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Pulsar Timing Arrays: New Advances Toward Detecting Low-frequency Gravitational Waves¹

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The gravitational wave landscape is expansive and ripe for discovery, offering unparalleled insights into a huge variety of astrophysical systems. Pulsar Timing Arrays (PTAs) exploit the exquisite rotational stability of millisecond pulsars to forge a galactic network of clocks, capable of registering the correlated influence of passing extragalactic gravitational waves. At nanohertz frequencies (where PTAs are sensitive) the most promising target is the ensemble signal of many inspiraling supermassive black-hole binary systems throughout the Universe. A detection of this signal (or even a stringent constraint) can teach us much about the merger history of massive galaxies, the dynamical environments of galactic cores, and the scaling relationships between massive black holes and their host galaxies. I will discuss the latest advances toward detection (including new insights into Solar System dynamics from NANOGrav's recent 11-year dataset), and the exciting astrophysical information that is accessible to PTAs.

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