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Abstract for an Invited Paper
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James Clerk Maxwell Prize Address: The Basis for Cosmic Ray Feedback: Written on the Wind[1]

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Cosmic rays represent only about a billionth of the interstellar gas in galaxies by number, but their energy density is equivalent to that of the thermal gas, Although virtually collisionless, they exchange energy and momentum with the thermal gas through their coupling to the interstellar magnetic field, thus playing a critical role in interstellar gas dynamics and energy balance. Cosmic ray driven galactic outflows, or winds, are one of their most dramatic and consequential signatures. Because cosmic rays are believed to be accelerated by stellar explosions, and removing gas in a wind reduces the rate of star formation, cosmic ray driven winds are considered a form of feedback. I will discuss the physical basis for magnetically mediated cosmic ray thermal gas coupling, which spans scales from astronomical units to thousands of light years, in galaxies of many types as they evolve over cosmic time.

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