

Embry-Riddle Aeronautical University
Aerospace Engineering
600 S. Clyde Morris Blvd
Daytona Beach, FL 32114 USA
+1(386) 226-7933 (o); +1(505) 920-7146(cell)
virginie.rollin@erau.edu
<http://webfac.db.erau.edu/~dupontv/>

Research Interests

Computational Materials Science, Molecular Dynamics, Carbon Nanotubes, Nanoscale Metals, Plasticity, Extreme Environments.

Education

- 2008 **Ph.D. in Mechanical Engineering**, *The University of Vermont*, Burlington, VT.
Dissertation: Multiscale Modeling of Contact Plasticity and Nanoindentation in Nanostructured FCC Metals. Advisor: Prof. Frederic Sansoz
- 2005 **Diplôme d'ingénieur (Master) in Mechanical and Aerospace Engineering**, *Ecole Nationale Supérieure de Mécanique et d'Aérotechnique (ENSMA)*, Poitiers, France.
- 2003 **B.S. in Mechanics**, *Université de Poitiers*, Poitiers, France.

Experience

- Since 2012 **Assistant Professor**, *Embry-Riddle Aeronautical University, Department of Aerospace Engineering*, Daytona Beach, FL.
 - Involved in student teaching and mentoring at the undergraduate and graduate level.
 - Conducting research in Computational Materials Science.
- Since 2012 **Visiting Scientist**, *Los Alamos National Laboratory (LANL), Theoretical Division*, Los Alamos, NM.
Collaboration on Computational Co-Design project.
- 2009 - 2012 **Postdoctoral Research Associate**, *Los Alamos National Laboratory (LANL), Theoretical Division*, Los Alamos, NM.
 - Computational Co-design project: part of a team that aims at developing a co-design code for multiscale materials modeling. Coded the multiscale program coupling finite elements and molecular dynamics.
 - Influence of temperature, strain rate and grain size on the plasticity and yield in copper: molecular dynamics simulations of shockless compression and shear of copper single and nano-crystalline samples.
 - Molecular dynamics studies of shock induced phase transformation in cerium: testing of a potential under development for use in molecular dynamics simulations of shocks in single crystalline cerium.
- 2008 - 2009 **Consultant**, Burlington, VT.
Prepared and analyzed fractured ceramic samples using Scanning Electron Microscopy. Helped the company improve their fabrication process by providing pictures and data.
- 2005 - 2009 **Graduate Teaching/Research Assistant, Research Assistant**, *The University of Vermont*, Burlington, VT.
 - Performed experimental studies on the growth and characterization of Nickel nanowires.
 - Conducted molecular dynamics simulations of nanoindentation on single crystalline nickel nanowires.
 - Performed molecular dynamics and statics simulations of nanoindentation on aluminum thin films. Compared the effects of different interatomic potentials on the plasticity behavior under nanoscale contact. Compared results to Hertzian theory.
- 2006; 2007 **Project Assistant**, *The University of Vermont*, Burlington, VT.
Created a vibration laboratory for the Mechanical Engineering Lab III including wireless strain gages.

Virginie Rollin (Dupont)

- 2005 **Intern**, *The University of Vermont*, Burlington, VT.
Conducted multiscale simulations of nanoindentation of thin films. Compared to theoretical models.
- 2004 **Intern**, *Commissariat à l'Energie Atomique (CEA)*, Gif sur Yvette, France.
Simulated the propagation of a crack along a bimetallic weld using finite elements.

Awards and Honors

- 2010 Los Alamos National Laboratory Certificate of Recognition for exceptional contribution in the Los Alamos Postdoc Association.
- 2007 Recipient of the “Mechanical Engineering Graduate Award 2007” for excellence in performance and greatest promise of success.
- 2007 3rd place for “Best presentation” during UVM’s Graduate Research Day.
- 2005 Pegasus Award.

Publications

Book Chapters

- V. Dupont, F. Sansoz, “Multiscale Modeling of Contact-induced Plasticity in Nanocrystalline Metals”, in *Trends in Computational Nanomechanics: Transcending Time and Space*, Ed. Dumitrica, Springer Series: Challenges and Advances in Computational Chemistry and Physics. Vol. 9 (2010).

Peer-reviewed Journal Articles

- V. Dupont, T.C. Germann, Strain rate and orientation dependencies on the strength of single crystalline copper under compression, *Physical Review B* **86**, 134111 (2012).
- G. Dimonte, G. Terrones, F.J. Cherne, T.C. Germann, V. Dupont, K. Kadau, W.T. Buttler, D.M. Oro, C. Morris, D.L. Preston, Use of Richtmyer-Meshkov instability to infer yield stress at high-energy-density, *Physical Review Letters* **107**, 264502 (2011).
- F. Sansoz, V. Dupont, Nanoindentation and plasticity in nanocrystalline Ni nanowires: A case study in size effect mitigation, *Scripta Materialia* **63**, 1136-1139 (2010).
- V. Dupont, F. Sansoz, Molecular dynamics study of crystal plasticity during nanoindentation in Ni nanowires, *Journal of Materials Research – Focus Issue on Indentation Methods in Advanced Materials Research* (Ed. E.P. George), **24**, 948-956 (2009).
- V. Dupont, F. Sansoz, Quasicontinuum study of incipient plasticity under nanoscale contact in nanocrystalline aluminum, *Acta Materialia* **56**, 6013-6026 (2008).
- F. Sansoz, V. Dupont, Atomistic mechanisms of shear localization during indentation of a nanostructured metal, *Materials Science and Engineering C* **27**, 1509-1513 (2007).
- F. Sansoz, V. Dupont, Grain growth behavior at absolute zero during nanocrystalline metal indentation, *Applied Physics Letters* **89**, 111901 (2006).

Refereed Conference Proceedings

- V. Dupont, F. Sansoz, Grain boundary structure evolution in nanocrystalline Al by nanoindentation simulations, *Mater. Res. Soc. Symp. Proceedings* **903E**, 0903-Z06-05.1 (2005).

Non-Refereed Conference Proceedings

- V. Dupont, S. -P. Chen, T.C. Germann, Isomorphic phase transformation in shocked cerium using molecular dynamics, *EPJ Web of Conferences* **10**, 00009 (2010).
- F. Sansoz, V. Dupont, Deformation of nanocrystalline metals under nanoscale contact, *Proc. of NSTI Nanotech 2006 Conference* **1**, 50-53 (2006).

Other Publications

- V. Dupont, S. –P. Chen, T. C. Germann, Isomorphic phase transformation in shocked cerium using molecular dynamics, TSC Directorate Science Highlights, (2011).
- V. Dupont, [Multiscale modeling of contact plasticity and nanoindentation in nanostructured FCC metals](#), Ph.D. Dissertation, The University of Vermont (2008).

Presentations

Invited Presentations

10. V. Rollin, Daytona Beach Science Café, Daytona Beach (06/2013).
Making Stuff Stronger: Nanomaterials
9. V. Dupont, CEA, Bruyères-le-Châtel, France (05/2012).
Study of high strain rate deformations using numerical calculations.
8. V. Dupont, Cardiff University, Cardiff, UK (04/2012).
Molecular dynamics studies of the strength of copper under uniaxial strain.
7. V. Dupont, Embry Riddle Aeronautical University, Prescott, AZ (04/2012).
Numerical studies on nanomaterials.
6. V. Dupont, Embry Riddle Aeronautical University, Daytona Beach, FL (04/2012).
Numerical studies on nanomaterials.
5. V. Dupont, T.C. Germann, *International Symposium on Plasticity*, San Juan, Puerto Rico (01/2012).
Strong anisotropy in the uniaxial compression of Cu.
4. V. Dupont, T.C. Germann, *International Symposium on Plasticity*, Puerto Vallarta, Mexico (01/2011).
Strain rate, temperature and representative length scale influence on plasticity and yield stress in copper.
3. V. Dupont, *Los Alamos National Laboratory*, Los Alamos, NM, T-1 Group Seminar (06/2010).
Molecular dynamics studies of FCC metals: shockless compression in Cu and shock-induced isomorphic phase transformation in Cs and Ce.
2. V. Dupont, *Universitat Politècnica de Catalunya*, Barcelona, Spain, Department of Materials Science and Engineering (06/2010).
Multiscale modeling of nanoindentation in nanostructured FCC metals / Isomorphic phase transformation in shocked metals.
1. V. Dupont, *Los Alamos National Laboratory*, Los Alamos, NM (05/2009).
Multiscale modeling of contact plasticity and nanoindentation in nanostructured FCC metals.

Oral Presentations

22. V. Rollin (Dupont), S. Pakin, D. Zhang, T.C. Germann, *Symposium MM: Materials Under Extreme Environments, MRS Fall Meeting*, Boston, MA (11/2012).
Computational Co-design in Materials Science: Multiscale Simulations of Copper under Shock.
21. S. Mao, X. Ma, V. Dupont, D. Zhang, *Session on Computational Fluid Dynamics IX, 65th Annual Meeting of the APS Division of Fluid Dynamics*, San Diego, CA (11/2012).
Scale-bridging schemes based on the material point method.
20. V. Dupont, T.C. Germann, *New Models and Hydrocodes for Shock Wave Processes*, London, UK (04/2012).
Orientation and grain size effects on the strength on copper under uniaxial strain.
19. V. Dupont, T.C. Germann, *Focus session: Simulation of Matter at Extreme Conditions - Shock Compression of Metals, APS 2012 March Meeting*, Boston, MA (02/2012).
Strain rate influence on the Hall-Petch effect in Cu.
18. F. Cherne, G. Dimonte, T.C. Germann, V. Dupont, *Focus session: Simulation of Matter at Extreme Conditions - Shock Compression of Metals, APS 2012 March Meeting*, Boston, MA (02/2012).

- A Molecular dynamics study of the Richtmyer-Meshkov instability.
17. V. Dupont, T.C. Germann, *APS Shock Compression of Condensed Matter conference*, Chicago, IL (06/2011).
High strain rate uniaxial compression of single and nano-crystalline copper.
 16. V. Dupont, T.C. Germann, S. -P. Chen, *Symposium on Dynamic Behavior of Materials V, TMS Annual Meeting & Exhibition*, San Diego, CA (02/2011).
Isomorphic phase transformation in cerium under shock loading using molecular dynamics.
 15. V. Dupont, T.C. Germann, S. -P. Chen, *Symposium on Phase Transformations and Mechanochemistry, Society of Engineering Science Annual Technical Meeting*, Ames, IA (10/2010).
Isomorphic phase transformation of cerium (and cesium) under shock loading using molecular dynamics.
 14. V. Dupont, F. Sansoz, *Symposium on Size Scale Effects in Micro/Nano Structured Materials and Composites, Society of Engineering Science Annual Technical Meeting*, Ames, IA (10/2010).
Size effects on the nanoindentation of Ni nanowires using molecular dynamics.
 13. V. Dupont, T.C. Germann, S. -P. Chen, *New Models and Hydrocodes for Shock Wave Processes in Condensed Matter*, Paris, France (05/2010).
Isomorphic phase transformation in shocked metals using molecular dynamics.
 12. V. Dupont, T.C. Germann, *Focus session: High pressure IV: Dynamics of Shock Induced Phase Transitions, APS 2010 March Meeting*, Portland, OR (03/2010).
Solid-solid phase transformation in shocked Cs and Ce using molecular dynamics.
 11. F. Sansoz, V. Dupont, T. Gang, K.D. Stevenson, *Symposium HH: Multiscale Polycrystal Mechanics of Complex Microstructures, MRS Meeting*, Boston, MA (12/2009).
Local plasticity during nanoindentation of nanocrystalline FCC metals using quasicontinuum simulations and nanomechanical experiments.
 10. F. Sansoz, V. Dupont, *ASME IMECE, track 13-3: Recent Advances in Computational Study of Nanostructures*, Boston, MA (11/2008).
Quasicontinuum and molecular dynamics simulations of contact plasticity in nanocrystalline metals.
 9. V. Dupont, *UVM Graduate Research Day*, Burlington, VT (04/2008).
Study of the Gekko Gecko Foot.
 8. V. Dupont, *UVM Graduate Research Day*, Burlington, VT (03/2007).
Properties of metallic nanomaterials (3rd place for “Best presentation”).
 7. F. Sansoz, V. Dupont, *Symposium on Mechanical Behavior of Nanostructured Materials, in Honor of Carl Koch, TMS Annual Meeting & Exhibition*, Orlando, FL (02/2007).
Atomic mechanisms of stress-assisted grain coarsening during indentation of a nanostructured metal.
 6. V. Dupont, F. Sansoz, *Symposium on Plasticity from the Atomic Scale to Constitutive Laws, TMS Annual Meeting & Exhibition*, Orlando, FL (02/2007).
Contact-induced shear localization in nanocrystalline Al by atomistic simulations.
 5. F. Sansoz, V. Dupont, *Symposium EE: Size Effects in the Deformation of Materials – Experiments and Modeling, MRS Fall Meeting*, Boston, MA (12/2006).
An atomistic model of grain coarsening during nanocrystalline metal indentation.
 4. F. Sansoz, V. Dupont, K.D. Stevenson, *Symposium A: Trends in Nanoscience – From Materials to Applications, E-MRS Spring Meeting*, Nice, France (06/2006).
AFM contact studies of metallic nanostructures: direct insight from atomistic simulations.
 3. V. Dupont, F. Sansoz, *TMS Annual Meeting*, San Antonio, TX (03/2006).
Atomistic simulation of metal surface indentation including interface friction and surface energy.
 2. V. Dupont, F. Sansoz, *Symposium Z: Amorphous and Nanocrystalline Metals for Structural Applications, MRS Fall Meeting*, Boston, MA (12/2005).
Grain boundary structure evolution in nanocrystalline Al by nanoindentation simulations.

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1. V. Dupont, F. Sansoz, *Symposium AA: Micro- and Nanomechanics of Structural Material, MRS Fall Meeting*, Boston, MA (12/2005).
Nanoindentation of single crystal: Effects of interface friction and adhesion energy.

Poster Presentations

5. V. Dupont, T.C. Germann, *Symposium on Deformation Mechanisms, Microstructure Evolution and Mechanical Properties of Nanoscale Materials, MRS Fall Meeting*, Boston, MA (12/2010).
Temperature and strain rate effect on plasticity and yield stress in nanocrystalline copper under compression.
4. V. Dupont, T.C. Germann, *Postdoc Research Day*, Los Alamos, NM (06/2010).
Strain rate influence on the mechanical properties of shocked metals.
3. V. Dupont, F. Sansoz, *TMS Annual Meeting & Exhibition*, Orlando, FL (02/2007).
High angle grain boundaries in nanocrystals: Atomistic simulations on the influence of structural units.
2. V. Dupont, F. Sansoz, *NSTI Nanotech 2006*, Boston, MA (05/2006).
Deformation of nanocrystalline metals under nanoscale contact.
1. V. Dupont, F. Sansoz, *TMS Annual Meeting & Exhibition*, San Antonio, TX (03/2006).
Nanocrystalline metal indentation: Novel insight from atomistic contact simulation.

Advised Students

Current Graduate Students

- Guttormur Ingvason, M.S. Candidate, expected graduation Fall 2013.
- Charles Wilson, M.S. Candidate, expected graduation Fall 2013.
- Ashok Bevara, M.S. Candidate, expected graduation Spring 2014.

Current Undergraduate Students

- Keith Alvares, B.S. Candidate, expected graduation Fall 2014.
- May Chong Chan, B.S. Candidate, expected graduation Fall 2013.
- Madhav Thaker, B.S. Candidate, expected graduation Spring 2014.

Teaching

Embry-Riddle Aeronautical University

- AE 316 – Aerospace Engineering Materials. Credits: 3. Level: Junior.
Student Enrollment: 70 (Fall '12), 62 (Spring '13), 38 (Fall '13).
- AE 399 – Special Topics in Aerospace Engineering – Investigation of the Chemical Vapor Deposition process and its influence on the growth of Carbon Nanotubes. Credits: 1. Level: Senior.
Student Enrollment: 1 (Fall '13).
- AE 514 – Introduction to the Finite Element Method. Credits: 3. Level: Graduate.
Student Enrollment: 21 (Fall '13).
- AE 699 – Special Topics in Aerospace Engineering – Onset of Irreversible Plasticity under Nanoindentation. Credits: 3. Level: Graduate.
Student Enrollment: 2 (Fall '12), 1 (Fall '13).

University of Vermont

- ME 124 – Mechanical Engineering Lab III. Credits: 2. Level: Junior.
Student Enrollment: 40. Spring '06, Spring '07, Spring '08. Teaching Assistant.
- ME 111 – System Dynamics. Credits: 3. Level: Junior.
Student Enrollment: 40. Fall '05, Fall '06, Fall '07. Grader.
- ME 101 – Materials Engineering. Credits: 3. Level: Junior.

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Student Enrollment: 40. Fall '05, Fall '06, Fall '07. Grader.

- ME 040 – Thermodynamics. Credits: 3. Level: Sophomore.

Student Enrollment: 40. Spring '06. Grader.

Professional Activities

Service for Embry-Riddle Aeronautical University

2013 Ignite Faculty Mentor

Service for the American Institute of Aeronautics and Astronautics (AIAA)

Since 06/2013 Member of the Materials Technical Committee

Service for the Los Alamos National Laboratory

2011 CNLS Deputy Director search committee

Service for the Los Alamos Postdoc Association

05/10 – 08/12 Member of the Career Committee: organization of career development seminars, Postdoc Research Day, Career Fair.

11/10 – 05/11 President

Reviewer for Referred Journals

Applied Physics Letters

Computational Materials Science

Materials Science & Engineering A

Physical Review B

Physical Review Letters

Affiliations

Materials Research Society (MRS), member

The American Institute of Aeronautics and Astronautics (AIAA), member

American Society for Engineering Education (ASEE), member

American Physical Society (APS), past member

The Minerals, Metals & Materials Society (TMS), past member

Session Chair

18th International Symposium on Plasticity and its Current Applications, Dynamic Plasticity Session, 2012

Funding and Computer Time Allocations

09/13 NSF Major Research Instrumentation Proposal, "MRI: Acquisition of a Scanning Electron Microscope for Cross-Disciplinary Research, Education and Community Outreach," Amount: \$365,197 FY 2013-14 (PI), Award # DMR-1337742.

04/13 Ignite Co-Curricular Research Project Grant, "*Carbon Nanotube and Graphene Growth Using Chemical Vapor Deposition*," Amount: \$6,000 FY 2013-14 (PI/Faculty Advisor).

04/13 Internal Student Research Grant Program, "*Carbon Fiber Reinforced Plastic Enhancement using Carbon Nanotubes*," Amount: \$7,000 FY 2013-14 (PI/Faculty Advisor).

04/13 Internal Faculty Research Program, "*Carbon Nanotube Growth Using Chemical Vapor Deposition*," Amount: \$12,482 FY 2013-14 (PI).

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10/12	INCITE allocation of 20 million core-hours on Intrepid (ANL) and 10 million core hours on Mira (ANL) for FY'13 (Co-PI)
03/12	Institutional Computing time allocation of 1.8 million CPU-hours on Mustang and 500,000 CPU-hours on Cerrillos over 2 years (PI)
12/11	Institutional Computing time allocation of 1 million CPU-hours on Mustang as an early user (PI)
09/11 – 06/14	Co-investigator on CoCoMANS LDRD-DR project at LANL (\$175k / year).
09/09 – 09/12	Postdoc Research Assistant funding on ASC PEM project at LANL (\$150k / year).
03/11	Institutional Computing time allocation of 1 million CPU-hours on Conejo and 250,000 CPU-hours on Cerrillos over 2 years (PI).
06/08 – 09/08	Research Assistant funding at the University of Vermont (\$5,000).
09/05 – 06/08	Teaching Assistant funding at the University of Vermont, included stipend (\$15k / 9 months) and tuition reimbursement.
2006 - 2008	Unlimited access on the Vermont Advanced Computing Center's cluster for testing codes on the new computer.

Miscellaneous

- **Languages:**

English (Fluent), French (Native), Russian, Spanish

- **Hobbies:**

Scuba Diving (Advanced, Altitude, Nitrox, Rescue): 60+ dives in various environments.

Private Pilot (120+ hrs)

Member of AOPA (Aircraft Owners and Pilots Association)

Flute and saxophone playing

Swing and salsa dancing: President of the Swing and Salsa club at ENSMA in 2004.

- **Volunteering:**

06/2012 Head Timer for the Air Race Classic 2012, Gallup, NM stop.

03/2012 Led the aviation/aerospace workshop for "Expanding Your Horizons" workshop in Los Alamos

Since 11/2010 Member of the Rio Grande Norte 99s (International Organization of Women Pilots): organization of seminars, educational events, fly-outs, fundraisers, ...

Since 2005 Translator for the "Amis des Enfants du Monde" association