

# Exotic Stars Are Testing Einstein's Predictions



**Maura McLaughlin**

Eberly Family Distinguished Professor, Physics and Astronomy

## CURRENT RESEARCH


### Opening a new window on the universe and building a diverse pipeline for a new field of astrophysics

In 1915, Einstein published the theory of general relativity, the most elegant and complete description of gravity, space and time ever constructed. This theory has been verified in a variety of settings both on earth and in space. One of Einstein's most fundamental predictions is the existence of invisible ripples in space-time called gravitational waves. While there is good evidence for their existence, they still have not been directly detected. Nearly 100 years after Einstein's work, Dr. Maura McLaughlin, of West Virginia University, and colleagues are on the brink of detection of these waves through monitoring of exotic stars called pulsars with the largest radio telescopes in the world. Pulsars emit extremely regular pulses and accurate timing of these celestial clocks allows scientists to detect tiny perturbations. These perturbations allow scientists to search for binary companions or planets, measure stellar masses, and test general relativity.

Dr. McLaughlin's use of radio pulsars is much more cost-effective than costly ground-based gravitational wave detectors like LIGO, and leads to many discoveries that come 'for free' along with the gravitational wave search. In addition, radio pulsar timing has impressive ramifications for radio communications, accurate timekeeping on Earth, and could be used for interstellar navigation. Finally, she is committed to involving students at all levels in her work through a program called the Pulsar Search Collaboratory that has involved over 2000 high-school students from 19 states in pulsar searching using the Green Bank Telescope in West Virginia. These students are making real contributions to the sensitivity of the experiment to gravitational waves...

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## AFFILIATION

 West Virginia University

## EDUCATION

- Ph.D., in Astronomy and Space Sciences, 2001, Cornell University
- B.S., in Astronomy and Astrophysics, 1994, Penn State University

## AWARDS

- Harley Kilgore Award for Promoting Public Understanding of Science and Research, 2011
- Eberly College of Arts & Sciences Outstanding Researcher Award, 2010
- Cottrell Scholar Award from the Research Corporation, 2009
- Alfred P. Sloan Research Fellow, 2008
- National Science Foundation Distinguished Research Fellowship, 2001

## RESEARCH AREAS

Environment, Atmospheric / Space, Space

## FUNDING REQUEST

Your contributions will support Dr. McLaughlin's research on radio pulsars and gravitational waves. In addition to supporting personnel involved in her research program, funding will help cover the \$300K/year needed to continue to run the Pulsar Search Collaboratory program. With your support, Dr. McLaughlin and her team could make the first direct detection of gravitational waves, keep world-class telescopes operational, and involve young people from across the nation in this transformational research!