

Abstract Submitted
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When you dance, you dance with the universe KIELAN WILCOMB¹, JAMES OVERDUIN, Towson University — As she spins, a dancer's hands are acted on by non-inertial forces such as the centrifugal and Coriolis force. After briefly summarizing the standard treatment of these forces, we ask whether the dancer would still experience them if, instead, she stood still while the rest of the universe spun around her. Within Newtonian physics, the answer is no, since the dancer is in an inertial frame. Within Einstein's general relativity, however, theoretical calculations show that a rotating mass distribution of cosmological dimensions pulls the inertial frame of an observer around with it, by a process known as frame dragging. The existence of frame dragging has recently been experimentally confirmed using gyroscopes in orbit around the spinning Earth. If the extrapolation to cosmology is valid, as we argue here, then a dancer experiences the same forces, whether or not she spins clockwise or the universe spins counter-clockwise around her. Her arms are, in a real sense, pulled out and around by the stars. The facts we present are not new, but they imply a radical reinterpretation of non-inertial motion on the conceptual level, one that we argue deserves to be brought into the standard undergraduate physics curriculum.

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