3:30PM K5.00001 Theory and Experiment in the Quantum-Relativity Revolution (Pais History of Physics Prize 2009) STEPHEN BRUSH, University of Maryland — Does new scientific knowledge come from theory (whose predictions are confirmed by experiment) or from experiment (whose results are explained by theory)? Either can happen, depending on whether theory is ahead of experiment or experiment is ahead of theory at a particular time. In the first case, new theoretical hypotheses are made and their predictions are tested by experiments. But even when the predictions are successful, we can’t be sure that some other hypothesis might not have produced the same prediction. In the second case, as in a detective story, there are already enough facts, but several theories have failed to explain them. When a new hypothesis plausibly explains all of the facts, it may be quickly accepted before any further experiments are done. In the quantum-relativity revolution there are examples of both situations. Because of the two-stage development of both relativity (“special,” then “general”) and quantum theory (“old,” then “quantum mechanics”) in the period 1905-1930, we can make a double comparison of acceptance by prediction and by explanation. A curious anti-symmetry is revealed and discussed.

4:06PM K5.00002 Tate Medal for International Leadership in Physics Talk: Nuclear Fusion Power: Are we really serious about our future? GUSTAV-ADOLF VOSS, DESY, Retired — There’s a frantic search under way for new energy sources that do not damage global climate. In the public discussion of this subject, nuclear fusion is hardly ever mentioned. Yet nuclear fusion is the answer to the problem. It’s the best way to generate large amounts of baseload power, needed in the intermediate and far future. The long-standing joke about fusion always being “just 50 years away” illustrates the unfavourable attitude most people have towards fusion technology, and while this is understandable in the light of fusion’s history, it is unwarranted. We need a strong international effort to develop this energy source to help avoid climate change turning into global disaster.