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Bringing Space Down to Earth: Exploring the Physics of Space Plasmas in the Laboratory[1]

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Laboratory experiments provide a valuable complement to explore the fundamental physics of space plasmas without the limitations inherent to spacecraft measurements. Specifically, experiments overcome the restriction that spacecraft measurements are made at only one (or a few) points in space, enable greater control of the plasma conditions and applied perturbations, can be reproducible, and are orders of magnitude less expensive than launching spacecraft. I will highlight key open questions about the physics of space plasmas and identify the aspects of these problems that can potentially be tackled in laboratory experiments, reviewing past successes in the laboratory investigation of the physical processes at play in different space environments, including the solar corona, solar wind, planetary magnetospheres, and outer boundary of the heliosphere. A strategy for future laboratory investigations of space physics will be outlined, with explicit connections to specific space environments.

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