BIOGRAPHICAL SKETCH

Provide the following information for the key personnel in the order listed for Form Page 2.
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NAME	POSITION TITLE
Deirdre R. Meldrum	Professor of Electrical Engineering Adjunct Professor of Bioengineering Adjunct Professor of Mechanical Engineering

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Washington, Seattle, WA	B.S.	1978-83	Civil Engineering
Rensselaer Polytechnic Institute, Troy, NY	M.S.	1983-85	Electrical Engineering
Stanford University, Stanford, CA	Ph.D.	1987-93	Electrical Engineering

A. Positions and Honors

Positions and Employment

1979 Engineering Co-op Student, Puget Sound Naval Shipyard, Bremerton, WA (designed & inspected foundations on Navy ships and submarines.)

1980-1981 Engineering Co-op Student, NASA Johnson Space Center, Houston, TX (Shuttle Mission Simulator instructor for astronauts.)

1982-1983 Design Engineer, Washington State Department of Transportation, Seattle, WA

1983-1984 Teaching Assistant, Department of Electrical Engineering, Rensselaer Polytechnic Institute, Troy, NY (courses in Probability, Discrete Time Systems, Linear Systems, & General Engr. Lab)

1984 Summer Intern, Galileo Flight Test Group, Guidance & Control Section, Jet Propulsion Laboratory, Pasadena, CA (tested the Galileo spacecraft flight software with flight hardware in the loop.)

1985-1987 Member of Technical Staff, Machine Intelligence Systems Group, Automated Systems Section, Jet Propulsion Laboratory, Pasadena, CA (developed algorithms for robot control, flexible space structure control, & identification. Tested identification algorithms on a 12-rib flexible antenna experiment.)

1987-1988 Graduate Research Assistant, Department of Electrical Engineering, Stanford University (investigated adaptive time-optimal control of flexible structures, advisor Gene F. Franklin)

1988-1989 Teaching Assistant, Department of Electrical Engineering, Stanford University (courses in Digital Signal Processing, Feedback Control Design, Electromagnetic Fundamentals, and Electromagnetic Waves)

1989-1992 NASA Fellow and Amelia Earhart Fellow, Stanford University (Obtained new results in adaptive control of multi-link serial manipulators using spatial operator algebra.)

1992-1998 Assistant Professor, Dept. of Electrical Engineering, Univ. of Washington

1997-1998 Adjunct Assistant Professor, Dept. of Bioengineering, Univ. of Washington

1998-2001 Associate Professor, Dept. of Electrical Engineering, Univ. of Washington
Adjunct Associate Professor, Dept. of Bioengineering, Univ. of Washington

2001-present Professor, Dept. of Electrical Engineering, Univ. of Washington
Adjunct Professor, Dept. of Bioengineering, Univ. of Washington
Adjunct Professor, Dept. of Mechanical Engineering, Univ. of Washington
(Founded the Genomation Laboratory that is dedicated to interdisciplinary problem solving for biotechnology. Teach courses primarily in controls systems, sensors, actuators, and robotics.)

Other Experience and Professional Memberships

Member, IEEE Robotics & Automation Technical Committee on Automation, 3/97-present; Region 6 Representative, IEEE Engineering, Medicine, & Biology Society (EMBS) Advisory Committee, 1999-2000; Professional Activities

Committee (PACE) Chair, IEEE Engineering Medicine & Biology Society (EMBS), 1999; United States Department of Transportation, Transportation Northwest (TransNow), Secretary, 1998-2000; Member, IEEE Transactions on Automation Sciences and Engineering (TASE) committee July 2002-pres.; Representative for IEEE Robotics and Automation Society to the IEEE Transactions on NanoBioscience, September 2002- pres.; Editor , IEEE Transactions on Automation Science and Engineering 2003-pres.; Editorial Board, Genome Research 2003-pres.; Editorial Board, Genomics 2003-pres.; Member: AAAS, ACS, HUGO, IEEE, Sigma Xi, SWE.

Honors

1989-1991	Zonta International Amelia Earhart Fellowship
1989-1992	NASA Graduate Student Researchers Fellowship
1993-present	Sigma Xi, The Scientific Research Society, full member
1993	SAE Ralph R. Teetor Educational Award
1993-1998	NIH NCHGR Special Emphasis Research Career Award
1995	NAE First Annual Symposium on Frontiers of Engineering (1 of 95 invited participants)
1996-2001	Presidential Early Career Award for Scientists and Engineers (nomination by NIH) "for recognition of innovative research utilizing a broad set of interdisciplinary approaches to advance DNA sequencing technology." [President William Clinton]
1997	University of Idaho Honors Convocation Speaker
1997	UW CoE Outstanding Faculty Award for Control Systems Laboratory & Curriculum (with J. Vagners of Aeronautics/Astronautics and M. Berg of Mechanical Engineering)
1998	UW CoE & EE Open House Display (with students), 1st place
2000	Finalist (1 of 4) Best Automation Paper, International Conf. on Robotics and Automation
2000-2003	Member, Peer Review Oversight Group (PROG), Office of the Director, National Institutes of Health (NIH)
2000-2003	Member, Scientific Advisory Board, Joint Genome Institute (JGI), Department of Energy (DOE)
2001-2006	Director (with M. Lidstrom), NIH NHGRI Center of Excellence for Genomic Science (CEGS), called Microscale Life Sciences Center (MLSC)
2003	Fellow of the American Association for the Advancement of Science (AAAS)

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

D. S. Bayard, F. Y. Hadaegh, and D. R. Meldrum, "Optimal experiment design for identification of large space structures," *Automatica: Journal of International Federation of Automatic Control*, vol. 24, pp. 357-364, 1988.

D. R. Meldrum, "The interdisciplinary nature of genomics," *IEEE Engineering in Medicine and Biology*, pp. 443-448, July/August 1995 [invited].

E. Tongco and D. R. Meldrum, "Optimal sensor placement and active vibration suppression of large flexible space structures," AIAA Journal of Guidance, Control, and Dynamics, pp. 961-963, July-August 1996.

Deirdre Meldrum, "A biomechatronic fluid sample handling system for DNA processing," *IEEE/ASME Transactions on Mechatronics*, special issue on Mechatronics in Manufacturing, vol. 2, no. 2, pp. 99-109, June 1997 [invited].

Lauren Sjoboen and Deirdre Meldrum, "Compact jam resistant capillary dispenser for automation systems," *Laboratory Robotics and Automation*, vol. 10, pp. 15-17, 1998.

H. T. Evensen, D. R. Meldrum, and D. L. Cunningham, "Automated fluid mixing in glass capillaries," *AIP Review of Scientific Instruments*, vol. 69, no. 2, pp. 519-526, Feb. 1998.

Neal Friedman and Deirdre Meldrum, "Capillary tube resistive thermal cycling," *Analytical Chemistry*, vol. 70, no. 14, pp. 2997-3002, July 15, 1998.

C. Taylor and D. R. Meldrum, "Fuzzy ramp metering: design overview and simulation results," *Transportation Research Record*, no. 1634, pp. 10-18, 1998. [this algorithm is in daily use on 126 freeway ramps on the Seattle freeway system.]

E. B. Arutunian, D. R. Meldrum, N. A. Friedman, and S. E. Moody, "Flexible software architecture for user-interface and machine control in laboratory automation," *Biotechniques*, vol. 25, no. 4, pp. 698-700, 704-705, October 1998.

Marco Daoura and Deirdre Meldrum, "Precise automated control of fluid volumes inside glass capillaries," *IEEE Journal of Microelectromechanical Systems*, vol. 8, no. 1, pp. 71-77, March 1999.

H.T. Evensen, D.R. Meldrum, C. Saenphimmachak, and E.E. Dixon, "High-density small-volume gel loading directly from capillary tubes," *BioTechniques*, vol. 27, no. 5, pp. 974-978, Nov. 1999.

D. R. Meldrum, H.T. Evensen, W.H. Pence, S.E. Moody, D.L. Cunningham, and P.J. Wiktor, "ACAPELLA-1K: A capillary-based submicroliter automated fluid handling system for genome analysis," *Genome Research*, Jan. 2000, Vol. 10, No. 1, pp. 95-104.

D. R. Meldrum, H.T. Evensen, W.H. Pence, S.E. Moody, D.L. Cunningham, and P.J. Wiktor,"ACAPELLA-1K: a biomechatronic fluid handling system for genome analysis that processes 1000 samples in 8 hours," *IEEE/ASME Transactions on Mechatronics*, vol. 5, no. 2, pp. 212-220, June 2000 [invited].

Deirdre Meldrum, "Automation for genomics, part 1: preparation for sequencing," *Genome Research*, vol. 10, no. 8, pp. 1081-1092, August 2000 [invited].

Deirdre Meldrum, "Automation for genomics, part 2: sequencers, microarrays, and future trends," *Genome Research*, vol. 10, no. 9, 1288-1303, September 2000 [invited].

Deirdre Meldrum, "Sequencing genomes and beyond," *Science*, vol. 292, no. 5516, 515, 517, 20 April 2001.

Crippen, S. M., M. R. Holl and D. R. Meldrum, "Examination of dielectrophoretic behavior of DNA as a function of frequency from 30Hz to 1MHz using a flexible microfluidic test apparatus," In *Micro Total Analysis Systems 2000*, Enschede, The Netherlands, 14-18 May 2000, Kluwer Academic Publishers, (2000), 529-532.

Mann, T. P., Holl, M. R., Saini, M. S., Fisher, C. H., Pence, W. H., Moody, S. E., Cunningham, D. L., Sabath, D. E., and Meldrum, D. R., "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," In *Micro Total Analysis Systems 2001*, Kluwer Academic Publishers, 575-576.

Jang, L.-S., Saini, M. S., Holl, M. R., and Meldrum, D. R., "Purification of DNA Sequencing Products with a Model Compound in a High-Throughput Microfluidic Format, the ACAPELLA-5K," In *Micro Total Analysis Systems 2001*, Kluwer Academic Publishers, 115-116.

Deirdre R. Meldrum and Mark R. Holl, "Microscale bioanalytical systems," *Science*, vol. 297, no. 5584, pp. 1197-1198, 16 August 2002 [invited by editor].

Mary E. Lidstrom and Deirdre R. Meldrum, "Life-on-a-Chip," *Nature Reviews Microbiology* vol. 1, no. 2, pp. 158-164, November 2003 [invited by editor].

Patents Granted

R. Seubert, M. V. Olson, D. R. Meldrum, B. Hannaford, P. Wiktor, N. A. Friedman, D. B. Snow, and R. Kraft, "Precision Small Volume Fluid Processing Apparatus," Patent number 5,785,926, July 28, 1998.

R. Kraft, N. A. Friedman, D. Meldrum, R. Seubert, "Precision Small Volume Fluid Processing Apparatus and Method," Patent number 6,218,193 B1, April 17, 2001.

C. Research Support

Ongoing Research Support

1 R24 HG02215-01 Meldrum (PI) 6/1/00 – 9/30/04
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), the Washington University St. Louis Genome Sequencing Center (R. Waterston), and the Whitehead Institute/MIT Center for Genome Research (E. Lander). It also provides support to build the 12-bay thermal cycling module, the purification module, and the capillary electrophoresis interface. A large subcontract to Orca Photonic Systems, Inc. is for building 3 more complete ACAPELLA systems, and a large subcontract to the Washington Univ. GSC provides reagents and supplies for extensive beta-testing.

1 R21/R33 CA84691-01 Meldrum (PI) 6/1/00 – 5/31/04
NIH National Cancer Institute
Automated Minimal Residual Disease Quantification
The major goal of this project is to develop an automated system for the quantification of minimal residual disease by using real-time PCR to quantify cancer cells in a background of nonpathologic DNA. Estimation algorithms will be designed and implemented on the automated system to derive the amplification yield. The sample DNA content will be derived from the amplification yield and calibrated fluorescence measurements of the reaction kinetics.

P50 HG002360-01 Meldrum (PI) 8/1/01 – 7/31/06
NIH/NHGRI
CEGSTech: Integrated Biologically-Active Microsystems

The major goal of this Center proposal is to design and build fully integrated and automated microsystems for the interrogation of individual cells. These systems will be able to simultaneously measure many variables in cells in real-time and provide data to analyze complex molecular outcomes such as cell proliferation, differentiation, apoptosis, and pathogenesis. The core technology developed will be converted into modules that automate detection of rare cells in cell populations and provide real-time analysis of metabolism in individual cells, taking advantage of genome sequence data. Modules will be developed for applications in proteomics, metabolomics, cancer biology, viral pathogenesis, and bacterial pathogenesis. Key investigators on the proposal are D. Meldrum, M. Lidstrom (co-PI), K. Bohringer, L. Burgess, B. Cookson, N. Dovichi, M. Holl, B. Marquardt, J. Mittler, J. Mullins, B. Reid, V. Vogel, and D. Wilson.

2 R01 HG01497-06 Meldrum (PI) 5/1/02 - 4/30/06
NIH/NGHRI
Microscale Instrument Development for Genomic Analysis

The major goal of this proposal is to design and build integrated and automated microsystems that are complementary to the PSO Center grant. The primary application to be addressed here is the study of the eukaryotic system. *Saccharomyces cerevisiae* (yeast). In addition, a mass spectrometry interface will be developed for highly selective and sensitive metabolomic analysis.

1 R01 GM068878-01 Meldrum (PI) 9/1/03 – 8/31/06
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: PI

[No number] Meldrum (PI) 01/01/03 – 12/31/03
Joint Institute for Nanoscience (JIN) UW & PNNL
Development of Cellular Absorptive Tracers (CATs) for Quantitative Characterization of the Complexity of Nanoscale Biological Systems

The major goal of this project is to develop CATs for characterizing the extent, location, and morphology of cell mass in MEMS and relating the resulting dataset of metabolic parameters to heterogeneity and morphology of cells.

Completed Research Support

1 R01 HG01497-05 Meldrum (PI) 5/1/96 – 4/30/02
NIH/NHGRI
Capillary Automated Submicroliter Sample Preparation

The major goal of this project is to develop an automated fluid sample handling system to prepare 5,000 reactions in an 8-hour period for restriction digests, PCRs, sequencing reactions, and so on. The instrument is to be capable of sample aspiration, reagent dispensing, mixing, fluid volume imaging, thermal cycling, offloading to capillary cassettes for storage, automated gel loading, and computer control with an easy-to-use user interface. In years 04 and 05 of this grant (PECASE award) the Acapella development is tapering off and a microfluidics/microfabrication effort has begun. (Two year extension was added for Presidential Early Career Award).