

Jesper Toft Kristensen

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PhD Candidate

(expected graduation: May 2015)

Applied and Engineering Physics

Cornell University, Ithaca, NY 14850

PROFESSIONAL OBJECTIVES

Interested in an R&D position which applies scientific computing for addressing predictive modeling and design of complex materials systems.

Integrating uncertainty quantification with multi-scale materials models (quantum to continuum) and incorporating machine learning in materials design.

Developing optimization- and prediction algorithms for synthesizing and data mining materials databases.

I am passionate about working at the intersection of materials science and information theory. This is a highly underdeveloped area and most of my research is focused on merging the two fields in a computationally efficient manner.

EDUCATION

Cornell University, New York 8/2011-present

PhD candidate in Applied and Engineering Physics.

Thesis advisor: Prof. Nicholas Zabaras

Minor: Materials Science.

GPA: 3.98/4.00

Cornell University, New York 8/2011-4/2014

Master of Science.

Advisor: Prof. Nicholas Zabaras

Minor: Materials Science.

GPA: 3.98/4.00

Cornell University, New York

8/2010-8/2011

Master of Engineering in Engineering Physics.

Department of Applied and Engineering Physics.

MEng-thesis supervisor: Prof. Frank Wise

GPA: 4.1/4.0

Technical University of Denmark

9/2007-6/2010

Bachelor of Science in Engineering in Physics and Nanotechnology. BSc-thesis supervisor: Professor Henrik Bruus, DTU Physics.

GPA: 11.57/12

TEACHING EXPERIENCE

Cornell University

2/2015

As PhD candidate

Position: Guest lecturer.

Course: Physics 1112 assistance course.

Supervisor: Sr. Lecturer in Physics Robert H. Lieberman

Cornell University

9/2014-present

As PhD candidate

Position: Tutor in the LSC Physics Help Center.

Course: Assisted students with physics homework, understanding course material, and discussing prelims and exams. The main physics topics were electrostatics and mechanics. Teaching fill 90 minute lectures on Physics.

Supervisor: Sr. Lecturer in Physics Robert H. Lieberman

Cornell University

9/2014-present

As PhD candidate

Position: Tutor in Office of Academic Diversity Initiatives (OADI).

Course: Assisted students with any kind of science problem. One-on-one sessions with help on homework, prelims, textbook material, etc.

Supervisor: Xavier Billingsley

Cornell University	9/2013
As PhD student	
Position:	Guest lecturer.
Course:	MAE 611
Supervisor:	Prof. Nicholas Zabaras
Cornell University	9/2011-12/2011
As PhD student	
Position:	Teaching Assistant.
Course:	<i>Laster and Photonics</i> at dept. of applied an engineering physics I covered 1 hr or theory and 1 hr of experiments every day for groups of 6-7 students at a time.
Technical University of Denmark	9/2008-12/2008
As BSc student	
Position:	Teaching Assistant.
Course:	<i>Fundamental Chemistry</i> at DTU Chemistry.
Technical University of Denmark	1/2010
As BSc student	
Position:	Teaching Assistant.
Course:	<i>Introduction to Physics and Nanotechnology</i> at DTU Physics I helped students during problem solving sessions.

RESEARCH PROJECTS

- Cornell University 10/2014-present

We are investigating the use of Bayesian thinking and information theoretic methodologies for global optimization of materials properties. In essence, we want to understand how the input structures should be chosen in a given computer experiment where, e.g., we want to learn the most possible about, say, a phase transition. I use the Conte supercomputer at Purdue University to run the experiments.

 - A publication is in preparation.
- Cornell University 9/2014-present

We are using the HiPerGator supercomputer at the University of Florida to characterize 2D sheets of molybdenum and tungsten (Mo,W) with sulfur anions. We are obtaining the ground states of the system along with phase

transitions and characterizations of the band gap using state-of-the-art band gap computations.

- A publication is in preparation.

3. Cornell University

1/2014-4/2014

Using the Olympus supercomputer at Pacific Northwest National Lab (PNNL) I developed a method for quantifying uncertainties in alloy properties. I did this using a Bayesian formalism and by coupling it with a reversible jump Markov Chain Monte Carlo (RJMCMC) algorithm.

I believe I was the first to do this.

- A publication was published from this work.

4. Cornell University

6/2013-8/2014

Using the Hopper supercomputer I generated a data set of nanowires and computed their thermal conductivities. I then developed a novel cluster expansion technique to aid the fitting process of this low-dimensional structure.

- A publication was published from this work.

5. Cornell University

11/2012-2/2013

Using the Olympus supercomputer at PNNL I compiled and modified the C++ ATAT software for binary alloy phase diagram computation using cluster expansions. I replaced the built-in standard MCMC library with my own adaptive sequential Monte Carlo (ASMC) approach and showed how the results were improved when compared to experiments. For this project I used VASP as well to obtain energies of alloy structures.

- A publication was published from this work.

6. Cornell University

9/2011-12/2011

MEng project. I used C++ and MatLab to model excitons in lead nanorods. In particular to set up and solve the matrix Hamiltonian (brute force method). I investigated new ways of visualizing exciton and biexciton wave functions.

Title: Exciton and Biexciton Wave Functions in PbSe Nanorods

Supervisor: Prof. Frank Wise

7. Technical University of Denmark/

1/2010-6/2010

University of California at Santa Barbara

Type: BSc thesis at DTU Nanotech / Researcher in the "UCSB Nanolab"

Title: *Theory of Electrokinetics in Nanofluidic Channels.*

Results: I generalized the models for conductance in silica nanochannels when exposed to NaCl solutions. We found a new trend of the conductance curve *not observed before*.

- A publication was published from this work.

OTHER RESEARCH COLLABORATORS

- Prof. Bilionis at Purdue University
Please see project 1. under “Research Projects”
- Prof. Hennig at University of Florida
Please see project 2. under “Research Projects”

PROFESSIONAL EXPERIENCE

- Reviewer for the International Journal of Uncertainty Quantification.
- Programmer at Unopak A/S (in Denmark)

PUBLICATIONS (NOT INCLUDING “IN PREPARATION”)

1. Cornell University October 2014

J. Kristensen, and N. Zabarar:

Predicting low-thermal-conductivity Si-Ge nanowires with a modified cluster expansion method

Physical Review B (*in print*) (2015).

2. Cornell University May 2014

J. Kristensen, and N. Zabarar:

Bayesian uncertainty quantification in the evaluation of alloy properties with the cluster expansion method

Computer Physics Communications, v 185, 11 (2014).

[Link to PDF](#)

3. Cornell University May 2013

J. Kristensen, Ilias Bilionis, and N. Zabarar:

Relative entropy as model selection tool in cluster expansions

Physical Review B 87, 17 (2013).

[Link to PDF](#)

4. Technical University of Denmark and
University of California at Santa Barbara

August 2010

Kristian Lund Jensen, Jesper Toft Kristensen, Andrew Michael Crumrine,
Mathias Bækbo Andersen, Henrik Bruus, and Sumita Pennathur.

*Hydronium-dominated ion transport in carbon-dioxide-saturated electrolytes
at low salt concentrations in nanochannels*

Phys. Rev. E 83, 056307 (2011).

[Link to PDF](#)

5. Technical University of Denmark

June 2008

J. Kristensen, A.Houmann, X.Liu, and D.Turchinovich:

*Low-loss polarization-maintaining fusion splicing of
single-mode fibers and hollow-core photonic crystal fibers,
relevant for monolithic fiber laser pulse compression*

Optics Express, vol. 16, p. 9986 (2008).

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TALKS AND CONFERENCES

University of Warwick,
Coventry, UK

Winter 2015

Invited

[Link to PDF](#)

University of Florida,
Gainesville, FL, USA

Fall 2014

Invited

TMS (143rd),
San Diego, CA, US

Spring 2014

SIAM on Uncertainty Quantification,
Savannah, GA, US

Spring 2014

[Link to PDF](#)

USNCCM (12th), Summer 2013
Raleigh, NC, US

TMS (142nd), Spring 2013
San Antonio, TX, US
Invited
[Link to PDF](#)

VISITING SCHOLAR (NON-DEGREE)

University of Warwick, Coventry, UK Winter 2015
Research scholar in the center for predictive modeling
Advisor: Prof. Nicholas Zabararas.

University of Florida, Gainesville, FL, USA Fall 2014
Research scholar in the Materials Science and Engineering Department
Advisor Cornell: Prof. Nicholas Zabararas.
Advisor Florida: Prof. Richard Hennig.

University of California, Santa Barbara, CA, USA Spring 2010
Research scholar for 5 months at the Mechanical Engineering Department
in the UCSB Nanolab in my last senior semester as a BSc student at DTU.
Supervisor DTU: Professor Henrik Bruus.
Advisor UCSB: Assistant Professor Sumita Pennathur.

HONORS AND AWARDS

Cornell University, New York 7/2011
Henri S. Sack Memorial Award.
"Top academic performance in MEng program 2010/2011"

Vera og Carl Johan Michaelsens fond 12/2010
Scholarship for my MEng studies at Cornell University.

Reinholdt W. Jorck and Wife's Fund 11/2010

Scholarship for my MEng studies at Cornell University.	
Civilingeniør Frants Allings Scholarship Scholarship for my MEng studies at Cornell University.	9/2010
Oticon Fund Scholarship for my MEng studies at Cornell University.	6/2010
Otto Mønstedts Fund Scholarship for my research at the University of California at Santa Barbara.	4/2010
Cornell University, New York MEC Fellowship. Master of Engineering Fellow.	4/2010
Cornell University, New York Nominated for the Lester B. Knight Scholarship.	4/2010
Technical University of Denmark Published in the student's magazine: <i>Krydsfelt</i> because of my young age when I first published. Main topic: <i>Talented and inventive students</i> . 34. edition 29. January 2009.	1/2009

REFERENCES

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Henrik Bruus, Professor

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and the Theoretical Microfluidics Group
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