Samuel Morgan Verbanic, PhD

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Professional Profile

Interdisciplinary research scientist with over 10 years of experience across a wide range of projects in biochemistry, molecular biology, bioinformatics, and bioengineering. Proven track record of innovative experimental design and creative problem solving, continuously finding ways to build and apply a deep skill set to identify and address new challenges. Self-starter undaunted by breaking new ground in areas of minimal prior expertise. Strong written, oral, and interpersonal communication skills that facilitate collaboration, leadership, and mentorship. Always curious, motivated to grow as a scientist and person, and excited about solving global challenges with the latest bioengineering methods.

Experience

Scientist I – R&D/Technology Innovation   4D Molecular Therapeutics, August 2021 – Present
- Designed, synthesized, produced/purified, and characterized novel AAV capsid libraries
- Developed materials & methods to quantify and reduce bias in AAV NHP screens
- Established high-throughput methods of synthesis and screening of promoter and transgene libraries
- Wrote proprietary python program to design novel transgene coding sequences with optimized expression and low immunogenicity; collaborated w/ Payload team on experimental validation
- Programmed machine-vision python app for automated, quantitative microscopy image & video analyses
- Created command-line, GUI, and plugin-based interfaces for proprietary R&D software
- Collaborated with IT to build and benchmark an enterprise-grade bioinformatics platform on AWS
- Acted as technical lead on major technology innovation initiative; collaborated with clinical and pre-clinical cross-functional teams to meet program-specific challenges and timelines

Postdoctoral Scholar   UCLA, March 2020 – August 2021
- Rapidly built out a new lab and wrote BUA applications, resulting in minimal downtime after a lab move
- Designed large-cohort longitudinal study of diabetic foot ulcer microbiomes and wrote IRB applications
- Continued bioinformatics work on microbiomes, viromes, and *in vitro* evolution experiments
- Explored startup opportunities with our phage-based bacterial detection & killing platform by performing market research and end-user interviews, writing funding applications, and attending workshops

Graduate Student Researcher   UCSB, August 2015 – March 2020
- Doctoral work focused on elucidating the role of the microbiome in chronic wound pathology
- Independently conducted two clinical microbiome investigations, from study design to publication
- Prepped >300 samples, >10 libraries for amplicon and shotgun Illumina and nanopore sequencing
- Used distributed computing, shell scripting, and R to analyze and interpret large NGS datasets
- Programmed a user-friendly NGS data processing pipeline for *in vitro* selection experiments
- Administrated lab AWS account and managed network-attached storage drives
- Maintained BSL2 compliance as lab biosafety officer for 5 years with zero incidents or citations
- Fostered collaborations with 5+ labs and institutions across several projects
- Co-authored 7 publications, 100+ total citations; listed inventor on 1 patent

Skills & Techniques

- **Molecular Biology & Biochemistry:** PCR/qPCR/ddPCR, NGS library preparation, gene synthesis, Illumina/PacBio/Oxford Nanopore sequencing, *in vitro* transcription, automated liquid handling systems, cloning/genome editing, nucleic acid extraction and purification, bioconjugation, FPLC, HPLC, diagnostic assay development, gel electrophoresis, high-throughput methods, low-biomass methods
- **Bioinformatics & Data Science:** bash, R, Python, Unix systems, text processing (AWK, sed, grep), git, LaTeX, Docker, Singularity, AWS/distributed computing, biostatistics, microbiome analyses, metagenomics, high-dimensional data, amplicon & WGS data, pipeline development, conda environments, clinical metadata, network analysis, visualization, UI development

Skills & Techniques (continued)

- **Microbiology:** transformation/transfection/transduction, cell culture w/ sterile technique (mammalian, bacterial, BSL2 organisms), virus production (AAV, bacteriophage), FACS, microscopy
- **Clinical Studies:** study design, logistics, budgeting, procurement, sample processing, IRB and BUA application writing, BSL2 handling protocols, HIPAA compliance

Education

PhD in Biochemistry & Molecular Biology, Bioengineering Emphasis   September 2015 – March 2020
University of California, Santa Barbara   Santa Barbara, CA

BA in Biochemistry   August 2011 – May 2015
Vassar College   Poughkeepsie, NY

Patents

- **Targeted Gold Nanoparticles for Detection and Cell Killing in Bacterial Infections**
  Huan Peng, Samuel Verbanic, and Irene A. Chen. *Provisional patent filed, full patent pending (USPTO),* **October 2, 2018**

Publications

- **The Chronic Wound Phageome: Phage Diversity and Associations with Wounds and Healing Outcomes**
  Samuel Verbanic, John Deacon, and Irene A. Chen. *Microbiology Spectrum*, **2022,** (accepted, DOI for publication in April 2022: https://10.1128/spectrum.02777-21)
- **A Bayesian Nonparametric Analysis for Zero Inflated Multivariate Count Data with Application to Microbiome Study**
  Kurt Shuler, Samuel Verbanic, Irene A. Chen, and Juhee Lee. *Journal of the Royal Statistical Society,* **2021,** https://doi.org/10.1111/rssc.12493
- **EasyDIVER: a pipeline for assembling and counting high throughput sequencing data from *in vitro* evolution of nucleic acids or peptides**
  Celia Blanco*, Samuel Verbanic*, Burckhard Seelig, and Irene A. Chen. *Journal of Molecular Evolution, Journal of Molecular Evolution,* **2020** (88), 477–481
- **Microbial predictors of healing and short-term effect of debridement on the microbiome of chronic wounds**
  Samuel Verbanic, Yuning Shen, Juhee Lee, John Deacon, and Irene A. Chen. *npj Biofilms and Microbiomes,* **2020** (6), 21
- **High throughput sequencing of *in vitro* selection for proteins using mRNA display**
  Celia Blanco, Samuel Verbanic, Burckhard Seelig, and Irene A. Chen. *Physical Chemistry Chemical Physics,* **2020** (22), 6492-6506 *(PCCP 'HOT' article, cover article)*
- **Improved single-swab sample preparation for recovering bacterial and phage DNA from human skin and wound microbiomes**
  Samuel Verbanic, Colin Y. Kim, John Deacon, and Irene A. Chen. *BMC Microbiology,* **2019** (19), 214
- **Vesicle membranes act as simple chaperones for functional RNA**
  Ranajay Saha, Samuel Verbanic, and Irene A. Chen. *Nature Communications,* **2018** (9), 2313
- **A Novel General Chemistry Laboratory: Creation of Biomimetic Superhydrophobic Surfaces through Replica Molding**
  Samuel Verbanic, Owen Brady, Ahmed Sanda, Carolina Gustafson, and Zachary J. Donhauser. *Journal of Chemical Education,* **2014** *91* (9), 1477-1480

Awards & Acknowledgements

- **BMSE/MCDB Retreat & Symposium,** *Best Microbiology Poster Award*   UCSB, September 2019
- **Center for Bioengineering Student Seminar,** *Best Speaker Award*   UCSB, May 2016
- **Sigma Xi Honors Research Society**   Vassar College, May 2015

Teaching & Leadership Experience

Undergraduate Research Mentor, *Chen Lab*   UCSB, January 2016 – December 2019
- Mentored 6 undergraduate students in wet lab and computational research, analysis, and presentation
- Mentees were members of UCSB diversity groups Women in STEM and MARC U*STAR

Co-Chair, *BMSE Graduate Student Recruitment Committee*   UCSB, January 2016 – December 2019
- Organized events, meetings, and outreach to recruit graduate students to the BMSE program

Teaching Assistant, *Introductory Biology Lab*   UCSB, September 2015 – December 2015
- Taught classes of up to 25 students about fundamental lab techniques and principles in biology
- Held office hours, one-on-one tutoring sessions, graded assignments, and revised course material

Hobbies & Interests

Backpacking & camping, cooking & fermentation, skateboarding, reading, climate change and sustainability