

# Francois Barthelat, Ph.D., Ing.

Department of Mechanical Engineering  
McGill University  
817 Sherbrooke Street West  
Montreal, Quebec H3A 2K6, Canada

Phone: (514) 398-6318  
Fax: (514) 398-7365  
[francois.barthelat@mcgill.ca](mailto:francois.barthelat@mcgill.ca)  
<http://barthelat-lab.mcgill.ca>

## EDUCATION

- Northwestern University (Evanston, IL) (01/2006 - 09/2006)  
Postdoctoral Researcher, Department of Mechanical Engineering.
- Northwestern University (Evanston, IL) (09/2000 - 06/2006)  
Ph.D. Department of Mechanical Engineering.  
Thesis: *The Mechanical Performance of Nacre from Seashells – Superior Toughness through Microstructural Design.*
- University of Rochester (Rochester, NY) (09/1997 – 09/1998)  
Master in Mechanical Engineering  
Thesis: *The poroelastic behavior of growth plate cartilage.*
- Ecole Nationale Supérieure d'Electricité et de Mécanique (Nancy, France) (1995 –1998)  
Bachelor of Mechanical Engineering. Area of specialization: *Solid Mechanics*

## PROFESSIONAL APPOINTMENTS

- McGill University (Montreal, QC)  
Full Professor, Mechanical Engineering (08/2017 – present)  
Associate Professor, Mechanical Engineering (06/2012 – 08/2017)  
Assistant Professor, Mechanical Engineering (09/2006 – 06/2012)  
Associate Member, Biomedical Engineering (03/2007 – present)  
Associate Member, Bioengineering (10/2013 – present)
- Northwestern University (Evanston, IL) (01/2006 - 09/2006)  
Postdoctoral Researcher, Department of Mechanical Engineering.
- Northwestern University (Evanston, IL) (09/2000 - 12/2005)  
Graduate Research Assistant, Department of Mechanical Engineering.
- DataPointLabs (Ithaca, NY) (12/1998 - 09/2000)  
Development Engineer, consultant in polymer testing
- University of Rochester (Rochester, NY) (09/1997 – 09/1998)  
Graduate Research Assistant

## DISTINCTIONS AND AWARDS

- Chwang-Seto Faculty Scholar, McGill University (2018). *Recognizes and fosters the research of outstanding young professors.*
- Visiting Professor, Institut d'Alembert, Jussieu, France (July 2017)
- Department of National Defence /NSERC Discovery Grant Supplement (2017-2020)
- 2015 Acta Biomaterialia Outstanding Reviewer (Elsevier). Recognition for continuous contributions as reviewer for Acta Biomaterialia, and for an outstanding review in 2015.
- Discovery Accelerator Supplement (2012-2015) awarded by the Natural Sciences and Engineering Research Council of Canada.
- Top ten scientific discovery in Quebec (2014) awarded by the magazine *Quebec Science*.
- Top-ten cited article in the *Journal of the Mechanics and Physics of Solids* over previous five years “Toughness Amplification in Natural Composites” (2014)
- Best Paper Award at the Society for Experimental Mechanical Annual Conference, Biological Systems and Materials Division (67 papers): “Multiscale characterization of a high-performance armor: fish scales” (2011)
- One of seven articles selected as highlight for 2010 in the journal *Bioinspiration and Biomimetics* (2011)
- Top-ten cited article in the *Journal of the Mechanics and Physics of Solids* over previous five years “On the mechanics of mother-of-pearl: A key feature in the material hierarchical structure” (2011)
- Best Paper by a Young Researcher awarded at the 12<sup>th</sup> International Conference on Fracture, out of 700+papers (2009)
- Hetényi Award for best research paper of the year published in *Experimental Mechanics* (2005)
- Smith Terminal Year Fellowship, Department of Mechanical Engineering, Northwestern University (2005)
- Walter P. Murphy Fellowship, Northwestern University (2000)

## RESEARCH OVERVIEW

At McGill I established the Laboratory for Advanced Materials and Bioinspiration and an independent research program on natural and bio-inspired materials. My laboratory focuses on the study of the structure and mechanics of natural materials, with the objective to mimic them in novel high-performance engineering materials. Representative projects:

- Mechanics of deformation and fracture in biological materials: Structure-mechanics-performance-function relationships in high-performance natural materials such as bone, teeth, structural proteins, seashells and fish scales. Combination of multiscale experiments and modeling.
- Design, fabrication and testing of novel biomimetic materials: New bio-inspired microstructures and innovative fabrication methods including self-propagating high-temperature synthesis of nacre-like reinforced cermets, chemically driven self-assembly of micro-inclusions, three-dimensional laser engraving to generate microstructures within the bulk of transparent materials, 3D printing. Applications in bioengineering, aerospace, construction, electronics.

- Mechanics of biological and bio-inspired interfaces: Cohesive behavior of proteins involved in blot clotting (fibrin) and in bone toughening (osteopontin). Biomimetic interfaces: polyelectrolytes, chitosan, architected interfaces.
- Novel Experimental techniques: Subset splitting digital image correlation for measuring strains near cracks and shear bands, rigid double cantilever beam for the direct determination of cohesive law, high-resolution in-situ microscopy loading setup for tensile tests on individual collagen fibrils.

## PROFESSIONAL MEMBERSHIP

- Ordre des Ingénieurs du Québec, Canada: *Ingénieur* (2010 - Present)
- Materials Research Society (MRS), USA: *Member* (2006 - Present)
- American Society of Mechanical Engineers (ASME), USA: *Member* (2006 - Present)
- Society for Experimental Mechanics (SEM), USA: *Member* (2006 - Present)
- Minerals, Metals & Materials Society (TMS), USA: *Member* (2012 - Present)

## INTERNAL APPOINTMENTS

- *Member*, Centre for Bone and Periodontal Research (2007-present)
- *Member*, Network for Oral and Bone Health Research (2007-present)
- *Member*, McGill Institute for Advanced Materials (2011-present)

## PUBLICATIONS

- *h*-index =31, Citations>4,700 total, >3,400 since 2014 (Google Scholar)
- The names of F. Barthelat's students and postdocs are underlined
- \*indicates F. Barthelat was principal investigator.

[J79] Z. Yin, F. Hannard and F. Barthelat\*: "Impact resistant nacre-like transparent materials" to appear in *Science*

[J78] N. Abid, F. Hannard, J.W. Pro and F. Barthelat\*: "Exploring the fracture toughness of tessellated materials with the discrete-element method". To appear in the *Journal of Applied Mechanics*, special issue on the Architected materials mechanics (2019)

[J77] J. W. Pro and F. Barthelat\*: "Discrete element models of tooth enamel, a complex three-dimensional biological composite" to appear in *Acta Biomaterialia*

[J76] A. Dalaq and F. Barthelat\*: "Strength and stability in architected spine-like segmented structures" *International Journal of Solids and Structures* 171, 146-157 (2019)

[J75] S. Cavelier, M. Tanzer and F. Barthelat\*: "Maximizing the strength of calcium sulfate for structural bone grafts" in review (*Journal of Biomedical Materials Research – Part A*)

[J74] J. W. Pro and F. Barthelat\*: "The fracture mechanics of biological and bioinspired materials" *MRS Bulletin (Materials Research Society)* 44 (1), 46-52 (2019) **Invited**

- [J73] N. Abid, J.W. Pro and F. Barthelat\*: “Fracture mechanics of nacre-like materials using discrete-element models: Effects of microstructure, interfaces and randomness” *Journal of the Mechanics and Physics of Solids*, 124, 350-365 (2019)
- [J72] M. Mirkhalaf, A. Sunesara, B. Ashrafi, and F. Barthelat\*: “Toughness by segmentation: fabrication, testing and micromechanics of architected ceramic panels for impact applications” *International Journal of Solids and Structures* 158, 52-65 (2019)
- [J71] M. Mirkhalaf, T. Zhou, and F. Barthelat\*: “Higher toughness and strength with segmentation: exploring geometry in topologically interlocked ceramics” *Proceedings of the National Academy of Sciences of the United States of America* 115 (37) (2018)
- [J70] R.A. Metzler, F. Barthelat and J.J. Wilker: “Disordered Structures in Biology Can Provide Material Properties not Obtained with Precise Hierarchy” *Advanced Functional Materials* 1805734 (2018)
- [J69] E. Zuza, J-R Sarasua, F. Barthelat, R. Martini, A. Larrañaga, N. Sadaba and I. Martinez de Arenaza: “Understanding the toughness mechanism prompted by submicron rigid particles in polylactide/barium sulphate composites” *Polymer Testing* 69, 340-349 (2018)
- [J68] Z. Yin and F. Barthelat\*: “Tough and deformable glasses with bioinspired cross-ply architectures” *Acta Biomaterialia* 75, 439-450 (2018)
- [J67] S. Cavelier, A.K. Dastjerdi, M.D. McKee and F. Barthelat\*: “Bone toughness at the molecular scale: a model for fracture toughness using crosslinked osteopontin on synthetic and biogenic mineral substrates” *Bone* 110, 304–311 (2018)
- [J66] I. Malik and F. Barthelat\*: “Bioinspired sutured materials for strength and toughness: Pullout mechanisms and geometric enrichments” *International Journal of Solids and Structures*, 38 118-133 (2018)
- [J65] N. Abid, M. Mirkhalaf and F. Barthelat\*: “Discrete-element modeling of nacre-like materials: effects of random microstructures on strain localization and mechanical performance”. *Journal of the Mechanics and Physics of Solids* 112, 385–402 (2018)
- [J64] L. Szewciw, D. Zhu and F. Barthelat\*: “The nonlinear flexural response of a whole teleost fish: contribution of scales”. *Journal of the Mechanical Behavior of Biomedical Materials* 17, S1751-6161 (2017) Special JMBBM issue in honor of Marc Meyers’ 70<sup>th</sup> birthday, **Invited**
- [J63] R. Martini, Y. Balit and F. Barthelat\*: “A comparative study of bio-inspired protective scales using 3D printing and mechanical testing” *Acta Biomaterialia* 55 p360–372 (2017)
- [J62] I. A. Malik, M. Mirkhalaf and F. Barthelat\*: “Bio-inspired “Jigsaw”-like interlocking sutures: Modeling, optimization, 3D printing and testing” *Journal of the Mechanics and Physics of Solids* 102, p 224-238 (2017)
- [J61] M.M. Porter, N. Ravikumar, F. Barthelat and R. Martini: “3D printing and mechanics of bio-inspired articulated materials and flexible armor”. *Journal of the Mechanical Behavior of Biomedical Materials* 73 p114–126 (2017)
- [J60] L. Szewciw and F. Barthelat\*. (2016). Mechanical properties of striped bass fish skin: Evidence of an extendon function of the stratum compactum”. *Journal of the Mechanical Behavior of Biomedical Materials* 73 p28–37 (2017)

- [J59] M. Mirkhalaf and F. Barthelat\*: “Design, 3D printing and testing of bistable architected materials with interlocks”. *Extreme Mechanics Letters* 11:1-7 (2017)
- [J58] F. Barthelat\*: “Growing a synthetic mollusk shell”. *Science* 354 (6308):32-33 (2016) **Invited**
- [J57] R. Martini and F. Barthelat\*: “Stretch-and-release fabrication, testing and optimization of a flexible ceramic armor inspired from fish scales”. *Bioinspiration and Biomimetics* 11 066001 (2016)
- [J56] A. Hart, E.J. Harvey, R. Rabiej, F. Barthelat, P.A. Martineau: “Fixation strength of four headless compression screws”. *Medical Engineering and Physics*, 38 (10):1037-1043 (2016)
- [J55] I. Malik and F. Barthelat\*: “Toughening of thin ceramic plates using bioinspired surface patterns” *International Journal of Solids and Structures* 97-98:389–399 (2016).
- [J54] R. Cipra, E. Habtour, J. Riddick, F. Barthelat, T. Siegmund: “Manufacture and Mechanics of Topologically Interlocked Material Assemblies”. *Applied Mechanics Reviews* 68(041401): 1-15 (2016)
- [J53] F. Barthelat\*, Z. Yin and M.J. Buehler: “Structure and mechanics of interfaces in biological materials”. *Nature Reviews Materials* 1(1):16007 (2016) **Invited**
- [J52] R. Martini and F. Barthelat\*: “Stability of hard plates on soft substrates and application to the design of bioinspired segmented armor”. *Journal of the Mechanics and Physics of Solids*, 92:195-209 (2016)
- [J51] M. Mirkhalaf, J. Tanguay and F. Barthelat\*: “Carving 3D architectures within glass: exploring new strategies to transform the mechanics and performance of materials”. *Extreme Mechanics Letters* 7:104-113 (2016)
- [J50] M. Mirkhalaf and F. Barthelat\*: “Nacre-like materials using a simple doctor blading technique: fabrication, testing and modeling”. *Journal of the Mechanical Behavior of Biomedical Materials* 56:23-33 (2016)
- [J49] A. K. Dastjerdi and F. Barthelat\*: “Teleost fish scales amongst the toughest collagenous materials”. *Journal of the Mechanical Behavior of Biomedical Materials* 52:95–107 (2015)
- [J48] J. Ajaja and F. Barthelat\*: “Damage accumulation in a carbon fiber fabric reinforced cyanate ester composite subjected to mechanical loading and thermal cycling”. *Composites Part B: Engineering* 90:523-529 (2015)
- [J47] A. Nabavi, S. Goroshin, D.L. Frost and F. Barthelat\*: “Mechanical properties of chromium–chromium sulfide cermets fabricated by self-propagating high-temperature synthesis” *Journal of Materials Science* 50:3434-3446 (2015)
- [J46] F. Barthelat\*: “Architected materials in engineering and biology: fabrication, structure, mechanics and performance” *International Materials Reviews* 60(8):413-430 (2015) **Invited**
- [J45] N. Funk, M. Vera, L. Szewciw, F. Barthelat, M. Stoykovich and F. Vernerey: “Bio-inspired fabrication and characterization of a synthetic fish skin for soft materials protection”. *ACS Applied Materials & Interfaces* 7:5972-83 (2015) **Featured in Science**
- [J44] M. Mirkhalaf and F. Barthelat\*: “A laser engraved glass duplicating the structure, mechanics and performance of natural nacre”. *Bioinspiration and Biomimetics* 10:026005 (2015) **Featured article**

- [J43] M. Mirkhalaf, C. Barrett and F. Barthelat\*: “Self-assembly of millions of microscopic tablets within polymer thin films: a possible pathway towards bio-inspired hybrid materials and coatings”. *RSC Advances* 5:4780–4787 (2015).
- [J42] J. Loiseau, A. Nabavi, A. Capozzi, O. E. Petel, S. Goroshin, F. Barthelat\*, D. L. Frost\* and A. J. Higgins\*: “Ballistic Response of Chromium/Chromium-Sulfide Cermets”. *Journal of the dynamic behavior of materials* 1:347-358 (2015)
- [J41] R. K. Chintapalli, S. Breton, A. K. Dastjerdi and F. Barthelat\*: “Strain rate hardening: a hidden but critical mechanism for biological composites?” *Acta Biomaterialia* 10(12):5064-73 (2014)
- [J40] F. Barthelat\*: “Designing nacre-like materials for simultaneous stiffness, strength and toughness: optimum materials, composition, microstructure and size”. *Journal of the Mechanics and Physics of Solids* 73:22-37 (2014)
- [J39] A. Nabavi, A. Capozzi, S. Goroshin, D.L. Frost and F. Barthelat\*: “A novel method for net-shape manufacturing of metal-metal sulfide cermets”. *Journal of Materials Research* 49:8095-8106 (2014)
- [J38] R. Chintapalli, M. Mirkhalaf, A. K. Dastjerdi and F. Barthelat\*: “Fabrication, testing and modeling of a new flexible armor inspired from natural fish scales and osteoderms”. *Bioinspiration & Biomimetics* 9:036005 (2014) **Editor’s pick for *Bioinspiration & Biomimetics* highlights of 2014**
- [J37] F. Vernerey and F. Barthelat: “Skin and scales of teleost fish: simple structure but high performance and multiple functions” *Journal of the Mechanics and Physics of Solids* 68:66-76 (2014)
- [J36] M. Mirkhalaf, A. K. Dastjerdi and F. Barthelat\*: “Overcoming the brittleness of glass through bio-inspiration and micro-architecture” *Nature Communications* 5:3166 (2014) **Featured in Nature, Phys.org, ScienceNews, ScienceDaily, Materials Today, Scientific American, Wired, American Ceramic Society, Canadian Geographic, CNET, SmartPlanet, Hunffington Post, Gizmag, Toronto Sun, LA times, Times of India, Radio Canada, Radio Canada International, DeutschlandRadio, Welt der Physik, The China Post, L’Usine Nouvelle, Science et Avenir, La Recherche.**
- [J35] F. Vernerey, K. Musiket and F. Barthelat: “Mechanics of Fish skin: A computational approach for bio-inspired flexible composites”. *International Journal of Solids and Structures* 51 (1):274-283 (2013)
- [J34] F. Barthelat\* and M. Mirkhalaf: “The quest for stiff, strong and tough hybrid materials: an exhaustive exploration” *Journal of the Royal Society Interface* 10:20130711 (2013) **Featured in Nature Materials**
- [J33] D.C. Bassett, G. Merle, B. Lennox, R. Rabiei, F. Barthelat, L.M. Grover, J.E. Barralet: “Ultrasonic Phosphate Bonding of Nanoparticles”. *Advanced Materials* 25(41):5953-5958 (2013)
- [J32] H.K. Heris, A.K. Miri, U. Tripathy, F. Barthelat, L. Mongeau: “Indentation of poroviscoelastic vocal fold tissue using an atomic force microscope” *Journal of the Mechanical Behavior of Biomedical Materials* 2:383-392 (2013)

- [J31] A. K. Dastjerdi, E. Tan and F. Barthelat\*: “Direct measurement of the cohesive law of adhesives using a rigid double cantilever beam technique” *Experimental Mechanics* 53(9):1763-1772 (2013)
- [J30] A. Hart, E.J. Harvey, L.P. Lefebvre, F. Barthelat, R. Rabiei, P. Martineau: “Insertion Profiles of 4 Headless Compression Screws” *Journal of Hand Surgery* 38(9):1728-1734 (2013)
- [J29] D. Zhu, L. Szewciw, F. Vernerey, and F. Barthelat\*: “Puncture resistance of the scaled skin from striped bass: collective mechanisms and inspiration for new flexible armor designs D. Zhu, L. Szewciw, F. Vernerey, and F. Barthelat. *Journal of the Mechanical Behavior of Biomedical Materials* 24:30-34(2013)
- [J28] F. Barthelat\*, A. K. Dastjerdi and R. Rabiei: “An improved failure criterion for biological and engineered staggered composites” *Journal of the Royal Society Interface* 10:20120849 (2013)
- [J27] F. Barthelat\*: “Science and engineering of natural materials: merging structure and materials” *Journal of the Mechanical Behavior of Biomedical Materials* 19:1-2 (2013)
- [J26] A. K. Dastjerdi, R. Rabiei and F. Barthelat\*: “The weak interfaces within tough natural composites: experiments on three types of nacre A. K. Dastjerdi, R. Rabiei and F. Barthelat. *Journal of the Mechanical Behavior of Biomedical Materials* 19:50-60 (2013)
- [J25] S. Cavelier, C. J. Barrett and F. Barthelat\*: "The mechanical performance of a biomimetic nanointerface made of multilayered polyelectrolytes" *European Journal of Inorganic Chemistry, Special issue on "Organic-Inorganic Hybrid Materials: Design and Applications"* (32):5380-5389 (2012) **(Invited)**
- [J24] S. Bekah, R. Rabiei and F. Barthelat\* "The micromechanics of biological and biomimetic staggered composites". *Journal of Bionic Engineering* 9(4):446-456 (2012) **(Invited)**
- [J23] A. Khayer Dastjerdi, M. Pagano, M.T. Kaartinen, M.D. McKee and F. Barthelat\* "Cohesive behavior of soft biological adhesives: Experiments and modeling". *Acta Biomaterialia* 8 (9):3349-3359 (2012)
- [J22] J. Poissant and F. Barthelat\*."In-situ mechanical testing of hydrated biological nanofibers using a nanoindenter transducer". *Experimental Mechanics* 52(9):1287-1295 (2012)
- [J21] A. K. Miri, François Barthelat and Luc Mongeau: “Effects of Dehydration on the Viscoelastic Properties of Vocal Folds in Large Deformations”, *Journal of Voice* 26(6):688-697 (2012)
- [J20] H. Humburg, D. Zhu, S. Beznia and F. Barthelat\*: "Bio-inspired Tapered Fibers for Composites with Superior Toughness". *Composites Science and Technology* 72 (9):1012-1019 (2012)
- [J19] D. Zhu, C. Fuentes Ortega, R. Motamedi, L. Szewciw, F. Vernerey and F. Barthelat\*: “Structure and mechanical performance of a modern fish scale” *Advanced Biomaterials* 14(4): B185-B194 (2012) **Cover of issue and featured on [www.sciencenow.com](http://www.sciencenow.com), [www.MaterialsViews.com](http://www.MaterialsViews.com) and [www.AskNature.org](http://www.AskNature.org)**
- [J18] M. Yourdkhani, D. Pasini and F. Barthelat\*: “Multiscale Mechanics and Optimization of Gastropod Shells”, *Journal of Bionic Engineering* 8:357-368 (2011)

- [J17] S. Bekah, R. Rabiei and F. Barthelat\*: “Structure, Scaling and Performance of Natural Micro- and Nanocomposites”. *BioNanoScience* 1(1-2):53-61 (2011) **Invited**
- [J16] F. Barthelat\* and D. Zhu: “A Novel Biomimetic Material Duplicating the Structure and Mechanics of Natural Nacre”, *Journal of Materials Research* 26(10):1203-1215 (2011)
- [J15] F. Barthelat\* and R. Rabiei: “Toughness Amplification in Natural Composites”, *Journal of the Mechanics and Physics of Solids* 59:829-840 (2011) **JMPS top-10 most cited article over the past 5 years**
- [J14] F. Barthelat\*: “Nacre from mollusk shells: a model for high-performance structural materials” *Bioinspiration & Biomimetics, special issue: “Biomimetics of Aquatic Life - Applications for Engineering”*, 5(3):1-8 (2010). **Invited, Editor’s pick for *Bioinspiration & Biomimetics* highlights of 2010**
- [J13] F. Vernerey and F. Barthelat: “On the Mechanics of Fish-Scale Structures”. *International Journal of Solids and Structures* 47(17):2268-2275 (2010)
- [J12] R. Rabiei, S. Bekah and F. Barthelat\*: “Failure mode transition in nacre and bone-like materials”. *Acta Biomaterialia* 6:1081-4089 (2010)
- [J11] J. Poissant and F. Barthelat\*: “A Novel “Subset Splitting” Procedure for Digital Image Correlation on Discontinuous Displacement Fields”. *Experimental Mechanics* 50(3):353-364 (2010)
- [J10] H.D. Espinosa, J.E. Rim, F. Barthelat and M.J. Buehler: “Merger of Structure and Material in Nacre and Bone - Perspectives on de novo Biomimetic Materials”, *Progress in Materials Science* 54:1059-1100 (2009)
- [J9] F. Barthelat\*: “Biomimetics for Next Generation Materials”. *Philosophical Transactions of the Royal Society A: Mathematical and Engineering Sciences* 365:2907-2919 (2007)
- [J8] F. Barthelat and H.D. Espinosa\*: “An Experimental Investigation of Deformation and Fracture of Nacre-Mother of Pearl”. *Experimental Mechanics* 47(3):311-324 (2007)
- [J7] H. Tang, F. Barthelat and H.D. Espinosa\*: “An Elasto-Viscoplastic Interface Model for Investigating the Constitutive Behavior of Nacre”. *Journal of the Mechanics and Physics of Solids* 55(7):1410-1438 (2007)
- [J6] F. Barthelat, H. Tang, P.D. Zavattieri, C.-M. Li and H.D. Espinosa\*: “On the mechanics of mother-of-pearl: A key feature in the material hierarchical structure”. *Journal of the Mechanics and Physics of Solids* 55(2):306-337 (2007). **JMPS top-10 most cited article over the past 5 years**
- [J5] F. Barthelat, C.M. Li, C. Comi and H.D. Espinosa\*: “Mechanical Properties of Nacre Constituents and Their Impact on Mechanical Performance”. *Journal of Materials Research* 21 (8):1977-1986 special issue on Mechanics of Biological and Biomimetic Materials at Small Length-Scales (2006)
- [J4] S. Lee, F. Barthelat, J.W. Hutchinson and H.D. Espinosa\*: “Dynamic Failure of Metallic Pyramidal Truss Core Materials - Experiment and Modeling”. *International Journal of Plasticity* 22(11):2118-2145 (2006)

- [J3] S. Lee, F. Barthelat, N. Moldovan, H.D. Espinosa and H.N.G. Wadley\*: “Deformation Rate Effects on Failure Modes of Open-Cell Al Foams and Textile Cellular Materials”. *International Journal of Solids and Structures* 43(1):53-73 (2006)
- [J2] F. Barthelat, Z. Wu, B.C. Prorok and H.D. Espinosa\*: “Dynamic Torsion Testing of Nanocrystalline Coatings Using High-Speed Photography and Digital Image Correlation”. *Experimental Mechanics* 43(3):331-340 (2003). **Hetényi Award for best paper of the year in Experimental Mechanics**
- [J1] S. Thelen, F. Barthelat and L. C. Brinson\*: “Mechanics Considerations for Microporous Titanium as an orthopedic implant material”. *Journal of Biomedical Materials Research* 69A(4):601-610 (2004)

## Book Chapters

- [BC7] F Barthelat\*: “The fracture mechanics of biological materials” in review for *Mechanics and Physics of Fracture: Multi-scale Modeling of the Failure Behaviour of Solids* L. Ponsón Ed. CISM International Centre for Mechanical Sciences (2018)
- [BC6] R Rabiei, A K Dastjerdi, M Mirkhalaf and F Barthelat\*: “Hierarchical structure, mechanical properties and fabrication of biomimetic biomaterials” in *Biomimetic biomaterials: Structure and applications* A J Ruys Ed. Woodhead Publishing (2013)
- [BC5] M. Mirkhalaf, D. Zhu and F. Barthelat\*: “Biomimetic Hard Materials” in *Engineered Biomimicry* A. Lakhtakia, R. J. Martin-Palma Eds. Elsevier (2013)
- [BC4] D. Zhu, F. Barthelat and F. Vernerey: “Intricate Multiscale Mechanical Behaviors of Natural Fish-Scale Composites” in *Handbook of Micromechanics and Nanomechanics* S.Li, X. Gao Eds. Pan Stanford Publishing (2013)
- [BC3] R. Rabiei, S. Bekah and F. Barthelat\*: “Nacre from mollusk shells: Inspiration for high performance nanocomposites”. In *Natural Polymers, Volume II: Natural Polymer Nanocomposites*, M. J. John and S. Thomas (Eds). Royal Society of Chemistry (2012)
- [BC2] F. Barthelat, J. Rim, and H.D. Espinosa: “A Review on the Structure and Mechanical Properties of Mollusk Shells – Perspectives on Synthetic Biomimetic Materials”. In *Applied Scanning Probe Methods XIII: Biomimetics and Industrial Applications*, B. Bhushan and H. Fuchs (Eds). Springer (2009).
- [BC1] F. Barthelat, K. Malukhin, and H.D. Espinosa\*: “Quasi-Static and Dynamic Torsion Testing of Ceramic Micro and Nano-Structured Coating Using Speckle Photography”. In *Recent Advances in Experimental Mechanics*, Gdoutos, E.E. (Ed.). Kluwer Academic Publishers (2002)

## Articles in Refereed Conference Proceedings

- [CP8] D. Zhu, L. Szewciw, F. Vernerey and F. Barthelat\*: “Structure and mechanical performance of teleost fish scales” *Materials Research Society Symposium Proceedings* 1420 (2012)
- [CP7] F. Barthelat\*, R. Rabiei and A. K. Dastjerdi: “Multiscale toughness amplification in natural composites” *Materials Research Society Symposium Proceedings* 1420 (2012)
- [CP6] R. Rabiei, S. Bekah and F. Barthelat\*: “Failure mode transition in natural mineralized composites” *Materials Research Society Symposium Proceedings* 1301, p. 81-86 (2011)

- [CP5] D. Zhu and F. Barthelat\*: “A Macroscale Biomimetic Composite Duplicating the Deformation Mechanisms of Nacre” *Materials Research Society Symposium Proceedings* 1301, p. 149-154 (2011)
- [CP4] M. Yourdkhani, D. Pasini, and F. Barthelat\*: “The hierarchical structure of seashells optimized to resist mechanical threats” *WIT Transactions on Ecology and the Environment* 138, pp. 141-152 (2010)
- [CP3] F. Barthelat\* and R. Rabiei: “Micromechanics of fracture in nacre from mollusk shells” *Proceeding of the 12th International Conference on Fracture 2009 (ICF-12)* (2009)
- [CP2] F. Barthelat and H. D. Espinosa\*: “Mechanical properties of nacre constituents: An inverse method approach” *Materials Research Society Symposium Proceedings* 844, art. no. Y7.5, pp. 67-78 (2005)
- [CP1] F. Barthelat, D. Fonck, and A.L. Lerner\*: “Investigation of the poroelastic behavior of the rabbit growth plate cartilage” *American Society of Mechanical Engineers, Bioengineering Division BED* 42, pp. 757-758 (1999)

### **Invited Conference Presentations and Invited Seminars**

- [I57] “Expanding material property space with bioinspiration and micro-architecture” workshop on "Tailor-Made Multiscale Materials Systems" Hamburg Collaborative Research Center SFB 986, June 19-21, 2019, Hamburg (Germany)
- [I56] “Segmentation and architecture in natural materials: discrete element models for bioinspiration” TMS 148th Annual meeting & exhibition, March 10-14, 2019, San Antonio TX (USA)
- [I55] “Optimum geometries in biological and bio-inspired sutured interfaces” TMS 148th Annual meeting & exhibition, March 10-14, 2019, San Antonio TX (USA)
- [I54] “Expanding material property space with bioinspiration and micro-architecture” Civil Engineering Department, Cornell University, November 8<sup>th</sup>, 2018 Ithaca NY (USA)
- [I53] “Expanding material property space with bioinspiration and micro-architecture” Solid Mechanics Laboratory - LMS - Ecole Polytechnique, Palaiseau (France) October 5, 2018
- [I52] “Expanding material property space with bioinspiration and micro-architecture” 18th US National Congress of Theoretical and Applied Mechanics, Chicago June 7th, 2018
- [I51] “Expanding materials performance using bioinspiration and micro-architecture” 3rd Montreal Biomaterials Research Day, Canadian Biomaterials Society, Montreal May 1st, 2018
- [I50] “Expanding materials performance using bioinspiration and micro-architecture” Graduate Seminar Series, Mechanical Engineering University of Colorado at Boulder March 23rd, 2018
- [I49] “Dense Architected Materials in Engineering and in Nature” TMS 147th Annual meeting & exhibition, 12 March 2018, Phoenix, AZ (USA)
- [I48] “Expanding Material Property Space Using Bioinspiration and Micro-architecture” ME-EM Graduate Seminar Speaker Series, Michigan Technological University February 15<sup>th</sup> 2018
- [I47] “Exploring material property space using bioinspiration and micro-architecture” Materials Research Outreach Symposium January 31 & February 1, 2018, University of California Santa Barbara
- [I46] “Structure and mechanics of natural scales: inspiration for novel flexible protective systems” ASME IMECE Tampa, November 9<sup>th</sup> 2017
- [I45] “Expanding material property space using bioinspiration and architecture” Graduate Seminar Series, Mechanical Engineering Purdue University September 14th, 2017

- [144] “Expanding material property space using bioinspiration and architecture” Séminaire de mécanique des solides, Institut d’Alembert (Paris) 11 Juillet 2017
- [143] “Toughness amplifications in biological and bio-inspired materials: a synergy of architectures and weak interfaces” 14<sup>th</sup> International Conference on Fracture (ICF14), 18-23 June 2017 Rhodes (Greece)
- [142] “Interfaces drive the mechanics of hard biological materials: discrete element models and bioinspired prototypes”. TMS 146th Annual meeting & exhibition, 26 February 2017, San Diego, CA (USA)
- [141] “The structure and mechanics of key interfaces within biological and bio-inspired materials” Society of Engineering Science 53rd Technical Meeting, 2-5 Oct. 2016 Baltimore, MD (USA)
- [140] Three invited lectures on fracture mechanics for a course on “Mechanics and Physics of Fracture: Multi-scale Modeling of the Failure Behaviour of Solids” (organizer: L. Ponson) at the International Centre for Mechanical Sciences (CISM), 26-30 Sept. 2016, Udine (Italy)
- [139] “Structure and mechanics of natural scales: inspiration for novel flexible protective systems” 11th International Congress of Vertebrate Morphology (ICVM11), 3 July 2016, Washington DC (USA)
- [138] “Micro-architectures and interfaces in biological and synthetic materials”. 47th Central Regional Meeting of the American Chemical Society, 18 May 2016, Covington, KY (USA)
- [137] “Architected materials in nature and engineering: structure, performance and fabrication”. Procter & Gamble, 17 May 2016, Cincinnati, OH (USA)
- [136] “Architected materials in engineering and in nature”. 2016 MRS Spring Meeting & Exhibit, 29 March 2016, Phoenix, AZ (USA)
- [135] “The structure and mechanics of interfaces within biological and bio-inspired materials”. TMS 145th Annual meeting & exhibition, 18 February 2016, Nashville, TN (USA)
- [134] “Architected materials in engineering and biology: fabrication, structure, mechanics and performance” 6th International Conference on Mechanics of Biomaterials and Tissues, 9 December 2015, Waikoloa, HI (USA)
- [133] “Architected materials in engineering and in nature” Concordia University Mechanical Engineering Seminar, 10 November 2015, Montreal, QC (Canada)
- [132] “Deformation and fracture mechanisms in bone and bone-like materials: inspiration for new engineering materials and biomaterials”. Biobone Symposium, Santiago de Compostela, Spain, 14 October 2015, Santiago (Spain)
- [131] “Architected materials in engineering and in nature: Structures, mechanics, performance and fabrication” University of California at Santa Barbara, Mechanical Engineering Seminar, 11 May 2015, Santa Barbara, CA (USA)
- [130] “Overcoming the brittleness of glass through bio-inspiration and microarchitecture” ASME 2014 International Mechanical Engineering Congress & Exposition, 11 November 2014, Montreal, QC (Canada)
- [129] “Architected materials in engineering and in nature: Structures, mechanics, performance and fabrication” Brown University, Solid Mechanics Seminar, 27 October 2014, Providence, RI (USA)
- [128] “Biology meets engineering: How bone, seashells and fish scales inspire new high-performance materials” Department of Biology, University of Guelph, 3 November 2014, Guelph, ON (Canada)
- [127] “The Biomimetic Materials Laboratory” McGill Bioengineering Symposium, 27 August 2014, Montreal, QC (Canada)

- [I26] “Overcoming brittleness through bio-inspiration and microarchitecture” COMPO2014, Weizmann Institute of Science, 29 April 2014, Rehovot (Israel)
- [I25] “Overcoming brittleness through bio-inspiration and microarchitecture” National Research Council Canada, 11 March 2014, Ottawa, ON (USA)
- [I24] “Overcoming brittleness through bio-inspiration and microarchitecture” SFB 986 Materials Science Colloquium, TUHH Technische Universität Hamburg-Harburg, 29 January 2014, Harburg (Germany)
- [I23] “Design, fabrication and testing of high-performance bio-inspired materials” McGill Association of Mechanical Engineers, 15 November 2013, Montreal, QC (Canada)
- [I22] “Bioinspiration from the sea: Structure, mechanics and performance of teleost fish scales” 13th International Conference on Fracture, June 18 2013, Beijing (China)
- [I21] “A novel digital image correlation procedure for discontinuous displacement fields: Application to fracture” 13th International Conference on Fracture, June 18 2013, Beijing (China)
- [I20] “Deformation and fracture mechanics in biological and biomimetic staggered composites” 13th International Conference on Fracture, June 18 2013, Beijing (China)
- [I19] “Toughness Amplification in Natural Composites” TMS 2013 142nd Annual meeting & exhibition, 5 March 2013, San Antonio, TX (USA)
- [I18] Overcoming brittleness through bio-inspiration and micro-architecture Materials Science and Engineering, University of Washington, 28 February 2013, Seattle, WA (USA)
- [I17] "Overcoming brittleness through bio-inspiration and architecture" Lassonde School of Engineering, York University, 15 February 2013, York, ON (Canada)
- [I16] "Biomimetics for next generation materials". Dawson College, 26 September 2012, Montreal, QC (Canada)
- [I15] “The multiple toughness amplifications of natural composites: the example of nacre”. 4<sup>th</sup> International Conference on Mechanics of Biomaterials & Tissues. Special session: "Science and engineering of natural materials: Merging structure and material" 13 December 2011, Waikoloa, HI (USA)
- [I14] “Toughness amplification in natural material: structural and scale effects”. Materials Research Society Fall Meeting, symposium on “Multiscale Mechanics of Hierarchical Materials” 29 November 2011, Boston, MA (USA)
- [I14] “The structure and mechanics of mother-of-pearl: bio-inspiration for high-performance structural materials”. University of Colorado at Boulder, Department of Civil Engineering, 15 April 2011, Boulder, CO (USA)
- [I13] “High-performance composites inspired from nature”. University of British Columbia, Advanced Materials Process Engineering Laboratories, 19 November 2010, Vancouver, BC (Canada)
- [I12] “Nacre from mollusk shells: a model for high-performance biomimetic materials”. Department of Civil Engineering, Purdue University, 11 June 2010, Lafayette, IN (USA)
- [I11] “Biomimetics for next generation materials”. John Abbott College, 19 January 2010, Sainte-Anne-de-Bellevue, QC (Canada)
- [I10] “Structure and Properties of Mineralized Tissues: The Deformation and Fracture of Nacre from Mollusk Shells”. Society for Integrative and Comparative Biology Symposium: “Biomaterials: Properties, Variation and Evolution”, 6 January 2009, Boston, MA (USA)
- [I9] “Hard Biological Materials as Models for Bio-inspired Composites”. 1<sup>st</sup> Biomimetic Symposium, McGill University, 31 November 2008, Montreal, QC (Canada)

- [18] “The deformation and fracture of nacre and other hard biological materials” Department of Mechanical Engineering, University of Alberta, 6 May 2008, Edmonton, AB (Canada)
- [17] “The deformation and fracture of nacre and other hard biological materials” Department of Mechanical Engineering, State University of New York at Stony Brook, 24 April 2008, Stony Brook, NY (USA)
- [16] “The Deformation and Fracture of Nacre-mother of Pearl”. ASME International Mechanical Engineering Congress & Exposition, 15 November 2007, Seattle, WA (USA)
- [15] “The deformation and fracture of nacre and other hard biological materials” Department of Mechanical Engineering, University of Vermont, 2 November 2007, Burlington, VT (USA)
- [14] “The deformation and fracture of nacre (mother-of-pearl) and other mineralized tissues”. Faculty of Dentistry, McGill University, 20 September 2007, Montreal, QC (Canada)
- [13] “The deformation and fracture of nacre (mother-of-pearl) and other hard biological materials” Bioengineering seminar series, McGill University, 16 March 2007, Montreal, QC (Canada)
- [12] “The Mechanical Performance of Nacre from Seashells-Superior Toughness through Microstructural Design”. Biomedical Engineering department, McGill University, 16 March 2007, Montreal, QC (Canada)
- [11] “Dynamic failure of metallic foams and blast resistant structures”. McGill Shock Wave Physics Group meeting, McGill University, 1 December 2006, Montreal, QC (Canada)

### **Conference Presentations**

- [C68] F. Barthelat: “Architected materials in engineering and in nature” TMS 2016 145th Annual meeting & exhibition February 14-18, 2016. Nashville, Tennessee (USA)
- [C67] R. Martini, D. Van Zyl and F. Barthelat: “Bio-inspired flexible armors with 3D printed tailored architectures” TMS 2016 145th Annual meeting & exhibition February 14-18, 2016. Nashville, Tennessee (USA)
- [C66] M. Mirkhalaf, A. K. Dastjerdi, F. Barthelat: “Overcoming brittleness through bio-inspiration and microarchitecture” 25th Canadian Congress of Applied Mechanics (CANCAM 2015) May 31-June 4, 2015, Western University, London (Canada)
- [C65] R. Martini, R. Chintapalli and F. Barthelat: “Flexible armors inspired from natural fish scales and osteoderms” 25th Canadian Congress of Applied Mechanics (CANCAM 2015) May 31-June 4, 2015, Western University, London (Canada)
- [C64] M. Mirkhalaf and F. Barthelat: “Doctor blading artificial nacre and bone” 25th Canadian Congress of Applied Mechanics (CANCAM 2015) May 31-June 4, 2015, Western University, London (Canada)
- [C63] R. Martini, D. Van Zyl and F. Barthelat: “Bio-inspired flexible armors with tailored architectures” Society of Engineering Science 52nd Annual Technical Meeting. Texas A&M University October 26–28, 2015, College Station, TX (USA)
- [C62] F. Barthelat: “Architected materials in engineering and in nature” Society of Engineering Science 52nd Annual Technical Meeting. Texas A&M University October 26–28, 2015, College Station, TX (USA)
- [C61] M. Mirkhalaf and F. Barthelat: “Systematic design of bio-inspired materials: Exploring synergies between micro-architecture and interfaces for simultaneous stiffness, strength and toughness” TMS 2015 144th Annual meeting & exhibition. March 15-19, 2015, Orlando, FL (USA)

- [C60] A.K. Dastjerdi and F. Barthelat: “Teleost fish scales amongst the toughest collagenous materials” TMS 2015 144th Annual meeting & exhibition. March 15-19, 2015, Orlando, FL (USA)
- [C59] R. K. Chintapalli, S. Breton, A. K. Dastjerdi and F. Barthelat: “Strain rate hardening: a hidden but critical mechanism for biological composites?” TMS 2015 144th Annual meeting & exhibition. March 15-19, 2015, Orlando, FL (USA)
- [C58] R.K. Chintapalli, S. Breton, A.K. Dastjerdi and F. Barthelat: “Strain rate hardening: a hidden but critical mechanism for biological composites? “ 9th international conference on mechanics of time dependent materials may 27th - 30th 2014, Montreal (Canada)
- [C57] M. Mirkhalaf, A. Khayer Dastjerdi and F. Barthelat” Overcoming brittleness through bio-inspiration and micro-architecture: fabrication and testing of a tough and deformable glass” 9th international conference on mechanics of time dependent materials may 27th - 30th 2014, Montreal (Canada)
- [C56] M. Mirkhalaf, A.K. Dastjerdi and F. Barthelat: “Overcoming brittleness through bio-inspiration and micro-architecture” ASME 2014 International Mechanical Engineering Congress & Exposition. Nov 14-20, 2014, Montreal (Canada)
- [C55] R.K. Chintapalli, S. Breton, A.K. Dastjerdi and F. Barthelat: “Strain rate hardening: a hidden but critical mechanism for biological composites?” ASME 2014 International Mechanical Engineering Congress & Exposition. Nov 14-20, 2014, Montreal (Canada)
- [C54] R.K. Chintapalli and F. Barthelat: “Fabrication, testing and modeling of a new flexible armor inspired from natural fish scales and osteoderms” ASME 2014 International Mechanical Engineering Congress & Exposition. Nov 14-20, 2014, Montreal (Canada)
- [C53] R.K. Chintapalli and F. Barthelat: “A flexible armor inspired from natural fish scales and osteoderms” Society for Engineering Science 51st Annual Technical Meeting, October 1-3, 2014, Purdue University, Lafayette (USA)
- [C52] M. Mirkhalaf and F. Barthelat: “Doctor blading artificial nacre and bone” Society for Engineering Science 51st Annual Technical Meeting, October 1-3, 2014, Purdue University, Lafayette (USA)
- [C51] M.Mirkhalaf, A.K. Dastjerdi and F. Barthelat.” Overcoming brittleness through bio-inspiration and micro-architecture” Society for Engineering Science 51st Annual Technical Meeting, October 1-3, 2014, Purdue University, Lafayette (USA)
- [C50] R.K. Chintapalli, S. Breton, A.K. Dastjerdi and F. Barthelat: “Strain rate hardening: a hidden but critical mechanism for biological composites?” Society for Engineering Science 51st Annual Technical Meeting, October 1-3, 2014, Purdue University, Lafayette (USA)
- [C49] R.K. Chintapalli and F. Barthelat: “A flexible armor inspired from natural fish scales and osteoderms” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 2-5 2014, Greenville, SC (USA)
- [C48] M. Mirkhalaf, A.K. Dastjerdi and F. Barthelat: “Overcoming brittleness through bio-inspiration and micro-architecture” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 2-5 2014, Greenville, SC (USA)
- [C47] R.K. Chintapalli and F. Barthelat: “Modeling, optimization, fabrication and testing of a bioinspired segmented armor system” TMS 2014 143rd Annual meeting & exhibition February 16-20 2014, San Diego, California, San Diego (USA)
- [C46] M. Mirkhalaf and F. Barthelat: “Doctor blading artificial nacre and bone” TMS 2014 143rd Annual meeting & exhibition February 16-20 2014, San Diego, California, San Diego (USA)

- [C45] M. Mirkhalaf, A.K. Dastjerdi and F. Barthelat: “Overcoming the brittleness of glass through bioinspiration and micro-architecture” TMS 2014 143rd Annual meeting & exhibition February 16-20 2014, San Diego, California, San Diego (USA)
- [C44] M. Mirkhalaf and F. Barthelat: “Bio-inspired nacre-like composites via simple, fast and versatile techniques such as doctor blading” 19th International Conference on Composite Materials July 28-August 2, 2013, Montreal (Canada)
- [C43] A.K. Dastjerdi and F. Barthelat: “Interlaminar fracture toughness of nacre: a high performance biological composite” 19th International Conference on Composite Materials July 28-August 2, 2013, Montreal (Canada)
- [C42] J. Ajaja and F. Barthelat: “Damage accumulation in a fiber reinforced composite for space applications” 19th International Conference on Composite Materials July 28-August 2, 2013, Montreal (Canada)
- [C41] M. Mirkhalaf, A. K. Dastjerdi, D. Zhu and F. Barthelat.” Overcoming brittleness though bio-inspiration and micro-architecture” 4th Canadian Conference on Nonlinear Solid Mechanics, July 23-26 2013, Montreal (Canada)
- [C40] R. Rabiei, M. Mirkhalaf and F. Barthelat: “Toughness Amplification in Natural Composites” 4th Canadian Conference on Nonlinear Solid Mechanics, July 23-26 2013, Montreal (Canada)
- [C39] D. Zhu, L. Szewciw, F. Vernerey and F. Barthelat: “Puncture resistance of the scaled skin from striped bass: collective mechanisms & inspiration for new flexible armor designs” 52nd Annual Meeting of the Canadian Society of Zoologists, May 14 2013, University of Guelph, Guelph ON (Canada)
- [C38] D. Zhu, L. Szewciw, F. Vernerey and F. Barthelat: “Biomimetic and multifunctional study of teleost fish skin” 5th International Conference on Mechanics of Biomaterials and Tissues 8-12 Dec. 2013, Sitges (Spain)
- [C37] M. Mirkhalaf, A.K. Dastjerdi and F. Barthelat: “Overcoming brittleness through bio-inspiration and micro-architecture: fabrication and testing of a tough and "ductile" glass” 5th International Conference on Mechanics of Biomaterials and Tissues 8-12 Dec. 2013, Sitges (Spain)
- [C36] M. Mirkhalaf and F. Barthelat: “Nacre-like composites obtained from a simple, fast and inexpensive doctor-blading technique” ASME 2013 International Mechanical Engineering Congress & Exposition. Nov 15-21, 2013, San Diego (USA)
- [C35] D. Zhu, L. Szewciw, F. Vernerey.” Failure mechanisms in a high-performance armor system: teleost fish scales” ASME 2013 International Mechanical Engineering Congress & Exposition. Nov 15-21, 2013, San Diego (USA)
- [C34] A. K. Dastjerdi, E. Tan and F. Barthelat.” The Cohesive Law and Toughness of Engineering and Natural Adhesives” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 3-5 2013, Lombard IL (USA)
- [C33] F. Barthelat, A. K. Dastjerdi and R. Rabiei: “An improved failure criterion for biological and engineered staggered composites” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 3-5 2013, Lombard IL (USA)
- [C32] A. K. Dastjerdi, M Pagano, M.T. Kaartinen, M. D. McKee and F. Barthelat.” Interfacial fracture toughness measurement of soft biological adhesives” TMS 2013 142nd Annual meeting & exhibition march 3-7, 2013, San Antonio, TX (USA)

- [C31] D. Zhu, L. Szewciw, F. Vernerey and F. Barthelat: “The structure and mechanics of a high-performance armor: fish scales” TMS 2013 142nd Annual meeting & exhibition march 3-7, 2013, San Antonio, TX (USA)
- [C30] F. Barthelat, R. Rabiei and S. Bekah” Micromechanics of fracture in nacre from mollusk shells “ 12th International Conference on Fracture , July 14 2009, Ottawa (Canada)
- [C29] L. Szewciw, D. Zhu, and F. Barthelat: “Mechanical performance of teleost fish skin” 51st Annual Meeting of the Canadian Society of Zoologists, Mount Allison University, 2012 Sackville, NB (Canada)
- [C28] L. Szewciw, D. Zhu and F. Barthelat: “Penetration resistance of striped bass (*Morone saxatilis*) fish skin” Society for Experimental Mechanics International Congress & Exposition on Experimental and Applied Mechanics, June 11-14, 2012, Costa Mesa, CA (USA)
- [C27] D. Zhu, H. Humburg and F, Barthelat: “Biomimetic Tapered Fibers for Enhanced Composite Toughness” Society for Experimental Mechanics International Congress & Exposition on Experimental and Applied Mechanics, June 11-14, 2012, Costa Mesa, CA (USA)
- [C26] L. Szewciw, D. Zhu, F. Vernerey and F. Barthelat: “The Multiscale Mechanics of Scaled Fish Skin” Society of Engineering Science 49th Technical Meeting, 10-12 Oct. 2012 Atlanta, GA (USA)
- [C25] A. K. Dastjerdi, M Pagano, M.T. Kaartinen, M. D. McKee and F. Barthelat: “A new method to measure the toughness of soft biological interfaces” Society of Engineering Science 49th Technical Meeting, 10-12 Oct. 2012 Atlanta, GA (USA)
- [C24] A. Nabavi, A.Cappozzi, S. Goroshin, D. Frost and F. Barthelat: “Net shape manufacturing of a novel cermet using self-propagating high temperature synthesis” TMS 2012 141st Annual meeting & exhibition March 11-15, 2012, Orlando, FL (USA)
- [C23] R. Rabiei, S. Bekah and F. Barthelat: “The multiple toughness amplification of natural composites: The example of nacre” 4th International Conference on Mechanics of Biomaterials & Tissues Dec.11-14 2011 Waikola, HI (USA)
- [C22] R. Rabiei, S. Bekah and F. Barthelat: “Toughness Amplification in Natural Composites” American Society for Composites 26th Annual Technical Conference 2011, Montreal (Canada)
- [C21] D. Zhu and F. Barthelat: “A biomimetic composite duplicating the structure and micromechanics of nacre” American Society for Composites 26th Annual Technical Conference 2011, Montreal (Canada)
- [C20] D. Zhu, F. Vernerey, and F. Barthelat: “The Mechanical Performance of a Teleost Fish Scale” International Bionic Engineering Conference, 18-20 Sep. 2011, Boston, MA (USA)
- [C19] F. Barthelat, R. Rabiei and D. Zhu: “A biomimetic composite duplicating the structure and micromechanics of nacre” International Bionic Engineering Conference, 18-20 Sep. 2011, Boston, MA (USA)
- [C18] D. Zhu, F. Vernerey, and F. Barthelat: “The Mechanical Performance of Teleost Fish Scales” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 13-16, 2011 Uncasville, CT (USA)
- [C17] S. Bekah, R. Rabiei and F. Barthelat: “Optimum structures and length scale in biological and bioinspired composites” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 13-16, 2011 Uncasville, CT (USA)
- [C16] D. Zhu and F. Barthelat: “A macroscale biomimetic composite duplicating the deformation mechanisms of nacre” Society for Experimental Mechanics Annual Conference & Exposition on Experimental and Applied Mechanics, June 13-16, 2011 Uncasville, CT (USA)

- [C15] S. Bekah, R. Rabiei and F. Barthelat: “Toughness Amplification in Natural Composites” Society of Engineering Sciences 48th Annual Technical Conference, Oct. 12-14 2011, Evanston, IL (USA)
- [C14] D. Zhu and F. Barthelat: “Fabrication, Testing and Modeling Of A Structured Material Inspired From Nacre” Society of Engineering Sciences 48th Annual Technical Conference, Oct. 12-14 2011, Evanston, IL (USA)
- [C13] D. Zhu, L. Szewciw, J. Poissant, F. Vernerey and F. Barthelat: “Multiscale Characterization of A High-performance Armor: Fish Scales” Society of Engineering Sciences 48th Annual Technical Conference, Oct. 12-14 2011, Evanston, IL (USA)
- [C12] R. Rabiei, S. Bekah and F. Barthelat: “Deformation and fracture mode transition in nacre and bone-like materials” ASME 2010 International Mechanical Engineering Congress & Exposition, Nov. 12-18 2010, Vancouver, BC (Canada)
- [C11] F. Barthelat and D. Zhu: “A Macroscale Biomimetic Composite Duplicating the Deformation Mechanisms of Nacre” ASME 2010 International Mechanical Engineering Congress & Exposition, Nov. 12-18 2010, Vancouver, BC (Canada)
- [C10] R. Rabiei, S. Bekah and F. Barthelat: “Deformation and fracture mode transition in nacre and bone-like materials” Materials Research Society Fall Meeting, Symposium on Bioinspired and Biological Materials, November 29-December 3, 2010, Boston, MA (USA)
- [C9] D. Zhu and F. Barthelat: “A Macroscale Biomimetic Composite Duplicating the Deformation Mechanisms of Nacre” Materials Research Society Fall Meeting, Symposium on Bioinspired and Biological Materials, November 29-December 3, 2010, Boston, MA (USA)
- [C8] R. Rabiei, S. Bekah and F. Barthelat: “Deformation and failure mode transition in hard biological composites” Society for Experimental Mechanics Annual Meeting, June 4-7 2010, Indianapolis, IN (USA)
- [C7] J. Poissant and F. Barthelat: “Applications of the subset splitting digital image correlation (SSDIC) method in fracture mechanics” Society for Experimental Mechanics Annual Meeting, June 4-7 2010, Indianapolis, IN (USA)
- [C6] M. Yourdkhani, F. Barthelat & D. Pasini” Multiscale modeling and optimization of gastropod shells” 22nd Canadian Congress of Applied Mechanics 2009 (CANCAM 2009) 31 May - 4 June 2009, Halifax, NS (Canada)
- [C5] R. Rabiei and F. Barthelat: “Micromechanics of fracture in sheet and columnar nacre” Society for Experimental Mechanics Annual Conference & Exposition, June 1-4 2009 Albuquerque, NM (USA)
- [C4] J. Poissant and F. Barthelat: “A Novel Digital Image Correlation Procedure for Discontinuous Displacement Fields” Society for Experimental Mechanics Annual Conference & Exposition, June 1-4 2009 Albuquerque, NM (USA)
- [C3] R. Rabiei, S. Bekah and F. Barthelat” The mechanical performance of sheet and columnar nacre” ASME 2008 International Mechanical Engineering Congress & Exposition, 91 Oct -6 Nov 2008, Boston, MA (USA)
- [C2] R. Rabiei and F. Barthelat: “The mechanical performance of sheet and columnar nacre” Society for Experimental Mechanics Annual Conference & Exposition, June 2-5 2008 Orlando, FL (USA)
- [C1] F. Barthelat and H.D. Espinosa: “The Deformation and Fracture of Nacre-Mother of Pearl” SEM Annual Conference and Exposition on Experimental and Applied Mechanics, June 4-6 2007, Springfield, MA (USA)

## Patents

- [P4] F. Barthelat and M. Tanzer: “Biocompatible, biodegradable and toughened bone graft substitute”. Patent application in process (McGill Report of Invention #15047).
- [P3] F. Barthelat, M. Mirkhalaf and A.K. Dastjerdi: “Bio-inspired engraving to generate toughness and resistance to impact in otherwise brittle materials” United States Provisional Patent Application US 61/946,279 (2014)
- [P2] H.D. Espinosa and F. Barthelat: “Building composite structure having material capable of deformation strain used in aeronautics involves layering first ceramic tablets alternating with second ceramic tablets in first layer, and then in second layer”. U.S patents US2012067519-A1; US8176705-B2;
- [P1] H.D. Espinosa and F. Barthelat: “Synthetic composite material, useful e.g. in aeronautics, defensive material, orthopedics and micro-electro-mechanical system, comprises interlocking ceramic tablets, where the ceramic tablets further comprise e.g. core and overlap area”. U.S patent US8067078-B1

## ACTIVITIES IN PROFESSIONAL SOCIETIES

- International Union of Theoretical and Applied Mechanics: Co-organizer (with T. Siegmund, Purdue) of a three day conference on the Mechanics of Architected Materials, to be held in September 2018 in Chicago (IL).
- 6th International Conference on Mechanics of Biomaterials and Tissues: Scientific Committee (2015)
- Society of Engineering Science (SES): Co-organizer for a Symposium on *Architected Materials* (2015)
- The Minerals, Metals & Materials Society (TMS): Co-organizer for the *Biological Materials Science Symposium*, TMS Annual Meeting (2015)
- Society for Experimental Mechanics (SEM): Elected Vice-Chair of the Biological Systems and Materials Technical Division. Co-organized three symposia on Biological Materials and Systems (2012, 2013, 2014), organized and chaired 20+ sessions at SEM Annual Conference (2007-2014).
- American Society of Mechanical Engineers: Topic Organizer for IMECE meetings (2008, 2010)
- Society of Engineering Science (SES): Co-organizer for a Symposium on *Biological Materials* (2012)
- 13<sup>th</sup> International Conference on Fracture (ICF13): Co-organizer of the session “*Biomaterials and Tissues*” and of a mini-symposium on “*Multiscale Modeling of Biological Systems*” (2013)

## ACTIVITIES IN SCIENTIFIC JOURNALS

- *Scientific Reports* (Nature Publishing Group): Editorial Board (Invited)
- *Journal of the Mechanical Behavior of Biomedical Materials* (Elsevier): Editorial Board (Invited)
- *Bioinspiration and Biomimetics* (IOPscience): Editorial Board (Invited)

- *Experimental Mechanics* (Springer): Associate Editor (Invited)
- *Experimental Techniques* (Wiley): Associate Editor (Invited)
- *Applied Mechanics Reviews* (American Society of Mechanical Engineers): Associate Editor (Invited)
- *Theoretical and Applied Mechanics Letters* (American Institute of Physics): Associate Editor (Invited)
- *Journal of the Mechanical Behavior of Biomedical Materials* (Elsevier): Guest editor for three special issues “Merging Materials and Structures” (2012), “Mechanics of collagen” (2015), “Biological Articulated Structures and Dermal Armors” (2016)

Reviewer (2-3 manuscripts/month): *Science, Nature, Nature Materials, Nature Communications, PNAS, Journal of the Mechanics and Physics of Solids, Acta Biomaterialia, Advanced Materials, Advanced Functional Materials, Journal of the Royal Society Interface, Biomaterials, PLOS ONE, Soft Matter, Journal of Materials Research, Journal of Materials Science, Journal of Biomedical Materials Research: Part A, Journal of the Mechanical Behavior of Biomedical Materials, Bioinspiration and Biomimetics, Journal of Bionic Engineering, Experimental Mechanics, Experimental techniques, Optics Express, Optics and Laser in Engineering, Journal of Composite Materials, Composites Science and Technology, Strain, Journal of Tribology, Tribology International, Tribology Letters, Modeling and Simulation in Materials Science and Engineering, Biophysical Chemistry, Materials Characterization, Journal of Reinforced Plastic and Composites*

## OUTREACH

- Redpath Museum, McGill University: Designed and assembled the Exhibition: “Bioinspiration and Biomimetics: How animals and plants inspire new engineering materials and devices” (Running December 2016- December 2017)
- Interview with journals, magazines and other news outlets: *La Presse* (Jan. 2015), *Nature* (Nov 2014), *Science et Avenir* (Apr. 2014), *Wired* (Mar. 2014), *Canadian Geographic* (Mar. 2014), *Materials360online* (Feb. 2014), *Scientific American Online* (Feb. 2014), *Les Cahiers techniques du bâtiment* (Mar. 2014), *Los Angeles Times* (Feb. 2014), *L’Usine Nouvelle* (Feb. 2014), *QMI Agency* (Feb. 2014), *Canadian Chemical News* (Feb. 2014), *Science News* (Jan. 2014), *Agence France-Presse* (Jan. 2014).
- Interviews with radios: *Radio Canada* (Feb. 2014), *Radio Canada International* (Feb. 2014), *Deutschlandfunk* (Jan. 2014), *La Grande Equation* “*Les matériaux du vivant qui nous font rêver*” (Nov. 2013).
- Science documentaries and multimedia: *Code Chastenay*, “Le verre dans tous ses éclats”, *Tele Quebec* (Oct 2014), *Galileo* (German TV, Feb. 2014), *Projet Biosphère* (Biosphère de Montréal, exhibit starting in 2015), “Xploration: Nature Knows Best” (FOX TV stations, 2016)
- Public Seminars, wide audience: *McGill Association of Mechanical Engineers* (Dec. 2014), *Dawson College* (Sep. 2012), *John Abbott College* (Jan. 2010).

## TEACHING

- *Advanced Mechanics of Materials* (MECH 632, formerly *Theory of Elasticity*): Entirely renewed the content of this course in 2015.
- *Mechanics of Biological Materials* (MECH 547): Entirely new course: structure and mechanics of proteins and polysaccharides, deformation and fracture of biological materials (skin, bone, tendons, blood vessels seashells, spider silk...). State of the art experimental and computational methods, novel biomimetic materials.
- *Mechanics of Deformable Solids* (MECH 321, taught three times)
- *Design of Machine Elements Design* (MECH 393, taught three times)
- *Theory of Elasticity* (MECH 632, taught twice)
- *Mechanics 1: Statics* (MECH 210, taught six times)