

Carson J. Bruns

carson.bruns@colorado.edu

www.emergentnanomaterials.comORCID: [0000-0002-4285-2725](https://orcid.org/0000-0002-4285-2725)

ATLAS Institute / Paul M. Rady Dept. of Mechanical Engineering

University of Colorado Boulder

1125 18th St, Boulder, 320 UCB, Room 225B, CO 80309, USAScopus Author ID: [35434518400](https://scopus.org/authors/35434518400)ResearcherID: [A-1342-2014](https://pubs.acs.org/author/A-1342-2014)**EDUCATION**

- | | | |
|---|---|---------------|
| • Doctor of Philosophy
Organic Chemistry | Northwestern University | December 2013 |
| | Advisors: J. Fraser Stoddart, Samuel I. Stupp | |
| • Bachelor of Arts <i>magna cum laude</i>
Majors: Chemistry, Religion Minor: Mathematics | Luther College | May 2008 |

PROFESSIONAL EXPERIENCE

- | | | |
|---|-----------------------------------|--------------|
| Assistant Professor | University of Colorado Boulder | 2017–Present |
| Co-Founder, President, Chief Scientific Officer | HYPRSKN Inc. | 2022–Present |
| Co-Founder & President | CHROMAPRAXIS LLC | 2020–2021 |
| Miller Research Fellow | University of California Berkeley | 2014–2017 |

AWARDS / HONORS

- | | | |
|---|---|-------------|
| Provost's Faculty Achievement Award | University of Colorado Boulder | 2024 |
| ASME Rising Star of Mechanical Engineering | ASME International Mechanical Engineering Congress and Exposition (IMECE) | 2024 |
| NSF CAREER Award | National Science Foundation | 2023 |
| Outstanding Faculty Mentor Award | University of Colorado Boulder | 2022 |
| Miller Research Fellowship | Miller Institute, UC Berkeley | 2014–2017 |
| Springer ISMSC2015 Poster Prize | International Symposium on Macro-cyclic & Supramolecular Chemistry | 2015 |
| NSF East Asia and Pacific Summer Institutes | University of Tokyo | Summer 2013 |
| JSPS Summer Program Fellow | | |
| NSF Graduate Research Fellowship | National Science Foundation | 2010–2013 |
| World Class University Project Visiting Scholar | Korea Advanced Institute of Science and Technology (KAIST) | Fall 2011 |
| Global Center of Excellence Visiting Scholar | University of Tokyo | Spring 2010 |
| Springer ISMSC2010 Poster Prize | International Symposium on Macro-cyclic & Supramolecular Chemistry | 2010 |
| Graduate Assistance in Areas of National Need | U.S. Department of Education | 2008–2009 |
| John G. and Mildred Breiland Fellowship | Luther College Dept. of Chemistry | 2007–2008 |
| NSF Research Experience for Undergraduates | Chulabhorn Research Institute | Summer 2007 |
| NSF Research Experience for Undergraduates | Coe College | Summer 2006 |
| Regents Scholarship | Luther College | 2004–2008 |

PUBLICATIONS| ⁼equal authors | [>]Bruns advisor | [^]Bruns advisees | ^{*}Corresponding author**Books**

CJ Bruns,^{*} JF Stoddart.[>] *The Nature of the Mechanical Bond: From Molecules to Machines*. Hoboken: John Wiley & Sons, 2016. 761 pages. ISBN: 9781119044000. doi.org/10.1002/9781119044123

Peer-Reviewed Publications[Google Scholar](https://scholar.google.com/citations?user=35434518400): 4486 Citations, *h*-index 29, *i*10 index 44**Work at CU Boulder:**

- 55.** DN Jung,[^] **CJ Bruns**^{*}. Typology Development for Synthetic Chemistry Sub-Tasks: Towards Human-Robot Collaboration Task Design in the Wet Lab. 2024 *International Design Engineering Technical Conference (IDETC-2024)*. Paper #142677. <https://doi.org/10.1115/DETC2024-142677>
- 54.** JL Butterfield,[^] JR Quigley,[^] **CJ Bruns**^{*}. Smart Tattoos from Intradermally Implantable Photochromic Nanosensors for Personal Ultraviolet Sensing and Dosimetry. *Adv. Funct. Mater.* **2024**, 2405831. doi.org/10.1002/adfm.202405831
- 53.** J-B Kauzya, B Hayes, AC Hayes, JF Thompson, C Bellerjeau, K Evans, J Osio-Norgaard, G Gavai, K Dikshit,[^] **C Bruns**, R MacCurdy, RA Street, GL Whiting.^{*} Direct ink writing of viscous

- inks in variable gravity regimes using parabolic flights. *Acta Astronautica* **2024**, 219, 569–579. doi.org/10.1016/j.actaastro.2024.03.037
52. Purnendu, ^ J Hartcher-O'Brien, V Mehta, N Colonnese, A Gupta, **CJ Bruns**, P Agarwal.* Fingertip Wearable High Resolution Electro-Hydraulic Interface for Multi-modal Haptics. 2023 *IEEE World Haptics Conference (WHC)*, Delft, Netherlands, **2023**, 299-305. doi.org/10.1109/WHC56415.2023.10224383
 51. SC Lamont, K Weishaar, **CJ Bruns**, FJ Vernerey.* Micromechanics and Damage in Slide-Ring Networks. *Phys. Rev. E* **2023**, 107, 044501. doi.org/10.1103/PhysRevE.107.044501
 50. KV Dikshit, ^ AM Visal, ^ F Janssen, ^ A Larsen, ^ **CJ Bruns**.* Pressure-Sensitive Supramolecular Adhesives Based on Lipoic Acid and Bio-Friendly Dynamic Cyclodextrin and Polyrotaxane Cross-Linkers. *ACS Appl. Mater. Interf.* **2023**, 15, 17256–17267. doi.org/10.1021/acsami.3c00927
 49. M Atreya, S DeSousa, J-B Kauzya, E Williams, K Dikshit, ^ A Hayes, J Nielson, A Palmgren, S Khorchidian, S Liu, A Gopalakrishnan, E Bihar, **CJ Bruns**, R Bardgett, JN Quinton, J Davies, JC Neff, GL Whiting.* A Transient Printed Soil Decomposition Sensor based on a Biopolymer Composite Conductor. *ACS Appl. Electron. Mater.* **2023**, 10, 2205785 doi.org/10.1002/advs.202205785
 48. Y Sui, AN Radwan, A Gopalakrishnan, K Dikshit, ^ **CJ Bruns**, CA Zorman, GL Whiting.* A Reactive Inkjet Printing Process for Fabricating Biodegradable Conductive Zinc Structures. *Adv. Eng. Mater.* **2023**, 25: 2200529. doi.org/10.1002/adem.202200529
 47. KV Dikshit, ^ **CJ Bruns**.* Slide-Ring Materials Based on Self-Assembled Polyrotaxane “Molecular Necklaces”. In *Supramolecular Nanotechnology. Advanced Design of Self-Assembled Functional Materials*. M Conda-Sheridan, O Azzaroni (Eds.) Weinheim: Wiley-VCH GmbH, **2023**. 565–594. doi.org/10.1002/9783527834044.ch21
 46. **CJ Bruns**.* Moving Forward in the Semantic Soup of Artificial Molecular Machine Taxonomy. *Nature Nanotechnol.* **2022**, 17, 1231–1234. doi.org/10.1038/s41565-022-01247-5
 45. M Atreya, G Marinick, C Baumbauer, KV Dikshit, ^ S Liu, C Bellerjeau, J Nielson, S Khorchidian, A Palmgren, Y Sui, R Bardgett, D Baumbauer, **CJ Bruns**, JC Neff, AC Arias, GL Whiting.* Wax Blends as Tunable Encapsulants for Soil-Degradable Electronics. *ACS Appl. Electron. Mater.* **2022**, 4, 4912–4920. doi.org/10.1021/acsaelm.2c00833
 44. H Kwon, ^ B Newell, **CJ Bruns**.* Redox-Switchable Host-Guest Complexes of Metallocenes and [8]Cycloparaphenylene. *Nanoscale* **2022**, 14, 14276–14285. doi.org/10.1039/d2nr03852h
 43. KV Dikshit, ^ **CJ Bruns**.* Chemorheological Monitoring of Cross-Linking in Slide-Ring Gels Derived from α -Cyclodextrin Polyrotaxanes. *Front. Chem.* **2022**, 10:923775. doi.org/10.3389/fchem.2022.923775
 42. JL Butterfield, ^ GP Penoncello, KV Dikshit, ^ **CJ Bruns**.* A Photochromic Intradermal Smart Tattoo Based on Diarylethene-Doped Polystyrene Nanoparticles for Personal γ -Ray Dosimetry. *ACS Applied Nano Materials* **2022**, 5, 13840–13844. doi.org/10.1021/acsanm.2c01554
 41. H Kwon, ^ **CJ Bruns**.* All-Conjugated Cycloparaphenylene-Polycyclic Aromatic Hydrocarbon Host-Guest Complexes Stabilized by CH– π Interactions. *Nano Research* **2022**, 15, 5545–5555. doi.org/10.1007/s12274-022-4145-5
 40. X Zhou, H Kwon, ^ RR Thompson, R Herman, FR Fronczek, **CJ Bruns**, S Lee.* Scalable Synthesis of [8]Cycloparaphenyleneacetylene via Alkyne Metathesis and Bromination/ Dehydrobromination. *Chem. Commun.* **2021**, 57, 10887–10890. doi.org/10.1039/D1CC04776K
 39. Purnendu, ^ S Novack, E Acome, M Alistar, C Keplinger, MD Gross, **C Bruns**, D Leithinger. Electrifiow: Augmenting Books With Tangible Animation Using Soft Electrohydraulic Actuators *SIGGRAPH '21 Labs*, August 09-13, **2021**, Virtual, USA. doi.org/10.1145/3450616.3464523
 38. Purnendu, ^ S Novack, E Acome, C Keplinger, M Alistar, MD Gross, **C Bruns**, D Leithinger. Electrifiow: Soft Electrohydraulic Building Blocks for Prototyping Shape-changing Interfaces, In *Designing Interactive Systems Conference 2021 (DIS '21)*, June 28-July 2, **2021**, Virtual Event. ACM, New York, NY, USA, 10 pages. doi.org/10.1145/3461778.3462093
 37. Purnendu, ^ E Acome, C Keplinger, MD Gross, **C Bruns**, D Leithinger. Soft Electrohydraulic Actuators for Origami Inspired Shape-Changing Interfaces. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI '21 Extended Abstracts)*, May 8–13, **2021**, Yokohama, Japan. ACM, New York, NY, USA, 6 pages. doi.org/10.1145/3411763.3451590
 36. KV Dikshit, ^ **CJ Bruns**.* Post-Synthesis Modification of Slide-Ring Gels for Thermal and Mechanical Reconfiguration. *Soft Matter* **2021**, 17, 5248–5257. doi.org/10.1039/D0SM02260H

35. A Parameswar, KV Dikshit,[^] S Movafaghi, **CJ Bruns**, AP Goodwin.* Mechanochemistry Activated Covalent Conjugation Reactions in Soft Hydrogels Induced by Interfacial Failure. *ACS Appl. Mater. Interfaces* **2021**, 13, 1486–1492. doi.org/10.1021/acsami.0c18432
34. JL Butterfield,[^] SP Keyser,[^] KV Dikshit,[^] H Kwon,[^] MI Koster, **CJ Bruns**.* Solar Freckles: Long-Term Photochromic Tattoos for Intradermal UV Radiometry. *ACS Nano* **2020**, 14, 13619–13628. doi.org/10.1021/acs.nano.0c05723
33. M Atreya, K Dikshit,[^] G Marinick, J Nielson, **C Bruns**, GL Whiting.* Poly(lactic acid)-Based Ink for Biodegradable Printed Electronics With Conductivity Enhanced Through Solvent Aging. *ACS Appl. Mater. Interfaces* **2020**, 12, 23494–23501. doi.org/10.1021/acsami.0c05196
32. **CJ Bruns**.* Exploring and Exploiting the Symmetry-Breaking Effect of Cyclodextrins in Mechanomolecules. *Symmetry* **2019**, 11, 1249–1271. doi.org/10.3390/sym11101249
31. D Sluysmans, F Devaux, **CJ Bruns**, JF Stoddart,[>] A-S Duwez.* Dynamic Force Spectroscopy of Synthetic Oligorotaxane Foldamers. *Proc. Natl. Acad. Sci. U.S.A.* **2018**, 115, 9362–9366. doi.org/10.1073/pnas.1712790115
30. D Sluysmans, S Hubert, **CJ Bruns**, Z Zhu, JF Stoddart,[>] A-S Duwez.* Synthetic Oligorotaxanes Exert High Forces When Folding Under Mechanical Load. *Nat. Nanotech.* **2018**, 13, 209–213. doi.org/10.1038/s41565-017-0033-7

Prior to CU Boulder:

29. S Loser, SJ Lou, BM Savoie, **CJ Bruns**, A Timalsina, MJ Leonardi, T Harschneck, R Turrissi, N Zhou, CL Stern, AA Sarjeant, A Facchetti.* RPH Chang.* SI Stupp,* MA Ratner.* LX Chen,* TJ Marks.* Systematic Evaluation of Structure-Property Relationships in Heteroacene-Diketopyrrolo-pyrrole Molecular Donors for Organic Solar Cells. *J. Mater. Chem. A* **2017**, 5, 9217–9232. doi.org/10.1039/C7TA02037F
28. CC Slack, JA Finbloom, K Jeong, **CJ Bruns**, DE Wemmer, A Pines, MB Francis.* Rotaxane Probes for Protease Detection by ¹²⁹Xe HyperCEST NMR. *Chem. Commun.* **2017**, 53, 1076–1079. doi.org/10.1039/C6CC09302G
27. JA Finbloom, CC Slack, **CJ Bruns**, K Jeong, DE Wemmer, A Pines, MB Francis.* Rotaxane-Mediated Suppression and Activation of Cucurbit[6]uril for Molecular Detection by ¹²⁹Xe HyperCEST NMR. *Chem. Commun.* **2016**, 52, 3119–3122. doi.org/10.1039/C5CC10410F
26. **CJ Bruns**, H Liu,[^] MB Francis.* Near-Quantitative Aqueous Synthesis of Rotaxanes via Bioconjugation to Oligopeptides and Proteins. *J. Am. Chem. Soc.* **2016**, 138, 15307–15310. doi.org/10.1021/jacs.6b10231
25. T Aytun, PJ Santos, **CJ Bruns**, D Huang, AR Koltonow, M Olvera de la Cruz, SI Stupp.* Self-Assembling Tripodal Small-Molecule Donors for Bulk Heterojunction Solar Cells. *J. Phys. Chem. C* **2016**, 120, 3602–3611. doi.org/10.1021/acs.jpcc.5b10064
24. X Hou,⁼ C Ke,⁼ **CJ Bruns**, PR McGonigal, RB Pettman, JF Stoddart.* Tunable Solid-State Fluorescent Materials for Supramolecular Encryption. *Nat. Commun.* **2015**, 6, 6884. doi.org/10.1038/ncomms7884
23. **CJ Bruns**,⁼ D Fujita,⁼ M Hoshino, S Sato, JF Stoddart,* M Fujita.* Emergent Ion-Gated Binding of Cationic Host-Guest Complexes Within Cationic M₁₂L₂₄ Molecular Flasks. *J. Am. Chem. Soc.* **2014**, 136, 12027–12034. doi.org/10.1021/ja505296e
22. **CJ Bruns**, JF Stoddart.* Rotaxane-Based Molecular Muscles. *Acc. Chem. Res.* **2014**, 47, 2186–2199. doi.org/10.1021/ar500138u
21. **CJ Bruns**, M Frasconi, J Iehl, KJ Hartlieb, ST Schneebeli, C Cheng, SI Stupp,* JF Stoddart.* Redox Switchable Daisy Chain Rotaxanes Driven by Radical-Radical Interactions. *J. Am. Chem. Soc.* **2014**, 136, 4714–4723. doi.org/10.1021/ja500675y **Featured in JACS Spotlights**
20. **CJ Bruns**, J Li, M Frasconi, ST Schneebeli, J Iehl, H-P Jacquot de Rouville, SI Stupp,[>] GA Voth,* JF Stoddart.* An Electrochemically and Thermally Switchable Donor-Acceptor [c2]Daisy Chain Rotaxane. *Angew. Chem., Int. Ed.* **2014**, 53, 1953–1958. doi.org/10.1002/anie.201308498
19. **CJ Bruns**, JF Stoddart.* Mechanically Interlaced and Interlocked Donor-Acceptor Foldamers. *Adv. Polym. Sci.* **2013**, 261, 271–294. doi.org/10.1007/12_2013_245
18. AC Fahrenbach, **CJ Bruns**, H Li, A Trabolsi, A Coskun, JF Stoddart.* Ground-State Kinetics of Bistable Redox-Active Donor-Acceptor Mechanically Interlocked Molecules. *Acc. Chem. Res.* **2014**, 47, 482–493. doi.org/10.1021/ar400161z

17. **CJ Bruns**,⁼ DJ Herman,⁼ JB Minuzzo, JA Lehrman, SI Stupp.^{>*} Rationalizing Molecular Design in Electrodeposition of Anisotropic Lamellar Nanostructures. *Chem. Mater.* **2013**, 25, 4330–4339. doi.org/10.1021/cm402505p
16. A Ruiz-Carretero, T Aytun, **CJ Bruns**, CJ Newcomb, W-W Tsai, SI Stupp.^{>*} Stepwise Self-Assembly to Improve Solar Cell Morphology. *J. Mat. Chem. A* **2013**, 1, 11674–11681. doi.org/10.1039/C3TA12411H
15. A Guerrero, SC Loser, G Garcia-Belmonte, **CJ Bruns**, J Smith, H Miyauchi, SI Stupp,[>] J Bisquert,^{*} TJ Marks.^{*} Solution-Processed Small Molecule: Fullerene Bulk-Heterojunction Solar Cells: Impedance Spectroscopy Deduced Bulk and Interfacial Limits to Fill-Factor. *Phys. Chem. Chem. Phys.* **2013**, 15, 16456–16462. doi.org/10.1039/C3CP52363B
14. M Juriček,⁼ JC Barnes,⁼ EJ Dale, W-G Liu, NL Strutt, **CJ Bruns**, NA Vermeulen, K Ghooray, AA Sarjeant, CL Stern, YY Botros, WA Goddard III,^{*} JF Stoddart.^{>*} Ex²Box: Interdependent Modes of Binding in a Two-Nanometer-Long Synthetic Receptor. *J. Am. Chem. Soc.* **2013**, 135, 12736–12746. doi.org/10.1021/ja4052763
13. **CJ Bruns**, JF Stoddart.^{>*} Molecular Machines Muscle Up. *Nat. Nanotech.* **2013**, 8, 9–10. doi.org/10.1038/nnano.2012.239
12. Z Zhu, **CJ Bruns**, H Li, J Lei, C Ke, Z Liu, S Shafaie, HM Colquhoun, JF Stoddart.^{>*} Synthesis and Solution-State Dynamics of Donor-Acceptor Oligorotaxane Foldamers. *Chem. Sci.* **2013**, 4, 1470–1483. doi.org/10.1039/C3SC00015J
11. JC Barnes,⁼ M Juriček,⁼ NL Strutt, M Frasconi, S Sampath, MA Giesener, PL McGrier, **CJ Bruns**, CL Stern, AA Sarjeant, JF Stoddart.^{>*} ExBox: A Polycyclic Aromatic Hydrocarbon Scavenger. *J. Am. Chem. Soc.* **2013**, 135, 183–192. doi.org/10.1021/ja307360n
10. **CJ Bruns**, JF Stoddart.^{>*} The Mechanical Bond: A Work of Art. *Top. Curr. Chem.* **2012**, 323, 19–72. doi.org/10.1007/128_2011_296
9. CM Gothard,⁼ **CJ Bruns**,⁼ NA Gothard, BA Grzybowski, JF Stoddart.^{>*} Modular Synthesis of Bipyridinium Oligomers and Corresponding Donor-Acceptor Oligorotaxanes with Crown Ethers. *Org. Lett.* **2012**, 14, 5066–5069. doi.org/10.1021/ol302301r
8. H-P Jacquot de Rouville, J Iehl, **CJ Bruns**, PL McGrier, M Frasconi, AA Sarjeant, JF Stoddart.^{>*} A Neutral Naphthalene Diimide [2]Rotaxane. *Org. Lett.* **2012**, 14, 5188–5191. doi.org/10.1021/ol3022963
7. AN Basuray, H-P Jacquot de Rouville, KJ Hartlieb, T Kikuchi, NL Strutt, **CJ Bruns**, MW Ambrogio, A-J Avestro, ST Schneebeli, AC Fahrenbach, JF Stoddart.^{>*} The Chameleonic Nature of Diazopyrenium Recognition Processes. *Angew. Chem., Int. Ed.* **2012**, 51, 11872–11879. doi.org/10.1002/anie.201205089
6. AC Fahrenbach, KJ Hartlieb, C-H Sue, **CJ Bruns**, G Barin, S Basu, MA Olson, YY Botros, A Bagabas, N Khadry, JF Stoddart.^{>*} Rapid Thermally Assisted Donor-Acceptor Catenation. *Chem. Commun.* **2012**, 48, 9141–9143. doi.org/10.1039/C2CC34427K
5. AC Fahrenbach, **CJ Bruns**, D Cao, JF Stoddart.^{>*} Ground-State Thermodynamics of Redox-Active Donor-Acceptor Mechanically Interlocked Molecules. *Acc. Chem. Res.* **2012**, 45, 1581–1592. doi.org/10.1021/ar3000629
4. S Loser, **CJ Bruns**, H Miyauchi, R Ponce Ortiz, A Facchetti,^{*} SI Stupp,^{>*} TJ Marks.^{*} A Naphthodithiophene-Diketopyrrolopyrrole Donor Molecule for Efficient Solution-Processed Solar Cells. *J. Am. Chem. Soc.* **2011**, 133, 8142–8145. doi.org/10.1021/ja202791n
3. **CJ Bruns**, S Basu, JF Stoddart.^{>*} Improved Synthesis of 1,5-Dinaphtho[38]Crown-10. *Tetrahedron Lett.* **2010**, 51, 983–986. doi.org/10.1016/j.tetlet.2009.12.060
2. RS Forgan, DC Friedman, CL Stern, **CJ Bruns**, JF Stoddart.^{>*} Directed Self-Assembly of a Ring-in-Ring Complex. *Chem. Commun.* **2010**, 5861–5863. doi.org/10.1039/C0CC00776E **Front Cover**
1. S Boonya-Udtayan, N Yotapan, C Woo, **CJ Bruns**, S Ruchirawat, N Thasana.^{>*} Synthesis and Biological Activities of Azalamellarins. *Chem. Asian J.* **2010**, 5, 2113–2123. doi.org/10.1002/asia.201000237

Non-Peer-Reviewed Publications

4. **CJ Bruns**,^{*} W Wang,^{*} K Hirose.^{*} Editorial: Recent Advances in Mechanically Bonded Molecules. *Front. Chem.* **2022**, 10:1095082. doi.org/10.3389/fchem.2022.1095082
3. **CJ Bruns**.^{*} Dynamic tattoos promise to warn wearers of health threats. *The Conversation*, **2020**. <https://theconversation.com/dynamic-tattoos-promise-to-warn-wearers-of-health-threats-133040>

2. CA Drahl.* Conversation with **Carson Bruns**. *ACS Cent. Sci.* **2019**, 5, 201–202.
doi.org/10.1021/acscentsci.9b00098 (Also appeared in *Chemical and Engineering News*, Volume 97, Issue 11. cenm.ag/bruns)
1. **CJ Bruns**.* The Rise of Smart Tattoos. *TEDxMileHigh*, **2019**. <https://www.tedxmilehigh.com/rise-smart-tattoos/>

Patents Pending

7. KV Dikshit,^ A Visal,^ **CJ Bruns**. Pressure-Sensitive Supramolecular Adhesives. *U.S. Patent Application 18/771,169*. Filed 12 July 2024.
6. **C Bruns**, J Butterfield,^ H Kwon,^ E Gardner. Photochromic and Photoprotective Polymer Nanoparticle Pigments and Formulations for Topical Use. *PCT Patent Application No. PCT/US24/25637*. Filed 22 April 2024.
5. **C Bruns**, J Butterfield,^ H Kwon,^ E Gardner. Ortho-Phthalaldehyde-Functionalized Ultraviolet Absorbers and Visible Chromophores for Semi-Permanent Topical Applications. *PCT Patent Application No. PCT/US24/25644*. Filed 22 April 2024.
4. K McCurdy, **C Bruns**, J Butterfield,^ J Osis. Electronic Multi-Lamp Pen for Activating Photo-Responsive Materials. *U.S. Patent Application 18/405,270*. Filed 5 January 2024.
3. K Shara,^ A Plum, M Graybill, **CJ Bruns**. Systems and Methods for Transferring Free Flowing Material and Facilitating the Reaction Thereof. *U.S. Patent Application 18/702,885*. 19 April 2024.
2. JL Butterfield,^ **CJ Bruns**. Multistable Photochromic Pigments for Intradermal Use in Re-Writable Tattoos and Intradermal Ultraviolet Dosimetry. *PCT Patent Application No. PCT/US2022/022802* Filed 31 March 2022.
1. JL Butterfield,^ **CJ Bruns**. Ultraviolet-Absorptive Nanoparticles and Microparticles for Intradermal Use. *PCT Application PCT/US2021/47941*. Filed 27 August 2021.

RESEARCH FUNDING & GIFTS	Value	Role	Portion	Dates
• <i>Molecular Machine Terminology</i> . International Union of Pure & Applied Chemistry (IUPAC) Project #2024-004-2-100	\$5000	PI	100%	7/8/24-7/7/26
• <i>Magic Ink</i> . Colorado OEDIT Advanced Industries Early Stage Capital & Retention Grant	\$250,000	PI	HYPRSKN	11/16/23-11/15/24
• CAREER: Intradermal Biocompatibility of Nanoparticles as Minimally Invasive Implant for Human Health. NSF #2235902	\$605,170	PI	100%	9/1/23-8/31/27
• <i>A Versatile Robotic System for Automating Organic Chemistry Operations in the Laboratory</i> . OEDIT AIA Proof of Concept / CU Lab Venture Challenge Award	\$62,500	PI	100%	4/1/23-8/31/24
• Collaborative Research: FW-HTF-R: RoboChemistry: Human-Robot Collaboration for the Future of Organic Synthesis NSF #2222952	\$1,820,478	PI	33%	9/1/22-8/31/25
• <i>Efficient, Scalable, Compostable Thin-Film BioPolymer Nanogenerators</i> . Facebook Research Award (PI: K. Jayaram)	\$149,259	Co-PI	50%	1/1/22-6/30/23
• <i>Smart Tattoos</i> . Venture Partners / OEDIT Pandemic HyperAccelerator for Science & Technology (PHAST) Grant	\$25,000	PI	100%	8/1/21-1/25/22
• <i>Single-Particle Mechanics for Biocompatibility Studies of Anti-Photocarcinogenic Tattoos</i> . CU COSINC-CHR Material Characterization Project Award	\$4,000	PI	100%	7/1/21-12/31/21
• <i>Self-Assembly of Shape-Defined Micro-Hydrogels: Top-Down Meets Bottom-Up</i> . NSF #2106158	\$457,946	PI	100%	7/1/21-6/30/24
• <i>"Invisible Melanin": Permanent Transparent Tattoos that Reduce Skin Cancer and Aging Rates</i> . Colorado OEDIT Advanced Industries Accelerator Proof of Concept Award #CTGG1 2021-2891	\$189,441 (25% CU cost share)	PI	100%	11/19/20-4/30/23
• <i>Transient Mechanics of Active Slide-Ring Networks: From Molecular Motors to Molecular Machine</i> . NSF #2023179 (PI: F. Vernerey)	\$477,044	Co-PI	50%	1/1/21-12/31/23
• <i>Microscopic Intradermal Implants for Biomedical Tattoos</i> . CU UROP Faculty Team Grant	\$3,000	PI	100%	AY 20/21

• <i>Colloidal Rotaxanes: Polymer Particles with Mechanical Bonds</i> . ACS PRF #59067-DNI7	\$110,000	PI	100%	9/1/18-8/31/20
• <i>Robotic Chemists: Automating the Synthesis of Multifunctional Materials</i> . CU MFM / ASIRT Seed (PI: D. Szafir)	\$30,000	Co-PI	50%	Spring 2018
• <i>A Chemistry Automation Robot</i> , VEX Robotics - Supplies Gift	\$16,000	PI	100%	2020-23

RESEARCH MENTORING

Postdocs	Dates Mentored	Current Position
Subhankar Mandal	June 2023–present	Postdoctoral Research Associate, CU
Hyejin Kwon	June 2018–December 2021	Director of Chemical R&D, HYPRSKN

PhD Students	Dates Mentored	Current Position
Joshua Coffie	August 2023–present	PhD Student, CU
Diane Jung	January 2023–present	PhD Student, CU
Aseem Visal	August 2021–present	PhD Student, CU
Purnendu	September 2018–January 2024	Postdoctoral Researcher, EPFL
Kailey Shara	June 2018–December 2023	PhD Student, CU
Karan Dikshit	January 2018–August 2022	R&D Engineer, Thintronics
Jesse Butterfield	September 2017–May 2022	Co-Founder, HYPRSKN

MS Students	Dates Mentored	Current Position
Jackson Pope	Spring 2021	PhD Student, CU
Ninad Mehta	Fall 2019–Spring 2020	FEA Engineer, Caterpillar, Inc.
Sean Keyser	May–December 2019	PhD Student, CU

Undergraduate Students	Dates Mentored
Mollie Stockton	October 2024–present
Kaylan Madrid	December 2024–present
Colin Watkins	September 2024–present
Roan Gerrald	September 2024–present
Ariana Morales Garcia	September 2024–present
Ignacio Lorente Montero	March 2024–June 2024
Emma Thomure	January 2024–present
Caitlin Rogers	September 2023–present
Zoe Zeidler	September 2023–May 2024
Neely Quirk	September 2022–May 2024
Julie Clarke	October 2021–May 2022
Femke Janssen	August 2021–May 2023
Teis Hart	August 2021–May 2022
Ferin von Reich	January 2021–December 2022
Jaime Wickersheim	Summer 2021
Elderied McKinney	Summer 2021
Matthew Kim	Spring 2021
Jennifer Quigley	Fall 2020–Summer 2021
Justin Hall	Summer 2020–Spring 2021
Rita Kamenetskiy	Spring–Summer 2020
Xuedan Filmore	Spring 2020
Emily Powis	Summer 2019
Ian Stokes	Summer 2019
Kiley Hartigan	April 2019–May 2020
Nicole Leon-Molina	Spring 2019
Aya Ishikawa	March 2019–May 2020
Sarah Sadeq	September–December 2018
Phillip Vo	January–December 2018
Hanwei Liu	March 2015–June 2016
Peter J. Santos	December 2012–May 2014
Brett Anderson	September 2011–May 2012

High School Students**Dates Mentored**

Ramshreyas Mangu

Summer 2024

Samuel Scott

Summer 2024

Collin Bunch

September 2023–May 2024

TEACHING

Courses Developed	Course Number		Semester
Color	ATLS-4519/5519		Fall 2017
Courses Taught	Course Number	Enrollment	Semester
Research Career Development (co-taught)	ATLS-7600-002	6	Spring 2024
Materials Science	MCEN-2024-002	76	Fall 2023
Color	ATLS-4141	17	Fall 2023
Research Career Development (co-taught)	ATLS-7600-002	6	Spring 2023
Color	ATLS-4141	18	Fall 2022
Chemistry for Materials and Energy Science	MCEN-1024-001	42	Fall 2022
Color	ATLS-4141	31	Spring 2022
Research Career Development (co-taught)	ATLS-5519-006	11	Spring 2022
Color	ATLS-4519/5519	14	Fall 2020
Chemistry for Materials and Energy Science	MCEN-1024-003	47	Fall 2020
Color	ATLS-4519/5519	10	Fall 2019
Chemistry for Materials and Energy Science	MCEN-1024-110	54	Fall 2019
Chemistry for Materials and Energy Science	MCEN-1024-120	66	Fall 2019
Color	ATLS-4519/5519	22	Fall 2018
Chemistry for Materials and Energy Science	MCEN-1020	43	Spring 2018
Color	ATLS-4519/5519	11	Fall 2017

Independent Study Students

	Course Number	Semester
Jacqueline Rivera	ATLS-5900	Spring 2024
Neely Quirk	MCEN-4848	Fall 2023
Zoe Zeidler	MCEN-4848	Fall 2023
Femke Jannsen (senior thesis)	CHEN-4010	AY 2022/23
Ferin von Reich	ATLS-4900-906	Spring 2021
Jackson Pope	MCEN-6848-900	Spring 2021
Justin Hall	MCEN-4848-924	Fall 2020
Sophie Adams	ATLS-4900-901	Spring 2020
Kailey Shara	ATLS-7900-904	Spring 2020
Aya Ishikawa	MCEN-4848-905	Spring 2019
Kailey Shara	ATLS-5900-901	Summer 2018
Phillip Vo	MCEN-4848-905	Spring 2018

INVITED TALKS

- 41.** Using Molecular Nano-Pulleys to Dissipate Stress in Bio-Friendly Soft Materials 15 August 2024
CU Boulder Innovation in Materials Science Symposium
- 40.** Integrating Molecular Machinery in Smart Materials: From Adhesives to Tattoos 16 February 2024
ACS Chicago Section Meeting
- 39.** How Nanotechnology will Transform Tattoos 27 November 2023
Radically Tender Tattoo Seminar, Berlin, Germany (Virtual Talk)
- 38.** Smart Tattoos for Human Health 28 September 2023
Douglas County Vintage & Vibrant Seniors Event, Parker, Colorado
- 37.** Research in the Emergent Nanomaterials Lab 13 September 2023
TTI Vanguard Field Trip, Boulder, Colorado

36. How Nanotechnology will Transform Tattoos <i>17th BMXNet Conference, Berlin, Germany</i>	9 September 2023
35. How Nano- and Microtechnology will Transform Tattoos <i>127th AFDO Educational Conference, Norfolk, VA</i>	13 June 2023
34. Intradermal Smart Tattoos Converging Nanoscience and Body Art <i>Molecular & Cellular Biology Symposium, University of Washington</i>	14 April 2023
33. Active Nanomaterials Powered by Nanomachines: From Smart Adhesives to Smart Tattoos. <i>University of Denver Department of Chemistry Seminar</i>	19 January 2023
32. Cobots in the Chemical R&D Lab <i>HUMAIN Future Lab Virtual Keynote, Ruhr-Universität Bochum</i>	5 December 2022
31. HYPRSKN: The Future of Skin <i>CatalyzeCU Guest Speaker Series</i>	19 May 2022
30. Finding Applications for Molecular Machines: Smart Adhesives to Smart Tattoos <i>Northwestern University Undergraduate Chemistry Council Colloquium</i>	13 May 2022
29. Tuning the unusual stress dissipation & actuation properties of slide-ring networks <i>2022 Boulder Workshop on Soft & Active Matter Mechanics</i>	28 April 2022
28. Unleashing the Power of Nanomachines <i>Paul M. Rady Dept. of Mechanical Engineering Strategic Advisory Board Meeting</i>	12 April 2022
27. Tattoos for Human Health: The Future of Smart Tattoos <i>Swedish American Historical Museum (Virtual)</i>	7 April 2022
26. Smart Tattoos <i>Teen Café, Lafayette Public Library</i>	31 March 2022
25. Biomedical Smart Tattoos <i>6th USERN Conference, Istanbul, Turkey</i>	8 November 2021
24. Unleashing the Power of Molecular Nanomachines <i>ATLAS Institute Annual Board of Directors Meeting</i>	15 October 2021
23. Tattoo Ink: Past, Present, Future <i>Susquehanna University Honors Colloquium, Selinsgrove, PA</i>	30 September 2021
22. Biomedical Applications of Tattoos <i>125th Annual Association of Food and Drug Officials Education Conference</i>	16 June 2021
21. Molecular Nanoengineering of Functional Materials <i>Brigham Young University Cheminar</i>	4 February 2021
20. Self-Assembling and Interlocking Polycyclic Aromatic Hydrocarbons. <i>ChemPhysChem 2nd Virtual Seminar</i>	22 October 2020
19. Biomedical Tattoos for Human Health. <i>University of Zurich Department of Chemistry Seminar</i>	15 April 2020
18. Smart Tattoos (https://youtu.be/wULG5olhbLA) <i>CU Boulder NEXT Buftalk, New York, NY, USA</i>	27 February 2020
17. Tattoos for Health: The Future of Smart Tattoos <i>Vesterheim Museum Fall Lecture Series, Luther College, Decorah, IA</i>	24 November 2019
16. Biomedical Tattoos for Human Health <i>CU Anschutz School of Pharmacy Graduate Seminar</i>	17 October 2019
15. The Future of Tattoos <i>Colorado Tattoo Convention & Expo, Denver, CO</i>	28 September 2019
14. Cultivating Creativity <i>ACTIVE Faculty Development and Leadership Program, CU Boulder</i>	27 September 2019
13. Chameleon Tattoos <i>Teen Science Café, Belmar Library, Lakewood, CO</i>	25 September 2019
12. Creativity in Biomedical Research <i>Boettcher Biomedical Summit, Denver, CO</i>	15 September 2019
11. Beyond Wellness Wearables: Get Ready for Smart Tattoos <i>me Convention by SXSW / Mercedes-Benz, Frankfurt, Germany</i>	12 September 2019
10. Can a Tattoo Help You Stay Healthy? go.ted.com/carsonbruns <i>TEDxMileHigh, Denver, Colorado</i> >700,00 Online Views	1 December 2018
9. Passionate Optimization (co-presented with Ben Shapiro) <i>ACTIVE Faculty Development and Leadership Program, CU Boulder</i>	1 November 2018

8. Skin 19 October 2018
Todd Reed Salon Series, Boulder, CO
7. Tech Tattoos: Tissue Engineering with Dermally Implanted Nanomaterials. 10 October 2018
International Symposium on Advanced Molecular Sciences
East China University of Science and Technology, Shanghai, China
6. Leveraging Artificial Molecular Machines in Active Soft Matter Systems 10 August 2018
CU Boulder Active Matter Workshop, Boulder, Colorado

Prior to CU:

5. Biochemical Applications of Rotaxanes 21 July 2016
Molecular Rotors, Motors, and Switches Conference.
Telluride Science Research Center, Telluride, Colorado
4. Host-Guest Chemistry Inside of Large, Self-Assembled Molecular Flasks 7 November 2014
5th Interdisciplinary Science Forum of the JSPS-US-AA
The University of Florida, Gainesville
3. Emergent Ion-Gated Binding of Host-Guest Complexes Within M₁₂L₂₄ Molecular Flasks 13 August 2014
248th ACS National Meeting and Exposition, San Francisco
2. The Art and Science of (re)Presentation and the Mechanical Bond 1 July 2014
Molecular Rotors, Motors, and Switches Workshop.
Telluride Science Research Center, Telluride, Colorado, USA
1. Self-Assembly of Organic-Inorganic Hybrids 1 March 2011
Northwestern University Department of Chemistry Organic Seminar

POSTERS (All Prior to CU)

9. **Bruns, C. J.**; Liu, H.; Finbloom, J. A.; Slack, C. C.; Jeong, K.; Wemmer, D. E.; Pines, A.; Francis, M. B. Utilizing the Mechanical Bonds of Rotaxanes in Bioconjugation and Controlled Release 10–14 July 2016
11th International Symposium on Macrocyclic & Supramolecular Chemistry (ISMSC), Seoul, South Korea
8. **Bruns, C. J.**; Liu, H.; Francis, M. B. Protein Mounted Rotaxanes. 28 June–2 July 2015
10th International Symposium on Macrocyclic & Supramolecular Chemistry (ISMSC), Strasbourg
Selected as a winner of the Springer ISMSC2015 Poster Prize
7. **Bruns, C. J.**; Frasconi, M.; Zhu, Z.; Sluysmans, D.; Stupp, S.; Duwez, A.-S.; Stoddart, J. F. Rotaxane-Based Molecular Muscles 7–12 June 2015
Gordon Research Conference on Artificial Molecular Switches and Motors, Easton, MA, USA
6. **Bruns, C. J.**; Frasconi, M.; Zhu, Z.; Sluysmans, D.; Stupp, S.; Duwez, A.-S.; Stoddart, J. F. Rotaxane-Based Molecular Muscles 6–10 April 2015
2015 MRS Spring Meeting, San Francisco, USA
5. **Bruns, C. J.**; Stoddart, J. F. Molecular Switches and Machines with Mechanical Bonds 30 June–4 July 2014
Molecular Rotors, Switches, and Machines Workshop, Telluride
Science Research Center, Telluride, Colorado, USA
4. **Bruns, C. J.**; Frasconi, M.; Li, J.; Schneebeli, S. T.; Iehl, J.; Jacquot de Rouville, H.-P.; Hartlieb, K. J.; Cheng, C.; Stupp, S. I.; Voth, G. A.; Stoddart, J. F. Donor-Acceptor Daisy Chain Rotaxanes: Thermally and Electrochemically Switchable Molecular Muscles 16–17 December 2013
RSC Macrocyclic and Supramolecular Chemistry Meeting. University of Glasgow, Scotland
3. **Bruns, C. J.**; Tayi, A. S.; Stupp, S. I.; Stoddart, J. F. From Switchable Mechanical Molecules to Artificial Muscles 5 April 2012
DOE Non-Equilibrium Energy Research Center Review. Baltimore, MD, USA
2. **Bruns, C. J.**; Fahrenbach, A. C.; Fujita, D.; Basu, S.; Fujita, M.; Stoddart, J. F. Pseudorotaxanation Within an Electrostatically-Gated M₁₂L₂₄ Coordination Sphere. 6–10 June 2010
5th International Symposium on Macrocyclic & Supramolecular Chemistry (ISMSC), Nara, Japan
Selected as a winner of the Springer ISMSC2010 Poster Prize
1. **Bruns, C. J.**; Thasana, N. Cu^I-Mediated Microwave-Assisted Synthesis of Azalamellarins 6–10 April 2008
235th National ACS Meeting. New Orleans, Louisiana, USA

PROFESSIONAL MEMBERSHIPS

Phi Beta Kappa Honors Society	Inducted 2008
Phi Lambda Upsilon Honorary Chemical Society, <i>Alpha Gamma Chapter</i>	Inducted 2010
JSPS-US Fellows Alumni Association	Inducted 2013
American Chemical Society	2011–Present
Materials Research Society	2015–Present
American Institute of Chemical Engineers	2015–Present
The Society of Rheology	2019–Present

SERVICE

Department / Unit Service

Chair, Graduate Committee, ATLAS Institute	AY 22/23 & 23/24
Graduate Committee, Biomedical Engineering Program	AY 23/24
DEI Committee, Paul M. Rady Dept. of Mechanical Engineering	AY 22/23 & 23/24
ATLAS Faculty Search Committee	Spring 2024
External Relations Committee, Paul M. Rady Dept. of Mechanical Engineering	2020–2021
Graduate Committee, ATLAS Institute	2020–present
MCEN Materials Science Preliminary Exam Committee Lead	2019, 2020
ATLAS Executive Committee	2018–2020
Chair, Graduate Engineering Annual Research & Recruitment Symposium	AY 2019/20
Vice Chair, Graduate Engineering Annual Research & Recruitment Symposium	AY 2018/19
CU Boulder Department of Mechanical Engineering Graduate Committee	2018–2020
ATLAS Institute ARPAC Self-Study Committee	AY 2017/18
Miller Institute Multidisciplinary Symposium Planning Committee	AY 2015/16
Northwestern Gelowitz Award Selection Committee	May 2013

College / University Service

Advisory Board, Prospects of Soft Matter Student Club	AY 2021/22
<i>Art is Engineering</i> Pop-Up Workshop, Engineering Center Lobby	3 Mar 2020
ACTIVE Faculty Development Program, Speaker / Advisor	2018, 2019
BOLD Center Partner: Goldshirt interviews, Research 101, Bring Bold Out	2018, 2021
Engineering Design Expo Judge	8 Dec 2018
CU Boulder CEAS Soft Materials Faculty Search Committee	AY 2017/18

Professional Service

Chair, IUPAC Task Group on Molecular Machine Nomenclature	May 2024-present
NSF Panelist (DMR / LEAPS-MPS, Panel ID P212676)	July 2021
Topic Collection Editor, <i>Frontiers in Chemistry</i>	2021–2022
Advisory Board, <i>Vantis Institute</i>	2020–present
Editorial Board, <i>Symmetry</i> Journal	2019–2020
<i>ad hoc</i> proposal reviewer for ACS Petroleum Research Fund	2018, 2022
<i>ad hoc</i> proposal reviewer for U.S. Department of Energy	2020–2021
<i>ad hoc</i> proposal reviewer for Swiss National Science Foundation	2020
Refereed for <i>Science</i> , <i>Nature Nanotechnology</i> , <i>Nature Chemistry</i> , <i>Nature Communications</i> , <i>Journal of the American Chemical Society</i> , <i>Advanced Materials</i> , <i>PNAS</i> , <i>ACS Applied</i> <i>Materials & Interfaces</i> , <i>Accounts of Chemical Research</i> , <i>Journal of Chemical Physics</i> , <i>Journal of Physical Chemistry</i> , <i>Journal of Organic Chemistry</i> , <i>Science Advances</i> , <i>Progress in</i> <i>Polymer Science</i> , <i>Chemical Science</i> , <i>ChemPlusChem</i> , <i>Symmetry</i> , <i>Molecules</i> , <i>Polymers</i> , <i>Biomechanics</i> , <i>Environmental Science: Nano</i> , <i>Materials</i> , <i>Gels</i> , <i>Processes</i> , <i>Chinese</i> <i>Chemical Letters</i> , <i>Nanomaterials</i> , <i>Pharmaceutics</i> , <i>Laser & Photonics Reviews</i> , <i>ACS Macro</i> <i>Letters</i> , <i>Chemistry</i> , <i>Advanced Sensor Research</i>	

MEDIA RECOGNITION / PRESS COVERAGE

News: [CNN](#), [NPR Marketplace](#), [The Conversation](#), [New York Post](#), [Chemical & Engineering News](#), [ACS Central Science](#), [Colorado Public Radio](#), [Denver Post](#), [Newsy](#), [Daily Mail](#) (x2), [Hindustan Times](#), [NRC Handelsblad](#), [CU Boulder Today](#), [Deutsche Welle](#), [Axios](#), [Global Cosmetics News](#), [Drug Discovery News](#)

Magazines: [People](#), [Inked](#), [Chemistry World](#), [Elements](#), [The Rooster](#), [The Coloradoan](#), [GQ](#), [Diversity in Action](#)

Blogs: [TED*MileHigh](#), [ThinkBig](#)

Radio / podcasts: [The Disruptors](#), [Underfutures](#), [WORT Madison](#), [KUNC](#), ABC Radio Tasmania, [Discovery Arc](#)

Television: [The History Channel](#), [Denver CBS 4 News](#), [Denver 7 News](#)
