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Reconsidering Scientific Revolution: Popper, Kuhn, and the Dialectics of Scientific Progress

This paper reexamines the concept of scientific revolution through the dialectical tension between Karl Popper's critical rationalism and Thomas Kuhn's socio-historical model of scientific revolutions. While Popper's falsificationism provides a methodological criterion for scientific progress through conjecture and refutation, Kuhn's paradigm shift model emphasizes the socio-cultural and psychological dimensions of revolutionary change. Analyzing their epistemological divergences and convergences reveal that scientific evolution is best understood as a non-linear process integrating both progressive continuity and revolutionary discontinuity. By situating this debate within broader social scientific and cultural studies frameworks, this paper argues that scientific revolutions are not merely cognitive events but are embedded within specific historical, institutional, and discursive formations. The resulting synthetic framework transcends the false dichotomy between rational progress and irrational revolution, offering a more nuanced understanding of scientific change that acknowledges both its logical structure and its cultural contingency.

I

The twentieth century witnessed parallel revolutions across different domains of human endeavor. For example, one can categorize the Bolshevik Revolution of 1917¹ as a political revolution oriented towards the radical transformation of social and economic relations in Tsarist Russian society through Marxist ideology. At the same historical moments, the emergence and the gradual developments of quantum mechanics initiated a comparable epistemic rupture within physics, destabilizing our classical assumptions and fundamentally reshaping our understanding of physical reality². Although the Bolshevik Revolution relied, in certain respects, on scientific