

Paul L. Babb

Senior Research Investigator

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QUALIFICATIONS SUMMARY

- **Senior research biologist with background in bioinformatics, genome assembly, and variant detection. Expertise in developing computational pipelines to interrogate heterogeneous data sets and downstream validation experiments.**
 - Proficient in languages Perl, R, Bash, and Python. Working knowledge of XML, HTML, and Java.
 - Computer platforms include Unix, Linux, and Windows. Over six years of experience with high performance cluster computing, parallel processing, and cloud computing (AWS).
 - Bioinformatics tools include Blast, BWA, STAR, GATK, FALCON/pb-assembly, Trinity, AllPaths-LG, Maker2, Augustus, MEME Suite, HMMER, PLINK, EFACTS, VAT, Picard, BEDtools, SAMtools, VCFtools, and PBSuite (among many others).
- **Bioinformatics accomplishments:**
 - *De novo* assembly, annotation, and publication of the first genome of an orb-weaving spider (*Nephila clavipes*). Recently completed the genome of Darwin's bark spider (*Caerostris darwini*), which spins the toughest silk on Earth.
 - Built the first comprehensive catalog of spider silk genes for *N. clavipes* (n=28) using long-read single molecule sequencing. These genes had previously eluded completion, as their repetitive structures prevented full assembly.
 - Designed and implemented a custom molecular inversion probe (MIP) sequencing protocol and variant calling pipeline for the detection of rare noncoding variants in human genomic regions associated with HDL cholesterol. Recently extended this protocol to target loci implicated in type 2 diabetes for a cohort of 25,000 cases and controls.
- **Extensive wet laboratory experience in genetics, molecular biology, and proteomics.**
- **Firsthand participation in US and international fieldwork research and rare specimen collection efforts.**
- **Strong leadership, communication, and collaboration skills.** Spearheaded an international collaborative effort to sequence and assemble two spider genomes. Managed technicians and teaching assistants. Instructed undergraduate and graduate students. Promoted genomic research to high school students. Worked with colleagues to compose peer-reviewed publications, conference presentations, and successful grant proposals.

EMPLOYMENT HISTORY

- 2018-present **Senior Research Investigator**
Depts. of Genetics and Systems Pharmacology, Perelman School of Medicine, University of Pennsylvania
- 2017-2018 **Senior Research Associate**
Depts. of Genetics and Systems Pharmacology, Perelman School of Medicine, University of Pennsylvania

EDUCATION

- 2012-2017 **Postdoctoral Researcher**
Depts. of Genetics and Systems Pharmacology, Perelman School of Medicine, University of Pennsylvania
Advised by Dr. Benjamin Voight
- 2012 **Ph.D.**
Biological Anthropology (Primate Genetics), Department of Anthropology, University of Pennsylvania
Advised by Drs. Theodore Schurr and Eduardo Fernandez-Duque
- 2003 **B.A.**
Biological Anthropology, Department of Anthropology, University of Pennsylvania

RESEARCH EXPERIENCE

Depts. of Genetics and Systems Pharmacology, Perelman School of Medicine, University of Pennsylvania 2012–Present

Principal Investigator: Benjamin Voight

Led *de novo* genome and transcriptome construction for two orb-weaving spider species in collaboration with Drs. Linden Higgins, Ingi Agnarsson, Matjaž Kuntner, and Cheryl Hayashi. Co-analyzed rare non-coding burden associated with HDL-C in humans with Dr. Sumeet Khetarpal and the laboratory of Dr. Dan Rader.

Laboratory of Molecular Anthropology, University of Pennsylvania 2006-2012

Principal Investigator: Theodore G. Schurr

Studied the phylogeography, population structure and sociobehavioral evolution of a wild population of owl monkeys (*Aotus azaraï*) using DNA sequencing, capillary-based fragment analyses, STR genotyping, and luciferase expression assays.

Laboratory for Cytogenetic Pathology, Harvard Medical School / Brigham & Women's Hospital Summer 2009

Principal Investigator: Charles Lee

Conducted custom copy number variant (CNV) microarray assays to reveal the levels of structural variation present in the genomes of rhesus macaques (*Macaca mulatta*) and other primates with Dr. Omer Gokçumen.

Department of Proteomics, Harvard Partners Center for Genetics and Genomics 2005-2006

Principal Investigator: David Sarracino

Investigated disease biomarker proteins and conducted pathogen proteome discovery sequencing using leptin-capture techniques, liquid chromatography, and high-resolution nanospray mass spectrometry.

Laboratory for Molecular Medicine, Harvard Partners Center for Genetics and Genomics 2004-2005

Principal Investigator: Heidi Rehm

Designed and validated high-fidelity pharmacogenetic DNA sequencing tests for clinical diagnostic screening and performed variant analysis in adherence with strict HIPAA and CLIA regulations.

Laboratory of Neurogenetics, NIAAA, National Institutes of Health 2003-2004

Principal Investigator: David Goldman

Investigated sequence diversity and function of neurotransmitter genes (*SERT*, *MAOA*, *COMT* and *DRD4*) across human and non-human primates under the mentorship of Dr. Tim Newman.

Laboratory of Molecular Anthropology, University of Pennsylvania 2001-2003

Principal Investigator: Theodore G. Schurr

Conducted mitochondrial DNA research to identify human population migration and settlement patterns in circum-Arctic and Oceanic populations using PCR, enzyme-based RFLP detection, and Sanger sequencing.

FIELDWORK EXPERIENCE

Andasibe-Mantadia National Park, Madagascar

Winter 2017

Focal observation, silk collection, and sample collection of Darwin's Bark spiders (*Caerostris darwini*) along waterways in Madagascar's eastern rainforests.

Charleston County, South Carolina, USA

Summers 2012-2018

Focal observation, silk collection, and sample collection of golden orb-weaver spiders (*Nephila clavipes*) along South Carolina's barrier islands, inland waterways, and coastal forests.

Estancia Guaycolec, Formosa, Argentina

Summer 2008

Focal observation and behavioral data collection of wild Azara's owl monkeys (*Aotus azaraï*) in the dry forests of Argentina's northern Gran Chaco region.

TEACHING EXPERIENCE

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|-------------|---|
| Spring 2009 | University of Pennsylvania, ANTH-003: <i>Introduction to Human Evolution</i> (Teaching Assistant) |
| Fall 2008 | University of Pennsylvania, ANTH-104: <i>Sex and Human Nature</i> (Teaching Assistant) |
| Spring 2008 | University of Pennsylvania, ANTH-003: <i>Introduction to Human Evolution</i> (Teaching Assistant) |
| Fall 2007 | University of Pennsylvania, ANTH-003: <i>Introduction to Human Evolution</i> (Teaching Assistant) |

PRESS

“Strong as silk”. Joshua Brown. *Vermont Quarterly*. Jun 27, 2018

<http://www.uvm.edu/vq/?Page=news&storyID=26151&category=vq-fetrs>

“Spider silk genes used in... venom gland?” Diana Gitig. *ARSTECHNICA*, May 4, 2017.

<https://arstechnica.com/science/2017/05/spider-silk-genes-used-in-venom-gland/>

“One big step closer to synthetic spider silk.” Christine Lepisto. *TreeHugger Blog*, May 2, 2017.

https://www.treehugger.com/biomimicry/one-big-step-closer-synthetic-spider-silk.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+treehuggersite+%28Treehugger%29

“Spider silk genome study could bring human applications of its unique properties closer.” Himanshu Goenka. *International Business Times*, May 1, 2017. <http://www.ibtimes.com/spider-silk-genome-study-could-bring-human-applications-its-unique-properties-closer-2532724>

“Penn scientists illuminate genetics underlying the mysterious powers of spider silks.” Karen Kreeger. *EurekAlert!*, May 1, 2017.

https://www.eurekalert.org/pub_releases/2017-05/uops-psi042717.php

“And the award for the best dad goes to...the OWL MONKEY: Mammal is unique in its monogamy and parenting skills”. Victoria Woollaston. *Daily Mail* (website), March 24, 2014. <http://www.dailymail.co.uk/sciencetech/article-2588228/And-award-best-dad-goes-OWL-MONKEY-Mammal-unique-monogamy-parenting-skills.html>

“Who’s Your Daddy? Owl Monkeys Know For Sure” Mary Bates. *WIRED Magazine* (website), March 20, 2014.

<https://www.wired.com/2014/03/whos-daddy-owl-monkeys-know-sure/>

PROFESSIONAL ACTIVITIES

2012-present **Journal Peer Reviewer**

Nature Communications, Genome Research, American Journal of Primatology, Developmental Science, Genes Brains Behavior, PLoS Genetics, PLoS One, Wiley Publishing

2017 **Video Contributor**, *Discovering the Genome*, a web-based genomics curriculum for science classes.

“AMAZING Silk Gene Diversity in the Golden Orb-weaver Spider Genome”

<https://discoveringthegenome.org/content/amazing-silk-gene-diversity-golden-orb-weaver-spider-genome>

2011-2016 **Education Committee Member**, American Association of Anthropological Genetics (AAAG)

2013 **Co-organizer**, *Application of Genomics to Anthropological Research (AGAR) Workshop II*

Texas Biomedical Research Institute, San Antonio, TX, January 2013.

2013 **Organizer**, *Teaching Anthropological Genomics and Next-Generation Sequencing Symposium*

American Association of Physical Anthropology Annual Conference, Knoxville, TN, April 2013.

2012 **Co-organizer**, *Application of Genomics to Anthropological Research (AGAR) Workshop*

Texas Biomedical Research Institute, San Antonio, TX, January 2012.

- 2012-present **Member**, American Arachnological Society (AAS), International Society of Arachnology (ISA), American Society of Human Genetics (ASHG)
- 2006-2012 **Member**, American Association of Anthropological Genetics (AAAG), American Society of Primatology (ASP), American Association of Physical Anthropologists (AAPA), International Primatological Society (IPS)

RESEARCH SUPPORT

- 2011 L.S.B. Leakey Foundation General Research Grant
 2011 University of Pennsylvania GAPSA Travel Grant
 2010 University of Pennsylvania GAPSA-Provost Award for Interdisciplinary Innovation
 2008 University of Pennsylvania Department of Anthropology Field Funds Grant
 2008 University of Pennsylvania GAPSA Travel Grant

AWARDS, HONORS, & FELLOWSHIPS

- 2017 Cover Article, *Nature Genetics*, June 2017
 2014 *New England BioLabs Poster Award for Distinguished Next Generation Sequencing Research*
 2011-2012 *Dissertation Completion Fellowship*, University of Pennsylvania Graduate School of Arts and Sciences
 2006-2011 *Benjamin Franklin Fellowship*, University of Pennsylvania
 2009 *Fellowship for Teaching Excellence* (Anthropology nominee), Center for Teaching and Learning
 2006-2009 *Dean's List* (graduate, all courses), University of Pennsylvania Graduate School of Arts and Sciences
 2008 *Dean's Scholar Award*, University of Pennsylvania Graduate School of Arts and Sciences
 2007 *Graduate Research Fellowship*, University of Pennsylvania Department of Anthropology
 2004 *Partners in Excellence Award*, Harvard Partners Center for Genetics and Genomics
 2003 *Post-Baccalaureate IRTA Fellowship*, National Institutes of Health
 2002-2003 *Dean's List* (undergraduate), University of Pennsylvania School of Arts and Sciences

PUBLICATIONS

* Denotes equal contribution

1. Khetarpal SA*, **Babb PL***, Zhao W, Hancock-Cerutti WF, Brown CD, Rader DJ[†], Voight BF[†]. (2018). Multiplexed targeted resequencing identifies coding and regulatory variation underlying phenotypic extremes of HDL-cholesterol in humans. *Circulation: Genomic and Precision Medicine* 11:1-10. [†Co-senior authors].
2. **Babb PL**, Lahens NF, Correa-Garhwal SM, Nicholson DN, Kim EJ, Hogenesch JB, Kuntner M, Higgins L, Hayashi CY, Agnarsson I, Voight BF (2017). The *Nephila clavipes* genome highlights the diversity of spider silk genes and their complex expression. *Nature Genetics* 49:895-903. [**Featured Cover Article**; Altmetric=148].
3. Vargas-Pinilla P, **Babb PL**, Nunes L, Paré P, Rosa G, Felkl A, Longo D, Salzano FM, Paixão-Côrtes, Gonçalves GL, Bortolini MC. (2017). Progesterone response element variation in the *OXTR* promoter region and paternal care in New World monkeys. *Behavior Genetics* 47:77-87.
4. **Babb PL**, Fernandez-Duque E, Schurr TG. (2015). Oxytocin receptor gene sequences in owl monkeys and other primates show remarkable interspecific regulatory and protein coding variation. *Molecular Phylogenetics and Evolution* 91: 160-177.
5. Huck M, Fernandez-Duque E, **Babb PL**, Schurr TG. (2014). Correlates of genetic monogamy in pair-living mammals: insights from Azara's owl monkeys. *Proceedings of the Royal Society B: Biological Sciences* 281: 1-8.
6. **Babb PL**, McIntosh AM, Fernandez-Duque E, Schurr TG. (2014). Prolactin receptor gene diversity in Azara's owl monkeys (*Aotus azarae*) and humans (*Homo sapiens*) suggests a non-neutral evolutionary history among primates. *International Journal of Primatology* 35:129-155.

7. **Babb PL**. (2012). Molecular evolution of vasopressin and oxytocin receptor genes in owl monkeys (*Aotus azarai*) of northern Argentina. *Doctoral dissertation*, 218 pages. Available from ProQuest: UMI Number AAI3508965.
8. **Babb PL**, Fernandez-Duque E, Baiduc C, Gagneux P, Evans S, Schurr TG. (2011). MtDNA diversity in Azara's owl monkeys (*Aotus azarai azarai*) of the Argentinean Chaco. *American Journal of Physical Anthropology* 146(2): 209-224.
9. Gokçumen O*, **Babb PL***, Iskow R, Zhu Q, Shi, X, Mills RE, Ionita-Laza I, Vallender EJ, Clark AG, Lee C†, Johnson WE†. (2011). Refinement of primate copy number variation hotspots identifies candidate genomic regions evolving under positive selection. *Genome Biology* 5(12): R52. [†Co-senior authors].
10. **Babb PL**, McIntosh AM, Fernandez-Duque E, Di Fiore A, Schurr TG. (2011). An optimized genotyping strategy for assessing genetic identity and kinship in Azara's owl monkeys (*Aotus azarai*). *Folia Primatologica* 82: 107-117.
11. **Babb PL**, Fernandez-Duque E, Schurr TG. (2010). *AVPR1A* sequence variation in monogamous owl monkeys (*Aotus azarai azarai*) and its implications for the evolution of platyrrhine social behavior. *Journal of Molecular Evolution* 71:279-297.
12. Friedlaender J, Schurr T, Gentz F, Koki G, Friedlaender F, Horvat G, **Babb PL**, Cerchio S, Kaestle F, Schanfield M, Deka R, Yanagihara R, Merriwether DA. (2005). Expanding southwest Pacific mitochondrial haplogroups P and Q. *Molecular Biology and Evolution*. 22(6): 1506-1517.
13. Rubicz R, Schurr TG, **Babb PL**, Crawford MH. (2003). Mitochondrial DNA variation and origins of the Aleuts. *Human Biology* 75(6): 809-35.

PUBLISHED ABSTRACTS

* Denotes equal contribution

Khetarpal SA*, **Babb PL***, Zhao W, DerOrhannessian S, Hancock-Cerutti WF, Elwyn S, Tran T, Brown CD, Voight BF†, Rader DJ†. (2016). Multiplexed targeted resequencing identifies rare noncoding variants associated with high HDL cholesterol. *American Society of Human Genetics 66th Annual Meeting Program Guide*:120. [†Co-senior authors].

Agnarsson I, **Babb PL**, Lahens NF, Nicholson DN, Kim EJ, Higgins L, Hogenesch JB, Kuntner M, Voight BF. (2016). *De novo* genomes of orb-weaving spiders reveal the diversity and complexity of spidroins. *The American Arachnological Society 40th Annual Meeting Program Guide*.

Babb, PL, Lahens, NF, Hogenesch JB, Agnarsson I, Higgins L, Voight BF. (2015). A first generation spider silk gene catalog from the golden orb-weaver (*Nephila clavipes*) genome. *Biology of Genomes Abstract Book* (Cold Spring Harbor Laboratory):29.

Babb PL, Voight BF. (2013). Multiple LD-independent signals of extreme sub-population variation at a region associated with type-2 diabetes suggests a non-neutral evolutionary history. *American Society of Human Genetics 63rd Annual Meeting Program Guide*:227.

McIntosh AM, **Babb PL**, Fernandez-Duque E, Schurr TG. (2012). *PRLR* sequence diversity in owl monkeys (*Aotus azarai*) and other paternal care-giving primates suggests the maintenance of variation by balancing selection. *American Journal of Physical Anthropology* 147(S54):211.

Babb PL, Fernandez-Duque E, Schurr TG. (2011). Monogamous owl monkeys differ in the structure of *OXTR* from other non-monogamous primates. *American Journal of Physical Anthropology* 144(S52):79.

Fernandez-Duque E, **Babb PL**, Schurr TG. (2011). Group structure and dispersal patterns of the socially monogamous owl monkey as revealed by mtDNA data. *American Journal of Physical Anthropology* 144(S52):135.

Babb PL, Fernandez-Duque E, Schurr TG. (2009). Vasopressin receptor V1a (*avpr1a*) gene variation in the monogamous owl monkey, *Aotus azarai azarai*. *American Journal of Physical Anthropology* 138(S48):81.

Babb PL, Gagneux P, Fernandez-Duque E, Schurr TG. (2008). Genetic variation and population structure in the owl monkey, *Aotus azarai*. *American Journal of Physical Anthropology* 135(S46):62.

Babb PL, Sithaldeen R, Ackermann RR, Newman TK. (2005). Mitochondrial DNA sequence evidence for a deep phylogenetic split in chacma baboons (*Papio hamadryas ursinus*) and the phylogeographic implications for *Papio* systematics. *American Journal of Physical Anthropology* 126(S40):67.

Newman TK, Howell S, Barr CS, **Babb PL**, Westergaard GC, Higley JD. (2005). Genetic and environmental influences on acquired dominance status in free-ranging male rhesus macaques (*Macaca mulatta*). *American Journal of Physical Anthropology* 126(S40):157.

Newman TK, Barr CS, **Babb PL**, Champoux M, Suomi SJ, Lesch K-P, Higley JD. (2004). MAOA gene promoter polymorphism influences aggression and impulsivity in male rhesus macaques (*Macaca mulatta*). *Neuropsychopharmacology* 29:S233.

Newman TK, Barr CS, **Babb PL**, Becker M, Suomi SJ, Lesch K-P, Higley JD. (2004). Social impulsivity in captive rhesus monkeys (*Macaca mulatta*) is influenced by variation in a functional MAOA gene promoter polymorphism. *American Journal of Primatology* 62(S1):102.

Newman TK, Gibson N, **Babb PL**, Higley JD, Goldman D. (2004). Comparative sequence analysis of a repeat polymorphism in the monoamine oxidase A (MAOA) gene promoter region in primates: evidence for selection? *American Journal of Physical Anthropology* 123(S38):152.

ADDITIONAL PRESENTATIONS

2019 **Babb PL**, Gregorič M, Lahens NF, Hogenesch JB, Hayashi CY, Kuntner M, Agnarsson I, Voight BF. The draft genome of Darwin's bark spider (*Caerostris darwini*) reveals an expanded capture spiral genetic toolkit. *21st International Congress of Arachnology*. (Podium presentation)

2017 **Babb PL**. Untangling the genomics of the toughest spider silks on Earth. *Department of Biology Seminar Series, St. Joseph's University*. (Guest lecture)

Babb PL, Gregorič M, Lahens NF, Hogenesch JB, Higgins L, Kuntner M, Hayashi CY, Agnarsson I, Voight BF. The draft genome of Darwin's bark spider reveals an expanded capture spiral genetic toolkit. *Perelman School of Medicine's Department of Genetics Annual Retreat*. (Podium presentation)

2016 **Babb PL**, Lahens NF, Correa-Garhwal SM, Nicholson DN, Kim EJ, Hogenesch JB, Kuntner M, Higgins L, Hayashi CY, Agnarsson I, Voight BF. The *Nephila clavipes* genome reveals the diversity and complexity of spider-silk genes. *Perelman School of Medicine Biomedical Postdoctoral Research Symposium*. (Podium presentation)

Babb PL, Lahens NF, Hogenesch JB, Gregorič M, Kuntner M, Higgins L, Agnarsson I, Voight BF. Cataloging the genetic toolkit of the strongest spider silk on Earth: the draft genome of Darwin's bark spider. *Perelman School of Medicine's Department of Genetics Annual Retreat*. (Poster presentation)

2015 **Babb PL**, Lahens NF, Hogenesch JB, Agnarsson I, Higgins L, Voight BF. A first generation spider silk gene catalog from the golden orb-weaver (*Nephila clavipes*) genome. *Perelman School of Medicine's Department of Genetics Annual Retreat*. (Poster presentation)

Babb PL. A first generation spider silk gene catalog from the golden orb-weaver genome. *Yale University Center for Genetic Analyses of Biodiversity, Laboratory of Drs. Gisella Caccone and Jeff Powell*. (Guest lecture)

2014 **Babb PL**, Voight BF. Assembly of the golden orb-weaver genome enables full characterization of spider silk gene repertoire. *Perelman School of Medicine Biomedical Postdoctoral Research Symposium*. (Poster presentation)

Babb PL. Weaving spider genomes. *Perelman School of Medicine Department of Genetics, Research in Progress Series*. (Podium presentation)

- Siewert K, **Babb PL**, Voight BF. Detecting multiple selective events on linked polymorphisms. *Perelman School of Medicine Genomics and Computational Biology Graduate Program Annual Retreat*. (Poster presentation)
- 2012 **Babb PL**, Fernandez-Duque E, Schurr TG. The enigmatic taxonomic status of *Aotus* among the platyrrhines: signals from five genetic loci. *24th Congress of the International Primatological Society*. (Podium presentation)
- 2009 Gokçumen O, **Babb PL**, Lee A, Mills RE, Smith RS, Vallender EJ, Blake-Kinnin ME, Lee C, Johnson WE. High resolution discovery of copy number variation among rhesus macaques (*Macaca mulatta*). *27th Annual Symposium on Nonhuman Primate Models for AIDS*. (Podium presentation)
- 2006 Hung KE, **Babb PL**, Krastins B, Sarracino D, Korzenik JR, Sands BE, Kucherlapati R. Proteomics approaches to biomarker discovery in inflammatory bowel disease. *Inflammatory Bowel Disease Summit*. (Poster presentation)
- Babb PL**, Wu E, Krastins B, Stoerker J, Sarracino D. Using immobilized lectins for proteomic analysis of glycosylated proteins in human plasma. *Harvard-Partners Center for Genetics and Genomics: Proteomics Symposium*. (Poster presentation)
- Krastins B, **Babb PL**, Satish KK, Wilson SB, Sarracino D. Phosphorylated proteins and peptides from stimulated and unstimulated Jurkat Cells. *Harvard-Partners Center for Genetics and Genomics: Proteomics Symposium*. (Poster presentation)
- 2005 Joshi VA, Verlander P, Anderson ND, **Babb PL**, Fulchiero E, Lindeman N, Longtime J, Louis DN, Janne PA, Sequist LV, Bell DW, Haber DA, Meyerson M, Johnson BE, Lynch TJ, Kucherlapati R. *EGFR* kinase domain sequencing for the prediction of drug response: the mutation spectrum. *American Association for Cancer Research Annual Meeting*. (Podium presentation)

PREPRINTS & MANUSCRIPTS IN PREPARATION

- Babb PL**, Gregorič M, Lahens NF, Higgins L, Hogenesch JB, Hayashi CY, Kuntner M, Agnarsson I, Voight BF (*In Preparation*). The genome of Darwin's bark spider (*Caerostris darwini*) reveals an expanded capture spiral genetic toolkit.
- Correa-Garhwal SM, **Babb PL**, Voight BF, Hayashi CY. (*In Preparation*). Sex-specific patterns of spidroin expression in the golden orb-weaver spider (*Nephila clavipes*) echoes the dimorphic nature of silk anatomy.
- Lekkas D, Voight BF, **Babb PL**. (*In Preparation*). Comparative venom analysis of two orb-weaving spiders suggests the adaptive role of dietary changes in the diversification of Kunitz- and serpin-type protease inhibitors.

ADDITIONAL TRAINING, SKILLS, & INTERESTS

Spoken languages: English (native), French (proficient)

Safety Training: Working with Human Subjects in Biomedical Research, CITI Good Clinical Practices, Biomedical Responsible Conduct of Research, Universal Precautions, Laboratory Safety, Working Safely with HIV and Bloodborne Pathogens, Using Animals in Intramural Research, Working Safely with Non-Human Primates, Hands-On Animal Techniques, Computer Security, and Protecting Human Subjects.

Travel: Extensive travel experience (Africa, Europe, Asia, and the Americas), including deserts, ice fields, mountains, swamps, and jungles.

Additional interests: Wildlife and landscape photography, graphic design (Adobe CreativeCloud Suite, R/RStudio), automotive restoration, performance engine construction, autocross racing, and electronic music composition.