

AARON SCHURGER PhD

CURRICULUM VITAE

French National Institute for Health and
Medical Research (INSERM)
Cognitive Neuroimaging Unit (U992)
NeuroSpin Research Center
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1015 Lausanne, Switzerland
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EDUCATION

Princeton University, Princeton, New Jersey

PhD, Psychology and Neuroscience (awarded 2008)
MA, Psychology and Neuroscience (awarded 2004)
Supervisors: Jonathan D. Cohen and Anne Treisman

Indiana University, Bloomington, Indiana

BA, Computer Science (with honors); minor concentration in Music (awarded 1992)

PROFESSIONAL APPOINTMENTS

- 2014 – *Associate Professor (Chargé de Recherche 1)*
INSERM (French National Institute of Health and Medical Research)
NeuroSpin Research Center, FRANCE
- 2013 – present *Senior Researcher*, Department of Life Sciences
École Polytechnique Fédérale de Lausanne, Lausanne, SWITZERLAND
- 2012 – 2013 *Visiting Fellow*, Bernstein Center for Computational Neuroscience
Humboldt-Universität zu Berlin, Berlin, GERMANY
- 2008 – 2012 *Post-doctoral Researcher*, Laboratory of Cognitive Neuroimaging
NeuroSpin, CEA-Saclay, Gif-sur-Yvette, FRANCE

GRANTS / FELLOWSHIPS / AWARDS / HONORS

- 2014 **ERC Starting Grant**, Horizon 2020
- 2013 **William James Prize**, Association for the Scientific Study of Consciousness
- 2010 **EC FP7 Marie Curie** Incoming International Fellowship (two-year tenure)
- 2007/08 Aspen Brain Research Retreat (Mind Science Found)
- 2006 **US NIH Ruth L. Kirschstein National Research Service Award** (two-year tenure)
- 2006 Summer Institute in Cognitive Neuroscience, Dartmouth College
- 2005 **Mind Science Foundation Research Award** for Consciousness Research
- 2002 **US NSF Graduate Research Fellowship** (three-year tenure)
- 2002 **Princeton-Oxford Exchange Grant**, CSBMB, Princeton University
- 2001 Princeton University Centennial Fellowship (one-year tenure)

CURRENT GRANT: ERC Horizon 2020 Starting Grant; 1.4 M Euros

“Brain-behavior forecasting: *Neural determinants of spontaneous self-initiated action, and their relation to the perception of personal causation and societal concepts of personal responsibility.*”

CO-AUTHORED GRANT IN REVIEW: HUG-MEG: Pioneering magnetoencephalography in Switzerland for studying the brain and its disorders. 1M CHF

PUBLICATIONS

Schurger A, Kim M, Cohen JD (2015) Paradoxical interaction between ocular activity, perception, and metacognition at the threshold of vision. *PloS One*, DOI:10.1371/journal.pone.0125278

Schurger A, Sarigiannidis I, Dehaene S (2015) Cortical activity is more stable when sensory stimuli are consciously perceived. *PNAS*, **112**(16): E2083-2092 ★

Schurger A, Uithol S (2015) Nowhere and everywhere: the causal origin of voluntary action. *Review of Philosophy and Psychology*, DOI: 10.1007/s13164-014-0223-2

Schurger A (2014) Intentions and voluntary actions: reframing the problem. *Cognitive Neuroscience*, DOI: 10.1080/17588928.2014.950214

Schurger A (2014) Consciousness Perceived. *Science*, **345**:147 (Review of *Consciousness and the Social Brain*, Michael S. A. Graziano, Oxford Univ Press, 2013)

King JR, Gramfort A, **Schurger A**, Naccache L, Dehaene S (2014) Two distinct dynamic modes subtend the detection of unexpected sounds. *PloS One* **9**(1):e85791

Schurger A, Marti S, Dehaene S (2013) Reducing multi-sensor data to a single time course that reveals experimental effects. *BMC-Neuroscience* **14**:122

King JR, Faugeras F, Gramfort A, **Schurger A**, El Karoui I, Wacongne C, Labyt E, Bekenshtein T, Naccache L, Dehaene S (2013) Single-trial decoding of auditory novelty responses facilitates the detection of residual consciousness. *Neuroimage* **83**: 726-738

Schurger A, Sitt J, Dehaene S (2012) An accumulator model for spontaneous neural activity prior to self-initiated movement. *PNAS* 109(42):16776-16777 ★

Schurger A, Pereira F, Treisman A, Cohen JD (2010) Reproducibility distinguishes conscious from non-conscious neural representations. *Science* **327**: 97-99 ★

Schurger A (2009) A very inexpensive MRI-compatible method for dichoptic visual stimulation. *J Neurosci Methods* **177**(1):199-202

Schurger A, Sher S (2008) Awareness, loss-aversion, and post-decision wagering. *Trends in Cognitive Sciences* **12**(3):209-210

Schurger A, Cowey A, Cohen JD, Treisman A, Tallon-Baudry C (2008) Distinct and independent correlates of attention and awareness in a hemianopic patient. *Neuropsychologia* **46**(8):2189-97 ★

Schurger A, Cowey A, Tallon-Baudry C (2006) Gamma-band oscillations correlate with awareness in hemianopic patient GY. *Neuropsychologia* **44**:1796-1803

Nieuwenhuis S, Yeung N, Holroyd CB, **Schurger, A**, & Cohen JD (2004) Sensitivity of electrophysiological activity from medial frontal cortex to utilitarian and performance feedback. *Cerebral Cortex* **14**:741-747

MANUSCRIPTS IN PREPARATION OR IN REVIEW

Schurger A, Mylopoulos M, Rosenthal D (*invited review, Trends in Cognitive Sciences*) Neural antecedents of voluntary movement: a new perspective.

Schurger A, Basbug M, Schapire R (*in review*) Mapping the time course of neural activity predictive of impending movement using boosting applied to M/EEG data.

Gale S, Prsa M, **Schurger A**, Gay A, Paillard A, Heberlin B, Guyot JP, Lopez C, Blanke O (*in review*) Evoked and oscillatory EEG responses to natural vestibular stimulation.

Evans N, Gale S, **Schurger A**, Blanke O (*in review*) Visuo-neural discrepancies modulate the sense of agency for brain-machine actions.

Guevarra R, **Schurger A** (*in prep*) A pink model of decision making.

Schurger A, Sarigiannidis I, Dehaene S (*in prep*) Non-monotonic relationship between stimulus intensity and discrimination accuracy at the threshold of vision.

BOOK CHAPTERS

Schurger A (*in prep*) *The Neuropsychology of Free Will*, in *The Blackwell Companion to Consciousness*, S. Schneider & M. Velmans Eds., John Wiley & Sons, West Sussex, UK.

Schurger A, Cowey A (2013) *Blindsight*, in *Encyclopedia of the Mind*, H. Pashler Ed., Sage Publications, Thousand Oaks, CA, USA.

AD-HOC REVIEWER FOR THE FOLLOWING JOURNALS

Current Biology; Consciousness and Cognition; NeuroImage; Journal of Experimental Psychology – General; PNAS; PloS One; Journal of Neuroscience; Psychological Science; Experimental Brain Research; Review of Philosophy and Psychology; Cognitive Neuroscience

CONFERENCE ABSTRACTS / POSTERS / OTHER

Schurger A, Sobolewski A, del R Millán J, Blanke O (2015). Readiness to perform an action without movement of the body in expert brain-computer interface users. 2015 Alpine Brain Imaging Conference, Champéry, Switzerland.

Schurger A and Marti S (2012). *Revealing the time-course of experimental effects in multivariate time-series data using a supervised leave-one-out procedure*. BioMag 2012, Paris

Marti S, **Schurger A**, Dehaene S (2012). Revealing single-trial time course of a sensory buffer during the psychological refractory period using a new spatial filtering method. SfN 2012, New Orleans

Schurger A, Parkkonen L, Souloumiac A, Monfort B, King JR, Naccache L, Dehaene S (2009) *Asynchronous decoding of brain states: experimental and clinical applications*. FRM/ICM Réunion Cerveau/Machine Interface (Brain-Machine Interface Meeting) 2009, Paris.

Schurger A, Pereira F, Treisman A, Cohen JD (2009) *Pattern of BOLD information distinguishes conscious from non-conscious responses to visual stimuli*. ASSC-13, Berlin

Schurger A, Kim MS (2007) *Category discrimination without awareness*. 2007 Princeton Research Symposium, Princeton, NJ.

Schurger A, Cowey A, Cohen JD, Treisman A, Tallon-Baudry C (2005) *Gamma-band oscillations correlate with awareness in blindsight*. OHBM 2005, Toronto.

Schurger A (2005) *Mooney Faces*. 2005 Princeton Art of Science competition. Image has been reproduced in several magazines and textbooks.

<http://www.princeton.edu/artofscience/gallery/view.php%3Ffid=77.html>

Schurger A, Tallon-Baudry C, Cohen JD, Treisman A, Cowey A (2004) *MEG correlates of awareness in blindsight patient GY*. 2004 Princeton Neuroscience Retreat, Princeton, NJ.

MEDIA ATTENTION

<http://www.newscientist.com/article/mg22630164.500-sparks-of-consciousness-mapped-in-most-detail-yet.html>

<http://www.newscientist.com/article/dn18150-signature-of-consciousness-captured-in-brain-scans.html>

<http://www.newscientist.com/article/dn22144-brain-might-not-stand-in-the-way-of-free-will.html>

INVITED LECTURES / CONFERENCE TALKS / SYMPOSIA

Vision and Cognition Seminar, Brain Mind Institute, EPFL
Invited Lecture: *Transient stability marks decisions in recurrent networks and perception*
EPFL, Lausanne, Switzerland, February, 2015

Bernstein Center for Computational Neuroscience, Freiburg (BCF)
Invited Lecture: *Cortical activity is more stable when stimuli are consciously perceived*
BCF, Freiburg, Germany, February, 2015

Division of Neurorehabilitation, University Hospital of Geneva
Invited Lecture: *Stability as a signature of conscious state in brain-injured patients*
Geneva, Switzerland, December 2014

Association for the Scientific Study of Consciousness
18th Annual Conference (ASSC18), **Symposium organizer and speaker**
Symposium title: *Quantifying Consciousness: Theoretical and Clinical Implications*
Lecture title: *Stability as a signature of neuronal adequacy for subjective report.*
Symposium speakers: Aaron Schurger (EPFL, Lausanne), Jacobo Sitt (ICM, Paris),
Marcello Massimini (Univ Milan, Italy), Anil Seth (Univ Sussex, UK)
Brisbane, Australia, July 2014

CUNY Cognitive Science Symposium (invited lecture)
Lecture title: *The time course of neural activity predictive of impending movement and its relation to the feeling of intending.*
CUNY, New York City, July 2013

Association for the Scientific Study of Consciousness
17th Annual Conference (ASSC17), **William James prize lecture**, opening plenary session
Lecture title: *Riding the cortical wave: An accumulator model for spontaneous neural activity prior to self-initiated movement.*
San Diego, CA, July 2013

Center for Neuro-Prosthetics (invited lecture)
Lecture title: *Spontaneous Neural Activity and Self-Initiated Movement*
École Polytechnique Fédérale de Lausanne, 10 October 2012

The Conscious Body: an interdisciplinary dialogue (invited lecture)
Lecture title: *A possible role for spontaneous brain waves in artistic improvisation.*
Paris, October 2012

CUNY Cognitive Science Symposium (invited lecture)
Lecture title: *Task-specific cortical activity is more stable when its information content is directly reportable.*
CUNY, New York City, July 2012

Association for the Scientific Study of Consciousness
16th Annual Conference (ASSC16), Concurrent Session 3.1
Lecture title: *Stability as a Hallmark of the Neural Dynamics Underlying Conscious Sensory Perception.*
University of Sussex, Brighton, UK, June 2012

Colloque de l'Institut d'Étude de la Cognition (invited lecture)
École Normale Supérieure Paris
Title: *Riding the cortical wave: spontaneous neural activity and self-initiated movement*
17 April 2012

Seminar on Causality (invited lecture)
NeuroSpin, CEA-Saclay, France
Title: *The neural antecedents of spontaneous movement initiation.*
12 January 2012

Lecture series for the Bioscience Master (invited lecture)
École Normale Supérieure de Lyon (Prof. Jean-René Duhamel)
Title: *Signatures of consciousness in the human brain*
26 May 2011

Colloque de l'Orme des Merisiers (**invited public lecture**)
l'Institut de Recherche sur les Lois Fondamentales de l'Univers
Title: *IRM: Perception et conscience / fMRI: Perception and consciousness*
Given in French, 7 April 2011

European Society for Psychology and Philosophy (ESPP) 2010 Annual Meeting
Symposium organizer and speaker
Symposium title: *Causality within the brain and between the brain and the limbs: a fresh look at the initiation of movement and the feeling of "intending"*
Lecture title: *Riding the cortical wave: volition as evidence accumulation*
Symposium speakers: Marc Pavlopoulos (CEA-Larsim, France), John-Dylan Haynes (BCCN, Berlin), Tillmann Vierkant (U. Edinburgh), Aaron Schurger (NeuroSpin, France)

CUNY Cognitive Science Symposium (invited lecture)
Lecture title: *Riding the cortical wave: volition as evidence accumulation*
CUNY Graduate Center, New York City, July 2010

Association for the Scientific Study of Consciousness
14th Annual Conference (ASSC14), Concurrent Session 1
Lecture title: *Paradoxical effects of fixational eye movements at the threshold of sensory awareness*
Toronto, Canada, June 2010

CUNY Cognitive Science Symposium (invited lecture)
Lecture title: *Category discrimination without awareness in normal subjects: evidence for a "Luke Skywalker" effect*
CUNY Graduate Center, New York City, June 2008

Towards a Science of Consciousness, "Tucson VIII"
Lecture title: *Category discrimination without awareness in normal subjects revealed using dichoptic color fusion and post-decision wagering*
Tucson, AZ, April 2008

Graduate Seminar Course on Cognitive Psychology, Spring 2008 (invited lecture)
Lecture title: *The Scientific Study of Consciousness*
Princeton University, March 2008

CUNY Cognitive Science Symposium (invited lecture)
Lecture title: *Dissociating attention from awareness, theoretically and empirically*
CUNY Graduate Center, New York City, April 2007

Association for the Scientific Study of Consciousness (**Tom Slick award lecture**)
10th Annual Conference (ASSC10), **Plenary Symposium 2**
Lecture title: *"Something happened": gamma oscillations, awareness, and attention-
without-awareness in a hemianopic patient*
Oxford, UK, June 2006

Seminar Course on *States of Consciousness*, Spring 2006 (invited lecture)
Lecture title: *Blindsight, neural synchrony, and sensory awareness*
Vassar College, March 2006

Symposium: *Consciousness, Self-experience, and the Brain* (invited lecture)
Presenters: Aaron Schurger (in lieu of Jonathan D. Cohen), Joseph Lichtenberg, M.D.,
Milton Kramer, M.D., and Marcel Kinsbourne, M.D.
New York Medical College, Department of Psychiatry and Behavioral Sciences
New York City, April 2002

SEMINARS, TUTORIALS, MEETINGS

Founder and co-organizer of the "Neuroscience of Brain-Computer Interfaces" (NBCI)
seminar series
École Polytechnique Fédérale de Lausanne
January 2014 – present

Co-organizer (w/ Etienne Klein and Frederic Pascal), *Seminar on Causality*
L'Orme des Merisiers, CEA-Saclay, France
January 2012

Co-organizer (w/ Claire Calmet and Regine Trebossen), visit to the NeuroSpin research
center for a group of advanced high-school students. Students participated in
preparing and running a magnetoencephalography experiment with their teacher
as the human subject, toured the facility, and engaged in discussion about
neuroscience.
January 2011

Co-organizer weekly seminars for the UNICOG research group at NeuroSpin
January 2009 – June 2011

Founder and organizer of the *Unsupervised Decoding Club* at NeuroSpin
A bi-weekly meeting that brings together the producers and the consumers of
statistical learning techniques.
October 2009 – 2013 (continues under new direction)
(<http://www.unicog.org/pmwiki.php/Site/UnsupervisedDecodingClub>)

Tutorial on the *derivation and use of spatial filters in the analysis of EEG and MEG data*
(NeuroSpin) June 2009

TEACHING

- 2008 **Cognitive Neuroscience**, w/ Prof. Sabine Kastner, Princeton University
- 2007 **Introduction to Psychology**, w/ Prof. Daniel Oppenheimer, Princeton University
- 2005 **Statistics for Psychology Research**, w/ Prof. Andrew Conway, Princeton University
- 2004 **Cognitive Neuroscience**, w/ Prof. Sabine Kastner, Princeton University
Developed the EEG component of the lab course. Taught precepts and labs.
- 1991 **Introductory Symbolic Logic**, w/ Prof. Leah Savion, Indiana University
(Undergraduate teaching assistantship)

SUPERVISING (present)

Silvia Marchesotti (PhD student, Department of Life Sciences, EPFL)
Leila Cammoun (senior bachelors project, Department of Life Sciences, EPFL)
Nicolas Oeggerli (bachelors project, Department of Life Sciences, EPFL)

SUPERVISING (past)

Olivia Gozel (PhD student, Department of Life Sciences, EPFL)
Steven Gale (PhD student, Department of Life Sciences, EPFL)
Leila Cammoun (bachelors project, Department of Life Sciences, EPFL)
Manon Lécolier (bachelors project, Department of Life Sciences, EPFL)
Ioannis Sarigiannidis (1st year master's, INSERM U992 / NeuroSpin, Feb - Sept 2011)
Jean-Rémi King (2nd year master's, INSERM U992 / NeuroSpin, 2009 academic year)
Min-Soo Kim (research internship, Princeton University, 2007-2008)

COMPUTING EXPERIENCE

Highly-proficient in: MatLab, C, Relational databases and SQL

Data-analysis tools: AFNI, SPM, FieldTrip, MNE, SciKit-Learn, libSVM

Selected programming contributions:

Effect-Matched Spatial Filtering (EMSf) MatLab Toolbox (on bitbucket.com).

"Helping parent" schedule solver and user interface.

University League Nursery School (Princeton, NJ).

Uses a Hopfield neural network to assign rotating shifts to "helping parents" based on individual preferences. Community service.

RESEARCH ASSISTANTSHIPS

1999 – 2001 **Neuroethology of echolocation in free-flying bats**

Full-time research assistant

Laboratory of Prof. Cynthia F. Moss, University of Maryland

Statistical data analysis; software development for signal processing, data management, and data visualization; free-flight behavioral experiments

1995 – 1998 **Neuroethology of communication and electrolocation in electric fish**

Research assistant

Laboratory of Prof. Philip Stoddard, Florida International University

Developed signal sorting methods in order to investigate rhythmic interactions between two fish during courtship and mating

PUBLICATIONS TO WHICH I CONTRIBUTED AS A RESEARCH ASSISTANT

Surlykke, A. and Moss, C.F. Echolocation behavior of the big brown bat, *Eptesicus fuscus*, in the field and the laboratory. *Journal of the Acoustical Society of America*, 2000, 108 (5) 2419-2429.

Moss, C.F. and Surlykke, A. Auditory scene analysis by echolocation in bats. *Journal of the Acoustical Society of America*, 2001, 110: 2207-2226.

PRIOR PROFESSIONAL ACTIVITY

Dewey & Schurger (Independent consulting partnership, 1995-1998)

Relational database systems for import-export and inventory control

Miami (USA), Castries (St. Lucia), Kingston (Jamaica)

Ernst & Young, LLP (Senior Information Systems Consultant, 1992-1994)

Development and optimization of relational database systems and software

Indianapolis (USA), Milton-Keynes (UK), Edinburgh, Mexico City

Based in Indianapolis, IN USA

NATURAL LANGUAGES

Native English speaker; fluent in French (active) and Spanish (latent).

NATIONALITY

United States (by birth), France (by marriage)

OTHER ACTIVITIES

Classical vocal performance (lyric tenor)

Arias (Mozart, Rossini, Donizetti, Verdi); Lieder (Schubert, Strauss, Brahms)