

<http://science.sciencemag.org/content/359/6374/382/tab-e-letters>

E: The Light Fantastic

- **Kirk T McDonald**, Professor of Physics, Emeritus, Princeton University, Princeton NJ 08544

(9 February 2018)

The feature article "The Light Fantastic" by Edwin Cartlidge of 26 January 2018 reviews exciting prospects for new experiments that "could rip apart empty space." The article mentions that one way to accomplish this with a laser beam is to first collide it with a fast-moving electron, which leads to a high-energy gamma ray that can then be collided with the laser beam, as was reported in the Science feature article by "Conjuring Matter From Light" by D. Ehrenstein, Vol. 277, p. 1202, (1997), DOI: <https://doi.org/10.1126/science.277.5330.1202> .

This technique was successfully used by the E144 Collaboration at the SLAC National Accelerator Laboratory in the mid 1990's to "spark the vacuum," producing electron-positron pairs in the collision of four or more laser photons with a gamma ray, a nonlinear QED effect.

See, "Positron Production in Multiphoton Light-by-Light Scattering," by D.L. Burke et al., Phys. Rev. Lett. 79, 1626 (1997), <https://doi.org/10.1103/PhysRevLett.79.1626> ; "Studies of nonlinear QED in collisions of 46.6 GeV electrons with intense laser pulses" by C. Bamber et al., Phys. Rev. D 60, 092004 (1999), <https://doi.org/10.1103/PhysRevD.60.092004>

This experiment has never been repeated, and we welcome future efforts to confirm and extend our results.

Physics opportunities in intense ultrafast lasers are reviewed in the recent report at <https://www.nap.edu/read/24939/chapter/1K>

Charles Bamber, Sydney, Australia, bamber.charles75@gmail.com

Steve Berridge, University of Tennessee, Knoxville TN 37996, scberridge@gmail.com

Steven J Boege, Illumina, Inc. 25861 Industrial Blvd. Hayward, CA 94545, sjboege@urgrad.rochester.edu

William M Bugg, University of Tennessee, Knoxville TN 37996, bugg@utk.edu

Christian Bula, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland, christian.bula@psi.ch

David L Burke, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, daveb@slac.stanford.edu

Clive Field, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA, sargon@slac.stanford.edu

Glenn A Horton-Smith, Kansas State University, Manhattan, KS 66506, gahs@phys.ksu.edu

Thomas Koffas, Carleton University, Ottawa, ON, K1S 5B6, Thomas.Koffas@cern.ch

Theofilos Kotseroglou, Thetametrisis LLC, 620 Price Avenue, Redwood City, CA 94063, theo@oramic.com

David D Meyerhofer, Los Alamos National Laboratory, Los Alamos, NM 87544, dmey@lanl.gov

Kirk T McDonald, Princeton University, Princeton, NJ 08544, kirkmcd@princeton.edu

Adrian C Melissinos, University of Rochester, Rochester, NY 14627, meliss@pas.rochester.edu

Eric Prebys, University of California, Davis, CA 95618, eprebys@ucdavis.edu

Wolfram Ragg, Roche Diagnostics International Ltd, Forrenstrasse 2, 6343 Rotkreuz, Switzerland, wolfram.ragg@roche.com

David A Reis, Stanford PULSE Institute, Stanford, CA 94305, dreis@stanford.edu

Konstantin Shmakov, Yahoo Labs, 701 First Avenue, Sunnyvale, CA 94089, kshmakov@oath.com

James E Spencer, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, jus@slac.stanford.edu

Dieter R Walz, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, richardwalz@sbcglobal.net

Achim W Weidemann, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, achim@slac.stanford.edu