

Heather J. Ray

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Professional Appointments

2020-present	Assistant Professor , Dep.t of Biological Sciences, Idaho State University
2018-present	Social Media Coordinator , Cell and Developmental Biology of <i>Xenopus</i> Course, Cold Spring Harbor Laboratory
2016-2020	IRACDA-MERIT Postdoctoral Fellow , Dept. Cell, Development and Integrative Cell Biology, University of Alabama Birmingham Advisor: Dr. Chenbei Chang
2019	Adjunct Instructor , Lawson State Community College, Birmingham, AL
2006-2010	Research Science Associate I , Dept. of Biology, University of Texas at San Antonio Advisor: Dr. Bernard Arulanandam

Education

2019	Developmental Biology Teaching Workshop , Darling Marine Science Center, Univ. of Maine
2018	Teaching certificates, Associate and Practitioner , Center for Integration of Teaching and Learning (CIRTL)
2017	Cell and Developmental Biology of <i>Xenopus</i> Course , Cold Spring Harbor Laboratory
2010-2016	Ph.D., Cell Biology, Stem Cells and Development , University of Colorado Anschutz Medical Campus Advisor: Dr. Lee Niswander Dissertation: Cellular and molecular investigations of non-neural ectoderm during murine neural tube closure
2008-2009	M.S., Biology , University of Texas at San Antonio Advisor: Dr. Bernard Arulanandam Thesis: The Fischer 344 rat reflects human susceptibility to <i>Francisella</i> pulmonary challenge and provides a new platform for virulence and protection studies
1995-1999, 2006	B.S. Biology, Honors Scholar , Oregon State University

Journal Publications

1. Groome, J.R., **Ray H.**, Chahine M. (2022) Editorial: Emerging Perspectives in Sodium Channelopathies. *Front. Pharmacol.* 13:1019004. Doi: 10.2289/fphar.2022.101904
2. **Ray, H.J.**, Chang, C. (2020) The transcription factor Hypermethylated in Cancer 1 (Hic1) regulates neural crest migration via interaction with Wnt signaling. *Dev. Biol.* 463: 169-181
3. Popov, I.K., **Ray, H.J.**, Skoglund, P., Keller, R., Chang, C. (2018) The RhoGEF protein Plekhg5 regulates apical constriction of bottle cells during gastrulation. *Development* 145:dev168922
4. Alkobtawi, M.*, **Ray, H.J.***, Barriga, E. H., Moreno, M., Kerney, R., Monsoro-Burq, AH., Saint-Jennet, JP, Mayor, R. (2018) Characterization of Pax3 and Sox10 transgenic *Xenopus laevis* embryos as tools to study neural crest development. *Dev. Biol.* 444: S202-S208 *Authors contributed equally
5. **Ray, H.J.**, Niswander, L (2016) Dynamic behaviors of the non-neural ectoderm during mammalian cranial neural tube closure. *Dev Biol* 416 (2): 279-85

6. **Ray, H.J.**, Niswander, L. (2016) Grainyhead-like 2 Downstream Targets act to suppress epithelial-to-mesenchymal transition during neural tube closure. *Development* 143 (7): 1192-204
7. Massarwa, R., **Ray, H.J.**, Niswander, L. (2013) Morphogenetic movements in the neural plate and neural tube: mouse. *WIREs Dev Biol.* doi: 10.1002/wdev.120
8. **Ray, H.J.**, Niswander, L. (2012) Mechanisms of tissue fusion during development. *Development* 139: 1701-1711
9. Signarovitz, A.L., **Ray, H.J.**, Yu, J.J., Guentzel, M.N., Chambers, J.P., Klose, K.E., Arulanandam, B.P. (2012) Mucosal immunization with live attenuated *francisella novicida* U112 Δ IgIB protects against pulmonary *F. tularensis* SCHU S4 in the fischer 344 rat model. *PLoS One.* 7(10): e47639
10. Li, L., Zeng, Y., Fang, K., Xiao, Y., Jin, H., **Ray, H.**, Chan, J. (2012) Anetodermic pilomatricoma: molecular characteristics and trauma in the development of its bullous appearance. *Am J Dermatopathol.* 34(4): e41-5
11. **Ray, H.J.**, Chu, P, Wu, T.H., Lyons, C.R., Klose, K.E., Guentzel, M.N., Arulanandam, B.P. (2010) The Fischer 344 rat reflects human susceptibility to *Francisella* pulmonary challenge and provides a new platform for virulence and protection studies. *Plos One* 5 (4): e9952
12. **Ray, H.J.**, Cong, Y., Murthy, A.K., Selby, D.M., Klose, K.E., Barker, J.R., Guentzel, M.N., Arulanandam, B.P. (2009) Oral live vaccine strain induced protective immunity against pulmonary *Francisella tularensis* challenge is mediated by CD4⁺ T cells and antibodies including IgA. *Clin Vaccine Immunol.* 16: 444-452.
13. **Powell, H.J.***, Cong, Y., Yu, J., Guentzel, M.N., Berton, M., Klose, K.E., Murthy, A.K., Arulanandam, B.P. (2008) CD4⁺ T cells are required during priming but not the effector phase of antibody-mediated IFN- γ -dependent protective immunity against pulmonary *Francisella* infection. *Immunol. Cell. Biology.* 86: 515-522. *Author's maiden name

Open-forum Publications

1. Navajas Acedo, J., Angermeier, A., Plygawko, A., Miller, A., Chaterjee, S., Wallingford, J., Michaux, G., Steventon, B., Behringer, R., Bergstrahl, D., **Ray, H.J.** Model Organism Databases: The Community Speaks... *The Node, community site for and by developmental and stem cell biologists*, (2021)
2. **Ray, H.J.** This year for Christmas, gift yourself with an amazing experience. Apply today for the 2018 CSHL Cell and Developmental Biology of *Xenopus* Course. *The Node, community site for and by developmental and stem cell biologists.* (2017)

Invited Presentations/Conferences

1. Mannan-binding lectin associated serine protease 1 (Masp1) is involved in ectodermal patterning during early *Xenopus laevis* development, National Society of Developmental Biology Conference, **July, 2022**
2. Masp1: A new player in ectodermal patterning? Northwest Regional Society of Developmental Biology Conference, **March, 2021 (talk)**
3. Mechanistic insight into Hypermethylated in Cancer (HIC1/2) transcription factors involved in complex developmental disorders, *Developmental Disorders: From Mechanism to Treatment*, **August, 2021 (talk)**
4. Investigating the Role of Mannan-binding Lectin Associated Serine Protease 1/3 (masp1/3) during early development, National Society of Developmental Biology Conference, **July, 2021**
5. Explorations of tumor suppressor function in neural crest development, Neural Crest Research Colloquium, invited seminar, **April, 2021 (talk)**
6. There and back again: a scientist's tale, University of Colorado Anschutz Medical Campus, CSDV seminar series, invited seminar, **April, 2021 (talk)**

7. Investigating the Role of Mannan-binding Lectin Associated Serine Protease 1/3 (masp1/3) during early development, Northwest Regional Society of Developmental Biology Conference, **September 2020 (talk)**
8. The Transcription Factor Hypermethylated in Cancer 1 (Hic1) Interacts with Canonical and Non-canonical Wnt Signaling Pathways During Neural Crest Migration, Society of Developmental Biology National Conference, Boston, MA, **July 2019**
9. Design of a hybrid classroom/laboratory course to increase community college student awareness of and interest in research science careers, National IRACDA Conference, Ann Arbor, MI, **June 2019 (talk)**
10. The Transcription Factor Hypermethylated in Cancer 1 (Hic1) Interacts with canonical and Non-canonical Wnt Signaling During Neural Crest Development, Southeast Regional Society of Developmental Biology Conference, Birmingham, AL. **May 2019**
11. The Transcription Factor Hypermethylated in Cancer 1 (Hic1) Interacts with Wnt Signaling Pathways During Neural Crest Migration, 17th International Xenopus Conference, Seattle, WA, **August 2018 (talk)**
12. The Tumor Suppressor Hypermethylated in Cancer 1 (Hic1) Interacts with Wnt Signaling Pathways During Neural Crest Migration, Society of Developmental Biology National Conference, Portland, OR **July 2018**
13. The Tumor Suppressor Hypermethylated in Cancer 1 (Hic1) Interacts with Wnt Signaling Pathways During Neural Crest Migration, National IRACDA Conference, Atlanta, GA, **July 2018**
14. The Tumor Suppressor Hypermethylated in Cancer 1 (Hic1) Interacts with Wnt Signaling Pathways During Neural Crest Migration, Southeast Regional Society of Developmental Biology Conference, Athens, GA, **May 2018 (talk)**
15. Investigating Hypermethylated in cancer 1 (Hic1) Function during Early *Xenopus* Development, Society of Developmental Biology National Conference, Minneapolis, MN, **July 2017**
16. Investigating Hypermethylated in cancer 1 (Hic1) Function during Early *Xenopus* Development, National IRACDA Conference, Birmingham, AL, **June 2017**
17. Grh12-like 2 Suppresses Epithelial-to-Mesenchymal Transition During Neural Tube Closure through Activation of Novel EMT Suppressors. International Conference on Neural Tube Defects, Austin, TX, **October 2015 (talk)**
18. Grh12-like 2 Suppresses Epithelial-to-Mesenchymal Transition During Neural Tube Closure and Cancer Progression through Activation of Novel EMT Suppressors. Society of Developmental Biology National Conference, Snowbird, UT, **July 2015**
19. Grh12 as a suppressor of EMT during murine neural tube closure. Society of Developmental Biology National Conference, Seattle, WA, **July 2014**
20. Grh12 as a suppressor of EMT during murine neural tube closure. Southwest Regional Meeting for the Society of Developmental Biology, Denver, CO, **February 2014 (talk)**
21. A Novel Live Imaging System for the Study of Epithelial Dynamics in the Mammalian Embryo. 8th Winter Conference of the European Society for Molecular Imaging, Les Houches, France, **January 2014 (talk)**
22. Grh12-regulated suppression of EMT in non-neural ectoderm during murine neural tube fusion. International Conference on Neural Tube Defects, Austin, TX, **October 2013 (talk)**
23. The role of Grh12-regulated non-neural ectoderm during murine neural tube fusion. Southwest Regional Meeting for the Society of Developmental Biology, Salt Lake City, Utah, **February 2013**
24. Analysis of phagocytic activity of rat macrophages for *Francisella tularensis*. 6th International Conference on Tularemia, Berlin, Germany, **September 2009**.
25. A defined intranasal vaccine against pulmonary tularemia requires the effective induction of MHC Class II-dependant humoral immunity. 13th International Congress of Mucosal Immunology, Tokyo, Japan, **July 2007 (talk)**
26. Intranasal vaccination with a defined attenuated *Francisella novicida* strain induces MHC Class II-dependant protection against tularemia. 5th International Conference on Tularemia, Woods Hole, Massachusetts, **October 2006**

Funded Grants

Extramural:

- 2022 Grinath, A.S. (PI), Martin, J. (Co-PI), Loxterman, J. (Co-PI), Pak, J (Co-PI), **Ray, H.J.** (Senior Personnel). *SPARK a FIRE for Transfer Student Success Using a Multidisciplinary Approach*. Project period: 10/01/2022-9//30-2028. Scholarships on Science, Technology, Engineering, and Mathematics Program (Track 2), National Science Foundation (**\$1,499,956**)
- 2022 Serve, K. (PI), Grinath, A.S. (Co-PI), Barrott, J. (Co-PI), **Ray, H.J.** (Senior Personnel). *MRI: Acquisition of a FACSMelody Flow Cytometer*. Project period 10/1/2022-9/30/2025. Major Research Instrumentation Program, National Science Foundation (**\$262,971**)
- 2022 **Ray, H.J.** (PI). *Gene Expression Changes in Response to Hic1 and Hic2 Loss of Function During Craniofacial Development*. Project period: 4/1/2022-5/1/2024. Partners in Science Program, M.J. Murdock Charitable Trust (**\$19,000**)
- 2021 **Ray, H.J.** (PI), Pradhan, D. (Co-PI). Gene Regulatory Networks in a Sexually Plastic Fish. Project Period: 7/1/2022-6/30/2023. GEM3 Vertically Integrated Project (VIP) Funding, Idaho EPSCoR, National Science Foundation (**\$12,000**)

Intramural:

- 2021 **Ray, H.J.** (PI), Pradhan, D. (Co-PI). *Mechanisms regulating Phenotypic Plasticity in a Highly Social Hermaphroditic Fish*. Project Period: 12/1/21-1/31/2023. Internal Small Grant Program, ISU Office for Research (**\$10,000**)
- 2021 Ray, H.J. (PI). *Uncovering the Function of the MASP-1 Protein in Early Embryonic Development*. Project Period: 10/1/21-6/1/2022. SBOE HERC Undergraduate Research Funds, ISU Office for Research (**\$8,000**)

Honors and Awards

- 2020 6th annual NIGHTSEA/EMS KEY Award for new faculty
- 2019 Postdoctoral Career Enhancement Award from the Office of Postdoctoral Education and the University of Alabama Birmingham to attend the Developmental Biology Teaching Workshop at the University of Maine Darling Marine Science Center
- 2019 Best talk in both “full-length” and “3MT” divisions, UAB Postdoctoral Research Day, UAB
- 2018 Travel Award from the Office of Postdoctoral Education at the University of Alabama Birmingham to present my work at the 17th International Xenopus Meeting in Seattle, WA
- 2018 Best poster presentation award at the 2018 National IRACDA Conference in Atlanta, GA
- 2018 Best oral presentation by a post-doctoral fellow, Southeast Regional Society of Developmental Biology conference, Athens, GA
- 2017 Best research talk by a post-doctoral fellow, 2nd place, Department of Cell, Development and Integrative Biology retreat, Guntersville, Al
- 2017 Postdoctoral Career Enhancement Award from the Office of Postdoctoral Education at the University of Alabama Birmingham to attend the Cell and Developmental Biology of *Xenopus* course at Cold Spring Harbor Laboratory, NY

- 2016- Mentored Experiences in Research, Instruction and Teaching (MERIT) Fellowship**, UAB and NIH
2020 National Institute of General Medical Sciences
- 2015 HIRS Travel Award from the University of Colorado Denver Graduate School to attend the Society for Developmental Biology National Conference, Snowbird, UT
- 2015 Nominated for the University of Colorado Anschutz Medical Campus Excellence Award for Outstanding Community Service by an Individual Student
- 2014 Best Student Talk, Cell Biology Stem Cells and Development Graduate Program Retreat, Breckenridge, CO
- 2014 Travel Award from the Society for Developmental Biology National Conference, Seattle, WA
- 2014 Best Student Presentation runner-up, Southwest Regional Society for Developmental Biology Meeting, Denver, CO
- 2014 HIRS Travel Award from the University of Colorado Denver Graduate School to attend the 8th Winter Conference of the European Society for Molecular Imaging, Les Houches, France
- 2013- Ruth L. Kirschstein National Research Service Award (NRSA)**, NIH National Cancer Institute
2016
- 2009 Travel Award from the International Tularemia Conference, Berlin, Germany, **2009**

Courses Taught

Idaho State University

- BIOL 2280/4480/5580: Vertically Integrated Project – Gene Regulatory Networks (Co-taught Dr. D. Pradhan) (F22, S22)
- BIOL 4430/5530: Bioethics (F22)
- BIOL 1101: Biology I (F20, F21)
- BIOL 3324/L: Developmental Biology and lab (S21, S22, S23)

University of Alabama at Birmingham

- GBSC 700: Developmental Biology Journal Club (S19, F19, S20)
- Cell and Molecular Biology Lab, MS in Biomedical and Health Science Program (Su2017)

Lawson State Community College

- BIOL 250: Practical Skills in Scientific Research (S19)
- BIOL 103: Introductory Biology (Co-taught Dr. M. Ellison) (S18, F18)

Stillman College

- STEAM Professionals Club (F17, S17, F18, S18)

University of Colorado Anschutz Medical Campus

- Summer Student Research Bootcamp (Su14, Su15)

Lectures

- Model Systems of Genetic Disorders, University of Alabama Birmingham (S18, S19)
- Chemistry Seminar Course, Oakwood University (S18, F22)
- Cell Signaling Graduate Course, University of Alabama Birmingham (S18, S19)
- Developmental Biology Graduate Course, University of Alabama Birmingham (F17, F19)
- Stem Cells and Development: An Integrated Approach, University of Colorado AMC (S13, S14, S15)

Developmental Neurobiology, University of Colorado AMC, (S13, S14)
Biomedical Core Courses, University of Colorado AMC (F11, F12, F13, F14, F15)

Mentored Research

Graduate and post-baccalaureate students

2020-present Nelly Cyuzuza, B.S., research assistant
2019-2020 Nazia Jamil, UAB PREP scholar
2017-2020 Saeid Mohammad-Parast, PhD student, Graduate Biomedical Sciences program UAB, lab of Dr. C. Chang
2013 Ashley Pacheco, rotating graduate student, Human Medical Genetics and Genomics program
2012 Colby Fees, rotating graduate student, Cell Biology Stem Cells and Development program

Undergraduate Students

Mya McHugh (2022-present), Marley Harrison (2022-present), Miriam Villa Lopez (2022-present), Mikayla Macaluso (2022-present), Maele Christensen (2021-present), Michael Lemos (2021-present), Aaliyah Tovar (2021-present), Emma Villanueva (2021-2022), Marta Monfort Venture (2021), Bailey Barnes (2021), Hannah Frawley (2021), Ben Storms (2021), Madison Roth (2021), Kathryn West (2020-2022), Maaha Jamshaid (2020), Jared Nessen (2020-2021), Yihan Zhong (2019), Autumn Beavers (2018), Onika Abrams (2017)

High School Students

Mason Munro-Ehrlich (2014), Lara Melkiorson (2013), Evan Provan (2012-2013)

Student Advisory Committees

Graduate

Diagnostic Exam Committees:

2020	Gabby Jablonski	MS Student, ISU Biology
2020	Sarah Brockway	MS Student, ISU Biology
2021	Danielle Trawick	MS Student, ISU Biology
2021	Erika Stewart	MS Student, ISU Biology
2021	Ujjwal Adhikari	MS Student, ISU Microbiology
2022	Reuben Opuku	MS Student, ISU Microbiology

Undergraduate

Honors Thesis Committees

2021	McKayla Jensen	BS Student, ISU Biology, Biomedical Sciences
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Service

Professional Community

2022-present Member, Professional Development and Education Committee, Society for Developmental Biology

- 2022-2024 Co-organizer, Northwest Regional Society for Developmental Biology Meeting, Friday Harbor Laboratory, WA
- 2021 Invited Session Chair, Northwest Regional Society for Developmental Biology Meeting, virtual
- 2021 Participant, IRACDA-MERIT program external review site visit
- 2021 Participant, IRACDA-MERIT program internal review
- 2021 Discussion leader for Developmental Biology Virtual Teaching Forum, topic: challenges with “returning to normal” after COVID-19
- 2021-present IRACDA-MERIT program Near-Peer mentorship program
- 2018-2019 Co-organizer, Southeast Regional Society for Developmental Biology Meeting, Birmingham, AL
- 2018-present Social Media Coordinator, Cell and Developmental Biology of Xenopus Course, Cold Spring Harbor Laboratory, NY
- 2018-present Judge for trainee poster/oral presentations, Society for Developmental Biology regional and national meetings

Reviewer Service: Federal Granting Agencies

- 2022 Ad-hoc reviewer, NSF (Developmental Systems)

Reviewer Service: Journals

Differentiation (2022: 1), *Star Protocols* (2022: 2), *Cancers* (2020, 2022: 2), *Toxins* (2021: 1), *Vaccines* (2020: 2)

Journal Service

- 2021-2022 Co-editor, *Frontiers in Pharmacology* section of Ion Channels and Channelopathies, Research Topic “Emerging Perspectives in Sodium Channelopathies”

University

- 2021-present Summer Research Coordinator, ISU INBRE summer fellowship program
- 2022 Participant, focus group for Idaho Making Progress Against Critical Teacher Shortages grant
- 2020-present Alternate member, Institutional Animal Care and Use Committee (IACUC), ISU
- 2018-2019 Vice Chair, Postdoctoral Association, University of Alabama Birmingham
- 2017-2020 Member, Postdoctoral Association Executive Committee, University of Alabama Birmingham
- 2017-2020 Co-chair, Mental Health and Wellness Committee, University of Alabama Birmingham

Departmental

- 2022-present Member, Awards and Scholarships Committee
- 2021-present Member, Graduate Education Committee
- 2021-present Chair, Freezer Space Committee
- 2021 Ad-hoc Tenure and Promotion Committee
- 2021 TT Assistant Professor Search Committee (Environmental and Applied Microbiology)
- 2021-present Participant, Bengal Visit Day
- 2020-present Participant “This is Biology” Speed Networking Event
- 2020-present Student advising, Biology majors in Biomedical Sciences Concentration
- 2013-2016 Student Representative, Graduate Advisory Committee, UCD Anschutz Medical Campus
- 2014 Chair, Student Committee to Appoint Graduate Program Director, UCD Anschutz Medical Campus
- 2012-2014 Chair, CSDV Graduate Program Retreat Planning Committee, UCD Anschutz Medical Campus

Community Education

- 2022 ISU TRIO Upward Bound summer program, lab tours for high school students
- 2022 American Indian Scholars, lab tours for 7-8 grade students
- 2019 Participant, Science Outreach Program, Department of Cell Development and Integrative Biology, Birmingham, AL
- 2012-2016 Science education interactions with Rock Canyon High School Biotechnology students, including job shadowing, Skype interviews, and summer internship opportunities, Littleton, CO
- 2012-2016 Provided lab tours and research discussions with philanthropists and patient families through Children's Hospital Colorado, Aurora, CO
- 2010-present Judge, numerous science fairs at middle and high school levels
- 2002-2004 Developed and ran a Community Outreach Program through Wildlife Rescue and Rehabilitation, Kendalia, TX