
BIOGRAPHICAL SKETCH

Mark R. Holl	Research Scientist The Center for Ecogenomics The Biodesign Institute at Arizona State University
eRA COMMONS USER NAME markholl	

Washington State University	B.S.	1986	Mechanical Engineering
University of Washington	M.S.	1990	Mechanical Engineering
University of Washington	Ph.D.	1995	Mechanical Engineering
University of Washington	Postdoctoral	1995-1997	Bioengineering
University of Washington	Postdoctoral	1998-1999	Bioengineering

A. Positions and Honors.

Positions and Employment

1981-1986 Instrument Maker, Washington State University, Pullman, WA
1987-1988 Engineer, Boeing Commercial Aircraft Company, Renton, WA
1988-1989 Lead Engineer, Boeing Commercial Aircraft Company, Everett, WA
1989-1995 Research Assistant, Mechanical Engineering, University of Washington, Seattle, WA
1995-1998 Post-Doctoral Senior Fellow, Bioengineering, University of Washington, Seattle, WA
1996-1998 Consultant, Senmed Medical Ventures, Cincinnati, OH
1997-1998 Senior Engineer, Micronics, Inc., Redmond, WA
1998-1999 Consultant, Micronics, Inc., Redmond, WA
1998-2000 Post-Doctoral Senior Fellow, Bioengineering, University of Washington, Seattle, WA
2000-2001 Research Engineer, Electrical Engineering, University of Washington, Seattle, WA
2001-2006 Research Assistant Professor, Electrical Engineering, University of Washington, Seattle, WA
2007- Research Scientist, The Biodesign Institute, Arizona State University, Tempe, AZ

Other Experience and Professional Memberships

2004-2006 NIH/NCI study section member (7 sections)
2006- NSF study section member (1 section)
2000- Journal review for: IEEE Transactions on Automation Science and Engineering, IEEE Transactions on Circuits and Systems I, Critical Reviews in Biotechnology, Genome Research, Analytical, Chemistry, Electrophoresis, Biotechniques
2005 Reviewer for the 1st IEEE Conference on Automation Science and Engineering (CASE)
2006 Program Committee member for the 2nd IEEE Conference on Automation Science and Engineering

Memberships: The American Society of Mechanical Engineers (ASME), Institute for Electrical and Electronic Engineers (IEEE), The American Association for the Advancement of Science (AAAS), the International Society for Optical Engineering (SPIE).

Honors

1984-1986 Boeing Commercial Aircraft Company Scholar (Full Tuition)
1985 Phi Kappa Phi Junior Scholarship
Phi Kappa Phi Honor Society
Tau Beta Pi Engineering Honor Society

B. Selected peer-reviewed publications (in chronological order).

(Peer-reviewed journal publications)

1. **Holl, M. R.**, M. Ma and V. Kumar (1998). "The effects of additives on microcellular PVC foams: part I – effect on processing and microstructure." Cellular Polymers **17**(4): 271-283.
2. **Holl, M. R.**, V. Kumar, J. L. Garbini and W. R. Murray (1999). "Cell nucleation in solid state polymeric foams: evidence of a triaxial tensile failure mechanism." Journal of Material Science **34**(4): 637-644.
3. Macounová, K., C. R. Cabrera, **M. R. Holl** and P. Yager (2000). "Generation of natural pH gradients in microfluidic channels for use in isoelectric focusing." Analytical Chemistry **72**(16): 3745-3751.
4. **Holl, M. R.**, J. L. Garbini, W. R. Murray and V. Kumar (2001). "A steady-state mass balance model of the polycarbonate-CO₂ system reveals a self-regulating cell growth mechanism in the solid-state microcellular process." Journal of Polymer Science, Part B: Polymer Physics **39**(8): 868-880.
5. Wang, W., **M. R. Holl** and D. T. Schwartz (2001). "Rapid prototyping of masks for through-mask electrodeposition of thick metallic components." Journal of the Electrochemical Society **148**(5): c363-c368.
6. Meldrum, D. R. and **M. R. Holl** (2002). "Microscale bioanalytical systems." Science (Techsight Section, Topical Category: Microfluidics) **297**(5584): 1197-1198.
7. Koschwanetz, J., **M. Holl**, B. Marquardt, J. Dragavon, L. Burgess and D. Meldrum (2004). "Identification of budding yeast using a fiber-optic imaging bundle." Review of Scientific Instruments **75**(5): 1363-1365.
8. Chao, S. H., **M. R. Holl**, J. H. Koschwanetz, R. H. Carlson, L. S. Jang and D. R. Meldrum (2005). "Velocity measurement in microchannels with a laser scanning microscope and particle linear image velocimetry." Microfluidics and Nanofluidics **1**(2): 155-160.
9. Jang, L. S., S. H. Chao, **M. R. Holl** and D. R. Meldrum (2005). "Microfluidic circulatory flows induced by resonant vibration of diaphragms." Sensors and Actuators, A **122**(1): 141-148.
10. Ngatchou, P. N., **M. R. Holl**, C. H. Fisher, M. S. Saini, J. Dong, T. T. H. Ren, W. H. Pence, D. L. Cunningham, S. E. Moody, D. A. Donaldson and D. R. Meldrum (2006). "A real-time qPCR analyzer compatible with high-throughput automated serial processing in 5- μ L capillaries." IEEE Transactions on Automation Science and Engineering special issue on life sciences. **3**(2): 141-151.

(Peer-reviewed conference proceedings)

1. **Holl, M. R.**, V. Kumar, J. L. Garbini and W. R. Murray (1994). Dynamic modeling of the solid state microcellular foam process, part 2: experiment and numerical simulation for the polycarbonate carbon dioxide system. ASME Winter Annual Meeting, Chicago, IL. **MD-Vol. 53**: 204-231.
2. **Holl, M. R.**, J. L. Garbini, W. R. Murray and V. Kumar (1994). Dynamic modeling of the solid state microcellular foam process, part 1: system analysis and model development. ASME Winter Annual Meeting, Chicago, IL. **MD-Vol. 53**: 147-203.
3. **Holl, M. R.**, P. G. Galambos, F. K. Forster, J. P. Brody and P. Yager (1996). Optimal design of a microfabricated diffusion-based extraction device. ASME International Mechanical Engineering Congress & Exposition, Atlanta, GA. **DSC Vol. 59**: 189-195.
4. Weigl, B. H., **M. R. Holl**, D. Schutte, J. P. Brody and P. Yager (1996). Diffusion-based optical chemical detection in silicon flow structures. Second International Symposium on Miniaturized Total Analysis Systems, μ TAS96, Basel, Switzerland: 174-184.
5. Altendorf, E., D. Zebert, **M. Holl** and P. Yager (1997). Differential blood cell counts obtained using a microchannel based flow cytometer. Transducers 97, Chicago, IL. **1**: 531-534.
6. Sabeti, R., **M. R. Holl**, E. A. Altendorf and P. Yager (1997). Microfabricated interlock system for precision alignment. Micro- and Nanofabricated Electro-Optical Mechanical Systems for Biomedical and Environmental Applications, SPIE BiOS '97, San Jose, CA, February 8-14, 1997. **2978**: 180-185.
7. Wu, C., **M. R. Holl**, M. Kenny and P. Yager (1997). Oxyhemoglobin measurement of whole blood specimens in a silicon microfabricated device. Micro- and Nanofabricated Electro-Optical Mechanical Systems for Biomedical and Environmental Applications, SPIE BiOS '97, San Jose, CA, February 8-14, 1997. **2978**: 155-164.
8. Yager, P., M. A. Fromowitz, D. J. Bell, F. K. Forster, J. P. Brody, Q. Dong, C. Cabrera, **M. R. Holl**, A. E. Kamholz and B. H. Weigl (1998). Design of microfluidic sample preconditioning systems for detection of biological agents in environmental samples. Proceedings of the SPIE, Microfluidic Devices and Systems, Santa Clara, CA, September 20-24, 1998. **3515**: 252-259.

9. Cabrera, C. R., K. Macounová, **M. R. Holl** and P. Yager (2000). Use of isoelectric focusing for sample preconditioning in a microfluidic electrochemical flow cell. 1st Annual International IEEE-EMBS Special Topic Conference on Microtechnologies in Medicine and Biology, Lyon, France: 357-360.
10. **Holl, M. R.**, K. Macounová and P. Yager (2000). A microfluidic sedimentation particulate capture device with internal degassing membranes. Micro Total Analysis Systems 2000, Enschede, The Netherlands, May 14-18, 2000, Kluwer Academic Publishers: 319-321.
11. Jang, L. S., M. S. Saini, **M. R. Holl** and D. R. Meldrum (2001). Purification of DNA sequencing projects with a model compound in a high-throughput microfluidic format, the ACAPELLA-5K. Micro Total Analysis Systems 2001, Monterey, CA, October 21-25, 2001: 115-116.
12. Mann, T. P., **M. R. Holl**, M. S. Saini, C. H. Fisher, W. H. Pence, S. E. Moody, D. L. Cunningham, D. E. Sabath and D. R. Meldrum (2001). Real-time fluorescence detection of DNA in 5 µl capillary channels for minimal residual disease quantification using the ACAPELLA-5K high-throughput automated analysis system. Micro Total Analysis Systems 2001, Monterey, CA, October 21-25, 2001: 575-576.
13. Meldrum, D. R., W. Pence, S. E. Moody, D. L. Cunningham, **M. R. Holl**, P. J. Wiktor, M. Saini, M. P. Moore, L. S. Jang, M. Kidd, C. Fisher and A. Cookson (2001). Automated, integrated modules for fluid handling, thermal cycling and purification of DNA samples for high throughput sequencing and analysis. 2001 IEEE/ASME International Conference on Advanced Intelligent Mechatronics, Como, Italy, July 8-11, 2001. **2**: 1211-1219.
14. Meldrum, D. R., W. H. Pence, S. E. Moody, D. L. Cunningham, **M. Holl** and P. J. Wiktor (2001). Automated microfluidics for genomics. Proceedings of the 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Istanbul, Turkey. **3**.
15. Jang, L. S., D. R. Meldrum and **M. R. Holl** (2002). An active mixer for microscale DNA purification and sequencing reaction clean-up. Micro Total Analysis Systems 2002, Nara, Japan, November 3-7, 2002.
16. Kosar, T. F., D. R. Meldrum and **M. R. Holl** (2002). Synchronization of bacterial cultures in a microsystem. Micro Total Analysis Systems 2002, Nara, Japan, November 3-7, 2002.
17. Lipscomb, R. C., J. Clemmens, Y. Hanein, **M. R. Holl**, V. Vogel, B. D. Ratner, D. D. Denton and K. F. Bohringer (2002). Controlled Microtubules Transport on Patterned Non-fouling Surfaces. 2nd Annual International IEEE-EMBS Special Topic Conference on Microtechnologies in Medicine & Biology, Madison, Wisconsin, May 2-4, 2002.
18. Meldrum, D. R., C. H. Fisher, M. P. Moore, M. Saini, **M. R. Holl**, W. H. Pence, S. E. Moody, D. L. Cunningham and P. J. Wiktor (2003). ACAPELLA-5K, A high-throughput automated genome and chemical analysis system. IEEE International Conference on Intelligent Robots and Systems, Las Vegas, NV, October 27-31, 2003. **3**: 2321-2328.
19. Meldrum, D., **M. Holl**, P. Seriburi, S. Phillips, S. H. Chao, L. Jang and F. Kosar (2003). MEMS modules for life-on-a-chip. Proceedings of the IEEE International Symposium on Circuits and Systems, Bangkok, Thailand. **3**: 111638-111641.
20. Banani, N., L. A. Lee, **M. R. Holl**, M. Troll, B. Marquardt and D. M. Wilson (2004). SLAP: Design software for optimization of fluorescence analysis systems. Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBC 2004, San Francisco, CA. **26**: 2086-2089.
21. Fung, T. H., G. I. Ball, S. C. McQuaide, S. H. Chao, A. Coleman-Lerner, **M. R. Holl** and D. R. Meldrum (2004). Microprinting of on-chip cultures: patterning of yeast cell microarrays using concanavalin-A adhesion. Proceedings of the ASME International Mechanical Engineering Congress, Anaheim, CA, November 13-20, 2004. Advances in Bioengineering (BED): 373-374.
22. Koschwanetz, J., **M. Holl**, D. Meldrum, M. McMurray and D. Gottschling (2004). Automation of yeast pedigree analysis. Proceedings of the IEEE International Conference on Robotics and Automation, New Orleans, April 26 thru May 1, 2004: 1475-1480.
23. Chao, S. H., **M. R. Holl**, L. S. Jang and D. R. Meldrum (2005). Three dimensional microfluidic flow field characterization with partial image velocimetry and laser scanning confocal microscopy. MicroTAS 2005, the 9th international Conference on Miniaturized Systems for Chemistry and Life Sciences, Boston, MA, October 9-13, 2005: 109-111.
24. Chao, S. H., **M. R. Holl**, J. H. Koschwanetz, R. H. Carlson, L. S. Jang and D. R. Meldrum (2005). Velocity measurement in microchannels with a laser scanning microscope and particle linear image velocimetry. Proceedings of the 2nd International Conference on Microchannels and Minichannels (ICMM2004), Rochester, New York, ASME: 925-930.

25. Chao, S. H., **M. R. Holl**, J. H. Koschwanetz, P. Seriburi and D. R. Meldrum (2005). Scaling for microfluidic mixing. Proceedings of the ASME 3rd International Conference on Microchannels and Minichannels, Toronto, Canada. **B**: 329-336.
26. Koschwanetz, J., **M. Holl**, R. H. Carlson, M. McMurray, D. Gottschling and D. Meldrum (2005). Automated Lifetime Analysis of a Single Yeast Cell. IEEE Conference on Automation Science and Engineering, Edmonton, Alberta, Canada, August 1-2, 2005.
27. Meldrum, D. R., **M. R. Holl**, C. H. Fisher, M. S. Saini, S. K. McGuire, T. T. H. Ren, W. R. Pence, S. E. Moody, D. L. Cunningham, D. A. Donaldson and P. J. Wiktor (2005). Sample preparation in glass capillaries for high throughput biochemical analysis. IEEE Conference on Automation Science and Engineering, Edmonton, Alberta, Canada, August 1-2, 2005.
28. Miller, A., M. Stanton, C. Sanchez, X. Li, S. McQuaide, B. Reid, D. Meldrum, T. Paulson and **M. Holl** (2005). Biopsy preparation for flow analysis using microfabricated disaggregation blades. IEEE Conference on Automation Science and Engineering, Edmonton, Alberta, Canada, August 1-2, 2005.
29. Chao, S. H., **M. R. Holl**, S. C. McQuaide and D. R. Meldrum (2006). Oxygen concentration measurement with a phosphorescence lifetime based micro-sensor array using a digital light modulation microscope. SPIE Conference on Imaging, Manipulation and Analysis of Biomolecules, Cells, and Tissues, San Jose, CA, January 22-27, 2005.
30. Chao, S. H., T. T. H. Ren, S. A. Gales, **M. R. Holl**, S. C. McQuaide and D. R. Meldrum (2006). Automated digital light modulation microscope (DLMM) for living cell array analysis: pattern recognition and spatial alignment. The first IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics, Pisa, Tuscany, Italy, February 20-22, 2006.
31. Koschwanetz, J., J. Wolfe, **M. Holl**, R. Carlson and D. Meldrum (2006). Automated, biomechatronic system to study single cell aging. The first IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics, Pisa, Tuscany, Italy, February 20-22, 2006.
32. McQuaide, S. C., **M. R. Holl**, L. Burgess, T. Molter, J. Dragavon, A. C. Young, T. Strovas, J. Anderson, A. Jen, B. Karlsgodt, M. Lidstrom and D. Meldrum (2006). A living cell array (LCA) for multiparameter cell metabolism studies. The first IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics, Pisa, Tuscany, Italy, February 20-22, 2006.

C. Research Support

Ongoing Research Support

1 R24 HG02215-05 Meldrum (PI) (40%) 6/1/00 – 9/30/07

NIH/ NHGRI

Advanced Develop/Test ACAPELLA Automated Sample Handler.

The major goal of this project is to alpha- and beta-test the ACAPELLA automated sample handler with the UW Genome Center (M. Olson). It also provides support to build the 12-bay thermal cycling module, the purification module, and the capillary electrophoresis interface.

Role: Co-Investigator

5 P50 HG002360-05 Meldrum (PI) (45%) 8/1/01 – 7/31/11

NIH/NHGRI

CEGSTech: Integrated Biologically-Active Microsystems (01-06)

CEGS: Microscale Life Sciences Center (06-11)

The goal of the MLSC is to develop cutting edge technology for multi-parameter analysis of single cells, and apply this technology to the understanding of biological questions characterized by cellular heterogeneity. Our current focus is on disease pathways, and our vision is to address pathways to disease states directly at the individual cell level, at increasing levels of complexity that progressively move to an *in vivo* understanding of disease. Two model systems, pro-inflammatory cell death (pyroptosis) and neoplastic progression of Barrett's esophagus, are addressed. Key investigators on the proposal are D. Meldrum, M. Lidstrom, K. Böhringer, L. Burgess, B. Cookson, N. Dovichi, M. Holl, A. Jen, B. Parviz, and B. Reid.

Role: Co-Investigator

2 R01 HG01497-08 Meldrum (PI) (5%) 5/1/02 - 4/30/07

NIH/NHGRI

Microscale Instrument Development for Genomic Analysis.

The major goal of this proposal is to design and build integrated and automated microsystems to study aging in the model eukaryotic system, *Saccharomyces cerevisiae* (yeast).

Role: Co-Investigator

1 R01 GM068878-03 Meldrum (PI) (5%) 9/1/03 – 8/31/07

NIH/NIGMS

High-throughput, Capillary-based Protein Crystallography.

The major goal of this proposal is to demonstrate and build proof-of-principle automated systems for protein crystallography inside glass capillaries.

Role: Co-Investigator

1 R21 CA 112149-01 Meldrum (PI) (5%) 5/1/05 – 4/30/06 (R21); 5/1/06-4/30/09 (R33)

NIH/NC

Automated Cell Preparation in Tubes for 3D Microscopy.

The major goal of this proposal is to develop a new automated system that will transform the difficult and messy clinical specimen into an optimal format for 3D microscopy for morphological and molecular analysis.

Role: Co-Investigator

Completed Research Support

1 R21/R33 CA84691-05 Meldrum (PI) 6/1/00 – 6/30/05

NIH National Cancer Institute

Automated Minimal Residual Disease Quantification.

The major goal of this project is to develop an automated system and algorithms for the quantification of minimal residual disease by using real-time PCR to quantify cancer cells in a background of nonpathologic DNA.

Role: Co-Investigator