

## John A. Nychka, Ph.D., P.Eng.

Date of Birth: October 13, 1974  
Canadian Citizen

### CONTACT INFORMATION

#### **Business**

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### EDUCATION

2004

#### **Doctor of Philosophy**

Materials, University of California Santa Barbara, CA, USA

- Advisor: Professor D.R. Clarke
- Funded by the US Office of Naval Research (ONR)

1999

#### **Master of Engineering**

Materials Science and Engineering, McMaster University, Hamilton, ON, Canada

- Advisor: Professor D.S. Wilkinson
- Funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) and MicroWear Corp.

1997

#### **Bachelor of Science**

Metallurgical Engineering, Co-op with Distinction, University of Alberta, Edmonton, AB, Canada

- Advisor: Professor M.L. Wayman

## PHILOSOPHY



*"Materials at the Interface"* is my professional philosophy: my teaching, research, and professional service are centered on materials at the interface.

*Materials at the Interface* is my research, teaching, and social change group at the University of Alberta. In my group we study, teach, and educate students, the private sector, and the public on matters related to the interaction of materials with many categories of "interfaces".

*Materials at the Interface* can be interpreted literally or metaphorically.

### Literally

Our scientific and engineering materials research involves systems with interfaces involving:

- Amorphous and crystalline materials
- Ceramic and metallic materials
- Natural fiber and polymer materials
- Cells, tissues, biological liquids, and substrates (e.g., ceramics, polymers, and metals)
- Plant surfaces and liquids

### Metaphorically

Materials are at the interface between:

- History and cultural development
- Ideas and future technology
- Teaching and learning
- Failures and solutions

My mission is to train people in the creation and dissemination of knowledge with respect to materials science and engineering. I have developed a system entitled "*Room with A VUE*". When you have someone in the room whom you are teaching or training (e.g., a student in the classroom, or laboratory, or in a public venue) the system focuses on making the information you are trying to convey:

- Accessible
- Visual
- Unexpected
- Engaging

By incorporating these four simple elements effective learning can be achieved. Students and researchers in my group are trained in weekly meetings to help teach them techniques related to the system, and are given the opportunity to practice with the group, and in other settings such as in outreach or professional service.

## EXPERIENCE

### ACADEMIC

#### *University of Alberta*

07/2007-Present     **Assistant Professor**  
Chemical and Materials Engineering

##### Teaching

Undergraduate teaching includes coordinating and teaching our introductory materials engineering service course and teaching senior level technical speaking. Pedagogical investigations and curriculum development have revolved around increasing the accessibility visualization, unexpectedness, and engagement components to materials education.

##### Research

Areas of study: mechanical behaviour of materials, biomedical materials and devices, catalyst supports, biomimetics and biological materials science, characterization of materials, and structure-property-processing relationships.

##### Service

Service activities have been at the university, technical society, conference organization, and engineering outreach levels.

#### *University of Kentucky*

08/2005-07/2007     **Assistant Professor**  
Chemical and Materials Engineering

##### Teaching

Undergraduate courses included introduction to materials science, materials science lab, research in materials science, independent work in materials engineering, corrosion (undergraduate and graduate course split). I also gave short workshops on materials engineering and characterization techniques to historic preservation graduate students.

Other teaching initiatives include equipment training, informal and formal student advising, planning student-faculty events, Materials Advantage chapter meetings; Graduate student advisor, PhD committee member (4 Mat E and 1 Mech E)

##### Research

Areas of study: mechanical behaviour of materials, oxidation of metals, biomedical and dental materials, biological materials science, characterization of materials, and structure-property-processing relationships.

##### Service

Service activities have been at the university, technical society, conference organization, and engineering outreach levels.

**EXPERIENCE (continued)****University of California Santa Barbara**

06/2005-07/2005

**Instructor**  
Materials

Summer session: Introduction to Structure and Properties of Materials. Developed course materials, demonstrations, and supervised two teaching assistants

04/2004-06/2005

**Post-Doctoral Researcher**  
Materials

Responsibilities included design, manufacture, and testing of equipment to measure vibration damping response of turbine engine alloys and coatings at high temperature (~1000°C). Performed calculations to define parameter space to aid in equipment selection. Mentored graduate students and a high school student, and organized research group meetings. Other projects: Laser induced spallation and breakdown of oxide scales (collaboration with U of A), and fracture mechanics of metal-ceramic interfaces

10/1999-04/2004

**Research Assistant**  
Materials

Worked on numerous research projects in areas of thermal barriers coatings, Raman and luminescence spectroscopy, oxidation of metals, and stress and strain measurement techniques. Performed failure analysis and residual stress measurements in collaboration with domestic and foreign universities and industry. Trained graduate students, visiting researchers, and undergraduate students in spectroscopy and materials characterization techniques

09/2002-08/2003

**Part Time Research Assistant**  
Psychology, University of California Santa Barbara

After being a volunteer test subject Computer animated a cistern-type toilet flushing for use in testing subjects' abilities to understand and explain mechanical systems. Repaired and maintained a surgical research laparoscope for use in testing motor coordination and spatial reasoning.

**McMaster University**

09/1997-09/1999

**Research Assistant**  
Materials Science and Engineering

Performed processing and mechanical property testing and analysis of silicon nitride based cutting tool materials. Spent summer of 1998 performing research in Fort Saskatchewan at the MicroWear Corporation for fulfillment of NSERC Industrial Post-Graduate Scholarship. Worked with other students, technicians, and engineers to accomplish scheduling, manufacture, and testing of materials for thesis research.

**EXPERIENCE (continued)****University of Tokyo**

03/2004

**Visiting Researcher**

Kagawa Lab, Institute of Industrial Science, Japan

Invited to visit Japan to perform research in the high temperature optical reflectivity measurements of stabilized zirconia, luminescence spectroscopy, and near field optical luminescence spectroscopy. Worked with graduate students and technical staff to perform novel experiments on thermal barrier coating materials. Results resulted in a publication, which I wrote.

**University of Alberta**

01/1997-05/1997

**Undergraduate Research Assistant (Dean's Research Award)**

Chemical and Materials Engineering

Performed materials characterization of bioceramic coatings on titanium alloys after *in vitro* leaching in order to select inert materials for implantation. Presented results in campus forum for the Dean of Engineering.

**Teaching Assistantships**

10/1999-12/1999

**Teaching Assistant**

Materials, University of California Santa Barbara

Prepared weekly lectures for assisting students in assignments and assisted in development of portions of assignments and answer keys. Materials in Engineering (Professor C.L. Levi).

09/1997-05/1999

**Teaching Assistant**

Materials Science and Engineering, McMaster University

Prepared weekly lectures for lab demonstrations (up to 5/week)

- Prepared specimens and demonstrated labs to multiple sections:
  - Mechanical Behaviour of Materials (Professor D.S. Wilkinson)
  - Measurements and Communication: Chemical reaction by reaction product and Chemical analysis by atomic levels (Professors M.B. Ives, P.S. Nicholson, A. Petric)
  - Engineering Computation (Professor P. Smith)
  - The Crystalline Structure of Materials (Professor G.A. Irons)
    - Developed Crystallography Laboratory Exercises: Powder Diffraction Pattern Analysis, Energy Dispersive X-Ray Analysis, Electron Diffraction
- Industry mechanical testing lab demonstration for Certificate Course in Metallurgy of Iron and Steel: hardness, Charpy fracture, and tensile testing (Professor J.D. Embury)

**EXPERIENCE (continued)****INDUSTRIAL**

2005-

***Consultant***

Provision of technical services to oil, military contractor, law, and agricultural product sectors. Responsibilities have included materials characterization, metallurgical analysis, patent infringement, failure analysis, materials selection, component redesign, heat treatment schedules, operating conditions, and identification of materials. Have overseen work performed by undergraduates, prepared technical reports and analyses, and interpretation of client supplied data. Projects have ranged in scope requiring a large knowledge base to determine solutions.

05/1997-09/1997

***Research and Development Engineer in Training***

MicroWear Corp., Fort Saskatchewan, Alberta, Canada

Designed and built a prototype ceramics extruder for experimental testing. Performed mechanical testing and microstructural analysis of extruded microwave sintered silicon nitride ceramics. Collaborated with Alberta Research Council in performing lab scale extrusion tests to produce ceramic filled polymer matrix composites (ARC investigator: D. Ghosh). Presented results at the 1998 Canadian Ceramics Society Conference in Toronto, ON.

05/1996-12/1996

***Co-op Student Researcher***

Westaim Corp., Fort Saskatchewan, Alberta, Canada

Worked on developing green forming technologies for ceramics: green machining, tape casting. Evaluated mechanical behavior, green machinability, and microstructure of microwave sintered ceramics. Operated and helped improve efficiency of microwave sintering furnaces.

01/1995-09/1995

***Co-op Student Researcher***

Gibraltar Mines Ltd., Williams Lake, British Columbia, Canada

Conducted experiments in a feasibility study of copper oxide ore. Operated solvent extraction equipment; performed analytical chemical analysis in assay lab. Trained in safe industrial and laboratory practices along with waste and hazardous materials information systems.

06/1994-09/1994

***Co-op Student Machinist***

Sage Fluid Control Ltd., Edmonton, Alberta, Canada

Operated computer numeric controlled lathes to machine forged metal pieces in to components for oil pipelines. Adjusted computer programs to aid in machining of parts. Assessed parts for specification adherence and assembled products.

## CONTRIBUTIONS TO EDUCATION

### Curriculum Development

#### *University of Kentucky*

##### **Materials Engineering Program**

I was involved in re-designing the undergraduate and graduate curricula to accommodate for concerns from the accreditation body, ABET. My role was to help to determine how to develop and implement lab courses, along with write new course syllabi for said lab courses and additional graduate courses. I also took part in determining which core courses should be in the graduate curricula, wrote new syllabi, and assisted in developing new procedures for the graduate student candidacy process.

A major initiative was undergraduate materials engineering lab renovation (\$63,000): planning, equipment acquisition, installation, and training. I was in charge of designing the laboratory space and deciding how to outfit the lab. I proposed the plan to our advisory board and gathered quotes, organized the purchasing, and implemented the changes. I also trained technical support staff in proper procedures for metallographic sample preparation and use of microscopes.

### Course Development

#### *University of Alberta*

I have been the course coordinator of the introductory multi-section materials engineering service course since Fall 2008 (Mat E 202). I have initiated serious course redevelopment which has involved writing a common set of notes, assignments, labs, and exams for all sections of the course. I have tried to incorporate more and more visualization exercises and demonstrations into the course, and have developed (with the help of summer Co-op students) and made available resources and training opportunities for other professors in the department. TA training has been another improvement in the course. I now undertake regular meetings with TAs in order to improve their teaching abilities and have coordinated Teaching Triads within the groups for their improvement as well. There are typically 19 TAs associated with this course each semester.

Another development surrounding the Mat E 202 course is the continued writing of an introductory textbook with Professor R. Eadie. Our textbook is aimed at the learning and teaching *experience* rather than an encyclopedic resource – we are using my “*Room with AVUE*” concept to make the course more accessible, visual, unexpected, and engaging.

I have also taught the senior undergraduate technical speaking course (CME 483) with the goal of providing and training students in the delivery of constructive feedback. I implemented changes in the course content to aid the students in understanding what “technical” means in a technical talk, and made new resources available to the students regarding giving feedback.

## CONTRIBUTIONS TO EDUCATION (continued)

### University of Kentucky

I redeveloped the introductory materials science course (MSE 201) and accompanying lab (MSE 202). I was in charge of creating a new format for exams, assignments, and lab reports, and updating the course content and notes to balance the emphasis on the different classes of materials and fundamental knowledge.

I developed a new senior/graduate split level course in oxidation and corrosion (MSE 599). This entailed a new syllabus, notes, assignments, exams, and exercises. A particularly successful innovation was homework assignments entitled "Corrosion on Campus" where I took photographs of examples of different types of corrosion on the campus and asked to students to find them, describe the mechanism, and suggest possible corrosion mitigation strategies.

As a team member on the lab course redevelopment effort I suggested new labs, provided write-ups and solutions for new labs, and helped to determine, order, and organize supplies for said labs.

### Courses Taught and Instructor Ratings

#### University of Alberta

Course	Year	Class Size	Respondents	Rating /5*
Mat E 202 – Materials Engineering II	Fall 2008	109	71	4.5
	Winter 2009	182	110	4.2
	Fall 2009	109	90	4.6
	Winter 2010	140	133	4.8
CME 483 – Colloquium II	Winter 2010	30	29	4.7

\*The USRI course evaluation system at the University of Alberta is based on a **5 point scale**, with **1** being the **lowest** rating and **5** being the **highest** rating. Student questionnaires form an important part of evaluating teaching effectiveness but cannot be taken alone as a complete assessment of an instructor or course. Factors other than an instructor's teaching ability may influence ratings. These factors include class size, class level, Faculty, time of class, required versus optional course, grade expectations, student GPA, gender, race, ethnicity, age of both students and instructors. Small differences in evaluation should not be considered as meaningful.

#### University of Kentucky

Course	Year	Class Size	Respondents	Rating /4*	Equivalent Rating/5
MSE 201 – Materials Science	Fall 2005	33	19	3.5	4.4
	Spring 2006	16	13	3.7	4.6
	Fall 2006	24	17	3.8	4.8
MSE 202 – Materials Science Lab	Fall 2006	11	6	3.7	4.6
MSE 599 – Corrosion	Spring 2007	11	7	3.7	4.6

\*The TCE course evaluation system at the University of Kentucky is based on a **4 point scale**, with **1** being the lowest rating and **4** being the **highest** rating. Guidelines for interpretation evaluations suggest viewing multiple sets of student ratings, considering the number of respondents, finding a useful reference point, and reflecting on the impact of course characteristics such as class size, class level, difficulty, required vs. optional, and time of day. An equivalent rating out of 5 on the same scale as the USRI for University of Alberta is also shown.



## CONTRIBUTIONS TO EDUCATION (continued)

### **University of California Santa Barbara**

<b>Course</b>	<b>Year</b>	<b>Class Size</b>	<b>Respondent s</b>	<b>Rating /5*</b>	<b>Equivalent Rating/5</b>
<i>MATRL 101 – Introduction to Structure &amp; Properties of Materials</i>	<i>Summer 2005</i>	19	18	1.7	4.3

*\*The ESCI course evaluation system at the University of California Santa Barbara is based on a 5 point scale, with 5 being the lowest rating and 1 being the highest rating. Care should be taken when interpreting the results. An equivalent rating out of 5 on the same scale as the USRI for University of Alberta is also shown.*

### **Mentoring and Peer Development**

2009

#### ***Nominator***

I was one of two nominators for a colleague's 3M National Teaching Fellowship package that was successful and awarded in 2010.

Fall 2009- Present

#### ***Peer Consultant***

Peer Consulting is a University wide service which provides teaching staff with one-on-one support from a peer outside their given faculty. Peer consultants are chosen by invitation, and provide:

- Support that is confidential, collaborative and non-judgmental, voluntary, and timely
- Advisement on pedagogical issues, ideas and concerns and offer encouragement and recommendations
- Student feedback in a positive, meaningful and useful manner
- <http://www.ctl.ualberta.ca/peer-consulting.html>

2009 - Present

#### ***Faculty Mentor, Fraser and Shirley Russell Teaching Fellowship Award***

This fellowship is awarded to graduate students with a keen interest in teaching, and the fellowship requires that the student teach a large portion of a course (up to 50%) and be mentored by a faculty member. I have mentored one such fellow and co-mentored another. My role was to co-instruct Materials Science II (Mat E 202) with a fellow in the CME department where we had 50% of lecture time each. I observed the fellow in the classroom and gave feedback regarding teaching style, delivery, content, context, visualizations, classroom control, and time management. I offered guidance on problem set development, midterm exam creation and grading, and was available as a resource for questions and discussions concerning teaching undergraduate course materials. We also prepared and published a manuscript of our experience in Academic Matters. I have also co-mentored a second fellow (and their other mentor) in the preparation and delivery of classroom demonstrations to enhance learning of difficult concepts.

**CONTRIBUTIONS TO EDUCATION (continued)**

- 2005 **Mentor**, Materials, University of California Santa Barbara
- High school student mentee
    - Trained student to perform vibration measurements and analysis
    - Aided student in presentation preparation
    - Offered guidance for college selection
- 2001-2005 **Mentor**, Materials, University of California Santa Barbara
- Graduate students
    - Training of students on equipment and imaging analysis and techniques
    - Aiding students in experimental design and data analysis
    - Paper reviewing
- 01/2003-09/2003 **Mentor**, Materials, University of California Santa Barbara
- Senior undergraduate Chemical Engineering mentee
    - Trained mentee in design of experiments, preparation of samples, operation of high temperature furnaces and luminescence spectrometer, time management, and technical poster presentation
    - Mentee won second place in the Engineering category for his poster in the Undergraduate Research Symposium

**Educational Training**

- 01-04/2010 **Teaching Enhancement Series**, Centre for Teaching and Learning, Seminar Series addressing both the theory and practice of teaching and learning in Higher Education, University of Alberta.
- 04-05/2009 **Less Teaching, More Learning!** University Teaching Services, Symposium Series with workshops on active and collaborative learning, and assessment, University of Alberta.
- 02/2009 **Science with Impact Certificate**, Let's Talk Science Partnership Program run workshop for outreach training for scientists, engineers, and technology professionals, University of Alberta.
- 09/2006 – 04/2007 **Classroom Assessment Techniques Workshop Series**, Office of Assessment and Teaching and Academic Support Center, A workshop, seminar, and discussion series aimed at introducing Angelo and Cross's Classroom Assessment Techniques into the classroom, University of Kentucky.

## SERVICE

### **University of Alberta**

Departmental Hiring Committee (2008-2009)

Member of Teaching Enhancement Committee in the Department of Chemical and Materials Engineering (2007- )

Undergraduate Student Evaluation Ratings Task Force; UTS (2008-2009)

Less Teaching More Learning Symposium Organizing Committee (Spring 2009) UTS, CME Department, and Faculty of Engineering

Lead organizer of a workshop regarding formative assessment in teaching - Guest: Royce Sadler (funded through a TLEF Award, the CME Department, and the Faculty of Engineering) (2008-2009)

Co-organizer of assessment workshops on assessment techniques – Guest: Tom Angelo (2009)

Panel member for Undergraduate Student Assessment: Instructor and Student Perspectives – How will we know? Beginning the conversation (2009)

Panel member on Pedagogical Provocations (Fall 2009) – a panel discussion and forum about teaching for instructors, students, administrators. Podcasts at: <http://www.uts.ualberta.ca/SeptemberForum.html>  
Engineering Day Committee (2007- )

### **University of Kentucky**

Materials Science and Engineering Undergraduate Committee (2005-2007)

Materials Science and Engineering Graduate Committee (2005-2007)

Materials Science and Engineering Faculty Search Committee (2005-2007)

CME Alumni Committee (2005-2007)

Academic Fair, *October 13 & 14, 2006*

Faculty Advisor, Chemical and Materials Engineering Graduate Student Association (2005-2007)

Engineer's Day 2006, 2007. Organized and ran demos and presentations.

Office of Residence Life House Calls Program (09/2006)

Focus group member for strategic planning, 2007

Interviewee for "Excellent Teachers" video, found at: <http://www.uky.edu/TASC/ED/interviews.php>

Associate Member Graduate School, 2006-

### **National**

*Committee Co-Chair Conference of Metallurgists (Nanomaterials), Vancouver, BC, October 3-6, 2010*

*Conference Organizing Committee Member Canadian Materials Science Conference, Edmonton AB, June 16-19, 2008*

### **International**

*Committee Chair TMS Annual Meeting, Seattle WA, February 14-18, 2010, Biological Materials Science*

*Committee Co-Chair TMS Annual Meeting, San Francisco CA, February 15-19, 2009, Biological Materials Science*

*Committee Chair Materials Science & Technology, Detroit MI, September 16-20, 2007*

Next Generation Biomaterials: Advanced Processing, Characterization, and Modeling of Materials for Medical Devices

*International Scientific Committee Member International Conference on Multi-functional Materials and Structures, Hong Kong, July 28-31, 2008, Biomaterials and Biomimetics Symposium.*

*Committee Member TMS*

Biomaterials Committee Vice-Chair (2010-present)

Mechanical Behavior (2008- )

Biomaterials (Member since 2008; Vice Chair 2010-present)

Nanomechanical Materials Behavior (2007- )

ASM International: Executive committee (Edmonton Chapter, 2008- )

JOM Advisor: Biomaterials Committee co-chair (2010-present)

**SERVICE (contined)*****The National Research Council, Washington, DC***

Invited participant in **The 2006 Assessment of Research-Doctorate Programs**

***Proposal Review***

Natural Sciences and Engineering Research Council of Canada (DG, CRD, SPG) (2007- )

National Science Foundation (USA) (2006-2007)

Department of Energy (USA) (2006-2007)

***Manuscript Peer Review (2005 – present)***

Metallurgical and Materials Transactions A (Key Reader 2008-present)

J. Mechanical Behavior of Biomedical Materials

Biomedical Materials

Cryobiology

Materials Science and Engineering A

J. American Ceramic Society

Materials Characterization

J. Materials Science

J. Nanomaterials

International Journal of Adhesion and Adhesives

Materials Chemistry and Physics (Including Materials Science Communications)

Surface and Coatings Technology

Applied Surface Science

Langmuir

The Kentucky Journal of Excellence in College Learning and Teaching

SAE International

J. Alloys and Compounds

J. Materials Chemistry

The Open Corrosion Journal

**COMMUNITY SERVICE**

- 06/2010 **Volunteer Instructor**, "Matter and Chemical Change" Vernon Barford Junior High School, Edmonton, AB.
- Prepared and ran demonstrations about the matter and chemical reactions and temperature dependent properties of materials to one Grade 9 class, and two Grade 7 classes.
  - Demonstrations and lecture materials were constructively aligned with EPSB curriculum.
  - Trained an undergraduate in Materials Engineering in classroom visitation.
- 06/2010 **Volunteer Instructor**, "Polymers", W.P. Wagner High School, Edmonton, AB.
- Prepared and ran demonstrations about the chemical structure of polymers to a class of 34 grade 12 Chemistry 30 FIRST students.
  - Students made Flubber (polyvinyl acetate cross-linked with boron tetrahydroxide) and tested its properties in order to determine the nature of the cross-link bonds.
  - Demonstrations and lecture materials were constructively aligned with EPSB curriculum.
- 01/2010 **Invited Speaker**, "Starting Research", Research by Parts Seminar Series, Chemical and Materials Engineering Graduate Student Association (CMEGSA), Edmonton, AB
- Presented ideas concerning how to start graduate research to graduate students and post-docs in Chemical and Materials Engineering.
- 07 & 08/2009-10 **Volunteer Instructor**, University of Alberta Discover E Program – Leadership and Engineering Applications, Projects, and Possibilities (LEAPP)
- Prepared and ran demonstrations and lecture about composite materials to high school students – how to design materials.
  - Aided students in design and testing of panels for impact resistance (panel construction with spaghetti and white glue).
  - Worked with instructors to develop contest rules and coordinate supplies and
- 04/2009 **Volunteer Instructor**, Meyonohk Elementary School, Edmonton, AB.
- Prepared and ran demonstrations about air to Grade 6 students
  - Students made rockets propelled by cans of compressed air and tested them at recess.
  - Demonstrations and lecture materials were constructively aligned with EPSB curriculum.
- 02 & 11/2009 **Volunteer Instructor**, University of Alberta Girls, Engineering and Mentorship Club (GEM), Edmonton, AB.
- Prepared and ran demonstrations about how temperature affects materials properties to a group of female junior high school students and their parents.
  - Worked with university student mentors to help train them in the skills of scientific demonstration.

**COMMUNITY SERVICE (contined)**

- 11/2008      **Volunteer Instructor**, *Meyonohk Elementary School*, Edmonton, AB.
- Prepared and ran demonstrations about liquids to Grade 2 students.
  - Exposed students to the scientific method.
  - Assisted student teacher in teaching science curriculum.
  - Demonstrations and lecture materials were constructively aligned with EPSB curriculum.
- 2010      **Volunteer Reviewer**, U of A Inaugural Engineering Graduate Research Symposium
- Reviewed oral presentations abstracts and presentations.
  - Judged technical poster session.
- 2008      **Volunteer Reviewer**, U of A Chemical and Materials Engineering Graduate Research Symposium
- Judged oral presentations for screening purposes.
  - Provided feedback to students for improvement.
- 09/2008      **Volunteer**, Let's Talk Science (LTS) Partnership Program
- Edited Engineering text in the LTS informational brochure for grade-schools.
- 03/2008      **Volunteer Instructor**, "Failure of Materials", Mini-workshop on materials engineering and materials failure analysis for high school students at Harry Ainlay Composite High School, Edmonton, AB.
- Initiated outreach activities and directed development of teaching materials with four materials undergraduates.
  - Created demos for a mini-lecture on materials, and coordinated case studies for undergraduates to assist high school students in hands on activities.
- 12/2007, 11/2009      **Invited Speaker**, "The Ins and Outs of Engineering at the U of A", Presented to high school students at Harry Ainlay Composite High School, Edmonton, AB.
- 11/2007      **Invited Speaker**, "Demystifying the Academic Job Search", Academic Night, Chemical and Materials Engineering Graduate Student Association (CMEGSA), Edmonton, AB.
- 04/2007      **Volunteer**, University of Kentucky, KY.
- Developed activities and contest based on design of materials for junior high school girls participating in a summer outreach camp.
- 04/2007      **Volunteer Instructor**, ASM Materials Engineering Instruction Course on Aluminum and its Alloys, Lexington, KY
- Developed teaching materials and demos for lectures regarding aluminum alloys.
- 02/2006      **Volunteer Instructor**, ASM Materials Engineering Instruction Course on Metallographic Techniques, SECAT, Lexington, KY.
- Developed teaching materials and demos for lectures regarding metallographic specimen preparation and analysis.
  - Consulted with students regarding the setup of their metallurgical lab and particular processes and data analyses.

**COMMUNITY SERVICE (contined)**

06/2003

**Volunteer Instructor, La Patera Elementary School, Goleta, CA.**

- Worked with student teacher to develop demonstrations to comply with grade 6 science curriculum.
- Prepared short seminar regarding size and scale for class of 30 students (also made accompanying scanning electron micrographs of insects as examples).
- Developed procedure and assisted students in making their own box camera obscura out of simple materials.

03/2003

**Volunteer Instructor, Hollister Elementary School, Goleta, CA.**

- Led discussion on the states of matter in a grade 1 class of 18 students.
- Developed and performed a demonstration on the states of matter –made dilatant non-Newtonian goo with the students.

10/2001

**Volunteer, New Student Orientation Discussion Panel, Graduate Student's Association, University of California Santa Barbara**

- Sat on a panel of four graduate students who spoke and entertained questions from audience of incoming graduate students.

1998-1999

**Volunteer Instructor, Let's Talk Science Partnership Program, McMaster University, Canada**

- Exposed elementary students to the benefits and opportunities in science
- Fostered students' perception of, and interest, in science
- Developed a proficiency in communicating science to a broad audience
- Demonstrated leadership, creativity, and organizational skills in designing and implementing hands-on activities to complement the Ontario Ministry of Education and Science and Technology Curriculum guidelines
- Assisted elementary school teachers in teaching science curriculum
- Developed and performed mechanics demonstrations with another graduate student for three grade 5 classes

## PROFESSIONAL AFFILIATIONS AND ACTIVITY

### ***Society Memberships***

American Ceramic Society (ACerS) (2008- )  
Association for Iron and Steel Technology (AIST) (2008- )  
American Society for Engineering Education (ASEE) (2007- )  
American Society for Metals (ASM International) (2006- )  
The Minerals, Metals & Materials Society (TMS) **Life Member** (2006)  
The American Association for the Advancement of Science (AAAS) (2006-2007)  
National Association of Corrosion Engineers International (NACE) (2005-2008)

2010 **Professional Engineer**, The Association of Professional Engineers, Geologists and Geophysicists of Alberta, Canada (APPEGA)  
2008- **Faculty Advisor**, Material Advantage Student Chapter, University of Alberta  
2008- **Student Outreach Chair**, ASM International, Edmonton Chapter  
2006-2007 **Past Chairman**, ASM International Bluegrass Chapter  
2000-2003 **Secretary**, Student Materials Society, University of California Santa Barbara  
1992-1999 **Member, Engineer in Training**, The Association of Professional Engineers, Geologists and Geophysicists of Alberta, Canada (APPEGA)



**AWARDS**

- 2009 **Teaching Excellence Appreciation Award**, Delta Chi Fraternity, Edmonton, Alberta
- 2006 **Nominee: Faculty of the Year Award**, The National Society of Collegiate Scholars, Washington, DC
- 2003 **Best Poster Award**, Engineering Conferences International: Thermal Barrier and Environmental Coatings Conference, Irsee, Germany
- 1999 **First Place Poster Award**, Canadian Ceramic Society Conference, Toronto, Canada
- 1999-2004 **Research Assistantship**, University of California Santa Barbara, USA
- 1999 **Teaching Assistantship**, University of California Santa Barbara, USA
- 1997-1999 **Graduate Student Assistantship**, McMaster University, Canada
- 1998-1999 **Natural Sciences and Engineering Research Council of Canada Industrial Post-Graduate Scholarship**, Materials Science and Engineering, McMaster University, Canada; MicroWear Corporation, Canada
- 1997 **Viridian Scholarship in Metallurgy** Chemical and Materials Engineering, University of Alberta, Canada
- 1997 **Dean's Research Award**, Faculty of Engineering, University of Alberta, Canada

## RESEARCH INTERESTS

### Research Summary

The central theme of my research is exploring the limits of materials at interfaces (both literal and metaphorical interfaces). This entails characterization of structure, materials properties, performance, and processing with a focus on stress and strain effects in structural and biological materials.



### **Properties of Materials**

The properties of materials have been of interest in human culture for tens of thousands of years, yet materials science and engineering has really only had the tools for proper study for ~100 years. The basic goal of research in this area is to determine structure-property-processing relationships to aid materials manufacture and reliability in service. By understanding the microscopic and atomic structure in materials we can understand, predict, and design materials for various applications. Materials characterization and testing are core elements of such research.

### **Characterization of materials**

In my group we use a host of materials characterization techniques for standard and creative structural, physical, and chemical characterization of materials.

Optical, electron, atomic, and focused ion beam microscopy.

Mechanical property and response testing (tensile testing, indentation hardness).

Spectroscopy: luminescence, optical reflectance, x-ray, FTIR, secondary ion mass, mechanical, atomic absorption, and laser induced breakdown.

### **Biological Materials Science**

Biological materials have the unique ability to be grown and perform a multitude of tasks over a large length scale. My interest is in biomaterials for bone repair/replacement, tissue scaffolds, cryopreservation, and biomimetics.

### **Materials and Systems of Interest**

#### Coatings and thin films

- Interface fracture mechanics
- Coatings for catalysis

#### Biological materials science

- Bioglass/Bioceramics
- Insect and water resistant plants
- Functional morphology in insects
- Cryopreservation of tissues
- Dental Nanocomposites
- Natural fiber biocomposites

#### Metallic Alloys

- High temperature corrosion resistance

- Metallic glass deformation

#### Thermally Grown Oxides

- Morphology and physical properties
- Growth stress measurement and modeling
- Diffusion and growth rate kinetics
- Phase transformations
- Oxidation synthesis of hydrophilic and hydrophobic thin films

#### Hard Materials

- Silicon nitride and other ceramics and coatings

## FUNDING HISTORY

### Principle Investigator

#### Current

Grant / Award	Title	Duration	Amount
NSERC Discovery	Chemomechanical Dissolution of Bioactive Glasses	2008-2012	\$23,100/yr
NSERC SPG Syncrude	Arranged Catalysts for Structured Hydrotreating Reactors	2009-2011	\$118,233
U of A TLEF Award	Formative Assessment Technique Development in Engineering	2008-2010	\$20,000

#### Previous

Grant / Award	Title	Duration	Amount
NSERC RTI	Multimode Digital Imaging Microscope	2009	\$96,184
KSEF Kentucky Science and Engineering Foundation, R&D Excellence Program	Characterization of Metallic Tin Whiskers in Lead-Free Solders	2007-2008	\$103,078
National Science Foundation ANSWER Program: International Materials Initiative through University of Tennessee	Characterization of <i>in-situ</i> Shear Band Formation in Metallic Glass	2007	\$7,306

#### Pending

Grant / Award	Title	Duration	Amount
FeMET Curriculum Development Grant	Visualization of Structure-Property-Processing Relationships in Carbon Steels	2010-2016	\$25,000
AFMNet - NSERC NCE <i>Advanced Food and Materials Network</i> AITF, Alberta Agriculture and Rural Development, Motive Industries, Beaver Plastics, Woodbridge	Transforming Agricultural Crops into Polymers and Composites	2011-2014	\$1,364,800

**FUNDING HISTORY (continued)****Co-Investigator**

## Current

<b>Grant / Award</b>	<b>Title</b>	<b>Duration</b>	<b>Amount</b>
NSERC RTI	Ultra-Sensitive High-Pressure Differential Scanning Calorimeter	2010	\$145,000
NSERC RTI	High Temperature Mechanical Tester	2010	\$87,212

## Previous

<b>Grant / Award</b>	<b>Title</b>	<b>Duration</b>	<b>Amount</b>
NSERC RTI	Isothermal Titration Calorimetry	2008	\$150,000
US Army Research Office	Biological Materials Science Symposium: Student Support Awards and Honoraria	2009 2010	\$10,000 \$5,000
National Science Foundation	Biological Materials Science Symposium: Student Support Awards	2009 2010	\$4,000 \$4,000
National Science Foundation ANSWER Program: International Materials Initiative through University of Tennessee	Neutron Diffraction Measurement of Electromigration-Induced Stresses in Lead-Free Alloy	2007	\$7,306
University of Kentucky Research Foundation Research Equipment Grant	Non-invasive Infrared Camera Acquisition for Materials Conservation and Historic Preservation	2007	\$50,961

## Pending

<b>Grant / Award</b>	<b>Title</b>	<b>Duration</b>	<b>Amount</b>
Subgrant through AITF	Biodegradability of Biocomposites: Materials Characterization and Testing	2010-2012	\$65,000

**SELECT RESEARCH COLLABORATIONS (past and present)*****The University of Alberta***

Prof. N. Semagina (CME): oxidation synthesis of catalyst supports (2009- )  
Prof. J.A.W. Elliott (CME), L.E. McGann (LMP), N. Jomha (LMP): materials engineering in cryobiology (2008- ).  
Prof. J.P. Acker (LMP): effects of cell substrates on cryopreservation (2009- ).  
Prof. A. McDonald (ME): composite coatings for bone fixation implants (2009- ).  
Prof. S. Ruecker (English and Film Studies): electronic paper, rich prospecting browsers for taxonomy in entomology and educational e-texts (2009 - ).  
Prof. R. Gupta (CME): ceramic gas separation materials (2009- ).  
Prof. D. Ivey (CME): Lead-free whisker growth (2008).  
Prof. W. Chen (CME): Oxidation of FeCrAl Alloys: Theta-Alumina Formation (2008).

***The University of Kentucky***

Prof. Fuqian Yang (CME): Mechanics and mechanical behaviour of materials (2006- ).  
Prof. Mike Sharkey (Entomology): Invasive and Parasitic Insect Structure and Function and Mechanical Properties (2007- ).

***Alberta Innovates Technology Futures***

Dr. J.D. Wolodko (Advanced Materials): structure-property-processing relationships in natural fiber reinforced biocomposites (2009- ).

***Syncrude Canada Ltd.***

Dr. J Adjaye: oxidation synthesis of catalyst supports for use in hydrotreating of hydrocarbons (2009- ).

***University of Pittsburgh***

Prof. G.H. Meier: Oxidation studies of nickel superalloys; comparisons of residual stress measurement techniques: XRD and photostimulated luminescence spectroscopy (PSLS) on stainless steels, nickel superalloys, and nickel aluminate coatings (2003-2008).

***The University of Western Ontario***

Prof. John Dryden: Modeling of grain boundary flux during oxide growth (2002-2008).

***Howmet Castings and Alcoa Business***

K.S. Murphy: Measurements of residual stresses on thermal barrier coated (TBC) aluminate-coated superalloys by PSLS; failure analysis of different YSZ coatings (2001-2004).

***The University of Tennessee***

Prof. P.K. Liaw: deformation of bulk metallic glass (2007-2008).

## STUDENT ADVISING

### Theses Supervised

- Masters
- S. Kashyap, *Effect of Crystallinity on Crack Propagation and Mineralization of Bioactive Glass 45S5*, M.Sc. Materials Engineering, University of Alberta, August 2010.
- J.E. Samad, *and Reaction Analysis*, M.Sc. Chemical Engineering, University of Alberta, August 2010 (co-supervisor: N. Semagina).
- H. Pirayesh, *Sol-gel Manufacture of Bioactive Glass 45S5*, M.Sc. Materials Engineering, University of Alberta, August 2010.
- Y. Li, *Whisker Growth in Lead-Free Solder*, M.Eng. Materials Engineering, University of Kentucky, *transferred to Ph.D. in Statistics*, 2008 (co-supervisor: F. Yang).
- Doctoral
- N.L. Robertson, *Biodegradability of Natural Fiber Reinforced Biocomposites*, PhD Materials Engineering, University of Alberta, *in progress* (co-supervisor: J.D. Wolodko, AITF). U of A Queen Elizabeth II Scholarship Recipient.
- Michal Zielinski, *Materials Engineering in Cryobiology*, PhD Materials Engineering and Medical Science, University of Alberta, *in progress* (co-supervisors: J.A.W. Elliott and L.E. McGann). U of A PhD Scholarship Recipient.
- Mehdi Ali Pour, *Ceramic Gas Separation Membranes for Oxy-Fuel Combustion*, Ph.D. Chemical Engineering, *in progress* (co-supervisor, Primary supervisor: R. Gupta).
- D. Li, *Localized Mechanical Deformation and Dissolution of 45S5 Bioglass*, Ph.D. Materials Engineering, University of Kentucky, January 2010 (supervisor then co-supervisor upon move to U of A; Primary supervisor: F. Yang). Research Challenge Trust Fund Awardee.

### Student Research

- Interns
- S. Malhotra and G. Goyal, *Visualization and Quantification of Soap Bubble Growth*, University of Alberta, 2008; Pre-engineering high school graduates.
- M. Davis, *Vibration Damping of Fiber Composites*, University of California Santa Barbara, 2005 (mentor; Primary supervisor: D.R. Clarke), Pre-engineering high school student. Summer mentorship program.
- T. Rutt, *Effect of Substrate on Cryopreservation of Cells*, University of Alberta, 2009 (co-supervisors: J.A.W. Elliott, L.E. McGann, J.P. Acker).
- M. Mahon, *Bioactive Glass Coatings via Thermal Spray*, University of Alberta, 2009 (co-supervisor: A. McDonald).
- D. Stevens, *Cryopreservation of Soft Tissues: Cooling and Heating Rate Measurements*, University of Alberta, 2008 (co-supervisors: J.A.W. Elliott, L.E. McGann). STEP Student.
- B. Alexander, *Effect of Media on Bioactive Response of Bioactive Glass*, University of Kentucky, 2006-2007.

**STUDENT ADVISING (continued)**

K. McCrary, *Microstructure-based Performance Variation in Gray Cast Iron*, University of Kentucky, 2006-2007 (industry sponsor: GE Lighting Glass Plant).

P. Rottmann, *Materials Characterization of Historic Mortars*, University of Kentucky, 2007 (co-supervisor: M. Spencer).

J. Ishmael, *Improved Materials for Dental Restoratives*, University of Kentucky, 2006-2007.

J. Ferguson, *3-D Interconnected Porous Macrostructures*, University of Kentucky, 2005-2006.

J. Clements, *Oxidation of FeCrAl Alloys: Theta Alumina Growth*, University of California Santa Barbara, 2001-2005 (mentor; Primary supervisor: D.R. Clarke).

Co-op M. Ma, *Curriculum Development in Materials Engineering: Visualization through Demonstrations*, University of Alberta, 2010.

G. Nelson, *Composite Material Implant Coatings for Bone Fixation*, University of Alberta, 2010 (co-supervisor: A. McDonald). NSERC USRA Student.

F. Balch and C. Tomas, *Curriculum Development in Materials Engineering: Development of Demonstration Materials*, University of Alberta, 2009 (co-supervisor: L. Mallory).

K. Jensen, *Lead-free Solder Whisker Growth*, University of Alberta, 2008 (co-supervisor: D. Ivey). NSERC USRA Student.

S. Mazur, *Crystallization of Bioactive Glass*, University of Alberta, 2008. NSERC USRA Student.

J. Deutsch, *Oxidation of FeCrAl Alloys: Theta Alumina Growth*, University of Alberta, 2008 (co-supervisor: W. Chen). NSERC USRA Student.

**Dean's Research Award**

K. Griep, *Heat Treating of Bioactive Glass*, University of Alberta, 2009-2010.

K. Jensen, *Oxidation Synthesis of Catalyst Supports*, University of Alberta, 2009-2010 (co-supervisor: N. Semagina).

G. Nelson, *Composite Dental Material Implant Coatings*, University of Alberta, 2009-2010 (co-supervisor: A. McDonald).

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**STUDENT ADVISING (continued)****Research Assistants**

- Graduate     A. Grotowski, *Rich Prospect Browser Development for Entomology*, University of Alberta, 2010 (co-supervisor; Primary supervisor: S. Ruecker, Humanities Computing; co-supervisor: M.J. Sharkey, Dept. of Entomology, University of Kentucky).
- B. Compton, *Deformation of Bulk Metallic Glass and Ductile Metals*, University of Kentucky, 2007 (co-supervisor: F. Yang).

**Teaching Mentees**

- N. Danilovic, Ph.D. in Materials Engineering Candidate, *Fraser and Shirley Russell Teaching Fellowship: Introductory Materials Engineering Course, Mat E 202*, University of Alberta, 2009.
- P. Kerr, Ph.D. in Materials Engineering Candidate, *Fraser and Shirley Russell Teaching Fellowship: Introductory Materials Engineering Course, Mat E 202*, University of Alberta, 2010 (co-mentor; Primary mentor: R. Eadie).
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**PUBLICATIONS (\* Presenting Author, HQP)****Refereed Papers**

1. S. Kashyap, K. Griep, and **J.A. Nychka**, "Crystallization Kinetics, Mineralization and Crack Propagation in Partially Crystallized Bioactive Glass 45S5," *in press in Materials Science and Engineering C: Materials for Biological Applications*, June 2010
2. **J.A. Nychka** and M.M. Gentleman, "Implications of Wettability in Biological Materials Science," *JOM*, (2010) **62** [7] 39-48, also including July JOM cover image.
3. **J.A. Nychka**, S.L.R Mazur, S. Kashyap, D. Li, and F. Yang "Dissolution of Bioactive Glasses: Effects of Crystallinity Coupled with Stress," *JOM*, (2009) **61** [9] 45-51
4. C.A. Boring, M.J. Sharkey, and **J.A. Nychka**, "Structure and functional morphology of the ovipositor of *Homolobus truncator* (Hymenoptera: Ichneumonidea: Braconidae)," *Journal of Hymenoptera Research*, (2009) **18** [1] 1-24
5. D. Li, F. Yang, and **J.A. Nychka**, "Indentation-induced Residual Stresses in 45S5 Bioglass and the Stress Effect on the Material Dissolution," *Engineering Fracture Mechanics*, (2008) **75** [17] 4898-4908
6. **J.A. Nychka**, D.R. Clarke, and G.H. Meier, "Spallation and transient oxide growth on PWA 1484 superalloy," *Materials Science and Engineering A* **490** (2008) 359-368
7. **J.A. Nychka**, D. Li, and B. Alexander, "In vitro Bioactivity of Bioactive Glass 45S5 as a Function of Indentation Load," *Journal of the Mechanical Behavior of Biomedical Materials* **1** (2008) 243-251
8. **J.A. Nychka** and D. Li, "Surface morphological changes accompanying dissolution of bioactive glass: effect of residual stress," *Advanced Materials Research: Multi-functional Materials and Structures* **47-50** (2008) 1302-1306
9. F. Yang, **J.A. Nychka**, G. Wang, W. Jiang, B.G. Compton, P.K. Liaw, and Y. Yokoyama, "Plasto-hydrodynamic Deformation of Brittle Bulk Metallic Glass at Room Temperature," *Fast Track Communication in the Journal of Physics D: Applied Physics* **41** (2008) 012005 (5pp)
10. **J.A. Nychka**, Y. Li, F. Yang, and R. Chen, "Can whiskers grow on bulk lead-free solder?" *Journal of Electronic Materials* **37** [1] (2008) 90-95
11. **J.A. Nychka**, D.R. Clarke, and J.R. Dryden, "Quantifying Cation Grain Boundary Diffusion," *Journal of Applied Physics* **102** (2007) 034907-1-5
12. G. Gregori, L. Li, **J.A. Nychka**, and D.R. Clarke, "Vibration damping of superalloys and thermal barrier coatings at high-temperatures," *Materials Science and Engineering A*, **466** [1-2] (2007) 256-264
13. M.M. Gentleman, V. Lughì, **J.A. Nychka**, and D.R. Clarke, "Non-contact Methods for Measuring Thermal Barrier Coating Temperatures," *International Journal of Applied Ceramic Technology*, **3** [2] (2006) 105-112
14. **J.A. Nychka**, T. Naganuma, M. Winter, Y. Kagawa, and D.R. Clarke, "Temperature Dependent Optical Reflectivity of Tetragonal-Prime Ytria-stabilized Zirconia," *Journal of the American Ceramic Society*, **89** [3] (2006) 908-913
15. **J.A. Nychka** and D.R. Clarke, "Quantification of Aluminum Outward Diffusion During Oxidation of Fe-Cr-Al Alloys," *Oxidation of Metals* **63** [5/6] (2005) 325-352
16. J.D. Almer, G. A. Swift, **J.A. Nychka**, E. Üstündağ, and D.R. Clarke, "In situ synchrotron measurements of oxide growth strains," *Materials Science Forum*, **490-491** (2005) 287-293
17. **J.A. Nychka**, M.Y. He, C. Pullen, and D.R. Clarke, "Surface Oxide Cracking Associated with Oxidation-Induced Grain Boundary Sliding in the Underlying Alloy," *Acta Materialia* **52** [9] (2004) 1097-1105
18. **J.A. Nychka**, T. Xu, D.R. Clarke, and A.G. Evans, "The Stresses and Distortions Caused by Formation of a Thermally Grown Alumina: Comparison Between Measurements and Simulations," *Acta Materialia* **52** [9] (2004) 2561-2568

**PUBLICATIONS (continued)**

19. **J.A. Nychka**, D.R. Clarke, S. Sridharan, E. Jordan, M. Gell, M.J. Lance, C.J. Chunnillall, I.M. Smith, S.R.J. Saunders, R. Pillan, V. Sergo, A. Selcuk, A. Atkinson, and K.S. Murphy, "NDE Assessment of TBCs: An Interim Report of a Photo-Stimulated Luminescence 'Round Robin' Test," *Surface and Coatings Technology* **163-164** (2003) 87-94
20. **J.A. Nychka** and D.R. Clarke, "Damage quantification in TBCs by photo-stimulated luminescence spectroscopy," *Surface and Coatings Technology* **146** (2001) 110-116

**Submitted Papers**

21. J.E. Samad and **J.A. Nychka**, "In situ Biomimetic Ceramic Coatings: Effects of Surface Morphology on Wettability," under review in *Bioinspiration and Biomimetics*, July 2010
22. H. Pirayesh and **J.A. Nychka**, "Sol-gel manufacture of bioactive glass-ceramic 45S5," to be submitted to *Biomaterials*, August 2010

**Patents**

23. US Provisional Patent Serial Number 61/304,137  
Title: Wettability of Thermally Grown Aluminum Oxide: Mimicking the Lotus Leaf  
Filing Date: February 12, 2010  
Inventors: J.A. Nychka and J.E. Samad

**Invited Presentations**

24. **J.A. Nychka**, "Changing In Vitro Response of Bioactive Glass with Thermal and Mechanical Processing," *Presented at the 8th Pacific Rim Conference on Ceramic and Glass Technology (PacRim 8), Vancouver, B.C. May 31 - June 5, 2009*
25. **J.A. Nychka**, "Bioactive Glasses," *Technical Talk to Materials Engineering Technical Society (METS) University of Alberta, March 19, 2009*
26. **J.A. Nychka**, "Proof that Comparing Apples to Apples is Harder than Comparing Apples to Oranges or Bananas: an Alumina Case Study," *University of California Irvine, Chemical Engineering and Materials Science Departmental Seminar, Irvine, CA. February 20, 2009*
27. **J.A. Nychka**, S.L.R. Mazur, D. Li, and F. Yang, "Effect of Crystallinity on Mechanical Properties and Dissolution of Bioactive Glass," *MS&T Annual Meeting, Pittsburgh, PA., Oct. 6-9, 2008*
28. **J.A. Nychka**, D. Li, and F. Yang, "Surface Morphological Changes Accompanying Dissolution of Bioactive Glass," *International Conference on Multi-functional Materials and Structures, Hong Kong, July 28-31, 2008*
29. F. Yang\*, **J.A. Nychka**, G. Wang, W. Jiang, B.G. Compton and P.K. Liaw, "Plasto-Hydrodynamic Deformation of Brittle Bulk Metallic Glass at Room Temperature," *TMS Annual Meeting, New Orleans, LA., March 9-13, 2008*
30. **J.A. Nychka\***, D. Li, and B. Alexander, "In Vitro Bioactivity of 45S5 Bioglass as a Function of Indentation Load," *TMS Annual Meeting, Orlando, FL., Feb. 25-March 1, 2007*
31. **J.A. Nychka\***, "The Role of Cation Diffusion in Alumina Scale Growth," *Presented at Oak Ridge National Laboratory to the Metals and Ceramics Division, Oak Ridge, TN, January 5, 2006*
32. **J.A. Nychka\***, "The Alumina Scale Growth Mechanism," *Presented at Wright-Patterson Air Force Base to the Materials and Manufacturing Directorate, Dayton, OH, December 1, 2005*
33. **J.A. Nychka\***, "Cation Diffusion in Thermally Grown Alumina Films"
  - a. University of British Columbia, Department of Metals and Materials Engineering, Vancouver, Canada, August 19, 2002
  - b. National Research Council of Canada, Institute for Fuel Cell Innovation, Vancouver, Canada, August 21, 2002

**PUBLICATIONS (continued)****Conference Presentations**

34. J.E. Samad\* and **J.A. Nychka**, "In situ Biomimetic Ceramic Coatings," *TMS Annual Meeting, Seattle, WA., Feb. 14-18, 2010*
35. S. Kashyap\*, H. Pirayesh\*, **J.A. Nychka**, D. Li, F. Yang, "Factors Affecting the Dissolution of Resorbable Bioactive Glasses," *TMS Annual Meeting, Seattle, WA., Feb. 14-18, 2010*
36. **J.A. Nychka**\*, "Isothermal vs. Continuous Cooling: Implications in Phase Transformations and Intracellular Ice Structure," *Extreme Cryo Conference, University of Alberta, Edmonton, AB, Jan. 29-30, 2010*
37. T. Rutt, M. Zhurova, **J.A. Nychka**\*, J.A.W. Elliott, L.E. McGann, and J.P. Acker, "The Effect of Substrate Material on Cell Monolayer Adhesion During Freezing and Thawing," *Extreme Cryo Conference, University of Alberta, Edmonton, AB, Jan. 29-30, 2010*
38. M. Zielinski\*, R.C. Prickett, J.A.W. Elliott, L.E. McGann, and **J.A. Nychka**, "Development of a Non-Ideal Solute Chemical Potential Equation for Use in Cryobiology," *Extreme Cryo Conference, University of Alberta, Edmonton, AB, Jan. 29-30, 2010*
39. **J.A. Nychka**, C.A. Boring, and M.J. Sharkey, "Structure and functional morphology in parasitic wasps," *TMS Annual Meeting, San Francisco, CA., Feb. 15-19, 2009*
40. D. Li\*, F. Yang, and **J.A. Nychka**, "Indentation deformation of crystallized Bioglass 45S5," *TMS Annual Meeting, San Francisco, CA., Feb. 15-19, 2009*
41. **J.A. Nychka**, "Tricky Transformations: Glass or Crystal? (How should materials engineering and cryobiology collaborate?)," *Extreme Cryo Conference, University of Calgary, Calgary, AB, Jan. 30-31, 2009*
42. M. Zielinski and **J.A. Nychka**\*, "(Backwards) Annealing Cartilage," *Extreme Cryo Conference, University of Calgary, Calgary, AB, Jan. 30-31, 2009*
43. **J.A. Nychka** and K. Cadien, "Are we at the bottom yet?" *Canadian Materials Science Conference, Edmonton, AB, June 16-19, 2008*
44. D. Li\*, F. Yang, and **J. Nychka**, "Precipitation, Growth and Mechanical Behavior of HA," *the 4th Kentucky Innovation and Enterprise Conference, Lexington, KY., April 17<sup>th</sup>, 2008*
45. **J.A. Nychka** D.Li, and F. Yang, "Controlling Chemical Reactions in Bioactive Glass with Mechanical Stress," *Canadian Materials Science Conference, Edmonton, AB, June 16-19, 2008*
46. D. Li\*, F. Yang, and **J.A. Nychka**, "Precipitation, Growth and Mechanical Behavior of Hydroxyl-Apatite Layers on 45S5 Bioactive Glass," *TMS Annual Meeting, New Orleans, LA., March 9-13, 2008*
47. D. Li\*, F. Yang, and **J.A. Nychka**, "Nano-structural precipitates on 45S5 Bioactive Glass," *NSF CMMI 2008 Research and Innovation Conference, Knoxville, TN., Jan. 7-10, 2008*
48. F. Yang\*, D. Li, and **J.A. Nychka**, "Indentation-Induced Residual Stresses in a 45S5 Bioglass," *The 8<sup>th</sup> International Conference on Fundamentals of Fracture, Hong Kong & Guangzhou, China, Jan. 3-7, 2008*
49. **J.A. Nychka**, "What can a physical metallurgist contribute to cryopreservation?" *Extreme Cryo Conference, University of Alberta, Edmonton, AB, Feb 1-2, 2008*
50. D. Li\*, F. Yang, **J.A. Nychka**, T. Day, "Indentation-Induced Residual Stresses in Bioglass and its Effects," *MS&T Annual Meeting, Detroit, MI., Sept. 16-21, 2007*
51. Y. Li\*, **J.A. Nychka**, and F. Yang, "Indentation-Induced Whisker Growth on an Electroplated Tin Film," *MS&T Annual Meeting, Detroit, MI., Sept. 16-21, 2007*
52. **J.A. Nychka**\*, F. Yang, R. Chen, and Y. Li, "Indentation Load Effects on Whisker Growth in Sn3.5Ag Solders," *TMS Annual Meeting, Orlando, FL., Feb. 25-March 1, 2007*
53. **J.A. Nychka**\* and D.R. Clarke, "Aluminum Diffusion in Alumina Scales Grown on Fe-Cr-Al Alloys," *Presented at the International Conference on Metallurgical Coatings and Thin Films, San Diego, May 2, 2005*

**PUBLICATIONS (continued)**

54. **J.A. Nychka\***, D.R. Clarke, S. Sridharan, E. Jordan, M. Gell, M.J. Lance, C.J. Chunnillall, I.M. Smith, S.R.J. Saunders, R. Pillan, V. Sergo, A. Selçuk, A. Atkinson, and K.S. Murphy, "NDE Assessment of TBCs: An Interim Report of a Photo-Stimulated Luminescence 'Round Robin' Test," *International Conference on Coatings and Metallurgical Thin Films, San Diego, 2002*
55. **J. A. Nychka\*** and D.R. Clarke, "Damage Quantification in TBCs by Photo-Stimulated Luminescence Spectroscopy," *International Conference on Coatings and Metallurgical Thin Films, San Diego, 2001*
56. **J.A. Nychka\***, P. Apté, "Green Forming of Silicon Nitride for Microwave Sintering Applications," *Canadian Ceramic Society Annual General Meeting, Toronto, Ontario, Canada, February 17, 1998*
57. T. Naganuma, K. Matsumura, **J.A. Nychka**, D.R. Clarke, and Y. Kagawa\*, "Interaction Between Visible-IR Wavelength Light and Y<sub>2</sub>O<sub>3</sub>-ZrO<sub>2</sub> Thermal Barrier Coatings," *Presented at the 28<sup>th</sup> International Cocoa Beach Conference and Exposition on Advanced Ceramics & Composites, January 29, 2004*
58. G.A. Swift, E.Üstündag\*, J.D. Almer, **J.A. Nychka**, and D.R. Clarke, "In-situ Investigation of Oxide Growth on a FeCrAlY Alloy," *Presented at the 28<sup>th</sup> International Cocoa Beach Conference and Exposition on Advanced Ceramics & Composites, January 29, 2004*

**Poster Presentations**

59. M. Zielinski\* L. Heidelberg, L.U. Ross-Rodriguez, J.A.W. Elliott, L.E. McGann, and J.A. Nychka, "Equilibrium Volume of Cells in Non-ideal Solutions of Permeating Cryoprotectants," *Presented at the 47<sup>th</sup> Annual Meeting of the Society for Cryobiology – Cryo-2010, Bristol, UK, July 17-20, 2010*
60. N.L. Robertson\*, Y. Maham, J.D. Wolodko, **J.A. Nychka**, "Standardized Thermal Analysis of Natural Fibers in Biocomposites," *Presented at the Chemical and Materials Engineering II Poster Session, Graduate Research Symposium, Faculty of Engineering, University of Alberta, Edmonton, AB, June 17, 2010*
61. H. Pirayesh\* and **J.A. Nychka**, "Manufacturing Bioactive Glass 45S5 by the Sol-Gel Method," *Presented at the Biomedical Engineering Poster Session, Graduate Research Symposium, Faculty of Engineering, University of Alberta, Edmonton, AB, June 17, 2010*
62. H. Pirayesh and **J.A. Nychka**, "Manufacturing Bioactive Glass 45S5 by the Sol-Gel Method," *Presented at the Biological Materials Science Poster Session, TMS Annual Meeting, Seattle, WA., Feb. 14-18, 2010*
63. S. Kashyap, K. Griep, and **J.A. Nychka**, "Bioglass Ceramics: Effect of Crystallinity on Fracture Toughness and Dissolution Rate," *Presented at the Biological Materials Science Poster Session, TMS Annual Meeting, Seattle, WA., Feb. 14-18, 2010*
64. J.E. Samad and **J.A. Nychka**, "Controlling wettability of FeCrAlY alloy surface by *in situ* oxidation: Mimicing the Lotus Leaf," *Presented at the Biological Materials Science Poster Session, TMS Annual Meeting, Seattle, WA., Feb. 14-18, 2010*
65. D. Li, F. Yang, and **J.A. Nychka**, "Stress-Assisted dissolution and precipitation of bioglass 45S5," *Presented at the Biological Materials Science Poster Session, TMS Annual Meeting, Seattle, WA., Feb. 14-18, 2010*
66. D. Li\*, F. Yang, and **J.A. Nychka**, "Indentation Behavior of Crystallized and Noncrystallized Bioglass 45S5," *Presented at the Biological Materials Science Poster Session, TMS Annual Meeting, San Francisco, CA., Feb. 15-19, 2009*
67. D. Li\*, F. Yang, and **J.A. Nychka**, "Precipitation, Growth and Mechanical Behavior of Hydroxyl Apatite Layers on 45S5 Bioactive Glass," *Presented at the Biological Materials Science Poster Session, TMS Annual Meeting, New Orleans, LA., March 9-13, 2008*
68. J.A. Ishmael\* and **J.A. Nychka**, "Improved Materials for Dental Restoratives," *Presented at the 6<sup>th</sup> Annual Posters-at-the-Capitol, Frankfort, KY., February 15, 2007*



**PUBLICATIONS (continued)**

69. G. Gregori\*, **J.A. Nychka**, L. Li and D.R. Clarke, "High Temperature Vibration Damping Measurements," *Presented at the Thermal Barrier Coatings MURI and NSF-EU Review, UC Santa Barbara, Santa Barbara, CA., USA, January 10-12, 2006.*
70. **J.A. Nychka\***, T. Naganuma, M.R. Winter, Y.Kagawa, and D.R. Clarke, "Temperature Dependent Optical Reflectivity of  $t^{\circ}$ -YSZ," *Presented at the Thermal Barrier Coatings MURI and NSF-EU Review, UC Santa Barbara, Santa Barbara, CA., USA, January 11-13, 2005*
71. **J.A. Nychka\***, D.R. Clarke, "High Temperature Vibration Damping Coatings," *Presented at the Thermal Barrier Coatings MURI and NSF-EU Review, UC Santa Barbara, Santa Barbara, CA., USA, January 11-13, 2005*
72. **J.A. Nychka\***, D.R. Clarke, "Quantifying Cation Grain Boundary Diffusion in Thermally Grown Alumina," *Presented at the Thermal Barrier Coatings MURI and NSF-EU Review, UC Santa Barbara, Santa Barbara, CA., USA, January 6-9, 2004*
73. **J. A. Nychka\***, D.R. Clarke, and J. Dryden, "Quantifying Cation Grain Boundary Diffusion in Thermally Grown Alumina," *Presented at the Engineering Conferences International Conference on Thermal and Environmental Barrier Coatings, Irsee, Germany, August 17-22, 2003*
74. **J.A. Nychka\***, D.R. Clarke, "Outward Cation Diffusion in Thermally Grown Alumina," *Presented at the Thermal Barrier Coatings MURI and NSF-EU Review, UC Santa Barbara, Santa Barbara, CA., USA, January 6-9, 2003*
75. **J.A. Nychka\***, D.S. Wilkinson, R. Roy, "Effects of Heat Treatments on the Mechanical Properties of a Microwave Sintered Silicon Nitride," *Presented at the Canadian Ceramic Society Annual General Meeting, Toronto, Ontario, Canada, 1999*

**Book Chapters**

76. **J.A. Nychka**, "Materials Engineering," Appearing in *Exploring Chemistry (Field Test II; Undergraduate Chemistry Text)*, R. Jensen, July 2009, Chapter 27, 728-735.

**Guest Lectures**

77. **J.A. Nychka**, "Pointillism, Wasps, & Algorithmic Criticism – Connections?" *Presented in Humanities Computing 500 Graduate Seminar course, October 22, 2009*

**Scholarly Engagement in Teaching**

78. N. Danilovic and **J.A. Nychka**, "Teaching Mentorship Matters," *Academic Matters, Featured web article January 2010:*  
[http://www.academicmatters.ca/site\\_search\\_results.news.gk?catalog\\_item\\_id=3800](http://www.academicmatters.ca/site_search_results.news.gk?catalog_item_id=3800)
79. **J.A. Nychka**, "What's in the Box?" *One of six submissions to be selected for a stage presentation at the 2<sup>nd</sup> Annual Festival of Teaching and Learning, University of Alberta, January 27, 2009*
80. U. Sundararaj, S.M. Kresta, L. Mallory, **J.A. Nychka**, J.A.W. Elliott, J. Derksen, R. Eadie, and L. Unsworth, "Teaching Triads" A skit about how Teaching Triads are used as a tool for professors to learn how to teach from their peers. *One of six submissions to be selected for an oral stage presentation at the 2<sup>nd</sup> Annual Festival of Teaching and Learning, University of Alberta, January 27, 2009; Directed by M. Kloster*
81. **J.A. Nychka\***, "Taking the "Greek" out of Scientific Equations," *Poster presented at the inaugural Festival of Teaching, University of Alberta, January 24, 2008*
82. **J.A. Nychka**, "Interviews with Excellent Teachers," *Invited video interview for the Teaching & Academic Support Center (TASC), University of Kentucky, Lexington, KY, Summer 2006*  
<http://www.uky.edu/TASC/ED/interviews.php>

**PUBLICATIONS (continued)**

83. **J.A. Nychka**, Educational Development: Classroom Assessment Technique Report: Content, Form, and Function Outlines, University of Kentucky, 2006,  
[http://www.uky.edu/TASC/ED/ED\\_docs/chemmaterial1\\_CAT.pdf](http://www.uky.edu/TASC/ED/ED_docs/chemmaterial1_CAT.pdf)
84. **J.A. Nychka**, Educational Development: Classroom Assessment Technique Report: Human Tableau, University of Kentucky, 2006,  
[http://www.uky.edu/TASC/ED/ED\\_docs/chemmaterial2\\_CAT.pdf](http://www.uky.edu/TASC/ED/ED_docs/chemmaterial2_CAT.pdf)

**Theses**

85. **J.A. Nychka**, "Quantifying Outward Cation Diffusion in Thermally Grown Alumina Scales," *Ph.D. Thesis*, University of California SantaBarbara, 2004
86. **J.A. Nychka**, "The Effects of Heat Treatment Conditions on a Microwave Sintered Silicon Nitride Ceramic," *M.Eng. Thesis*, McMaster University, 1999
87. **J.A. Nychka**, "The Effects of Alloy Content on the Colour of Copper-Tin and Copper-Tin-Lead Bronzes," *B.Sc. Thesis*, 1997