

# IAN D. DRYG, Ph.D.

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United States Citizen

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## Profile:

### Innovative and motivated scientist looking for exciting opportunities in R&D and Bioinformatics/Data Science.

- Enthusiastic scientist with 9 years of experience using a variety of wet lab and bioinformatics techniques to study brain inflammation (PhD), and immuno-oncology (post-PhD).
- Strong interest in further exploring data science, bioinformatics/computational biology, next-gen sequencing technologies, digital pathology, and spatial biology technologies (i.e. multiplexed IHC, multi-omics, spatial transcriptomics).
- Experienced remote worker.

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## Skills:

**Computational:** Python (Pandas, Numpy, Scipy, Matplotlib, Plotnine, Sklearn, Pythologist), R (DESEQ2, Seurat, Tidyverse), Git / Version Control, GSEA, Linux, Data Analysis & Presentation, Image Analysis, FIJI (ImageJ), Microsoft Office (Excel, Powerpoint, Word)

**Technical:** Flow Cytometry, Immunohistochemistry, Tissue Histology, Polymer Chemistry, Bioconjugation (EDC-NHS), Electrical Impedance Spectroscopy, Electrophysiology

**Imaging:** Immunofluorescence, Confocal and Widefield Microscopy, Optical Coherence Tomography, Scanning Electron Microscopy

**Mol. Bio:** Primary Cell Isolation, Cell Culture, ELISA, PCR, Protein Chemistry

**Animal:** Rat & Mouse: Handling, Anesthesia, Injections, Surgery, Euthanasia, Cardiovascular Perfusions

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## Education:

**2013 – 2019**      **University of Washington – Seattle, WA**  
**Ph.D.** – Bioengineering, August 2019  
Concentration – Neural Engineering, Neural Interfaces, Foreign Body Reaction, Inflammation, Biomaterials  
Thesis – Modulating Neuroinflammation with Porous Templated Scaffolds  
GPA – 3.7 / 4.0

**2012 – 2013**      **Purdue University – West Lafayette, IN**  
**M.S.** – Biomedical Engineering, May 2013  
Concentration – Neural Engineering, Neural Interfaces, Reactive Tissue Response  
Thesis – Magnetically Inserted Flexible Electrodes: Tissue Response and Functional Lifetime  
GPA – 3.75 / 4.0

**2008 – 2012**      **Purdue University – West Lafayette, IN**  
**B.S.** – Biomedical Engineering Major, Mathematics Minor, May 2012  
GPA – 3.63 / 4.0

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## Research Experience:

**2022 – Present**      **Scientist**  
**2021 – 2022**      **Computational Biologist II**  
Dana-Farber Cancer Institute – Boston, MA, USA / Remote

Department of Data Science / Knowledge Systems Group / Center for Immuno-Oncology

- Interfaced as a bridge between clinical experts (Pathologists) and computational experts (Data Scientists).
- Conducted in-depth analyses on various clinical studies, from mining and rearranging large multi-institution datasets to exploring hypotheses with individual research labs.
- Utilized python for data wrangling, analysis, and visualization of large datasets, including OncDRS (a database of cancer patients at Dana-Farber related institutions) and several single-cell spatial datasets from stained tissue biopsies of clinical trials.
- Performed spatial analysis of multiplexed immunofluorescence tissue samples to test hypotheses and better understand how spatial organization of cells affects clinical outcomes in cancer. Utilized our custom-made pipeline for spatial biology called Pythologist (python + pathologist).
- Analyzed various RNA sequencing datasets using standard tools in R, including bulk RNA-seq (DESEQ2) and single-cell RNA-seq (Seurat).

2020 – Present **Postdoctoral Researcher**

**NYU Langone Health** – New York, NY, USA

Advisor: Amanda Lund Ph.D., Department of Dermatology

- Applied CODEX multiplexed immunohistochemistry with 26+ markers to visualize and quantify high-dimensional, spatially resolved distribution of cells in human melanoma and lymph node metastasis.
- Collaborated with multiple labs integrating multiplexed IHC and spatial transcriptomics data to train a machine learning model for cancer prognosis prediction.
- Analyzed RNA sequencing datasets using standard tools in R, including bulk RNA-seq (DESEQ2) and single-cell RNA-seq (Seurat).
- Performed GSEA on bulk RNA-seq data to identify enriched transcriptional phenotypes in tumor associated and egressed CD8+ T-cells.

2015 – 2019 **PhD Student Researcher**

**University of Washington** – Seattle, WA, USA

Advisors: Buddy Ratner Ph.D. & James Bryers Ph.D.

PhD Dissertation: *Modulating Neuroinflammation with Porous Templated Scaffolds*

- Extensive experience implementing *in vivo* and *in vitro* experiments to understand the effects of engineered biomaterial parameters on the foreign body reaction resulting in data for several publications and pilot grant funding of \$50,000 (Institute for Translational Health Sciences at UW).
- Completed immunohistological analyses (IHC, IF) on various tissues (primarily CNS) from end to end: animal implant surgeries, tissue preparation in sectioning, antibody staining, tissue clearing or expansion, fluorescence microscopy, data acquisition, analysis and data visualization.
- Led development of pHEMA/GMA co-polymer with stiffness and pore size tunability for device/tissue interfacing
- Collaborated with chemical engineering students developing polyurethane-based and surface-modified polymers for improved biocompatibility of implanted devices
- Published multiple articles in peer reviewed journals.
- Presented scientific presentations and poster presentations at 15+ internal and 4 international conferences.
- Built network of local collaborators in order to facilitate polymeric brain implant testing in a rat model.
- Isolated primary immune and neurological cells and performed multi-parameter flow cytometry with data analysis in FCS Express, FlowJo and Excel.
- Maintained familiarity with advances in the field and with scientific literature to become a subject matter expert for histopathology, flow cytometry, electron microscopy, immunofluorescence and confocal microscopy, regenerative biomaterials, and brain-computer interfaces.
- Mentored, supervised, and trained 1 undergraduate and 1 graduate student researcher who have continued successful scientific and medical careers.

2013 – 2015 **PhD Student Researcher**

**University of Washington / Seattle Children's Research Institute** – Seattle, WA, USA

Advisor: Bill Shain Ph.D.

- Collaborated with groups from UW, SDSU, and MIT, and Blackrock Microsystems. Developed implantable neural devices which avoid, control, or investigate reactive brain tissue responses.
- Characterized the functionality of various neural interfaces using electrophysiology, impedance spectroscopy, and tissue histology.

**2014 Summer Visiting Scholar**

**University of Freiburg – Freiburg, Germany**

Advisor: Ulrich Hofmann Ph.D.

Visiting Scholar Thesis: *Optical Coherence Tomography for Online Monitoring of Brain Implants*

- Collaborative international exchange using Optical Coherence Tomography (OCT) for real-time monitoring of tissue responses surrounding implantable neural devices *in vivo*, compared with traditional immunohistochemistry.

**2011 – 2013 Masters Student Researcher**

**Purdue University – West Lafayette, IN, USA**

Advisor: Pedro Irazoqui Ph.D.

Masters Thesis: *Magnetically Inserted Neural Electrodes: Tissue Response and Functional Lifetime*

- Can smaller implant size, faster insertion speed, and inert electrode material reduce the tissue response in the brain; and increase functional lifetimes for neural prostheses?

**2011 – 2012 Summer Research Intern**

**Purdue University and Northwestern University– West Lafayette, IN, USA and Chicago, IL, USA**

Advisors: Pedro Irazoqui Ph.D. (Purdue) & Todd Kuiken M.D. (Northwestern)

Senior Design Thesis: *The Osseo-Magnetic Link – A Prosthetic for Transradial Amputees*

- Developed a prosthetic arm to allow transradial amputees more intuitive and accurate control of wrist rotation.

**2010 Undergraduate Researcher**

**Purdue University – West Lafayette, IN, USA**

Advisor: Alyssa Panitch Ph.D.

Undergraduate Research Thesis: *Local treatment of osteoarthritis using cytokines harvested from the patient*

- Utilized ELISA to measure pro- and anti-inflammatory cytokine response to treatment.

**Publications:**

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- 2022** Dalia Barkley, Reuben Moncada, Maayan Pour, Deborah A Liberman, **Ian Dryg**, Gregor Werba, Wei Wang, Maayan Baron, Anjali Rao, Bo Xia, Gustavo S França, Alejandro Weil, Deborah F Delair, Cristina Hajdu, Amanda W Lund, Iman Osman, Itai Yanai. "Cancer cell states recur across tumor types and form specific interactions with the tumor microenvironment." *Nature Genetics* 54 (8), 1192-1201
- 2022** Maria Steele, **Ian Dryg**, Dhaarini Murugan, Julia Femel, Haley du Bois, Cameron Hill, Sancy Leachman, Young Hwan Chang, Lisa Coussens, Abhinav Jaiswal, Ines Delclaux, Sunny Son, Niroshana Anandasabapathy, Amanda Lund. "T cell egress via lymphatic vessels is tuned by antigen encounter and limits tumor control." *Nature Immunology* (In Press)
- 2022** Maria M. Steele, **Ian D. Dryg**, Dhaarini Murugan, Julia Femel, Haley du Bois, Cameron Hill, Sancy A. Leachman, Young H. Chang, Lisa M. Coussens, Amanda W. Lund. "T cell Egress via Lymphatic Vessels Limits the Intratumoral T cell Repertoire in Melanoma." *bioRxiv* 2022.05.30.494080. Preprint. doi: <https://doi.org/10.1101/2022.05.30.494080>
- 2021** **I. Dryg**, Y. Xie, M. Bergmann, G. Urban, W. Shain, U.G. Hofmann. "Long-term in vivo Monitoring of Gliotic Sheathing of Ultrathin Entropic Coated Brain Microprobes with Fiber-based Optical Coherence Tomography." *bioRxiv* (2020). Preprint.
- 2017** C. Boehler, C. Kleber, N. Martini, Y. Xie, **I. Dryg**, T. Stieglitz, U. Hofmann, M. Asplund. "Actively controlled release of Dexamethasone from neural microelectrodes in a chronic in-vivo study." *Biomaterials* (2017). Print.
- 2016** Noah Goshi, M. Vomero, **Ian Dryg**, S. Seidman, Sam Kassegne. "Modeling and Characterizing of Tissue/Electrode Interface in Capacitive ECoG Glassy Carbon Electrodes." *ECS Transactions*. (2016)

- 2016 Maria Vomero, **Ian Dryg**, Tyler Maxfield, William Shain, Steve Perlmutter, Sam Kassegne. "In-Vivo characterization of Glassy Carbon-Electrodes and Histological Analysis of Brain Tissue after Chronic Implants." ECT Transactions. (2016)
- 2015 **Dryg, Ian**, Matthew Ward, Kurt Qing, Henry Mei, Jeremy Schaffer, and Pedro Irazoqui. "Magnetically Inserted Neural Electrodes: Tissue Response and Functional Lifetime." Transactions on Neural Systems and Rehabilitation Engineering (2015).Print.

#### **Presentations:**

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- 2022 **Society for Immunotherapy of Cancer (SITC) Conference – Boston, MA**  
Poster Title: Exploring features and parameters for neighborhood analysis in human cancer multiplexed immunofluorescence data
- 2022 **Society for Immunotherapy of Cancer (SITC) Conference – Boston, MA**  
Poster Title: Standardizing the analysis of spatial imaging features in tumor samples
- 2019 **Society for Biomaterials Conference – Seattle, WA**  
Poster Title: Porous Hydrogels for Neural Implants: Effect of Pore Size on Glial Encapsulation
- 2018 **NeuroFutures Conference – Seattle, WA**  
Poster Title: Directing Brain Tissue Integration for Long-Term Electrophysiology with Conductive Microporous Hydrogel Electrodes
- 2018 **Gordon Conference for Neuroelectronic Interfaces – Galveston, TX**  
Poster Title: Directing Brain Tissue Integration for Long-Term Electrophysiology with Conductive Microporous Hydrogel Electrodes
- 2017 **SPIE Photonics West – San Francisco, CA**  
Poster Title: Online Monitoring of Tissue Responses to Plasma Coated Rigid Neural Implants using Fiber-based Optical Coherence Tomography
- 2015 **Biomaterials Seminar: University of Washington – Seattle, WA**  
Presentation Title: Tissue Responses to Neural Implants
- 2015 **NSF Site Visit: UW Center for Sensorimotor Neural Engineering – Seattle, WA**  
Poster Title: First-ever optical monitoring of brain implants; comparison with traditional tissue histology
- 2014 **First Annual NeuroFutures Conference – Seattle, WA**  
Poster Title: Correlating tissue responses with recording performance of implanted and brain-surface electrodes
- 2014 **NSF Site Visit: UW Center for Sensorimotor Neural Engineering – Seattle, WA**  
Poster Title: Correlating tissue responses with recording performance of implanted and brain-surface electrodes
- 2013 **Cyberonics, Inc. – Houston, TX**  
Event: Educational/Informational Class on Neuroscience for Employees of Cyberonics, Inc.  
Presentation Title: Neural Interfaces
- 2012 **American Epilepsy Society Annual Meeting – San Diego, CA**  
Poster Title: Magnetically Inserted Flexible Microelectrodes Reduce the Reactive Tissue Response
- 2012 **Undergraduate Research Poster Symposium – West Lafayette, IN**  
Poster Title: Active Sensor for Proprioception in Trans-radial Amputees
- 2011 **TechCon – Austin, TX**  
Poster Title: Active Sensor for Proprioception in Trans-radial Amputees
- 2011 **Undergraduate Research Poster Symposium – West Lafayette, IN**

#### Grants/Awards:

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- 2016**      **Institute for Translational Health Sciences Collaboration Grant**  
Project: Modulating Neuroinflammation after Spinal Cord Injury using Porous Templated Scaffolds
- 2014**      **NSF Center for Sensorimotor Neural Engineering Student Seed Grant – January 2014**  
Project: Correlating Surface and Implantable Electrode recording Performance using focal Drug Delivery and light evoked responses  
Each student is the PI of his/her grant. Provides funding for a research project. Awarded to a handful of graduate students within the CSNE.
- 2014**      **NSF Center for Sensorimotor Neural Engineering Research Grant**  
Project: Correlating Surface and Implantable Electrode recording Performance using focal Drug Delivery and light evoked responses  
Awarded to a handful of graduate students within the CSNE. Covers tuition, stipend, etc.

#### Honors:

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- 2015**      **2nd Place - DARPA C4C Combinator Innovation Competition**  
Project: Combine 2 or more DARPA-funded research projects to develop new product/business ideas.
- 2012**      **Undergraduate Research Poster Symposium**  
Award: Purdue Engineering Student Council Award  
Poster Title: Active Sensor for Proprioception in Trans-radial Amputees
- 2011**      **1st Place - Undergraduate Research Poster Symposium**  
Award: First Place in Innovative Technology/Entrepreneurship & Design  
Poster Title: Multi-modal Flexible Neural Prosthesis Combining Optical, Chemical, and Electrical Stimulation
- 2008 – 2012**      **Purdue University Presidential Scholarship – \$10,000 per year**  
High academic achievement; Demonstrated experience in leadership, service, and/or school or community activity.
- 2000 – 2008**      **Boy Scouts of America – Troop 89, Bettendorf, IA**  
Eagle Scout; Patrol Leader; Den Chief

#### Interests/Activities:

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- General:**      Outdoors sports | Photography | Music | Fitness
- 2014 – 2019**      **University of Washington Climbing Club** – Rock Climbing, Mountaineering, Ski touring
- 2014 – 2018**      **University of Washington Kayak Club** – Whitewater and Sea Kayaking
- 2008 – 2013**      **Purdue Outing Club** – Outdoor Adventure Sports  
Positions: President, Whitewater Kayaking Consultant  
Activities: Whitewater Kayaking, Rock Climbing, Caving, Mountain Biking
- 2009 – 2012**      **Purdue Tomahawk** – Leadership and Community Service  
Positions: Pledge Mentor, Social Coordinator
- 2009 – 2013**      **Purdue Biomedical Engineering Society**
- 2009 – 2011**      **Purdue Rescue Squad** – Provide medical assistance at Purdue Football Games
- 2006**      Eagle Scout – Boy Scouts of America