

# Geoffrey D Hannigan

## *Curriculum Vitae*

Email: [hanni035@umn.edu](mailto:hanni035@umn.edu)

Website: <http://microbiology.github.io>

### **EDUCATION**

#### **University of Pennsylvania**

Ph.D. ( 2015 )

School of Medicine

Program: Cell & Molecular Biology

Concentration: Gene Therapy & Vaccines

Certification: HHMI Med Into Grad Scholar

#### **University of Minnesota Duluth**

B.S. ( 2011 )

College of Science and Engineering

Major: Cell & Molecular Biology

Minors: Chemistry, Philosophy

### **RESEARCH & RELATED EXPERIENCE**

#### **Bioinformatics Scientist ( July 2017 – Present )**

Merck Research Labs, Exploratory Science Center

Cambridge, MA

Topics: *Human Microbiome, Human Genetics, Virome, Machine Learning, Data Integration*

#### **Postdoctoral Research Fellow ( October 2015 – July 2017 )**

University of Michigan, Medical School

Dr. Patrick Schloss (Principal Investigator)

Topics: *Gut Microbiome, Virome, Virus-Host Interactions, Bioinformatics, Machine Learning*

#### **Scientific Advisory Board Member ( April 2015 – July 2017 )**

SmartPhage, Inc

San Francisco, CA

*Custom Phage Company*

#### **PhD Candidate ( 2012 – 2015 )**

University of Pennsylvania, School of Medicine

Dr. Elizabeth Grice, Ph.D. (Principal Investigator)

Topics: *Skin Microbiome & Virome, Bioinformatics, Dermatologic Disease Etiology*

#### **Undergraduate Researcher ( 2009 – 2011 )**

University of Minnesota Duluth, Department of Biology

Dr. John Dahl, Ph.D. (Principal Investigator)

Topics: *Microbial Ecology, Microbiology, Mycobacteria, Bacteriophages, Biochemistry*

### **Undergraduate Research Fellow ( Summer 2010 )**

Mayo Clinic Graduate School, Department of Virology and Gene Therapy

Dr. Roberto Cattaneo, Ph.D. (Principal Investigator)

Dr. Patricia Devaux, Ph.D. (Research Advisor)

Topics: *Measles Virus Evasion of Immune System, Molecular Biology of Measles Infections*

### **Undergraduate Researcher ( 2008 – 2009 )**

University of Minnesota Duluth, School of Medicine

Dr. Jean Regal, Ph.D. (Principal Investigator)

Topics: *Mechanisms of Lung Injury, Asthma, Allergies, Immunology*

### **COMPUTATIONAL SKILLS**

Bash programming, R, Perl, Python, Julia, MySQL, Neo4j/Cypher, GNU Make, Unix/Linux, Machine Learning, Microbiome processing (Qiime/Mothur), Genomic processing (Bowtie, Blast, etc), RHEL, CentOS, Ubuntu, Mac OS, Windows OS, Windows Office, Adobe Creative Suite (Illustrator/Photoshop)

### **COMPETITIVE GRANTS & FELLOWSHIPS**

**University of Michigan Molecular Mechanisms in Microbial Pathogenesis Fellowship (MMMP)**

2016 - 2017

**National Defense Science & Engineering Graduate Fellowship (NDSEG)**

2012 - 2015

**University of Pennsylvania Biomedical Graduate School TRE Award**

2014-2015

**University of Pennsylvania Biomedical Graduate School Student Travel Award**

2014

**University of Minnesota Undergraduate Research Opportunity Program Grant**

2011

**Mayo Clinic Summer Undergraduate Research Fellowship**

2010

**University of Minnesota Undergraduate Research Opportunity Program Grant**

2009

### **PUBLICATIONS**

**Hannigan GD**, Duhaime MB, Ruffin IV MT, Koumpouras CC, and Schloss PD. In Review. Diagnostic Potential & the Interactive Dynamics of the Colorectal Cancer Virome. *bioRxiv*. doi: 10.1101/152868.

**Hannigan GD**, Duhaime MB, Koutra D, and Schloss PD. 2018. Biogeography and Environmental Conditions Shape Bacteriophage-Bacteria Networks Across the Human Microbiome. *PLOS Computational Biology*. doi: 10.1371/journal.pcbi.1006099.

- Bartow-McKenney C, **Hannigan GD**, Horwinski J, Hesketh P, Horan A, Mehta S, Grice EA. 2018. The Microbiota of Traumatic, Open Fracture Wounds is Associated with Mechanism of Injury. *Wound Repair Regen*. doi: 10.1111/wrr.12642.
- Hannigan GD**, Zheng Q, Meisel JS, Minot S, Bushman FD, Grice EA. 2017. Evolutionary and Functional Implications of Hypervariable Loci Within the Skin Virome. *PeerJ*. doi: 10.7717/peerj.2959.
- Meisel JS, **Hannigan GD**, Tyldsley AS, SanMiguel AJ, Hodkinson BP, Zheng Q, Grice EA. 2016. Skin microbiome characterizations are biased by experimental design. *Journal of Investigative Dermatology*. doi: 10.1016/j.jid.2016.01.016.
- Hannigan GD**, Meisel JS, Tyldsley AS, Zhang Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. 2015. The human skin dsDNA virome: Topographical and temporal diversity, genetic enrichment, and its dynamic associations with the host microbiome. *mBio*. 6(5):e01578-15. doi: 10.1128/mBio.01578-15.
- Hannigan GD**, Hodkinson BP, McGinnis K, Tyldsley AS, Anari JB, Horan AD, Grice EA, Mehta S. 2014. Culture-independent pilot study of microbiota colonizing open fractures and association with severity, mechanism, location, and complication from presentation to early outpatient follow-up. *J Orthop Res*. 32(4):597-605. doi: 10.1002/jor.22578.
- Hannigan GD**, Pulos N, Grice EA, Mehta S. 2014. Current concepts and ongoing research in the prevention and treatment of open fracture infections. *Advances in Wound Care*. doi: 10.1089/wound.2014.0531.
- Hannigan GD**, Weiner DB. 2014. Current Progress in DNA Vaccine Cancer Therapy. *Advanced Textbook on Gene Transfer, Gene Therapy and Genetic Pharmacology*. D. Scherman, Editor. Imperial College Press.
- Hannigan GD**, Grice EA. 2013. Microbial ecology of the skin in the era of metagenomics and molecular microbiology. *Cold Spring Harb Perspect Med*, Fiona Watt and Tony Oro, Editors. doi: 10.1101/cshperspect.a015362.
- Hannigan GD**, Krivogorsky B, Fordice D, Welch JB, Dahl JL. 2013. *Mycobacterium minnesotense* sp. nov., a photochromogenic bacterium isolated from sphagnum peat bogs. *International journal of systematic and evolutionary microbiology* 63: 124-128.

## **PUBLISHED SOFTWARE & CONTRIBUTIONS**

- Hannigan GD**, Loesche MA, Hodkinson BP, Mehta S and Grice EA. 2015. **Creator** (cre), **Author** (aut). patPRO: Visualizing Temporal Microbiome Data. <http://CRAN.R-project.org/package=patPRO>

Oksanen J, et al. 2016. **Contributor** (ctb). Vegan: R Package for Community Ecologists. <http://CRAN.R-project.org/package=vegan>

## **PUBLISHED ABSTRACTS**

### *Oral Presentations*

**Hannigan GD**, Duhaime MB, Ruffin IV MT, Koumpouras CC, and Schloss PD. *Viral and Bacterial Communities of Colorectal Cancer*. American Society for Microbiology General Meeting. June 5, 2017. New Orleans, Louisiana.

**Hannigan GD**, Meisel JS, Tyldsley AS, Zheng Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. *The Human Skin dsDNA Virome: Topographical and Temporal Diversity, Functionality, and its Dynamic Associations with the Host Microbiome*. 5<sup>th</sup> International Human Microbiome Congress. April 2, 2015. Luxembourg, Luxembourg.

**Hannigan GD**, Meisel JS, Tyldsley AS, Zheng Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. *The Human Skin dsDNA Virome: Topographical and Temporal Diversity, Functionality, and its Dynamic Associations with the Host Microbiome*. University of Pennsylvania Dermatology Research Seminar. April 7, 2015. Philadelphia, PA.

**Hannigan GD**, Meisel JS, Tyldsley AS, Zheng Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. *The Human Skin dsDNA Virome: Topographical and Temporal Diversity, Functionality, and its Dynamic Associations with the Host Microbiome*. University of Pennsylvania Gene Therapy and Vaccines Graduate Trainee Research Seminar. March 9, 2015. Philadelphia, PA.

**Hannigan GD**, Meisel JS, Tyldsley AS, Zheng Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. *The Human Skin dsDNA Virome: Topographical and Temporal Diversity, Functionality, and its Dynamic Associations with the Host Microbiome*. University of Pennsylvania Dermatology Basic Research Symposium. October 9, 2014. Philadelphia, PA.

**Hannigan GD**, Hodkinson BP, McGinnis K, Tyldsley AS, Horan AD, Mehta S, Anari JB, Grice EA. *The Dynamic Microbiomes Associated with Traumatic Wound Healing*. 5th Annual HHMI Med Into Grad Symposium. June 14-15, 2013. New Haven, CT.

### *Poster Presentations*

**Hannigan GD**, Duhaime MB, Ruffin IV, MT, Schloss, PD. *Unraveling the Role of the Gut Virome in Colorectal Cancer*. 6<sup>th</sup> International Human Microbiome Congress. November 9-11, 2016.

**Hannigan GD**, Meisel JS, Tyldsley AS, Zheng Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. *The Human Skin dsDNA Virome: Topographical and Temporal Diversity, Functionality, and its Dynamic Associations with the Host Microbiome*. University of Michigan ASM Branch Meeting. October 23-24, 2015. Ann Arbor, MI.

- Hannigan GD**, Meisel JS, Tyldsley AS, Zheng Q, Hodkinson BP, SanMiguel AJ, Minot S, Bushman FD, Grice EA. *The Human Skin dsDNA Virome: Topographical and Temporal Diversity, Functionality, and its Dynamic Associations with the Host Microbiome*. University of Pennsylvania Biomedical, Health, and Natural Sciences Research Day. March 20, 2015. Philadelphia, PA.
- Hannigan GD**, Meisel JS, Tyldsley AS, Zhang Q, Hodkinson BP, SanMiguel AJ, Grice EA. *Topographical and Temporal Diversity of Healthy Human Skin Phage and Bacterial Communities*. 2014 Molecular Genetics of Bacteria and Phages Meeting. August 5-9, 2014. Madison, WI.
- Hannigan GD**, Hodkinson BP, McGinnis K, Tyldsley AS, Anari JB, Horan AD, Grice EA, Mehta S. *The Dynamic Microbiomes Associated with Traumatic Wound Healing*. University of Pennsylvania Biomedical, Health, and Natural Sciences Research Day. April 18, 2014. Philadelphia, PA.
- Hannigan GD**, Hodkinson BP, McGinnis K, Tyldsley AS, Horan AD, Mehta S, Anari JB, Grice EA. *The Dynamic Microbiomes Associated with Traumatic Wound Healing*. University of Pennsylvania Center for Musculoskeletal Disorders Scientific Symposium. November 13, 2013. Philadelphia, PA.
- Hodkinson BP, **Hannigan GD**, McGinnis K, Tyldsley AS, Horan AD, Mehta S, Anari JB, Grice EA. *The Dynamic Microbiomes Associated with Traumatic Wound Healing*. 12th Annual University of Pennsylvania Biomedical Postdoctoral Research Symposium. November 4, 2013. Philadelphia, PA.
- Hannigan GD**, Hodkinson BP, McGinnis K, Tyldsley AS, Horan AD, Mehta S, Anari JB, Grice EA. *The Dynamic Microbiomes Associated with Traumatic Wound Healing*. Building Towards a P50: Injury Science at Penn. May 24, 2013. Philadelphia, PA.
- Hannigan GD**, Hodkinson BP, McGinnis K, Tyldsley AS, Horan AD, Mehta S, Anari JB, Grice EA. *The Dynamic Microbiomes Associated with Traumatic Wound Healing*. 2nd Annual Penn Science Student Research Symposium. April 12, 2013. Philadelphia, PA.
- Devaux P, **Hannigan GD**, Hudacek AW, Cattaneo R. *Characterization of glycine-rich region involved in the interaction between measles virus P protein and STAT1*. 30th Annual Meeting of the American Society for Virology. July 16-20, 2011. Minneapolis, MN.
- Hannigan GD**, Dahl JL. *Mycobacterium arupense in Northern Minnesota Bogs*. 16th Annual University of Minnesota Duluth Undergraduate Research & Artistic Showcase. April 15, 2011. Duluth, MN.
- Hannigan GD**, Regal JF. *Mechanisms of Lung Injury*. 14th Annual University of Minnesota Duluth Undergraduate Research & Artistic Showcase. April 30, 2009. Duluth, MN.

## **FORMAL TEACHING EXPERIENCE**

Workshop Leader, Introduction to R Programming, October 2017  
Workshop Leader, Lab Notebooks and Project Management with GitHub, October 2016  
Workshop Leader, Introduction to R Programming, September 2016  
Workshop Leader, Introduction to Human Virome Analysis, June 2015  
Workshop Leader, Introduction to R Programming, March 2015  
Workshop Leader, Introduction to Bioinformatics & Programming, September 2014  
Teaching Assistant, Undergraduate Genetics Supplemental Instruction. 2010.  
Tutor, Undergraduate Mathematics. 2009.

## **MEMBERSHIP IN PROFESSIONAL SOCIETIES**

**International Society for Viruses of Microorganisms**

Member, 2013-Present

**American Society for Microbiology**

Member, 2013-Present

## **OUTREACH & LEADERSHIP**

**Research Blogger at “Prophage”** (2013 – Present)

**Boston/Cambridge Microbiome Meetup Group Organizer** (April 2018 - Present)

**Ann Arbor R User Group Organizer** (2016 - 2017)

**Co-Leader of Data Analysis Reading Group** (2016 - 2017)

**Program Representative in Biomedical Graduate Student Association** (2013 – 2015)

**Co-founder and Leader of Microbiome Student Journal Club** (2012 – 2015)