

BIOGRAPHICAL SKETCH
Jessica Mark Welch

1. Contact Information

Address: Marine Biological Laboratory, 7 MBL Street, Woods Hole, MA 02543
website: www.mbl.edu/jbpc/jmarkwelch/
email: jmarkwelch@mbl.edu
telephone: (508) 289-7180 (office); (774) 521-4017 (cell phone)

2. Professional Preparation

Harvard and Radcliffe Colleges, Cambridge, MA; B.A. in Biology *magna cum laude*, June 1989

Harvard University, Cambridge MA; Ph.D. in Biology, June 2001. Thesis advisor: Matthew S. Meselson

Marine Biological Laboratory, Woods Hole, MA; post-doctoral training with Matthew S. Meselson and Gary G. Borisy, part-time 2001-2006, full-time 2006-2009

3. Appointments

2016–present Associate Scientist, Marine Biological Laboratory, Woods Hole, MA

2015–2016 Associate Research Scientist, Marine Biological Laboratory, Woods Hole, MA

2009–2015 Assistant Research Scientist, Marine Biological Laboratory, Woods Hole MA

4. Selected Publications:

Perera, D., McLean, A., Morillo-López, V., Cloutier-Leblanc, K., Almeida, E., Cabana, K., **Mark Welch, J.**, and Ramsey, M. (2021). Mechanisms underlying interactions between two abundant oral commensal bacteria. *The ISME Journal* (online ahead of print). doi: 10.1038/s41396-021-01141-3.

Mark Welch, Jessica L., Shamayim T. Ramírez-Puebla, and Gary G. Borisy (2020). Oral Microbiome Geography: Micron-Scale Habitat and Niche. *Cell Host & Microbe* 28(2): 160-168. doi: 10.1016/j.chom.2020.07.009. PMID: 32791109.

Wilbert, Steven A., **Jessica L. Mark Welch**, and Gary G. Borisy (2020). Spatial Ecology of the Human Tongue Dorsum Microbiome. *Cell Reports* 30(12): 4003-4015.e3. doi: 10.1016/j.celrep.2020.02.097. PMID: PMC7179516.

Shaiber, A., Willis, A. D., Delmont, T. O., Roux, S., Chen, L.-X., Schmid, A. C., Yousef, M., Watson, A. R., Lolans, K., Esen, Ö. C., Lee, S. T. M., Downey, N., Morrison, H. G., Dewhirst, F. E., **Mark Welch, J. L.**, & Eren, A. M. (2020). Functional and genetic markers of niche partitioning among enigmatic members of the human oral microbiome. *Genome Biology* 21:292. doi:10.1186/s13059-020-02195-w.

Utter, D. R., Borisy, G. G., Eren, A. M., Cavanaugh, C. M., & **Mark Welch, J. L.** (2020). Metapangenomics of the oral microbiome provides insights into habitat adaptation and cultivar diversity. *Genome Biology* 21:293. doi: 10.1186/s13059-020-02200-2.

Schlundt, C., **J.L. Mark Welch**, A.M. Knochel, E.R. Zettler, and L.A. Amaral-Zettler (2020). Spatial structure in the “Plastisphere”: Molecular resources for imaging microscopic communities on plastic marine debris. *Molecular Ecology Resources* 20(3): 620-634. doi: 10.1111/1755-0998.13119. PMID: PMC7318237.

Mark Welch, J.L., F.E. Dewhirst, and G.G. Borisy (2019). Biogeography of the Oral Microbiome: the Site-Specialist Hypothesis. *Annual Review of Microbiology* 2019 Jun 10. doi: 10.1146/annurev-micro-090817-062503.

Lutz, H.L., S.T. Ramírez-Puebla, L. Abbo, A. Durand, C. Schlundt, N.R. Gottel, A.K. Sjaarda, R.T. Hanlon, J.A. Gilbert, and **J.L. Mark Welch** (2019). A Simple Microbiome in the European Common Cuttlefish, *Sepia officinalis*. *mSystems* 4(4): e00177-19. doi: 10.1128/mSystems.00177-19. PMID: PMC6517690.

Mark Welch, J.L., Y. Hasegawa, N.P. McNulty, J.I. Gordon, and G.G. Borisy (2017). Spatial organization of a model 15-member human gut microbiota established in gnotobiotic mice. *Proceedings of the National Academy of Sciences (USA)* 114 (43): E9015-E9114. PMID: PMC5664539.

Utter, Daniel R., **J.L. Mark Welch**, and Gary G. Borisy (2016). Individuality, stability, and variability of the plaque microbiome. *Frontiers in Microbiology* 7: 564. PMID: PMC4840391.

Mark Welch, J.L., B.J. Rossetti, C.W. Rieken, F.E. Dewhirst, and G.G. Borisy (2016). Biogeography of a human oral microbiome at the micron scale. *Proceedings of the National Academy of Sciences (USA)* 113: E791-800. PMID: PMC4760785.

Mark Welch, J.L., D.R. Utter, B.J. Rossetti, D.B. Mark Welch, A.M. Eren, and G.G. Borisy (2014). Dynamics of tongue microbial communities with single-nucleotide resolution using oligotyping. *Frontiers in Microbiology* 5: 568. PMID: PMC4224128.

Eren, A.M., G.G. Borisy, S.M. Huse, and **J.L. Mark Welch** (2014). Oligotyping analysis of the human oral microbiome. *Proceedings of the National Academy of Sciences (USA)* 111: E2875-E2884. PMID: PMC4104879.

Valm, A.M., **J.L. Mark Welch**, C.W. Rieken, Y. Hasegawa, M.L. Sogin, R. Oldenbourg, F.E. Dewhirst, and G.G. Borisy (2011). Systems-level analysis of microbial community organization through combinatorial labeling and spectral imaging. *Proceedings of the National Academy of Sciences (USA)* 108: 4152-4157. PMID: PMC3054005.

Mark Welch, D.B., **J.L. Mark Welch**, and M. Meselson (2008). Evidence for degenerate tetraploidy in bdelloid rotifers. *Proceedings of the National Academy of Sciences (USA)* 105: 5145-5149.

Mark Welch, J.L., D.B. Mark Welch, and M. Meselson (2004). Cytogenetic evidence for asexual evolution of bdelloid rotifers. *Proceedings of the National Academy of Sciences (USA)* 101: 1618-1621.

5. Service:

Teaching and mentoring: My goal as a teacher and mentor is to help students become thoughtful, confident, independent scientists. The surest route to this goal is for young scientists to carry out genuine cutting-edge research with guidance and support. To this end I have mentored ten undergraduates through the MBL REU program, the Partnership Education Program (PEP), and the Metcalf program. Each of

them carried out independent work on imaging or bioinformatics of host-associated microbes. Four of these undergraduates are co-authors on published papers based on their work with me, and two others are co-authors on submitted manuscripts.

Non-scientists can experience the joy and excitement of science by guided hands-on experimentation. I developed a laboratory-based teaching module in which students sample their own tongue microbiomes and carry out CLASI-FISH and spectral imaging to visualize the structures that bacteria build on their tongues. To date using this module, I have worked with fellows in the 2021 Logan Science Journalism Program at MBL and with students in the September 2019 University of Chicago September course at MBL, “Visualization in Biology: Science, Culture, Representation.” About half of the undergraduate students and all of the journalists had not previously used a micropipetter, and for most it was their first experience with microscopy. I have also given guest lectures in the MBL September course “Microbes across Environments” for several years.

Public education: Images of the spatial organization of bacterial communities, particularly the complex and charismatic communities in the human mouth, provide an eye-catching and intuitive introduction to the bacterial world. Using these images as a starting point, I have given several talks for the general public including a “Science Before Supper” talk at the Falmouth public library in November 2016; a talk in the symposium “Art and Science: More than Meets the Eye” sponsored by the National League of American Pen Women, Cape Cod Branch, at the Cultural Center of Cape Cod in South Yarmouth, MA on May 2, 2018; and a reprise of the art and science talk at the Unitarian Universalist Fellowship of Falmouth on July 25, 2018.

I have provided images of microbial communities for the 2018 and subsequent editions of Brock Biology of Microorganisms (the 2018 edition devoted an entire page to my image of dental plaque) as well as to a French publisher, Editions Hachette, for a science textbook for 15-year-old pupils.

Service to MBL: I am co-chair, with Clare Waterman, of the Science Council of the MBL Society. I am co-organizer with Zoe Cardon of the Micro-Eco discussion group, and I serve as a member of the MBL-WHOI library Joint User Committee (since 2018).

6. List of Current Collaborators:

Gary G. Borisy, The Forsyth Institute
Brent Coull, Harvard T.H. Chan School of Public Health
Sujit Datta, Princeton University
Floyd E. Dewhirst, The Forsyth Institute
A. Murat Eren, University of Chicago
Kathryn M. Kauffman, University at Buffalo
Patrick La Riviere, University of Chicago
Kyu Ha Lee, Harvard T.H. Chan School of Public Health
B. Duygu Özpolat, Marine Biological Laboratory
Rut Pedrosa-Pàmies, Marine Biological Laboratory
Catherine Pfister, University of Chicago
Matthew Ramsey, University of Rhode Island
Katharina Ribbeck, Massachusetts Institute of Technology
Michael Shribak, Marine Biological Laboratory
Jacqueline Starr, Brigham and Women’s Hospital
Ying Zhang, University of Rhode Island