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The Ubiquity of Diffusive Shock Acceleration

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Diffusive shock acceleration (DSA) is arguably one of the most important energization process in the universe, occurring on heliospheric, galactic, and even cosmological scales. The recent discoveries in the DSA theory that originate from first-principle kinetic plasma simulations are outlined. When ion acceleration is efficient, the back-reaction of non-thermal particles and self-generated magnetic fields becomes prominent and leads to both enhanced shock compression and particle spectra significantly softer than the standard test-particle DSA theory. These results are discussed in the context of the vast non-thermal phenomenology of space and astrophysical shocks.