James Saxon

CONTACT

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POSITIONS

Harris School of Public Policy, University of Chicago, Chicago, Illinois

Postdoctoral Scholar supervised by Dan Black, Economics Group, 2016 - present

Enrico Fermi Institute, University of Chicago, Chicago, Illinois

Enrico Fermi Fellow (Postdoctoral Scholar in Physics), 2014-2016

EDUCATION

University of Pennsylvania, Philadelphia, Pennsylvania

Ph.D., Experimental Particle Physics, August 2014

- Advisor: H. H. Williams. Dissertation: *Observation of the Higgs Boson, Measurements of its Production, and a Search for Higgs Boson Pair Production.*
- ATLAS Thesis Award; US ATLAS Outstanding Graduate Student Award (2014).

M.S., Physics, May 2012

Swarthmore College, Swarthmore, Pennsylvania

B.A., Physics and Political Science, May 2010

Goldwater Scholar, April 2008

Visiting Student at Oxford University, 2007-2008

- First class marks and special praise from the college tutorial committee.

CURRENT RESEARCH

Clustering Algorithms and Political Districting

Compactness has long been recognized in Congress, the courts, and the political science literature as a potential restraint on gerrymandering political districts. Yet a proliferation of definitions of *compactness* has hardly led to widespread use: the discussion has floundered for want of a consistent and comprehensive framework with which to compare the proposals. I am writing a tool that both evaluates all proposals and automatically generates "optimal" maps for each, so as to compare the measures' spatial consistency (principal components, rank correlations) and political effects (electoral bias and competitiveness).

Outcomes of Children Born to Teen Mothers

Roughly half of all pregnancies in the United States are unwanted or mistimed. Single parenthood is an important factor in childhood poverty, and "unwanted" children have worse outcomes than their peers. Using NLSY79 data, I am studying the educational, criminal, and employment outcomes of children born after "unwanted" pregnancies to young mothers. Following work by Hotz, Mullin, and Sanders that evaluates the mothers' outcomes, I am working on using miscarriages as an (imperfect) instrument for childbirth.

Death and Measurement Error

Black, Sanders, Taylor, and Schofield (forthcoming) show that a failure to correctly match death records is largely responsible for the purported late-life deceleration of mortality hazards in old men. Working with Dan Black to extend this on the NLS Mature Women dataset, I have begun studying the rates of incorrect matches (false positives), and methods for correcting measurements by introducing additional covariates of life expectancy.

Research in Physics

The ATLAS Experiment, CERN, Geneva, Switzerland (2003-2016)

I worked on the ATLAS experiment over thirteen years, starting after my sophomore year in high school. I participated in the design, production, and operation of two major subdetectors. My contributions to the discovery and early measurements of the Higgs Boson were recognized with both the ATLAS Thesis Award and US ATLAS Outstanding Graduate Student Award. Highlights of my time on the experiment include:

▷ Detector Design, Commissioning, and Operations
- The Transition Radiation Tracker (TRT) is one of the main subdetectors of the ATLAS experiment; it records the trajectories of charged particles and provides unusual particle identification capabilities. I began working on the prototype custom electronics for the TRT in high school, and continued through grad school on the installation, testing, commissionning and operation of the detector and its support and data acquisition systems.
- The LHC collides protons at 40 MHz but can only write these 'events' to disk at 1 kHz. The decision whether to save an event is made real-time by a mixture of hardware and software called a 'trigger' (2.5 μs for the first stage; 1 s for the final decision). If better information can be processed in that time, a better decision can be made. As a postdoc, I worked on simulation studies, firmware, and electronics for a custom hardware system capable of reconstructing the trajectories of all charged particles in the detector in 100 μs (Fast TracKer, FTK).

▷ Multivariate Algorithms for Particle Identification and the Higgs Discovery
- One of the prime methods for observing and discovering the Higgs boson was in its decay to two photons. Without great care however, the small signal is overwhelmed by a background of quarks and gluons (the building blocks of nucleons). I studied variables that discriminate photons from quarks and gluons, and designed the multivariate algorithms that selected the photons used by ATLAS for the Higgs discovery.

▷ Early Measurements with the Higgs Boson
- After discovering a new particle, one of the first critical questions was whether it was the Higgs. This was determined by understanding its interactions with other particles. I played an important role in defining the first measurements of the "Higgstrahlung" production process – radiation of a Higgs from a W or Z boson.
- As the particle became more-convincingly "the Higgs," I proposed a broad slate of measurements of the properties of its production and decay (differential cross sections), and helped assemble a large team to perform this work. I was co-editor of the first conference proceedings on the subject. This subsequently became a major area of LHC research.

▷ Exotic Interactions of the Higgs Boson
- After identifying a new particle, there was much hope that it would provide a "portal" to "new" physics. I led the first search for Higgs boson pair production (in the $\gamma\gamma b\bar{b}$ final state), which subsequently, became a focal point of LHC research.
- As a postdoc, I was the "contact person" (analysis lead) for searching for invisible decays of the Higgs boson. To date, none have been found...

▷ I served on the ATLAS internal review boards for a number of high-profile publications, as well as actually writing two – a rarity on a 3000-person collaboration.

Teaching Experience

University of Chicago, Chicago, Illinois

Instructor, Harris School of Public Policy. (2016)
- In my first quarter at the Harris School, I was responsible for designing and teaching a quarter-long *Introduction to Programming for Public Policy* for masters students. The course covered algorithmic thinking, basic programming (python), and data manipulation (syllabus). There were 60 students divided between two sections.

University of Pennsylvania, Philadelphia, Pennsylvania

Teaching Assistant, Department of Physics and Astronomy. (2010-2011)

- I supervised labs, and graded labs, exams, and quizzes. After transitioning to research, I mentored two undergraduates and one younger graduate student at Penn. (At Chicago, I was directly responsible for two graduate students and an undergrad.)

Other Work Experience

United States House of Representatives, Washington, DC

Intern, Committee on Science and Technology. (Dec. 2008 - April 2009)

- Summarized scientific reports for the staff of the Subcommittee on Energy and the Environment; prepared questions for witnesses; office and clerical work.

Public Presentations

Diphotons at ATLAS. Argonne National Laboratory, New Physics Interpretations at the LHC. Lemont, USA, May 2016.

Physics at the Large Hadron Collider. Swarthmore College, Department Colloquium. Swarthmore, USA, November 2015.

The Discovery of the Higs Boson. Swarthmore Rotary Club. Swarthmore, PA, USA, November 2015.

Fast TracKing at ATLAS: Why and How? Fermi National Accelerator Laboratory, US LHC Users' Association, Lightning Round. Batavia, USA, November 2015.

The Fast TracKer (FTK) at ATLAS. Fermi National Accelerator Laboratory, LPC Physics Forum. Batavia, USA, October 2015.

ATLAS Physics: Highlights and Hopes. University of Pennsylvania, Electronics and Instrumentation for Past and Future Discoveries. Philadelphia, USA, May 2015.

Higgs to Two Photons as a Tool for Discovery. University of Chicago, HEP Seminar. Chicago, USA, November 2014.

Searches for Higgs boson pair production in the $hh \to \gamma\gamma b\bar{b}$ final state from ATLAS and CMS. CERN Theory Division, Collider Cross Talk. Geneva, Switzerland, July 2014.

Combined Measurements of the Properties of the Higgs Boson Using the ATLAS Detector. Phenomenology Symposium. Pittsburgh, PA, May 2014.

Searches for Dihiggs and rare decays. [Session Convener] ATLAS Higgs Workshop. Rome, Italy, April 2014.

Beyond Discovery: Early Measurements of the Higgs Boson in the Diphoton Decay Channel. Lawrence Berkeley National Lab. Berkeley, USA, December 2013.

Differential cross sections of the Higgs boson measured in the diphoton decay channel. Meeting of the American Physical Society Division of Particles and Fields. Santa Cruz, CA, August 2013.

Differential cross section measurements in $h \to \gamma\gamma$ with the ATLAS detector at the LHC. [Poster] European Physical Society Conference on High Energy Physics. Stockholm, Sweden, July 2013.

ATLAS Tracking, Beam Protection and Forward Detector Systems [Poster] C. Alpigiani, A. Gorisek, J. Saxon, A. Schorlemmer, S. Valentinetti, and N. Venturi. Large Hadron Collider Committee Meeting. Geneva, Switzerland, March 2013.

Selected Publications	See attachment.
Languages	Native English, fluent French, competent Spanish, basic German.
	C++, python, bash, LaTeX, SQL (Postgres, MySQL, Oracle), VHDL, html/css.
Non-Academic Awards	Rotary International Exchange Fellowship to Paris, 2003-2004
	Eagle Scout with Silver Palm, 2002
References	Available on request.