

Sébastien Philippe

CONTACT INFORMATION

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EDUCATION

Princeton University, Princeton, USA

Ph.D. in Applied Physics, expected 2017

Department of Mechanical and Aerospace Engineering (MAE)

- Thesis: Zero-Knowledge Nuclear Warhead Verification
- Committee: Alexander Glaser (Advisor), Robert J. Goldston and Michael Littman

Graduate Certificate in Science, Technology and Environmental Policy, 2016

Woodrow Wilson School of Public and International Affairs (WWS)

M.A. in Applied Physics, 2014

Concentration: Nuclear Energy, Physics and Engineering; Plasma Physics and Fusion Energy; Statistical Mechanics; Experimental Methods.

Institut National des Sciences Appliquées, Lyon, France

M.S., Mechanical and Design Engineering, 2004–2010

The University of Dublin, Trinity College, Dublin, Ireland

B.A. and B.A.I., Mechanical and Manufacturing Engineering, highest honor (1.1), 2007–2009

CURRENT POSITIONS

Nuclear Futures Laboratory (MAE)

and Program on Science and Global Security (WWS)

and Princeton Plasma Physics Laboratory (PPPL), Princeton University, USA

Ph.D. Candidate

July, 2012 - present

I develop the theory and experimental demonstration of a physical "zero-knowledge" cryptographic technique using neutron imaging that could confirm the authenticity of nuclear weapons without learning any sensitive information.

Science & Global Security, Princeton University, USA

Editorial Assistant, Peer-Reviewed Journal

April, 2014 - present

Write editorials, contact reviewers, and work with authors to revise papers.

PROFESSIONAL EXPERIENCE

Direction Générale de l'Armement, Ministry of Defense, Paris, France

Nuclear Safety and Security Engineer

February, 2011 - June, 2012

Developed and implemented nuclear safety regulations in the French strategic nuclear forces, defended cases in front of the national safety authorities, validated changes in system design impacting nuclear safety, analyzed and accepted the outcomes of public contracts, held co-secretary position in the Navy and Procurement Agency joint-group for the acquisition and preservation of nuclear safety and security.

Institut de Recherche Stratégique, Ecole Militaire, Ministry of Defense, Paris, France

Graduate Research Fellow

October, 2010 - December, 2010

Conducted studies on Iran's nuclear program for the joint chief of staff, drafted a proposal for a research project on ballistic missile defense in Europe with NATO partners.

Center for Science and Peace Research, University of Hamburg, Hamburg, Germany
Research Assistant February, 2010 - August, 2010
Conducted a technical assessment of the Iranian nuclear fuel cycle. Attended the 2010 Nuclear Non-Proliferation Treaty review conference in the United Nations (NY, USA) as a member of civil society and participated in simulations of negotiations on a nuclear weapons convention.

ADDITIONAL
TRAINING

Thermo Fisher Scientific, Colorado Springs, CO, USA
"P385 D-T Neutron Generator Training Certificate," 2015.

Los Alamos National Laboratory, Los Alamos, NM, USA
"Introduction to the General Monte Carlo N-Particle (MCNP6) Transport Code," 2013.

Ecole des Applications Militaires de l'Energie Atomique, Cherbourg, France
"Advanced nuclear safety: nuclear weapons systems, naval nuclear reactors, military law and environmental regulations," 2011.

Ecole Nationale Supérieure des Techniques Avancées, Paris, France
"Solid propellant propulsive systems: advanced architecture and design," 2011.

TEACHING

Science & Global Security: From Nuclear Weapons to Cyberwarfare, Princeton University
Woodrow Wilson School of Public and International Affairs, Preceptor and Teaching Assistant, with Prof. A. Glaser, Fall 2015.

Unmaking the Bomb: The Science & Technology of Nuclear Nonproliferation, Disarmament, and Verification, Princeton University, Department of Mechanical and Aerospace Engineering, Teaching Assistant, with Prof. A. Glaser, Spring 2015.

Science and Technology of Nuclear Energy: Fission and Fusion, Princeton University
Department of Astrophysical Sciences, Teaching Assistant, with Prof. R. J. Goldston, Spring 2014.

HONORS
AND AWARDS

George W. Riesz '50 *52 SEAS Fellowship, Princeton University, Full Tuition and Stipend, 2012.

Explo'Ra Sup Fellowship, Rhones-Alpes Region, Stipend for a 6 months internship abroad, 2010.

UREKA Supplement Award, Science Foundation Ireland, €7500 for summer research, 2008.

Socrates Fellowship, European Commission, Full Tuition and Stipend for one year abroad, 2008.

Explo'Ra Sup Fellowship, Rhones-Alpes Region, Full Tuition and Stipend for one year abroad, 2007.

MEMBERSHIPS

Associate, Consortium for Verification Technology, since October 2014.

Member, Institute of Nuclear Materials Management (INMM), since 2014.

Class representative, MAE Graduate Student Council, 2013-2016.

LANGUAGES

French (mother tongue), English (fluent), German (basics)

JOURNAL
PUBLICATIONS

S. Philippe, R. J. Goldston, A. Glaser and F. d'Errico, "A physical zero-knowledge object-comparison system for nuclear warhead verification," *Nature Communications*, 7:12890 (2016).

S. Philippe, "Safeguarding the Military Naval Nuclear Fuel Cycle," *Journal of Nuclear Materials Management*, Vol. XLII, No.3, 2014.

S. Philippe and A. Glaser, "Nuclear Archaeology for Gaseous Diffusion Enrichment Plants," *Science & Global Security*, Vol. 22, Iss. 1, 2014.

SUBMITTED
AND IN REVIEW

S. Philippe and F. von Hippel, "Moving Forward on Converting the U.S. Nuclear Navy to LEU Fuel."

WORKING
PAPERS

S. Philippe, M. Kütt , B. Barak, A. Glaser and R. J. Goldston, "Testing Strategies for the Authentication of Nuclear Weapons with High Confidence," working draft.

S. Philippe, "The French Naval Nuclear Reactor Program and its Conversion from Highly to Low Enriched Uranium," in preparation.

B. Pelopidas and **S. Philippe**, "Rethinking the origins of nuclear secrecy: the wartime origins of the French Atomic Energy Commission," in preparation.

ONLINE
PUBLICATIONS

F. von Hippel and **S. Philippe**, "U.S. Office of Naval Reactors outlines \$1 billion R&D plan for development of LEU fuel," *IPFM Blog*, 14 August 2016.

B. Pelopidas and **S. Philippe**, "Pour une recherche indépendante sur les armes nucléaires en France," (The case for independent research on nuclear weapons in France), *The Conversation*, 12 July 2016 (in French).

S. Philippe, "Bringing Law to the Sea: Safeguarding the Naval Nuclear Fuel Cycle," *Bulletin of the Atomic Scientists*, 4 September 2014.

B. Pelopidas and **S. Philippe**, "Les Armes Nucléaires et l'illusion de la Sûreté," (Nuclear Weapons and the Illusion of Safety), *Mediapart*, 7 January 2014 (in French).

CONFERENCE
PUBLICATIONS

F. von Hippel and **S. Philippe**, "A Ban On the Production of Highly Enriched Uranium," 57th Annual INMM Meeting, 24-28 July 2016, Atlanta, Georgia.

S. Philippe, A. Glaser, R. J. Goldston and F. d'Errico, "Zero-Knowledge Differential Isotopic Comparison of Special Nuclear Materials," 57th Annual INMM Meeting, 24-28 July 2016, Atlanta, Georgia.

S. Philippe, M. Kuett, M. McKeown, A. Glaser and U. Rhrmair, "The Application of Virtual Proofs of Reality to Nuclear Safeguards and Arms Control Verification," 57th Annual INMM Meeting, 24-28 July 2016, Atlanta, Georgia.

S. Philippe, R. J. Goldston, G. Ascione, F. d'Errico, C. Gentile and A. Glaser, "Experimental Demonstration of a Physical Zero-knowledge Protocol for Nuclear Warhead Verification," 56th Annual INMM Meeting, 12-16 July 2015, Indian Wells, California.

S. Philippe, B. Barak and A. Glaser, "Designing Protocols for Nuclear Weapons Verification," 56th Annual INMM Meeting, 12-16 July 2015, Indian Wells, California.

M. Kütt , A. Glaser and **S. Philippe**, "Leveraging the Wisdom of the Crowd: Hardware and Software Challenges for Nuclear Disarmament Verification," 56th Annual INMM Meeting, 12-16 July 2015, Indian Wells, California.

S. Philippe, "All at Sea? A Safeguards Approach for the Military Naval Nuclear Fuel Cycle," 55th Annual INMM Meeting, 20-24 July 2014, Atlanta, Georgia.

R. J. Goldston, F. d'Errico, A. di Fulvio, A. Glaser, **S. Philippe** and M. Walker, "Zero-Knowledge Warhead Verification: System Requirements and Detector Technology," 55th Annual INMM Meeting, 20-24 July 2014, Atlanta, Georgia.

M. Kütt , **S. Philippe**, B. Barak, A. Glaser and R. J. Goldston, "Authenticating Nuclear Warheads With High Confidence," 55th Annual INMM Meeting, 20-24 July 2014, Atlanta, Georgia.

S. Philippe, A. Glaser, M. Walker, B. Barak and R. J. Goldston, "Resolving the Information Barrier Dilemma: Next Steps Towards Trusted Zero-Knowledge Nuclear Warhead Verification," INMM Information Analysis Technologies, Techniques and Methods for Safeguards, Nonproliferation and Arms Control

Verification Conference, 12-14 May 2014, Portland, Oregon.

S. Philippe and A. Glaser, "Nuclear Archaeology for Gaseous Diffusion Enrichment Plants," 54th Annual INMM Meeting, 14-18 July 2013, Palm Desert, California.

TALKS

Kilotons, Kilowatts and Kilograms: Fissile Materials Science and Policy, SEAS Grad-Postdoc Energy Meeting, Princeton University, 16 June 2016

A Physical Zero-Knowledge Shell Game, Workshop on Techniques for Protection of Imaging Information, Pacific Northwest and Sandia National Laboratories, Seattle, 1 June 2016

Naval Nuclear Propulsion in France, International Panel on Fissile Materials Annual Meeting, AAAS, Washington DC, 14 March 2016

Designing Protocols for Nuclear Weapons Verification, with Malte Goettsche, Princeton Verification Workshop, Princeton University, 11 December 2015.

Zero-Knowledge Neutron Detection: First Experimental Demonstration of a Physical Zero-Knowledge Protocol, with Francesco d'Errico (Yale University), Consortium for Verification Technology Annual Meeting, University of Michigan, Ann Arbor, 16 October 2015

Zero-Knowledge Warhead Verification using the Template-Matching Approach, SGS (Princeton) and PVTs (Chinese Academy of Engineering Physics) Workshop on Verification Technology, Beijing, 16 June 2015.

Safeguarding the Naval Nuclear Fuel Cycle, International Atomic Energy Agency, Vienna, 6 January 2015.

Building Confidence without Sharing Secrets: The Case for Safeguards in the Naval Nuclear Fuel Cycle, New Technologies for Information Analysis to Support Non-Proliferation and Disarmament Verification, Vienna Center for Disarmament and Non-Proliferation, Vienna, 12 December 2014.

Arms Control and Disarmament Verification Approaches in Military and Sensitive Environment, Science and Global Security Seminar, Princeton University, 19 November 2014.

Is There a Bomb in the Box? Nuclear Warhead Authentication and the Virtues of Knowing Nothing, 26th International Summer Symposium on Science and World Affairs, Princeton University, 28 July 2014 *and* Department of Mechanical and Aerospace Engineering, Princeton University, 21 May 2014.

The Nuclear Archaeology of Gaseous Diffusion Enrichment Plants, Princeton University Research Symposium, 20 October 2013 *and* Department of Mechanical and Aerospace Engineering Research Day, Princeton University, 13 September 2013.

Underwater Criticality: Submarine Propulsion Options and Their Consequences on the Non-Proliferation Regime, 24th International Summer Symposium on Science and World Affairs, Princeton University, 6 July 2012.

A Technical Review and Capability Assessment of the Iranian Nuclear Fuel Cycle, 22nd International Summer Symposium on Science and World Affairs, Deutsches Elektronen-Synchrotron (DESY) Research Center, Hamburg, Germany, 10 July 2010.

The Future of Nuclear Deterrence in Europe: Solving a Square Relationship Between NATO, the European Union, the United Kingdom, and France, 21st International Summer Symposium on Science and World Affairs, Fudan University, Shanghai, China, 22 July 2009.

Last Update: September 2016