

Katarina Bendtz

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RESEARCH OCCUPATIONS

CURRENT, FROM APR 2017 (FT)

Stockholm University
Post Doc Researcher (Cognitive Neuroscience)

My current research is focused on the neurobiology and cognitive processes of language and communication at the intersection between neuroscience and psycholinguistics. In my main project I'm studying individual differences in communicative (so called pragmatic) ability in young adults, as well as developing a prototype for an augmented reality game for adolescents with social communicative impairments. The pragmatic abilities that we study are for example audience design, to take the perspective of the listener in a conversation, and monitoring for mutual understanding in a conversation. We are currently conducting a behavioral study where we have developed three new tests of these abilities. The behavioral study will be followed by a neuroimaging (fMRI) study where we will look at group level differences.

I'm also an invited affiliated researcher at the Centre of Cultural Evolution, Stockholm University.

Principal investigator: Associate Prof. Julia Uddén

TEACHING OCCUPATIONS

Stockholm University
Co-funder and director

2011 – 2013 (PT)

Middle- and high-school outreach project "Physics Show", where we developed and performed physics' experiments with children.

Stockholm University
Lab/computing teacher

2011 – 2012 (PT)

"Experimental Methods in Physics", B.Sc. program in physics.

House of Science, Stockholm
Lab teacher

2010 – 2012 (PT)

Natural science experiments with high school children at a government funded facility for children's science education.

OTHER

(Parental leave)

MAY 2016 – APR 2017

EDUCATION

2011 – 2016 **Ph.D, Experimental Particle Physics**
 Stockholm University

2008 – 2010 **M.Sc, Theoretical Physics**
 Stockholm University, Tokyo University

2005 – 2008 **B.Sc, Physics**
 Stockholm University

2002 – 2005 **Language and Social Sciences Studies**
 French language, Economic history
 Lund University

DOCTORAL RESEARCH

"Searches for Massive Highly Ionising Particles at the ATLAS Experiment and in Polar Volcanic Rocks, and Performance Studies of the First Level ATLAS Trigger System"

My Ph.D research concerned the search for Beyond Standard Model (BSM) particles, so called magnetic monopoles and Highly Electrically Charged Objects (HECOs). The Standard Model (SM) of particle physics describes the elementary particles and their interactions. Despite passing a number of high precision falsification tests, the SM suffers from a number of shortcomings. Many BSM theories have therefore been postulated

The particles were sought using the ATLAS detector at the Large Hadron Collider (LHC), CERN. My main responsibility was the statistical method (the CLs method), particle simulations, a pattern recognition algorithm as well as developing the selection criteria.

I was also part of another cross-disciplinary project, searching for monopoles in polar volcanic rock in a collaboration of physicists and geologists. I was responsible for the data taking, which was carried out by a SQUID detector at ETH, Zürich.

In addition to my physics analysis research, I was involved in several technical research projects, focused around the ATLAS trigger, a runtime custom-built system responsible for selecting interesting collisions from the 40 MHz bunch crossing rate.

Supervisors: Prof. David Milstead and Prof. Sten Hellman

GRANTS AND AWARDS

2018	Project Grant for 2 moths Research at Tokyo University (Main supplicant) The neural mechanisms of the timing of a conversation <i>Tokyo University and Stockholm University</i>	2017	Postdoctoral Fellow Grant The neural mechanisms of pragmatic ability <i>Promobilia Foundation</i>
2018	Project Scholarship (Main supplicant) The neural mechanisms of the timing of a conversation <i>IDO foundation for language research</i>	2010	Scholarship Exchange Studies with Japan <i>Marcus and Amalia Wallenbergs Foundation</i>
2018	Travel Scholarship <i>Knut and Alice Wallenberg foundation</i>	2009	CERN Summer Student Program Scholarship <i>CERN</i>
2018	Initiation of Research Collaborations Grant (co-supplicant) <i>Tokyo University and Stockholm University</i>	2001	Best Performing Student in Humanities <i>Tibble High School</i>

SUPERVISION

BACHELOR THESIS Sarah Ericsson, Uppsala University, Jan 2018 - June 2018

COMMUNICATION

CONFERENCES	Oral Presentation at CERN ATLAS Level 1 trigger system conference – 2011 Oral presentation at The Physical Society of Japan (JSPS) annual conference – 2010
PANEL DISCUSSION	MIRAI seminar on Sustainable Social Systems and Technology for Ageing Society, Tokyo University – 2018 Sweden - Japan future research relations at the Swedish Embassy in Tokyo – 2018
OUTREACH	Co-producer of the Science Podcast "Professor Magenta", assigned one of the top podcasts in 2016 by "Dagens Nyheter", Sweden's largest newspaper – 2015 - present. Performance art lecture on quantum mechanics at International Scene of Contemporary Dance Sweden – 2018 Natural science columns, political and cultural magazine "Arena" – 2016 - 2017 Oral presentation on magnetic monopoles, Stockholm University Annual Public High School Lectures – 2016 Oral presentation on the Higgs Mechanism, Stockholm University Public Lectures – 2013

BOARD MEMBERSHIPS

Women in Psychology at Stockholm University (WIPS)

CURRENT, FROM SEP 2017

SKILLS

Applied mathematics

Quantum field theory, the theory of particle physics, is founded on quantum mechanics and relativity. These theories are based on mathematical multivariate differential equations, advanced linear algebra, multivariate (complex) analysis and tensor algebra. Throughout my education and physics research I have applied mathematics to all sorts of problems, from theoretical to statistical, and mathematical intuition and problem solving is one of my absolute strengths. In my current research I have continued to take a mathematical approach whenever possible. I have for example studied the theory behind statistical parametrical mapping (fMRI analysis). Mathematical modelling can be considered my main expertise.

Statistics and research method

During my Ph.D I was particularly interested in the frequentist statistical methods used to set limits on the production of elementary particles. During my post doc I have embraced the Bayesian statistical framework and am now using a Bayesian approach in my research.

(Interdisciplinary) team work

I like to work in teams together with other passionate researchers, solving problems together. I find interdisciplinary research teams the most inspiring.

Computing

I'm a committed programmer, fluent in python, C++, R and MatLab and happy to learn anything new. During my Ph.D research I was also trained to process big data and to use distributed computing through the extensive and complex CERN GRID service. I'm interested in numerical methods and computer science in general.

Neuroimaging analysis

I learnt fMRI processing by performing the data analysis in a study of language processing (mentioned as the first paper in the list of "to be submitted") together with top experts in the field of neuroimaging analysis.

Cognitive neuroscience of language, communication and ToM

Since I started my current research I have been devoted to learn as much as possible about cognition and especially about language and social processing.

RESEARCH INTERESTS

Cognitive computational neuroscience

Recently I have become interested in cognitive computational neuroscience, the intersection between cognitive neuroscience, computational neuroscience and AI. I'm convinced that combining my fascination for cognition and my experience of cognitive neuroscience research with my background of applied mathematics will be a fruitful combination and my way forward. In the field of cognitive computational neuroscience, how structured symbolic knowledge is implemented in the human brain is an open question that I believe is one of the most interesting and challenging of our time.

PUBLICATIONS

10.1 Neuroscience (in preparation)

1. J. Uddén, A. Hultén, **K. Bendtz**, Z. Mineroff, K. S. Kucera, A. Vino, E. Fedorenko, P. Hagoort, S. E. Fisher. Towards robust functional neuroimaging genetics of cognition: language processing as an example. (*To be submitted*)
2. **K. Bendtz**, J. Uddén. A stopping rule for data collection with a Bayesian approach. (*In preparation*)

10.2 Particle Physics

The publication authorship conventions in the large ATLAS (or MoEdal) collaboration differ significantly from those of other fields, and are worth a note here. All publications of research performed with the ATLAS detector are authored by "ATLAS collaboration", where all so called ALTAS authors are included in the author list, including thousands of names, and where the order of the authors is strictly alphabetical and therefore non-informative in the sense of contribution. To become an ATLAS author, it is required that you have contributed to the technical maintenance or development of the ATLAS detector, work which is crucial for the integrity of the research findings of the ATLAS. The publications I list here, correspond to the research where I made a substantial contribution.

The fourth publication is not ALTAS based research. The sixth publication concerns upgrade of the ATALS detector and is therefore excepted from the authorship convention.

1. ATLAS Collaboration, Search for magnetic monopoles and stable particles with high electric charges in 8 TeV pp collisions with the ATLAS detector, *Phys. Rev. D* **93**, 052009 (2016) [impact factor 4.4]
2. MoEdal Collaboration, Search for magnetic monopoles with the MoEDAL prototype trapping detector in 8 TeV proton-proton collisions at the LHC, *JHEP* **2016**, 067 (2016) [impact factor 5.5]
3. ATLAS Collaboration, Search for long-lived, weakly interacting particles that decay to displaced hadronic jets in proton-proton collisions at $\sqrt{s}=8$ TeV with the ATLAS detector, *Phys.Rev. D* **92** (2015) [impact factor 4.4]
4. **K. Bendtz**, D. Milstead, H.-P. Hächler, A. M. Hirt, P. Mermod, P. Michael, T. Sloan, C. Tegner, S. B. Thorarinnsson, Search for magnetic monopoles in polar volcanic rocks, K. Bendtz et al, *Phys. Rev. Lett.* **110** 121803 (2014) [impact factor 8.8]
5. ATLAS Collaboration, The ATLAS transverse-momentum trigger performance at the LHC in 2011, *ATLAS-CONF-2014-002 CERN* (2014)
6. O. Sasaki, Y. Suzuki, K. Nagano, M. Ishino, M. Ikeno, **K. Bendtz**, T. Domae, H. Sakamoto, T. Kawamoto, C. Fukunaga, Design studies of the ATLAS muon Level-1 trigger based on the MDT detector for the LHC upgrade, Sasaki O. et al. *J. Instrum.* **5** C12021 (2010) [impact factor 1.3]

REFERENCES

Prof. David Milstead (Ph.D supervisor)

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Dr. Julia Uddén (current PI)

POSITION Associate Professor
 EMPLOYER Department of Psychology, Stockholm University
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Dr. Johan Lundberg (CERN Summer student PI)

POSITION Senior C++ developer and team leader
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