

**Study questions for Darrigol (2006) "The Genesis of the Theory of Relativity"**

1. What are three myths associated with the origin of the theory of relativity?
2. What topic was widely discussed in the decade prior to Einstein's 1905 paper on relativity?
3. What was Maxwell's phenomenological theory concerned with?
4. In Maxwell's theory, what was charge density? What was conduction current?
5. What is stellar aberration? Why was it a problem for Maxwell's theory?
6. How did the corpuscular theory of light explain stellar aberration?
7. How did Young propose to explain stellar aberration in the wave theory of light?
8. What did Arago observe about refraction of starlight in a prism on the earth? How did Fresnel propose to modify Young's explanation of stellar aberration to account for Arago's observation?
9. How was Stoke's ether theory different from Fresnel's?
10. What was the purpose of Fizeau's experiment? What was it taken to demonstrate?
11. What was the purpose of the Michelson-Morley experiment? What was it taken to demonstrate?
12. How did Lorentz's theory characterize the ether?
13. How did Lorentz interpret the coordinate transformations he introduced (that now bear his name)?
14. How did Lorentz interpret the Michelson-Morley experiment?
15. What were the three general principles that Poincare based his physics on?
16. According to Poincare, which principles did Lorentz's theory violate?
17. How did Poincare interpret Lorentz's transformations?
18. What was Poincare's Relativity Postulate?
19. What were Poincare's views on the ether?
20. What was the asymmetry in Lorentz's theory (and Maxwell's theory) that motivated Einstein's 1905 paper on relativity?
21. How did Einstein reconcile the relativity principle with Lorentz's theory?
22. According to Darrigol, what components of Einstein's 1905 paper on relativity already existed in the works of earlier physicists?
23. According to Darrigol, what components of Einstein's 1905 paper were novel?

**Study questions for Brush (2007) "How Ideas Became Knowledge: The Light-Quantum Hypothesis"**

1. In 1905, what type of optical phenomena did Einstein think might lead the wave theory of light to "contradictions"? What type of description did he think might need to be used instead of the wave theory?
2. By 1905, what properties of light were thought to prove its wave nature?
3. What is the relation between energy and frequency that Planck wrote down in 1900? Why did Planck refuse ("as late as 1910") to accept Einstein's hypothesis that electromagnetic radiation is quantized?
4. Explain what Einstein's "photoelectric equation" represents:  $(1/2)Mv^2 = h\nu - p$ .
5. What did Millikan provide in 1916?
6. What is the "essence" of the Compton Effect?
7. How did Bohr, Kramers and (a reluctant) Slater interpret the laws of conservation of energy and momentum in order to save the wave theory of light from the Compton Effect?
8. What was Einstein's reaction to Bohr and Kramers?
9. Was the Light Quantum Hypothesis only accepted *after* the discovery of the Compton Effect?
10. What is the "novel prediction" associated with the Compton Effect? According to Brush, did this novel prediction influence the acceptance of the Light Quantum Hypothesis?
11. According to Brush, what three major facts influenced the acceptance of the Light Quantum Hypothesis by the physics community?