaches, rotation-ality as the observer's boost speed approaches c.

Objections to relativity of E and M:

- If E and B are the same thing, then why are there electric monopoles but not magnetic ones?!

Radiation by accelerated charges

- "In free-electron lasers, relativistic electrons were injected into an undulator, so that synchrotron radiation is generated. In the proper frame of the electrons, the undulator is contracted which leads to an increased radiation frequency. Additionally, to find out the frequency as measured in the laboratory frame, one has to apply the relativistic Doppler effect. So, only with the aid of length contraction and the relativistic Doppler effect, the extremely small wavelength of undulator radiation can be explained.[15][16]
  I did some calculations (with suggestions from Dad because I have a 5-volt brain) and found out that the formula for the result is identical if you apply a *primary Doppler shift only*, without the time dilation (= relativistic Doppler –primary Doppler) or length contraction. (See "FLASHundulatorelectronscalculation.jpg" in Deformography.)
  So according to this, **the wavelength of the radiation emitted by accelerating electrons suffers no relativistic corrections.** (Recall: I don't think we ever made any such transverse Doppler correction to the radiated spectra in my A502 astrophysics course, when transforming from the charge's to the observer's frame.) In this example it also appears to be independent of the velocity of the electron (however, the calculation assumes v ~ c).
  Additionally, note that the formulae for the radiation (power and spectrum thereof) emitted by an accelerating charge do not feature Planck's constant h anywhere. So evidently **radiation by accelerating charges is a purely electromagnetic (not quantum, not electronic) phenomenon.**