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MAJORANA: An Ultra-Low Background Enriched-Germanium Detector Array for Fundamental Physics Measurements

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The MAJORANA collaboration aims to perform a search for neutrinoless double-beta decay ($0\nu\beta\beta$) by fielding arrays of HPGe detectors mounted in ultra-clean electroformed-copper cryostats located deep underground. Recent advances in HPGe detector technology, in particular P-type Point-Contact (PPC) detectors, show great promise for identifying and reducing backgrounds to the $0\nu\beta\beta$ signal, which should result in improved sensitivity over previous generation experiments. The ultra-low energy threshold possible in PPC detectors also enables a broader physics program including sensitive searches for dark matter and axions. The MAJORANA DEMONSTRATOR R&D program will field three $\sim$20 kg modules of PPC detectors at Sanford Underground Laboratory. Half of the detector mass will be enriched to 86% in ^{76}Ge. I will present the motivation, design, recent progress and current status of this R&D effort, and discuss its physics reach.