

LETTERS

B1913+16. Orbital parameters of the system are determined in a purely phenomenological way, without assuming any specific theory of gravity. The combination of phenomenological parameters can then be compared with the predictions of any specific relativistic theory of gravity, such as general relativity. The key point is that timing observations give access to more phenomenological parameters than the number of independent dynamical degrees of freedom. This redundancy allows one to extract one or more tests of any theory of gravitation. In this way Einstein's theory passes several independent tests, including the crucial one involving radiation damping effects—currently at the 0.3% level—thereby verifying the predicted existence, quadrupolar nature and propagation speed of gravitational waves.

We have no reason to think that general relativity necessarily comprises the last valid words to be written about gravity, not least because the theory is not perturbatively quantizable. Perhaps most importantly, binary-pulsar timing experiments offer a means of probing the nature of gravity under strong-field conditions that do not exist anywhere within the solar system. With such experimental tools, large regions of gravitational "theory space" can be summarily rejected. In the future, one might even hope to isolate a region in which the "true" theory of gravity departs from general relativity. In the meantime, Einstein's theory of gravity remains the best thing going in the nonquantum regime, in full accord with all high-precision experimental tests, including gravitational-radiation losses from binary pulsar systems.

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JOSEPH H. TAYLOR
Princeton University
Princeton, New Jersey
THIBAUT DAMOUR

Institut des Hautes Etudes Scientifique
9/93 Bures sur Yvette, France

New Data Advance Retarded Forces

We read with great interest the Search and Discovery story "New Evidence Confirms Old Predictions of Retarded Forces," by Barbara Goss Levi (April 1993, page 18). We wish to mention two other kinds of experiments that are very pertinent to the issue of retardation. One experiment was a pioneering study by Ed Sabisky and Charles Anderson,¹ who demonstrated that liquid helium films possess a thickness dependence on gas pressure that agrees remarkably well with the retardation theory of Igor E. Dzyaloshinskii, Evgenii M. Lifshitz and Lev P. Pitaevskii² (although more recent data are not so consistent). The second experiment is an ongoing project in the group of Thomas Greytak and Daniel Kleppner.³ This experiment measures the sticking at ultralow energy of a hydrogen atom to a cold liquid He surface. Calculations⁴ indicate that the sticking coefficient is reduced by a factor of two when retardation is taken into account! The latest data⁵ are consistent with this prediction. We are optimistic therefore about the prospect for further experimental validation of this fundamental concept.

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CARLO CARRARO
Harvard University
Cambridge, Massachusetts
MILTON W. COLE

Pennsylvania State University
University Park, Pennsylvania
5/93

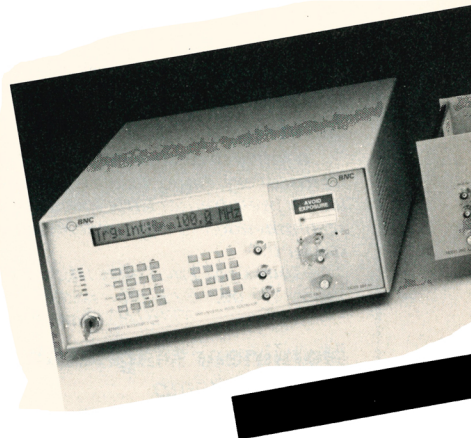
NASA, Congress and Gomory's 'Goals'

Much of what Ralph Gomory says about Federally funded science in his article "Goals for the Federal Role in Science and Technology" (May 1993, page 42) is indisputable, but his comments on "the huge bill the government pays NASA" call for a personal reply on some specific points.

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