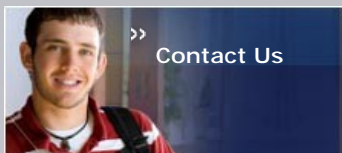
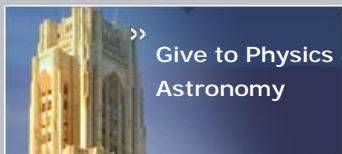
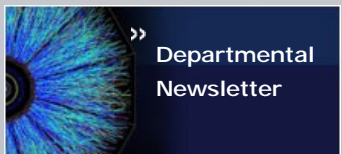


DEPARTMENT OF PHYSICS & ASTRONOMY

SEARCH: Sea

- » Prospective Students
- » Visitors
- » Alumni

- » Home
- » About
- » Undergraduate Pgm.
- » Graduate Program
- » News and Events
- » Research
- » People
- » Student Resources



Home >

Eric S. Swanson

Associate Professor



Contact:

University of Pittsburgh
217 Allen Hall

Pittsburgh, PA 15260

O: (412) 624-9057

F: (412) 624-9163

swansone@pitt.edu

Research: [Particle Physics](#)

Personal Web site: [Research Web Site](#)

Education

Ph.D., Physics, University of Toronto, 1991

Research

I am interested in learning how quarks and gluons build the universe. Quarks are the most basic bits of matter which form all other massive particles such as protons, neutrons, pions, and many others (electrons and neutrinos are not made of quarks). Gluons are the carriers of the force which acts between quarks (much the same as photons are the carriers of the electromagnetic force). The whole thing is described by a quantum field theory called Quantum Chromodynamics, or *QCD* for short.

Although it is easy to describe QCD (the whole theory can be written on one line), it embodies many fascinating phenomena. These include color confinement, asymptotic freedom, spontaneous chiral symmetry breaking, important topological features, the quark-gluon plasma phase transition, and the emergence of an entirely new class of matter made of gluons (like atoms made of pure light!).

QCD is also widely applicable. It is used in nuclear physics (how the nuclei of atoms are formed and behave), astrophysics (the formation of neutron and quark stars), cosmology (the very early universe is thought to have been a quark-gluon plasma), and hadronic physics (the physics of protons, pions, etc). You can find a pedagogical introduction to particle physics [here](#) and an introduction to QCD in an article I wrote for [American Scientist](#).

My research concentrates on describing the structure and interactions of hadrons -- those particles which are made of quarks and gluons. I am especially interested in *exotics*, particles made in whole or in part by gluons. There is an active effort to discover these particles around the world. I am a member of a new \$30 million [experimental effort](#) being mounted at [Jefferson Lab](#) in Virginia. Gluons are an especially interesting part of QCD because their peculiar properties are thought to underlie many of the interesting phenomena I mentioned above.

Understanding QCD means understanding its vacuum. Some of my current research involves using a numerical method called lattice gauge theory to probe different

Grad Students

[Pok Man Lo](#)
[Joseph Meyers](#)

Postdocs

[Yasser Mustafa](#)

aspects of the QCD vacuum. My students and I are also examining the application of the Schwinger-Dyson formalism to nonperturbative properties of quantum field theory.

Publications

- "Confinement Models at Finite Temperature and Density", Pok Man Lo and E.S. Swanson, Phys. Rev. D81, 034030 (2010).
- "Hadron loops: General theorems and application to charmonium", T. Barnes and E.S. Swanson, Phys. Rev. C77, 055206 (2008).
- "A Canonical Ds(2317)?", O. Lakhina and E.S. Swanson, Phys. Lett. B650, 159 (2007).
- "The New Heavy Mesons: a Status Report", E.S. Swanson, Phys. Rept. 429, 243 (2006).
- "Higher Charmonia," T. Barnes, S. Godfrey, and E.S. Swanson, Phys. Rev. D72, 054026 (2005).
- "Short Range Structure in the X(3872)," E.S. Swanson, Phys. Lett. B588, 189 (2004).
- "Coulomb Gauge QCD, Confinement, and the Constituent Representation," A. Szczepaniak and E.S. Swanson, Phys. Rev. D65, 025012 (2002).
- "Chiral Extrapolation, Renormalization, and the Viability of the Quark Model," A. Szczepaniak and E.S. Swanson, Phys. Rev. Lett. 87, 072001 (2001).
- "One the Excitation Spectrum of Heisenberg Spin Ladders," T. Barnes, E. Dagotto, J. Riera, and E.S. Swanson, Phys. Rev. B47, 3196 (1993).

recent publications

Musings, Rants, Rambles, and other Writing

- [Keep Your Hands off of My Theory!](#), Pittsburgh Post Gazette op-ed, Jan 9, 2011
- [Weather and Climate aren't the Same](#), Pittsburgh Post Gazette, Feb 2010
- [We Can't Run and We Can't Hide](#), Pittsburgh Post Gazette op-ed, Sept 27, 2009.
- [Stop Freaking Out about Cell Phones!](#), Pittsburgh Post Gazette op-ed, Aug 3, 2008
- [Na tropie egzotycznych hadronow](#), Postepy Fiziki, Jan 18, 2005.
- [Rumsfeld's Folly: National Missile Defense](#), Pittsburgh Post Gazette op-ed, Jan 14, 2001
- [The Search for QCD Exotics](#), American Scientist, Sept, 2000
- [Science Stew](#)

Guest Appearances

- [Are Cell Phones Safe?](#), www.procon.org, Feb 2010
- [KDKA's Jeff Verszyla is Tweeting up a Storm](#), Pittsburgh Post Gazette, Oct 16, 2009
- [Hadronic Physicists Find a Home](#), APS News, Oct 2009
- [Exotic Arrival](#), Frontline Magazine, May 2009
- [Physicists Spot Unusual Charged Meson](#), Physics World, Nov 15, 2007
- [Starting From Square One](#), Science News, Aug 7, 2004
- [Misbehavin' Meson: perplexing particle flouts the rules](#), Science News, June 26, 2004
- [New Hadronic Physics Topical Group Approved](#), APS News, Jan 2002

Department of Physics and Astronomy
University of Pittsburgh
100 Allen Hall
3941 O'Hara St
Pittsburgh PA 15260
O: (412) 624-9000 | F: (412) 624-9163