Barclay Alexander Jenks Jumet — Curriculum Vitae

PhD Student
Rice University
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Education

Rice University, Doctor of Philosophy — 05/2020–present
Mechanical Engineering, *GPA 3.81/4.00*
Advised by Prof. Daniel J. Preston.

The University of Alabama, Bachelors of Science (*magna cum laude*) — 05/2020
Mechanical Engineering (Honors College), *GPA 3.85/4.00*
Research supervised by Prof. Xuefeng Wang.

Professional Experience

Research Assistant — 05/2020–present
Preston Innovation Laboratory, Rice University | Houston, TX
» Creating constituent components of robots in textile platforms and other soft materials.
» Integrating thermal, fluidic, and electronic systems to enable human-centric devices.

Research Assistant — 05/2019–07/2019
Nanotechnology & Biomedicine REU, University of Georgia | Athens, GA
» Developed a low-cost, wireless system for at-home rehabilitation and analyzing gaits.
» Investigated and compared optical, electromagnetic, and inertial tracking systems.

Inventory Logistics Personnel — 01/2018–01/2019
Systems Integration, Mercedes-Benz, U.S., International | Vance, AL
» Found, corrected, and reported malfunctions in inventory management software.

Co-Operative (Co-Op) Engineer — 08/2017–05/2019
Machining and Assembly, Hyster-Yale Group | Sulligent, AL (*3 Rotations*)
» Developed solutions & improvements for 7 drive-axle and transmission assembly lines.
» Integrated software (VBA, SQL) & hardware (PLC, electropneumatics) for assembly processes.

Integration Intern & Interim Lead — 05/2017–12/2017
Systems Integration, Mercedes-Benz, U.S., International | Vance, AL
» Implemented a new software client (SAP) for inventory management.
» Provided regular updates on process flow and group progress to systems engineers.

Fellowships, Awards, and Honors

$208,750 in fellowships awarded to date.

Lodieska Stockbridge Vaughn Fellowship — 2024–2025
Graduate and Postdoctoral Studies, Rice University
» Awarded as one of three graduate students across all disciplines for "outstanding achievement and promise."

Rice Innovation Fellowship — 2024–2025
Liu Idea Lab for Innovation and Entrepreneurship (LILIE) & Office of Innovation, Rice University
» $20,000 awarded and weekly training and mentorship provided to translate research into a startup.

Bioelectronics NSF Research Traineeship (NRT) Fellowship — 2023–2025
Institute of Biosciences and Bioengineering, Rice University

Best Poster Award — 2023
Embodied Intelligence and Soft Robotics Workshop, IEEE RoboSoft Conference
» "Fluidically Programmed Spatiotemporal Haptic Cues in Wearables"

Future Founders Summit — 2022
Liu Idea Lab for Innovation and Entrepreneurship (LILIE), Rice University
» Selected for attending a multi-day entrepreneurship-focused training and practicum.

MRS Travel Award — 2021
2021 Materials Research Society (MRS) Fall Meeting

Resiliency Award — 2021
Additive Manufacturing, Performance, and Tribology (AMPT) Center

Graduate Research Fellowship Program (GRFP) — 2020–2023
National Science Foundation (NSF)

Order of Omega — 2018
The University of Alabama
» Top 3% of Greek-affiliated students based on scholarship, leadership, and involvement.

Emerging Scholars Program — 2018–2020
The University of Alabama

UA Scholar & College of Engineering Scholarships — 2015–2020
The University of Alabama
» Full tuition and stipend provided for all four years of enrollment.

ARTICLES IN PEER-REVIEWED JOURNALS

*Denotes equal contribution. **Denotes co-corresponding authorship. Denotes a trainee.

10. Z.A. Zook, **B. Jumet**, A. Yousaf, D.J. Preston, M.K. O'Malley, "Multiscale Textile-Based Haptic Interactions," *Advanced Intelligent Systems*, 2024. *In-print. 10.1002/aisy.202300897.*

9. V.T. Vo, A. Rajappan, **B. Jumet**, M.D. Bell, D.J. Preston, "Sheet-Based Fluidic Diodes for Embedded Fluidic Circuitry in Soft Devices," *Advanced Intelligent Systems*, 2024. *In-print. 10.1002/aisy.202300785.*

8. **B. Jumet**, Z.A. Zook, A. Yousaf, A. Rajappan, D. Xu, T.F. Yap, N. Fino, Z. Liu, M.K. O'Malley, D.J. Preston, "Fluidically Programmed Wearable Haptic Textiles," *Device*, 1(3), 2023.
» Featured on the journal's front cover and in a "Preview Article" (*Device*, 1(3), 2023).

7. N. Fino, **B. Jumet**, Z.A. Zook, D.J. Preston, M.K. O'Malley, "Mechanofluidic Instability-Driven Wearable Textile Vibrotactor," *IEEE Transactions on Haptics*, 2023.

6. M. Schara*, M. Zeng*, **B. Jumet****, D.J. Preston**, "A Low-Cost Wearable Device for Portable Sequential Compression Therapy," *Frontiers in Robotics and AI*, 9(1012862), 2022.
» Co-corresponding authorship.

5. A. Rajappan, **B. Jumet**, R.A. Shveda, C.J. Decker, Z. Liu, T.F. Yap, V. Sanchez, D.J. Preston, "Logic-Enabled Textiles," *Proceedings of the National Academy of Sciences (PNAS)*, 119(35), 2022.
» Featured in PNAS "In This Issue," 119(35), 2022.

4. R.A. Shveda*, A. Rajappan*, T.F. Yap, Z. Liu, M.D. Bell, **B. Jumet**, V. Sanchez, D.J. Preston, "A Wearable Textile-Based Pneumatic Energy Harvesting System for Assistive Robotics," *Science Advances*, 8(34), 2022.

3. **B. Jumet**, M.D. Bell, V. Sanchez, D.J. Preston, "A Data-Driven Review of Soft Robotics," *Advanced Intelligent Systems*, 4(4), 2022.
» Awarded "top downloaded article" certificate by *Advanced Intelligent Systems*.

2. A. Rajappan, **B. Jumet**, D.J. Preston, "Pneumatic Soft Robots Take a Step Toward Autonomy," *Science Robotics*, 6(51), 2021.

1. R. Li, **B. Jumet**, H. Ren, W. Song, Z.T.H. Tse, "An inertial measurement unit tracking system for body movement in comparison with optical tracking," *Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine*, 234(7), 2020.

PEER-REVIEWED CONFERENCE PROCEEDINGS

Conference proceedings are typically 6–8 pages in length.

2. N. Fino, Z.A. Zook, **B. Jumet**, D.J. Preston, M.K. O'Malley, "A Soft Approach to Convey Vibrotactile Feedback in Wearables Through Mechanical Hysteresis," 6th IEEE-RAS International Conference on Soft Robotics (RoboSoft), Singapore, Apr. 3–7, 2023.

1. **B. Jumet**, Z.A. Zook, D. Xu, N. Fino, A. Rajappan, M. Schara, J. Berning, N. Escobar, M.K. O'Malley, D.J. Preston, "A Textile-Based Approach to Wearable Haptic Devices," 5th IEEE-RAS International Conference on Soft Robotics (RoboSoft), Edinburgh, Scotland, UK, Apr. 4–8, 2022.

CONFERENCE PRESENTATIONS

10. **B. Jumet**, Z.A. Zook, N. Fino, A. Yousaf, A. Rajappan, D. Xu, T.F. Yap, Z. Liu, M.K. O'Malley, D.J. Preston, "Wearable Haptics Enabled by Fluidically Programmed Textiles," 2023 Society of Engineering Science (SES) Annual Technical Meeting, Minneapolis, MN, Oct. 8–11, 2023. *Oral presentation.*

9. M.D. Bell, A. Eujayl, **B. Jumet**, A. Rajappan, T.F. Yap, E. Noce, S. Urbina, C. Tran, D.J. Preston, "A Textile-Based Body Heat Recovery System to Power Wearable Soft Devices," 2023 Society of Engineering Science (SES) Annual Technical Meeting, Minneapolis, MN, Oct. 8–11, 2023. *Oral presentation.*

8. V.T. Vo, A. Rajappan, **B. Jumet**, M. D. Bell, D.J. Preston, "Sheet-Based Fluidic Diodes for Integrated Circuitry in Soft Robotics," 2023 Society of Engineering Science (SES) Annual Technical Meeting, Minneapolis, MN, Oct. 8–11, 2023. *Oral presentation.*

7. **B. Jumet**, Z.A. Zook, A. Yousaf, A. Rajappan, D. Xu, T.F. Yap, N. Fino, Z. Liu, M.K. O'Malley, D.J. Preston, "Fluidically Programmed Spatiotemporal Haptic Cues in Wearables," Embodied Intelligence and Soft Robotics Workshop, 6th IEEE-RAS International Conference on Soft Robotics (RoboSoft), Singapore, Apr. 3, 2023. *Poster.*

6. G. Vega, **B. Jumet**, D.J. Preston, "Retrofitting a Low-Cost 3D Printer to Facilitate Fabrication of Textile-Based Devices," Rice Summer Undergraduate Research Symposium, Rice University, Houston, TX, Aug., 2022. *Poster*.

5. L.A. Less, M.D. Bell, **B. Jumet**, D.J. Preston, "Optimization of Heat-Sealing Process for Polymeric Sheets & Textiles," Rice Summer Undergraduate Research Symposium, Rice University, Houston, TX, Aug., 2022. *Poster*.

4. S. Urbina, **B. Jumet**, M.D. Bell, D.J. Preston, "Pneumatic Supernumerary Finger Made from Sheet-Based Materials," Rice Summer Undergraduate Research Symposium, Rice University, Houston, TX, Aug., 2022. *Poster*.

3. **B. Jumet**, Z.A. Zook, D. Xu, N. Fino, A. Rajappan, M. Schara, J. Berning, N. Escobar, M.K. O'Malley, D.J. Preston, "A Textile-Based Approach to Wearable Haptic Devices," 5th IEEE International Conference on Soft Robotics (RoboSoft), Edinburgh, Scotland, UK, Apr. 4–8, 2022. *Poster.*

2. **B. Jumet**, J. Berning, N. Escobar, M. Schara, Z.A. Zook, M.K. O'Malley, D.J. Preston, "Textile-Based Wearable Haptic Devices," MRS Fall Meeting, Boston, MA, Nov. 29–Dec. 2, 2021. *Oral presentation.*

1. **B. Jumet**, R. Li, H. Ren, W. Song, Z.T.H. Tse, "Portable and Wearable Motion Tracking System for Out-of-Clinic Rehabilitation," Biomedical Engineering Society Annual Conference, Philadelphia, PA, Oct. 16–19, 2019. *Poster.*

INTELLECTUAL PROPERTY

1. **B. Jumet**, Z.A. Zook, A. Yousaf, A. Rajappan, D. Xu, T.F. Yap, N.W. Fino, Z. Liu, M.K. O'Malley, and D.J. Preston, Rice University, 2023. Fluidically Programmed Wearable Haptic Textiles. *U.S. patent pending*.

OTHER RELEVANT EXPERIENCE

TEXTILE-RELATED WORK

Sales Associate (01/2015–08/2015)
Collared Greens, LLC | Richmond, VA
» Worked closely with product team for in-depth exposure to the clothing retailer experience.

Co-Founder, Chief Operations Officer (02/2012–01/2016)
Evans on the Waters, LLC | Richmond, VA
» Online and exhibition retailer of bowties, T-shirts, and hair bows.
» Grass-roots funding enabled profitable business before exiting.
» Responsible for designing, sewing, and assembling all bowties before we used large-scale manufacturing.
» Responsible for designing all t-shirts and most hair bows.
» Oversaw and executed decisions related to product design, sales, and manufacturing.

SHADOWING

Assistive Technology Engineering Department (05/2018)
Hunter Holmes McGuire Veterans Association Medical Center | Richmond, VA

Orthotist and Prosthetist (12/2016)
Hanger Clinic, Inc | Richmond, VA

UNDERGRADUATE RESEARCH

09/2019–05/2020
Designing a passive mechanical control scheme for stabilizing the torso in rehabilitating spinal cord injuries.
» Supervised by Prof. Xuefeng Wang, Mechanical Engineering, The University of Alabama.
» Team Lead, Capstone Engineering Project

05/2019–07/2019
Accessible, at-home gait analysis and rehabilitation enabled by wearable, textile-mounted IMUs.
» Supervised by Prof. Zion T.H. Tse, Electrical and Computer Engineering, University of Georgia.
» Experience provided through NSF's Nanotechnology and Biomedicine REU.

08/2018–05/2020
Designing an infinitely variable transmission for light-duty biomedical applications.
» Supervised by Prof. Xuefeng Wang, Mechanical Engineering, The University of Alabama.

05/2018–08/2018
Casting elastomer that mimics the bioimpedance of human tissue for predicting or analyzing athletic injuries.
» Supervised by Prof. Todd Freeborn, Electrical Engineering, The University of Alabama.

03/2018–08/2018
Dissipating thermal energy in buildings by introducing phase-change materials into roof shingles.
» Supervised by Prof. Adam Hauser, Physics, The University of Alabama.

GRANT WRITING ($707k awarded to date)

Bioelectronics NRT Seed Fund, 2023 ($2.9k, awarded)
- » "A Functional Electrical Stimulation Sleeve and System for Simple and Precise Electrode Placement"
- » Collaboration between graduate researchers in the labs of Prof. M. K. O'Malley (Mechanical Engineering) and Prof. John Seymour (Neurosurgery, Electrical and Computer Engineering)
- » Awarded grant as co-PI.

Transportation Research Board IDEA Grant, 2023 ($100k, awarded)
- » "Mechanotherapeutic Cushion for Customers and Operators in Public Transit"
- » Based on my coordination with industry contacts in Houston, TX and Atlanta, GA.
- » Awarded grant as primary contributor.

Rice University Brown Teaching Grant, 2023 ($3k, awarded)
- » "Creating and Deploying Fluidic Circuits to Aid Students in Learning Analogies Between Fluidic, Thermal, and Electrical Systems"
- » Assisted in preliminary results, figures, and writing. Advised a mentee in the writing process.

Google Research Scholar Program, 2022 ($60k, not awarded)
- » Based on a collaboration between Prof. D.J. Preston and Prof. M.K. O'Malley.
- » Provided primary contributions in preliminary results, demonstrations, figures, writing, and editing.

National Science Foundation NRI-3.0, 2022 ($750k, not awarded)
- » Based on a collaboration between Prof. D.J. Preston and Prof. M.K. O'Malley.
- » Assisted in preliminary results, demonstrations, figures, writing, and editing.

National Science Foundation CAREER Award, 2022 ($600k, awarded)
- » "Textile-Based Wearable Robots with Integrated Fluidic Logic"
- » Assisted in preliminary results, demonstrations, figures, writing, and editing.

AATCC Foundation Student Research Support Grant, 2020 ($1.1k, awarded)
- » "Retrofitting a Low-Cost 3D Printer to Facilitate Fabrication of Textile-Based Assistive Devices"
- » Awarded grant as lead PI.

MENTORSHIP, TEACHING, AND SERVICE

MENTORSHIP OF UNDERGRADUATE RESEARCHERS

Damian Gonzalez, Rice University '24 (05/2023–present)
- » *Project title (1):* CNC Thermal Bonding
- » *Project title (2):* Functional Electrical Stimulation with Textiles

Karina Manrique, Rice University '26 (05/2023–present)
- » *Project title:* Textile Logic Components for Education and Outreach

Vi T. Vo, Rice University '23 (05/2023–present)
- » *Project title:* Textile Logic Components
- » *Currently:* NSF GRFP Fellow, PhD Candidate at Boston University (PI: Prof. Tommaso Ranzani)

Hannah Wixom, Rice University '26 (01/2023–present)
- » *Project title:* Soft Logic Components

Leighton A. Less, Rice University '24 (06/2022–08/2022)
- » *Project title:* Characterization of Thermal Layer-Based Fabrication

Sofia Urbina, Louisiana Tech University '23 (06/2022–08/2022)
- » *Project title:* Layer-Based Fabrication of Assistive Devices
- » *Currently:* PhD Candidate at Rice University (PI: Prof. Daniel J. Preston)

Mingde (Bryan) Zeng, Rice University '23 (05/2022–05/2023)
» *Project title:* Soft, Interactive Wearables

Mark Schara, Rice University '23 (05/2022–05/2023)
» *Project title:* Soft, Interactive Wearables

Aman Eujayl, Rice University '23 (01/2022–05/2023)
» *Project title:* Thermal Aspects of Wearable Devices
» *Currently:* PhD Candidate at California Institute of Technology

Gerardo Vega, Rice University '23 (09/2021–07/2023)
» *Project title:* CNC Thermal Bonding
» *Currently:* BRIDGE Fellow, Masters Student at Carnegie Mellon University (PI: Prof. Victoria Webster-Wood)

Doris Xu, Rice University '23 (09/2021–05/2023)
» *Project title:* Soft, Wearable Haptic Devices
» *Currently:* PhD Candidate at Cornell University (PI: Prof. Cara M. Nunez)

TEACHING EXPERIENCE

MECH 587: Capillarity and Wetting | Guest lecturer (Spring 2024)
» *Topic:* Fluid Mechanics Concepts and Formalisms: Navier-Stokes Equations, Couette Flow, and Poiseuille Flow

MECH 472: Thermofluidic Systems | Guest lecturer (Fall 2023)
» *Topic:* Demonstrations and Explanations of Fluidic Analogies to Electronic Circuits

PEER-REVIEWER

Science Robotics [x2]
IEEE-RAS International Conference on Robotics and Automation (ICRA) [x2]
IEEE-RAS International Conference on Soft Robotics (RoboSoft) [x2]

CONFERENCE ORGANIZATION

Full-Day Workshop on "New Directions for Simplified Control of Soft Robots"
5th IEEE-RAS International Conference on Soft Robotics (RoboSoft), 2022.
» Student Organizer

LEADERSHIP ROLES

Diversity, Equity, and Inclusion (DEI) Committee, Mech. Eng. Graduate Student Association, 08/2023–present
» Discuss DEI initiatives on a short- and long-term basis in regards to Masters and PhD students in the department.
» Lead discussion on initiatives regarding student-related financials (stipends, fellowships).
» Discuss with prospective faculty about their plans & experience with DEI during their on-site interviews.

Co-Chair, Soft Robotics & Materials Subgroup, Preston Innovation Laboratory, 05/2020–present
» Lead and moderate discussions in a bi-weekly meeting.
» Coordinate scheduling on a semesterly and weekly basis.

COMMUNITY OUTREACH

Low-Cost Barriers to Reduce the Spread of COVID-19 in Local Elementary School, 07/2020–08/2020
» Led the design, acquisition of materials, and assembly of transparent barriers to enable a safer learning environment for elementary students in Alvin, Texas.
» Newsletter: https://ral.rice.edu/stories/2021/winterspring/rice-students-help-block-spread-covid-19

SELECT MEDIA COVERAGE

AWARDS

Rice Innovation Fellows

» Announcement from Rice University: "Rice U. announces latest cohort of Innovation Fellows"
» Houston InnovationMap: "10 Houston Scientists Named to Fellowship for Turning Research into Businesses"

OUTREACH

"Rice Students Help Block the Spread of COVID-19"

» https://ral.rice.edu/stories/2021/winterspring/rice-students-help-block-spread-covid-19

TEXTILE DEVICES

Jumet, et al., "Fluidically Programmed Wearable Haptic Textiles," *Device*, 1(3), 2023.

» Featured on the journal's front cover.
» Featured in a "Preview Article" by T. Tat, X. Zhao, and J. Chen (*Device*, 1(3), 2023).
» Featured in more than 20 worldwide news outlets from Forbes, NSF, Houston InnovationMap, BBC, and others.
» Featured in a video by NSF: https://www.youtube.com/watch?v=4iZsEwRYjUM
» Rice article & video: https://news.rice.edu/news/2023/smart-fabrics-informed-touch-can-tell-you-where-go
» Resulted in being named as one of the "3 Houston Innovators to Know This Week"

Rajappan, **Jumet**, et al., "Logic-Enabled Textiles," *PNAS*, 119(35), 2022.

» Featured in *PNAS* "In This Issue," 119(35), 2022.