Curriculum Vitae for Jacob C. Jonsson, JCJonsson@lbl.gov

Education

M. Sc. in Engineering Physics from Uppsala University. 1993-1999.
Thesis: Optical Characterisation of Melanin. ISSN 1401-5757.
Thesis supervisor: Prof. Carl-Gustaf Ribbing.

Ph. D. in Solid State Physics from Uppsala University. 1999-2004.
Thesis: Optical Characterisation of Miniature Structures and Translucent Sheets for Daylighting Applications. ISBN91-554-5948-X
Advisor: Prof. Arne Roos.
Web access: http://uu.diva-portal.org/smash/record.jsf?searchId=2&pid=diva2:164487

Publications

"Microscopic spectrophotometry applied to quasifractal gold particle clusters", Jacob C. Jonsson, Juan Sotelo, Gunnar A. Niklasson, Arne Roos, and Bengt Nilsson, in Proceedings of SPIE 4103, L.M. Hanssen, Ed., 98-105 (2000)

"Microscopic spectrophotometry as a method to study defects in thin films", Jacob C. Jonsson, Arne Roos, Per Nostell, in Proceedings of Northern Optics 2000, K. Biedermann and U. Olin, Eds., 124 (2000)

"Investigation of optical properties of injection moulded subwavelength gratings", Jacob C. Jonsson and Fredrik Nikolajeff, in proceedings of SPIE 4779, A. Duparré and B. Singh, Eds., 23-30 (2002).

"Spectral and global diffuse properties of high-performance translucent sheets for energy efficient lighting and skylights", Geoffrey B. Smith, Jacob C. Jonsson, Jim Franklin, Appl. Opt., 42, 3981-3991 (2003)

"Light trapping in translucent samples and its effect on the hemispherical transmittance obtained by an integrating sphere", Jacob C. Jonsson, Arne Roos, Geoffrey B. Smith, in proceedings of SPIE 5192, L.M. Hanssen, Ed., 91-100 (2003)

"Photoelectrochemical and optical properties of nitrogen doped titanium dioxide films prepared by reactive DC magnetron sputtering", Torbjörn Lindgren, Julius M. Mwabora, Esteban Avendaño, Jacob C. Jonsson, Anders Hoel, Claes-Göran Granqvist, and Sten-Eric Lindquist, J. Phys. Chem. B 107, 5709-5716 (2003)

"Optical properties of injection moulded subwavelength gratings", Jacob C. Jonsson and Fredrik Nikolajeff, Opt. Express, 12, 1924-1931 (2004)

"Transmittance of a bioceramic dental restorative material based on calcium aluminate", Håkan Enqvist, Jesper Lööf, Stina Uppström, Mike W. Phaneuf, Jacob C. Jonsson, Leif Hermansson, and Nils-Otto Ahnfelt, J. Biomed. Mat. Res. B Appl. Biomat. 69B, 94-98 (2004)

"Experimental and Monte Carlo analysis of isotropic multiple Mie scattering", Jacob C. Jonsson, Geoffrey B. Smith, and Gunnar A. Niklasson, Opt. Comm., 240, 9-17 (2004)

"Angle-dependent light scattering in materials with controlled diffuse solar optical properties", Jacob C. Jonsson, Linus Karlsson, Per Nostell, Gunnar A. Niklasson and Geoffrey B. Smith, Sol. Energy Mat. Sol. Cells, 84, 427-439 (2004)

"Directional and angle-resolved optical scattering of high-performance translucent sheets for energy efficient lighting and skylights", Jacob C. Jonsson, Geoffrey B. Smith, Christine Deller, and Arne Roos, Appl. Opt. 44, 2745-2753 (2005)

"Obtaining the bidirectional transmittance distribution function of isotropically scattering materials using an integrating sphere", Jacob C. Jonsson and Henrik Brandén, Optics Communications, 277, 228-236 (2007)

"Light-loss when measuring transmittance of thick scattering samples with an integrating sphere", Jacob C. Jonsson and Mike Rubin, Proc. SPIE 6670, 667007 (2007)

"Optical absorption in lithiated tungsten oxide thin films: Experiment and theory", Lars Berggren, Jacob C. Jonsson, and Gunnar A. Niklasson, J. Appl. Phys. 102, (2007)

"Light-scattering properties of a woven shade-screen material used for daylighting and solar heat-gain control", Jacob C. Jonsson, Eleanor Lee, and Mike Rubin, Proc. SPIE 7065, 706525 (2008) LBNL-828E

"NFRC Interlaboratory Comparison on Optical Properties", Jacob C. Jonsson, Mike Rubin, presented at NFRC meeting 2008. LBNL-501E

"Optical characterization of fritted glass for architectural applications", Jacob C. Jonsson, Mike Rubin, Annica M. Nilsson, Andreas Jonsson, Arne Roos, Optical Materials, 31, 949-958 (2009)

"Simulating Complex Window Systems using BSDF Data", Maria Konstantoglou, Jacob C. Jonsson, Eleanor S. Lee, Proc. 26th Conference on Passive and Low Energy Architecture, Claude MH Demers and André Potvin, Ed, 2.1.21 (2009)

"Light-scattering properties of a venetian blind slat used for daylighting applications", Annica M. Nilsson, Jacob C. Jonsson , Solar Energy, 84, 2103-2111 (2010)

"Transmissionsgrad von Strukturglas für solare Anwendungen - Ergebnisse eines Ringversuchs des ICG-TC10", Wilson, H.R., Bretschneider, J., Hofmann, T., Hutchins, M., Jonsson, J., Kermel, M., Marenne, I., Roos, A., van Nijnatten, P.A., and Kuhn, T., 20. OTTI-Symposium Thermische Solarenergie 2010, 355-360 (2010)

"Experimental validation of bidirectional reflection and transmission distribution measurements of specular and scattering materials", Lars O. Grobe, Stephen Wittkopf, Peter Apian-Bennewitz, Jacob C. Jonsson and Mike Rubin, Proc. SPIE 7725, 772510 (2010); doi:10.1117/12.854011

“Transmittance of patterned "solar glass" panes – results of a measurement round robin by ICG-TC10 “, Helen Rose Wilson, Joachim Bretschneider, Thomas Hofmann, Michael Hutchins,Jacob Jonsson, Christine Kermel, Ingrid Marenne, Arne Roos, Peter van Nijnatten, Tagungsband Colloquium Optische Spektrometrie COSP 2011, Berlin, Germany (2011)

“Method for more accurate transmittance measurements of low-angle scattering samples using an integrating sphere with an entry port beam diffuser”, Annica M. Nilsson, Andreas Jonsson, Jacob C. Jonsson, Arne Roos, Applied Optics, 50, 999-1006 (2011)

“Simulating the Daylight Performance of Complex Fenestration Systems Using Bidirectional Scattering Distribution Functions within Radiance”, Ward, G., Mistrick, R., Lee, E.S., McNeil, A. and Jonsson, J. C., Leukos, Vol. 7, No. 4, 241-261 (2011).

“Transmittance of patterned "solar glass" panes – results of a measurement round robin by ICG-TC10“, Helen Rose Wilson, Annica Nilsson, Joachim Bretschneider, Thomas Hofmann, Michael Hutchins, Jacob Jonsson, Christine Kermel, Ingrid Marenne, Arne Roos, Peter van Nijnatten, Conf. Proc. 11th ESG Conference, Maastricht, Netherlands, (2012)

“Inter-laboratory comparison using integrating sphere spectrophotometers to measure reflectance and transmittance of specular, diffuse, and light-redirecting glazing products”, Jacob C. Jonsson, Charlie Curcija, *Proc. SPIE* 8495, Reflection, Scattering, and Diffraction from Surfaces III, 849509 (October 15, 2012); doi:10.1117/12.932104

“A validation of a ray-tracing tool used to generate bi-directional scattering distribution functions for complex fenestration systems”, Andrew McNeil, Jacob C. Jonsson, David Appelfeld, Greg Ward, Eleanor S. Lee, *Solar Energy*, 98, 404-414 (2013)

“An Edge-Heating Device for Optical Measurement of Thermochromic Glazing Materials and Recommended Test Procedure”, Jacob C. Jonsson, Howdy Goudey, Charlie Curcija, *Journal of Testing and Evaluation*, vol 42, no 2, 305-311 (March 2014) DOI: 10.1520/JTE20120341

“A Pilot Demonstration of Electrochromic and Thermochromic Windows in the Denver Federal Center, Building 41, Denver, Colorado”. Eleanor S. Lee, Luis L. Fernandes, Howdy Chad Goudey, Jacob C. Jonsson, Dragan Charlie Curcija, Xiufeng Pang, Dennis DiBartolomeo, and Sabine Hoffmann. GSA/ GPG report deliverable, September 30, 2012, released March 30, 2014.

Work experience during 1992-2004 – pre dissertation

Summers 1992, 1993: Total of 90 days as programmer at KSU AB, a company providing simulation training for employees at all Swedish nuclear plants. Programming languages used were C and C++ in a Solaris/UNIX environment. I also wrote a short introduction for persons who were new to the Solaris/UNIX environment. Supervisor: Erik Kaffher.

Summers 1993, 1994: Total of 70 days as programmer at Studsvik Nuclear AB. Most of the job was to write macros in MS Excel for automation of data analysis, storage, and presentation.

1995-1996: 10 months spent in mandatory military service.

Summers 1996-2002: Writing and text setting for The MATLAB 5 Handbook, Eva Pärt-Enander and Anders Sjöberg, ISBN 0-201-39845-1, as well as for the Swedish translation of said book (Användarhandleding för MATLAB 5, and later versions 6, 6.5 and 7). The book is still being produced at the information technology department at Uppsala University. My main contributions for version 5 was writing examples and text for new features, incorporation of old material (version 4 of the book was a compendium copied locally) that was in Framemaker format to the LaTeX format used to print the book, and finally I was contact person towards the printing house. Supervisor Eva Pärt-Enander

2001-2004: Worked as mentor in the mandatory pedagogical course for teachers at Uppsala University. This included coming to visit a lecture or demonstration given by a teacher taking the course. The visit was combined with two hours discussion before and after the lecture where we looked at how parts of the course were applied to the given lecture. I was the only graduate student in the mentor program, all other mentors were professors. During the years as mentor I had a total of 14 adepts, some who kept contact outside the program for teaching support.

Work experience post dissertation

June 2004-December 2004: Research assistant and teacher at Uppsala University. Documented processes of the optical measurement laboratories at the solid state physics department, and assisted researchers with measurements.

July 2005-December 2005: Visiting scholar at Lawrence Berkeley National Lab. Development of a virtual goniophotometer in TracePro. Research of novel experimental techniques for characterizing diffuse samples using traditional equipment. Study of new optical techniques and materials for daylighting applications in buildings.

January 2006-December 2009: Post doc fellow at EETD at Lawrence Berkeley National Lab. See below for description of activities.

January 2010-current: Senior Scientific Research Associate. Work has been done in several ongoing parallel projects so these are presented on project basis:

<u>Virtual gonioradiometer in TracePro.</u>

This set of computer programs was created together with Christian Kohler in 2005. Refinement to stream-line data import into Window 6 was carried out. Sensitivity analysis to determine limitations of the programs were completed.

This tool has been pivotal for several of the papers published in this period.

Programming of Optonic M750MA goniometer

I revived an instrument that had fallen into disuse by rewriting the control system. The old software did not function under windows so it was rewritten from scratch in C++. By having full control of the code it has been possible to do measurements that have been the core of our analysis of e.g. fritted glass. It has provided unique data on patterned glass samples. The instrument is incredibly useful for scattering measurements but also outstanding for characterizing specular samples at varying angles of incidence.

The Pullback method

The "pullback" method is a novel way to obtain bi-directional transmittance distribution function (BTDF) data without using a goniophotometer. This enables manufacturers to measure detailed scattering properties with their existing equipment. The basic idea is rather trivial, but the mathematical formulation and computational solution to that problem was not trivial. In collaboration with scientific computing researcher Henrik Brandén at Uppsala University we managed to solve the problem for several test cases and also explain and motivate the quality of the different cases.

Venetian blinds

Window 6 includes a radiosity model to give an analytical value of the BSDF for venetian blind systems. The model was successfully verified using the novel virtual goniophotometer developed at LBNL. Some of the experiments for this work were carried out at my old lab in Uppsala where I am still welcome to come and use unique equipment. We extended the work to demonstrate cases when the model broke down.

In spring 2009 I supervised Annica Nilsson from Uppsala University who managed to produce a conference paper in her six week stay that will be presented at ISES 2009. I defined her project and managed to keep it on track on the tight schedule. Her supervisor Arne Roos at Uppsala University has a long history of collaboration with LBNL and this follows in that tradition. One of the goals, other than the paper, was to teach Annica how to use the TracePro virtual goniophotometer developed at LBNL.

Fritted glass

A common component in architect designed façades is panels of fritted glass. This material is hard to characterize using commercial spectrophotometers and inter-laboratory comparisons typically yield poor agreement between participants. The work resulted in a journal paper published in 2009 and spawned a conference paper 2007.

Future work in this area is expected to extend the number of characterized frits available in the Window 6 database.

Daylighting materials

Shade screens are a popular method used to reduce glare and solar heat gain of glazings. One material was characterized and published as a conference paper at SPIE 2008 and its properties entered into the Window 6 database. The paper included angle-resolved scattering versus angle of incidence, a quantity that is rarely given in similar studies where only direct-hemispherical properties are described. Further studies have given

insight about the translucent properties of the threads which explains why theoretical cut-off angles does not agree with experiment.

pgII photogoniometer

LBNL purchased a Pabopto pgII photogoniometer in 2008. Together with Mike Rubin I helped specify the capabilities we required. Most of 2009 have been spent calibrating and writing post processing software to allow input of data from the pgII into Window 6 and Radiance.

International Commission on Glass – TC10

Technical committee 10 works with characterization of glass and glazing products. I have been invited as a member and to attend meetings as technical expert. TC10 has a long history of doing interlaboratory comparisons of different difficult products, and I have been taking part in the latest ones.

In 2010 the group completed a project on patterned glass (glass with e.g. a pyramid pattern on one surface) has yielded 50+ pages of data and an analysis of this will be presented at the 20th OTTI-Symposium Thermische Solarenergie in 2010 with me as co-author.

For the fall meeting 2011 I was invited speaker to share the experiences from the inter-laboratory comparison that LBNL conducts for the IGDB participants every four years.

Technical expert in various NFRC committees

Even though I rarely attend NFRC meetings I contribute technical expertise to various technical groups. I took part in rewriting the E903 standard for spectroscopic measurements, doing a complete rewrite of the section on scattering samples and contributing comments on the other sections. I am member of the task group Non-planar products.

Mike Rubin and I have worked on running continuous inter-laboratory comparisons for manufacturers that wants to submit data to the international glacing database (IGDB) maintained by LBNL.

Development of an optical characterization method for shade fabrics

Windows are often combined with shade fabrics in the form of roller shades, drapes, awnings, or drapes. Such fabrics have the potential to have radically different properties compared to glass in that the openness between the threads allow for a see-through quality while the thickness of the sample results in a blocking of light incident at oblique angles.

I have been working on developing a measurement technique that is as similar to the measurement of glass items as possible without losing significant accuracy. Quantification of the possible measurement error that can be made when measuring inhomogeneous samples where the instrument sample area is not much larger than the variations in the fabric helped inform sample preparation and measurement strategy.

Measurements of the angle dependent properties of a large number of shade fabrics allowed for comparison with and refinement of analytical models which allows for a simplified method to get the angle dependence of the fabric.

Teaching experience

Autumn 1994: Introductory computer usage for new engineering physics student. Two groups of 20 peoples, 10 hours for each group. Content covered was basic UNIX knowledge, file systems, running programs, e-mail etc. I was the only teacher the students saw in this course, hence I hold all lecturing, tutoring and grades hand-ins.

Spring 1995: Same as above but the students were studying Molecular Biotechnology.

Autumn 1996: The introductory computer usage course had grown to 32 hours extended to include WWW, Excel, Word, Maple and PC/Windows usage. Two groups of 20 persons each from the Aquatic and Environmental Engineering program were the target.

Autumn 1997: Refreshment course in mathematics for engineering students. Repetition of high school math for students in the Aquatic and Environmental Engineering program. One group of more than 30 students. I was the only teacher the students saw in this course, hence I hold all lecturing, tutoring and grades hand-ins.

Autumn 1998: Teacher in Programming Techniques I for engineering physics students. I had one group of 30 students for which I was the only teacher they had contact with. 40+ hours of lectures, 20+ hours of computer room supervision. Four groups where thought in parallel and I created 40% of the hand-in problems and 25% of the problems final exam, three other teachers did the rest of the hand-ins and exam problems. Programming language used was in majority C++ and for a small part of the course, MATLAB.

Spring 1999: Teacher in Programming Techniques I for students in the Aquatic and Environmental Engineering program. Same as above, but now there were only two groups and my colleague who had the other group was new so I created 60% of the hand-in problems and 75% of the exam problems. This work is done as a part of my position as graduate student. The choice to teach at the information technology department rather than at the materials science department was due to the lack of students in the materials science department, educational work there would have been restricted to supervision of a single experiment in one course.

Spring 2000: Teacher in Programming Techniques I for students in the Aquatic and Environmental Engineering program. Same as above.

Spring 2001: Teacher in Programming Techniques I for students in the Molecular Biotechnology program. Same as above. Four groups in parallel, I was the most senior teacher and responsible for planning and organizing the course. Managed to distribute the workload of hand-ins and exam problems so that I only did 10% and 25% respectively.

Spring 2002: Teacher in Programming Techniques II. Students were off site and usage of internet for tutoring and examination was used with large success, approximately 80 students followed the course. My colleague in this course, Eva Pärt-Enander, was working part time at Uppsala Learning Lab with research on distance/off-site education. Content of this course was advance data structures, object oriented programming techniques taken further than in the course Programming Techniques I.

Autumn 2002: Teacher in Programming Techniques I for engineering physics students. Described above, programming language now changed to Java and MATLAB was removed from the course. Responsible for one of four groups.

Autumn 2004: Teacher in Programming Techniques I for engineering physics students. As above, however, I had two of the four groups, doubling the work load from earlier years.

References:

Research:

Prof. Arne Roos. Uppsala University. Arne.Roos@angstrom.uu.se
Prof. Geoffrey B. Smith, University of Technology Sydney. Geoff.smith@uts.edu.au
Dr. Helen Rose-Wilson, Fraunhofer ISE, Helen.rose.wilson@ise.fhg.de
Dr. Mike Rubin, retired from Lawrence Berkeley National Laboratory. MikeRubin77@gmail.com
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