

Jing Du

Assistant Professor

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RESEARCH INTERESTS

Biomechanics and Biomaterials; Solid mechanics; Fracture mechanics; Bio-inspired design; Biomedical devices.

EDUCATION

Princeton University, Princeton, New Jersey, USA

- 2012, Ph.D. in Mechanical and Aerospace Engineering
“Adhesion and Contact in Soft and Hard Materials: From Organic Electronics to Medical Devices”
- 2009, M.A. in Mechanical and Aerospace Engineering

Tsinghua University, Beijing, China

- 2007, M.S. in Materials Science and Engineering
“Calculation and Analysis on the Molecular Vibration of Fullerenes via Bonding Element”
- 2005, B.S. in Mechanical Engineering and Automation

RESEARCH EXPERIENCE

Assistant Professor: Mechanical and Nuclear Engineering Department	2015-present
Postdoctoral Scholar: Professor Sunita Ho at University of California, San Francisco	2013-2015
Research Assistant: Professor Wole Soboyejo at Princeton University	2008-2013
Intern Scientist: Cordis Corporation - a Johnson & Johnson Company	2010
Research Assistant: Professor Pan Zeng and Professor Dehai Wu at Tsinghua University	2005-2007

TEACHING EXPERIENCE

ME 597 Mechanical Behaviors of Biological Tissues and Biomaterials	2019-present
ME 360 Mechanical Design, Penn State University	2017-present
ME 461 Finite Elements in Engineering, Penn State University	2015-present
Fatigue and Fracture of Materials, African University of Science and Technology, Nigeria	2011

HONORS AND AWARDS

Oak Ridge Associated Universities (ORAU), Ralph E. Powe Junior Faculty Enhancement Award	2017
International Association of Dental Research, Mineralized Tissue Group, Young Investigator Award	2015
Princeton University Harari Post-graduates Fellowship	2008
Princeton University First Year Graduates Fellowship	2007
Tsinghua University Best Thesis Award	2005
Beijing City Honored Graduate	2005
China National First-Class Scholarship	2004

RESEARCH SUPPORT

- “Biomechanics Study Towards Patient-Specific Implants for Osteoarthritic Shoulders”, Center for Biodevices, Penn State University, 2020-2021
- “An Integrated Computational-Experimental Approach to Three-dimensional Fracture in Polymer-Ceramic Composites”, National Science Foundation, 2018-2021
- “Assessing the Performance of Additively Manufactured Variable Lattice Structures”, Stryker, 2018-2019
- “Image-based Alveolar Bone Biomechanics Study: from Laboratory to Clinical Computed Tomography (CT)”, National Institutes of Health, Clinical and Translational Science Institute of Penn State University, 2017-2018
- “3-Dimensional full-field mechanical properties and microstructure measurement of polymer-ceramic composites,” ORAU (Oak Ridge Associated Universities), 2017- 2018.
- “Adhesion between a polymer and a transition metal oxide: Atomic- and macro- scales investigations,” Material Computation Center, Penn State University. 2017-2018.

PEER-REVIEWED JOURNAL ARTICLES

27. Y. Zhou, M. Kastner, T. Tighe, **J. Du**, Elastic modulus mapping for bovine cortical bone from submillimeter- to submicron-scales using PeakForce Tapping atomic force microscopy. *Extreme Mechanics Letters*, 41, pp 101031, 2020.
26. Y. Zhou, C. Gong, M. Hossaini-Zadeh, **J. Du**, 3D full-field strain in bone-implant and bone-tooth constructs and their morphological influential factors. *Journal of the Mechanical Behavior of Biomedical Materials*, 110, pp 103858, 2020.
25. D. Schmitthenner, C. Sweeny, **J. Du**, A. Martin, The effect of a stiff foot plate on walking gait mechanics. *Journal of Biomechanical Engineering*, 142(9), pp 091012, 2020.
24. Y. Zhou, C. Gong, G. Lewis, A. Armstrong, **J. Du**, 3D full-field biomechanical testing of a glenoid before and after implant placement. *Extreme Mechanics Letters*, 35, pp 100614, 2020.
23. K. Su, J. Yang, Y. Li, **J. Du**, Numerical simulation of mandible bone remodeling under tooth loading: A parametric study. *Scientific Reports*, 9, pp 14887, 2019.
22. Q. Mao, K. Su, Y. Zhou, M. Hossaini-Zadeh, G. Lewis, **J. Du**, Voxel-based micro-finite element analysis of dental implants in a human cadaveric mandible: Tissue modulus assignment and sensitivity analyses. *Journal of the Mechanical Behavior of Biomedical Materials*, 94, pp 229-237, 2019.
21. Y. Jiang, Y. Zhou, X. Bao, C. Chen, L. N. Randolph, **J. Du**, and X. L. Lian, An ultrasensitive calcium reporter system via CRISPR-Cas9 mediated genome editing in human pluripotent stem cells. *iScience*, 9, pp 27-35, 2018.
20. J. Hu, Y. Zhou, J. D. Obayemi, **J. Du**, W. O. Soboyejo, An investigation of the viscoelastic properties and the actin cytoskeletal structure of triple negative breast cancer cells. *Journal of the Mechanical Behavior of Biomedical Materials*, 86, pp 1-13, 2018.
19. J. Asare, E. T`urk`oz, B. Agyei-Tuffour, O. K. Oyewole, A. A. Fashina, **J. Du**, M. G. Zebaze Kana, W. O. Soboyejo, Effects of pre-buckling on the bending of organic electronic structure. *AIP Advances*, 7, pp 045204, 2017.
18. J. Asare, S. A. Adeniji, O. K. Oyewole, B. Agyei-Tuffour, **J. Du**, E. Arthur, A. A. Fashina, M. G. Zebaze Kana and W. O. Soboyejo, Cold welding of organic light emitting diode: Interfacial and contact model. *AIP Advances*, 6, pp 065125, 2016.
17. V. C. Anye, M. G. Zebaze Kana, **J. Du**, W. O. Soboyejo, Effect of pressure and MoO₃ hole injection layer on the current-voltage characteristics of organic light emitting diodes. *Advanced Materials Research*, 1132, pp 160-165, 2015.

16. O. K. Oyewole, D. Yu, **J. Du**, J. Asare, V. C. Anye, A. A. Fashina, M. G. Zebaze Kana, W. O. Soboyejo, Lamination of organic solar cells and organic light emitting devices: Models and experiments. *Journal of Applied Physics*, 118, pp 075302-075302-12, 2015.
15. **J. Du**, J. Lee, A. Jang, A. Gu, A. J. Miller, R. Prevost, M. Hossaini-Zadeh, D. Curtis, S. Ho, Biomechanics and strain mapping in bone as related to immediately-loaded dental implants. *Journal of Biomechanics*, 48(12), pp 3486-3494, 2015.
14. O. K. Oyewole, D. Yu, **J. Du**, J. Asare, D. O. Oyewole, V. C. Anye, A. Fashina, M. G. Zebaze Kana, W. O. Soboyejo, Micro-wrinkling and delamination-induced buckling of stretchable electronic structures. *Journal of Applied Physics*, 117(23), pp 235501-235501-11, 2015.
13. **J. Du**, X. Niu, W. Soboyejo, Creep-assisted slow crack growth in bio-inspired dental multilayers. *Journal of the Mechanical Behavior of Biomedical Materials*, 46, pp 41-48, 2015.
12. D. Yu, O. K. Oyewole, D. Kwabi, T. Tong, V. C. Anye, J. Asare, E. R. Rwenyagila, A. Fashina, O. Akogwu, **J. Du**, W. O. Soboyejo, Adhesion in flexible organic and hybrid organic/inorganic light emitting device and solar cells. *Journal of Applied Physics*, 116(7), pp 074506-074506-9, 2014.
11. **J. Du**, V. C. Anye, E. O. Vodah, T. Tong, M. G. Zebaze Kana, W. O. Soboyejo, Pressure-assisted fabrication of organic light emitting diodes with novel MoO₃ hole-injection layer materials. *Journal of Applied Physics*, 115(23), pp 233703-233703-9, 2014.
10. **J. Du**, T. Tong, W. Akande, A. Tsakiridou, W. Soboyejo, Pressure effects on the lamination of organic light emitting devices. *Journal of Display Technology*, 9(8), pp 601-606, 2013.
9. **J. Du**, X. Niu, N. Rahbar, W. Soboyejo, Bio-inspired dental multilayers: effects of layer architecture on the contact-induced deformation. *Acta Biomaterialia*, 9(2), pp 5273-9, 2013.
8. W. L. Shan, **J. Du**, E. P. Hampp, H. Li, M. Johnson, G. Papandreou, C. A. Maryanoff, W. O. Soboyejo, Degradation and adhesive/cohesive strengths of a reservoir-based drug eluting stent. *Journal of the Mechanical Behavior of Biomedical Materials*, 14, pp 208-215, 2012.
7. I. Yakub, **J. Du**, W. O. Soboyejo, Mechanical properties and design of porous clay-based ceramics. *Materials Science and Engineering A*, 558(15), pp 21-29, 2012.
6. **J. Du**, E. Hampp, W. Shan, H. Li, G. Papandreou, C. A. Maryanoff, W. O. Soboyejo, Adhesion between a suspended polymeric film and a metallic substrate: Experiments and models. *Journal of Materials Research*, 27(14), pp1797-1805, 2012.
5. W. L. Shan, **J. Du**, E. P. Hampp, H. Li, G. Papandreou, C. A. Maryanoff, W. O. Soboyejo, Adhesion and cohesion in structures containing suspended microscopic polymeric films. *Acta Biomaterialia*, 8(4), pp1469-1480, 2012.
4. **J. Du**, P. Zeng, Molecular vibrational modes of C₆₀ and C₇₀ via finite element method. *European Journal of Mechanics A/Solids*. 28(5), pp948-954, 2009.
3. P. Zeng, X. Yang, **J. Du**, A C-C bonding element and coordinate transformation for vibrational analysis of C60 nano-molecule. *Chinese Journal of Computational Mechanics*, 02, pp150-155, 2008. (in Chinese)
2. P. Zeng, X. Yang, **J. Du**, Computational investigation for Raman vibration modes of C60 molecule. *Journal of Vibration Engineering*, 02, pp185-188, 2007. (in Chinese)
1. P. Zeng, **J. Du**, X. Yang, An equivalent C-C bonding element for representing the force-energy relation of carbon-carbon covalent bond. *Acta Mechanica Solida Sinica*, 04, pp325-332, 2007. (in Chinese)

BOOK CHAPTERS

2. **J. Du**, X. Niu, W. Soboyejo, "Bio-inspired Design of Dental Functionally Graded Multilayer (FGM) Structures". In *Bioinspired Structures and Design*, Editors: Wole Soboyejo and Leo Daniel, Cambridge University Press, Cambridge, UK, 2020.
1. X. Niu, **J. Du**, "The Mechanics and Bio-inspired Design of Dental Materials". In *Frontiers in Bionic Mechanics*, Shanghai Jiaotong University Press, Shanghai, China, 2020

CONFERENCE PAPERS

4. A. Madra, K. Su, **J. Du**, M. Hillman, (2019). Multi-scale reduced-order model of composite microstructure based on X-ray micro-CT imaging, In: *14eme Collq. Natl. En Calc. Des Struct. (CSMA 2019)*, Giens (Var), France, 2019. (pp. 1–8).
3. Y. Zhou, C. Gong, M. Hossaini Zadeh, **J. Du**, (2019). 3D Contact and Strain in Alveolar Bone under Tooth/Implant Loading, In: *TMS (Ed.), TMS 2019 148th Annual Meeting & Exhibition Supplemental Proceedings*. The Minerals, Metals & Materials Series. (pp. 793–798). Cham: Springer.
2. Y. Zhou, M. A. Hernandez Lamberty, G. S. Lewis, A. D. Armstrong, **J. Du**, (2018). 3D Full-field Mechanical Measurement of Shoulder Bones under Implant Loading, In: *TMS (Ed.), TMS 2018 147th Annual Meeting & Exhibition Supplemental Proceedings*. The Minerals, Metals & Materials Series. (pp. 287–293). Cham: Springer.
1. K. Su, L. Yuan, **J. Du**, (2017). Bone Remodeling Under Tooth Loading. In: *TMS (Ed.), TMS 2017 146th Annual Meeting & Exhibition Supplemental Proceedings*. The Minerals, Metals & Materials Series. (pp. 331–340). Cham: Springer.

INVITED TALKS

17. "Imaging-based experiments and modeling for bone-implant biomechanics", Penn Center for Musculoskeletal Disorders, University of Pennsylvania, October 2020.
16. "Crack growth and fracture toughness in bio-inspired design of dental multilayers", Society of Photo-Optical Instrumentation Engineers (SPIE) Smart Structures + Nondestructive Evaluation Digital Forum, April 27-May 1, 2020.
15. "Bio-inspired design of functionally graded dental materials", Department of Biomedical Engineering, Pennsylvania State University, September 2017
14. "Mechanics and Materials in Dental Research", Department of Mechanical Engineering, Temple University, February 2017
13. "Mechanics and Materials in Dental Research", School of Mater Science and Engineering, University of Science and Technology Beijing, December 2016
12. "Mechanics and Materials in Dental Research", Department of Mechanical Engineering, Tsinghua University, December 2016
11. Bio-inspired design of functionally graded dental materials, Department of Engineering Science and Mechanics, Pennsylvania State University, October 2016
10. "Mechanics and Materials in Dental Research", College of Engineering, Peking University, December 2016
9. "Adhesion and Contact in Healthcare or Energy Related Materials and Structures", Department of Mechanical Engineering, Clemson University, March 2015
8. "Adhesion and Contact in Healthcare or Energy Related Materials and Structures", Department of Mechanical and Nuclear Engineering, Pennsylvania State University, March 2015

7. "Adhesion and Contact in Biomedical Materials and Structures", Department of Mechanical Engineering, University of Nevada, Reno, February 2015
6. "Adhesion and Contact in Healthcare or Energy Related Materials and Structures", Department of Mechanical Engineering and Materials Science, Duke University, February 2015
5. "Adhesion and Contact in Healthcare or Energy Related Materials and Structures", School of Mechanical Engineering, Purdue University, February 2015
4. "Adhesion and Contact in Biomedical Materials and Structures", Department of Biomedical Engineering and Department of Mechanical & Industrial Engineering, New Jersey Institute of Technology, February 2015
3. "Adhesion and Contact in Healthcare or Energy Related Materials and Structures", Department of Mechanical Engineering, University of Rochester, January 2015
2. "Adhesion and Contact in Soft and Hard Materials: From Organic Electronics to Drug Eluting Stents", Department of Mechanical Engineering, University of South Florida, March 2012.
1. "Design of Dental Multilayer Structure", Structural Analysis and Plastic Forming Lab, Tsinghua University, December 2009.

PROFESSIONAL SERVICES AND AFFILIATIONS

- **Grant Review** - National Science Foundation; National Institutes of Health.
- **Editorial Experiences**
 - Editorial Board - *Scientific Reports*.
 - Guest Editor – Special issue “Multiscale Experiments and Modeling in Biomaterials and Biological Materials”, in *JOM* journal, June 2021.
 - Co-editor – Volume “Bioengineering”, in Elsevier’s series *on Comprehensive Structural Integrity*, 2022.
- **Journal Review**
Extreme Mechanics Letters, Dental Materials, Journal of Biomechanics, Journal of the Mechanical Behavior of Biomedical Materials, Journal of the Royal Society Interface, PLOS ONE, Scientific Reports, Journal of Materials Research and Technology, Annals of Biomedical Engineering, BioMedical Engineering OnLine, Composite Interfaces, IEEE Transactions on Device and Materials Reliability, Journal of Applied Physics.
- **Conference Organizing**
 - Organizer, Session Chair and Judge for the Biological Materials Science Symposium at the Minerals, Metals and Materials Society (TMS) 2018, 2019 and 2020 Annual Meeting & Exhibition
 - Reviewer, Solids Technical Committee, Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), June 17-20, 2020, Vail, CO.
 - Organizer and Session Chair for the Dental Biomechanics session at the 16th International Symposium on Computer Methods on Biomechanics and Biomedical Engineering, and 4th Conference on Imaging and Visualization (CMBBE), August 14-16, 2019, New York, NY.
 - Session Chair for the Educational Symposium at the 22nd International Congress of Dento-Maxillo-Facial Radiology and Joint Conference of the American Academy of Oral & Maxillofacial Radiology, August 22-25, 2019, Philadelphia, PA.
 - Judge for National Science Foundation (NSF) Poster Competitions at the ASME's International Mechanical Engineering Congress and Exposition (IMECE), November 11-14, 2018, Pittsburgh, PA.
 - Session Chair for the Mineralized Tissue II poster session at the 47th Annual Meeting of American Association for Dental Research (AADR), March 21-24, 2018, Fort Lauderdale, FL.
- **Service and Membership**

- Secretary, Member, Biomaterials Committee, Minerals, Metals and Materials Society (TMS)
- Member, Mechanical Behavior of Materials Committee, Minerals, Metals and Materials Society (TMS)
- Member, Bone Mechanics Theme, Solids Technical Committee, Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C)
- Membership: Materials Research Society (MRS), American Society of Mechanical Engineers (ASME), Society of Engineering Science (SES), American Association of Dental Research (AADR)