
Hans M. Christen Director, Center for Nanophase Materials Sciences
Ridge National Laboratory

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Professional Positions

- 2014-present **Director, Center for Nanophase Materials Sciences (ORNL)**
Responsible for division operations and coordination of research activities within the Center for Nanophase Materials Sciences (CNMS), a Nanoscale Science Research Center (NSRC) established as part of the Department of Energy's (DOE) Office of Science contribution to the U.S. Government National Nanotechnology Initiative (NNI), providing users state-of-the-art nanoscience research capabilities and executing a cutting-edge nanoscience research program.
- 2013 **Associate Division Director, Novel Materials and Mechanisms, Materials Science and Technology Division, Oak Ridge National Laboratory (ORNL)**
Responsible for the coordination and line management of seven research groups within the Materials Science and Technology Division, with emphasis on materials synthesis, microscopy, structural and functional properties, and materials theory.
Research in the area of oxide heterostructures, ferroelectrics, and multiferroics.
- 2011-2013 **ORNL Manager, DOE Materials Sciences and Engineering Program**
Coordination of all research programs funded by the U.S. Department of Energy, Office of Basic Energy Sciences, Materials Sciences and Engineering Division performed at Oak Ridge National Laboratory within the Materials Science and Technology Division, the Chemical Sciences Division, the Center for Nanophase Materials Sciences (CNMS), and at the Spallation Neutron Source.
- 2006-2013 **Distinguished Research Staff and Group Leader, Thin Films and Nanostructures, Materials Science and Technology Division, ORNL**
Research focusing on the effects of confinement, strain, and interfaces in perovskite structures and superlattices; ferroelectric, magnetic, and multiferroic oxides.
Responsible for operations and safety of the group's laboratories; program development, mentoring and training.
Contribution to CNMS research and user activities.
- 2000-2006 **Research Staff Member, Condensed Matter Sciences Division, ORNL**
Research focusing on thin films of complex metal-oxides and the development of pulsed-laser deposition techniques (incl. compositional-spread methods, applied superconductivity research). Involved in the planning of the CNMS laboratories.
- 1999-2000 **Program Manager, Microwave Microscopy, Neocera, Inc., Beltsville, MD**
Responsible for technology transfer from the University of Maryland; commercialization of a measurement tool; investor and customer interactions.
- 1997-1999 **Staff Scientist, Neocera, Inc., Beltsville, MD**
Development of oxide materials for superconducting device applications. Improvements to the pulsed-laser deposition process.
- 1994-1996 **Swiss National Science Foundation and Oak Ridge Associated Universities Postdoctoral Fellow, ORNL**
Research focused on epitaxial ferroelectric films and study of size and strain effects.

1991-1994 **Research Assistant, IBM Research Division, Zurich, Switzerland, Research Laboratory**
Dissertation research; dielectric spectroscopy on single-crystal and thin-film samples.

Education

Swiss Federal Institute of Technology (Ecole Polytechnique Fédérale de Lausanne [EPFL]), Lausanne, Switzerland

Ph.D. 1994 Physics
Thesis: “Dielectric Properties of Perovskites with Polar Disorder ($K_{1-x}Li_xTaO_3$ and $Pb[Mn_{1/3}Nb_{2/3}]O_3$) and of $SrTiO_3$ Films”

M.S. 1991 Physics Engineering (diplôme d’ingénieur)

Research Programs

2006-2013 Principal Investigator, *Interfaces in Epitaxial Complex Oxides*, U.S. Dept. of Energy (DOE) Field Work Proposal ERKCS80.

2004-2009 Co-Leader, *Emergent Behavior in Nanoscale Systems* (2007-2009) and *Functional Nanomaterials* (2004-2007) Scientific Theme Areas, Center for Nanophase Materials Sciences, Oak Ridge National Laboratory (ORNL).

2001-2006 Task Co-Leader, *The Emergence of Nanoscale Cooperative Phenomena*, U.S. Dept. of Energy, Nanoscale Science, Engineering, and Technology Initiative (NSET) Program.

Principal Investigator: *Highly-Polar Oxides for Photovoltaics Beyond p-n Junctions* (ORNL Laboratory Directed R&D, 2010-2012), *Deterministic Growth of Complex Oxide Nanorods Using Pulsed-Laser Deposition* (ORNL Seed Money, 2007-2008), *Interfacial Solids* (ORNL Laboratory Directed R&D, 2005-2006), *Development of a Combinatorial Search Apparatus* (ORNL Seed Money, 2001-2002), *Improvement of Spatial Resolution in Microwave Microscopy* (U.S. National Science Foundation—Small Business Innovation Research, Phases I&II, 1998-2000), *Tunable Microwave Materials* (US Air Force—Small Business Innovation Research, Phase II, 1997-1999).

Professional Activities, Honors, Awards

Fellow, American Physical Society (2011)

Member, Executive Board, Advanced Materials Interfaces, 2013 – present

International Organizing Committee of the Workshop on Oxide Electronics series, 2012 – 2015

Member, Organizing Committee, EMRS symposium on Multifunctional Oxide Films, 2014

Organizer, American Physical Society March Meeting Symposium on Dielectric, Ferroelectric, and Piezoelectric Oxides, 2007, 2011 (Co-Organizer), 2012 (Lead); on Bulk Magnetic Oxides, 2014 (Co-Organizer)

Co-organizer, 2010 European Materials Research Spring Meeting Symposium “Frontiers of Multifunctional Oxides”

Member, Alabama EPSCoR RII External Advisory Board, 2010-2012

Member, Program Advisory Committee (PAC), University of Tennessee/ORNL Joint Institute for Advanced Materials (JIAM), 2009–2011

Member, Proposal Review Panel (PRP), Center for Functional Nanomaterials (CFN) at Brookhaven National Laboratory, 2009–2011

Reviewer, NSF MRSEC Panel, 2008

Reviewer, NSF Career Panel, 2005

Co-Organizer, Georgia Tech – Imperial College – ORNL Nanoscience Workshop (2005)

Reviewer, DOE Peer Review: Superconductivity for Electric Systems/University Panel, 2003

Co-Organizer, Focus Session on Epitaxial Superlattices and Nanostructures, 15th American Conference on Crystal Growth, 2003

Panelist, International Workshop on Processing and Applications of Superconductors, 2003
ORNL Research Accomplishment Award, 1999
Swiss National Science Foundation Fellowship, 1994

Publications and Patents: Author or co-author of more than 170 articles in refereed journals and conference proceedings, over 3,500 citations; 4 book chapters; and 7 issued US patents (ISI h-index: 34) [as of summer 2015]

Graduate and Postdoctoral Advisors:

Ph.D. Advisors: André Châtelain (EPFL, Lausanne), Jochen Mannhart (IBM, Zurich)
Postdoctoral Advisors: Lynn A. Boatner (ORNL), David P. Norton (ORNL)

Supervised Students and Postdocs:

Student:

Charlee J.C. Bennett, 2007-2009 (joint with D. P. Norton, U. Florida) (then postdoc at NRL)

Postdocs:

Hong Ying Zhai, 2001-2003 (then postdoc at Stanford)

Isao Ohkubo, 2002-2004 (then research faculty at U. Tokyo)

Ho Nyung Lee, 2002-2003 (then staff at ORNL)

Dae Ho Kim, 2005-2007 (then faculty at Tulane U.)

Michael D. Biegalski, 2006-2008 (then staff at ORNL)

Hyun Sik Kim, 2008-2010 (then research staff at U. Warwick)

Wolter Siemons, 2010-2013 (then staff at ASML)

Christianne Beekman, 2012-2014 (then faculty at Florida State)

Research Interests: Understanding the influence of epitaxial strain, spatial confinement (size effects), and interfacial mechanisms on the properties of thin films, superlattices, and nanostructures, formed of complex metal-oxides including ferroelectrics, magnetic and multiferroic perovskites, high-temperature superconductors, high-k dielectrics, and optical materials. Application and improvements of pulsed-laser deposition methods for the synthesis of precisely tailored superlattices, as well as novel deposition approaches, such as compositional-spread and temperature-gradient methods and rf sputtering. Neutron studies (reflectometry, diffraction) and synchrotron x-ray diffraction for investigations of epitaxial films. Particular interest in the links between electronic and ionic effects as well as phenomena related to surface catalytic activity.