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Toward a Rethinking of the Relativity Revolution

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This journey in the history of physics is offered in celebration of David Cassidy's Pais Prize. The journey, undertaken in part with the community of historians of physics and in part not, starts from a conventional characterization of the relativity revolution as an abrupt transition, in 1905, from pre-Einsteinian darkness to Einsteinian light, and ends with an alternative perspective on the relativity revolution, seeing it as a process extending over 50 years, in two phases: first, the *protorelativity* phase, lasting from the early 1880s to 1905, and involving initial treatments of the length contraction, the mass increase, and invariance properties; second, the *Einsteinian* phase, beginning with his recasting of the basic theoretical framework—with the inclusion now of the time dilation and the $E = mc^2$ relationship—and continuing with the ensuing competition between the protorelativistic and Einsteinian approaches, issuing in the final triumph of the Einsteinian approach only in the early 1930s. A proper appreciation of the character and importance of the protorelativity phase of the relativity revolution is relevant to a variety of contexts: for the teaching of relativity theory, it makes available a more concrete and pictorial approach to the relativistic effects—retaining greater (length contraction) or somewhat lesser (mass increase) validity to the present day; for the ongoing discourse on the nature of scientific revolutions, it provides a perspective on the intricacies and complexities of those occurrences, and on the elements of continuity and gradualism in even the most radical changes; and for our general understanding of historical process in the history of the sciences, it shows the importance of the broader scientific research community for even the most individual accomplishments.