BRUCE KENT GALE

Merit Medical Systems Inc. Endowed Professor of Engineering and
Chair of Mechanical Engineering, University of Utah
Director, State of Utah Center of Excellence for Biomedical Microfluidics
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Education

September, 1995 to August, 1999	**PH.D. IN BIOENGINEERING** University of Utah Major Subjects: Microelectromechanical Systems (BioMEMS), Analytical Biosensors, VLSI Fabrication, Microfluidics, Cell and Tissue Engineering Dissertation Chair: A. Bruno Frazier	SEPTEMBER 1999 Salt Lake City, UT
September 1990 to June 1991 and January 1994 to August, 1995	**B.S. IN MECHANICAL ENGINEERING** Brigham Young University Major Subjects: Control Systems, Robotics, Compliant Mechanisms	AUGUST 1995 Provo, UT

Academic Appointments

July 2018 to present	**Chair,** Mechanical Engineering, University of Utah
July 2013 to present	**Professor**, Mechanical Engineering, University of Utah.
July 2013 - present	**Adjunct Professor,** Bioengineering; Electrical and Computer Engineering; Materials Science and Engineering, all at the University of Utah
July 2007 to June 2013	**Associate Professor**, Mechanical Engineering, University of Utah.
July 2007 – June 2013	**Adjunct Associate Professor,** Bioengineering; Electrical and Computer Engineering; Materials Science and Engineering, all at the University of Utah
July 2004 to present	**Director,** Utah State Center of Excellence for Biomedical Microfluidics. Supervise, direct, and perform research on biomedical microdevices important to the economy of the state of Utah.
February 2002 – June 2007	**Adjunct Assistant Professor,** Bioengineering; Electrical and Computer Engineering; Materials Science and Engineering, all at the University of Utah
Dec 2001 to June 2007	**Assistant Professor**, Mechanical Engineering, University of Utah. Teach classes in Mechanical Engineering, advise students, and perform research involving MEMS devices and their applications to in microfluidics and sensing.
August, 1999 to Dec 2001	**Assistant Professor**, Biomedical Engineering, Louisiana Tech University. Teach classes in Biomedical Engineering, advise students, and perform research involving MEMS devices and their applications to biology and medicine.
Sept 1995 to August, 1999	**Graduate Research Assistant**, Micro Instrumentation Research Laboratory and Center for Biopolymers at Interfaces, University of Utah.

Industrial Appointments

December, 2004 to present	**Founder and Principal Scientist**, Carterra (formerly Wasatch Microfluidics), Salt Lake City, Utah.
January, 2010 to 2017	**Chief Science Officer**, Guanine, Inc., Salt Lake City, Utah.
February, 2013 to present	**Founder, Chairman and Vice President Engineering,** Espira, Inc., Salt Lake City, Utah.
January 2016 to December 2020	**Founder and Vice President of Engineering,** Advanced Conceptions (Nanonc), Inc., Salt Lake City, Utah.
January 2016 to present	**Founder and Vice President of Engineering,** Microsurgical Innovations, Inc., Salt Lake City, Utah.
May 2018 to present	**Founder, Chair, and Vice President of Engineering,** WFluidx, Inc., Salt Lake City, Utah.

Teaching and Graduate Student Training

Spring 2022	Instructor, ME EN 2960 Foundations of Microsystems (1 h, 2 sections)
Fall 2012, 2013, 2014, 2016, 2017	Instructor, ME EN 2450 Numerical Methods for Sustainable Engin. Design (3 h)
Spring 2011-2012, 2015	Instructor, ME EN 4010 Senior Design II (3 h)
Fall 2009-2011,-20,-22 Spring 2013,-15,-17,-19	Instructor, ME EN 5/6730 and ECE 5/6962 and BME 5/6701 Microfluidic Chip Design and Fabrication (3 h)
Spring 2006/-08/-18	Instructor, ME EN 7960 and Bioen 6900 Microfluidic Design and Simulation (3 h)
Fall 2002-2007, 2019	Instructor, ME EN 2400 &2410 Dynamics, University of Utah (4 h)
Spring 2002,-03,-05,-07,-13	Instructor, ME EN 5050 & 6050, ECE 5221 and 6221, BIOEN 6421 Introduction to Micromachining, University of Utah (3 h)
Fall 2001	Instructor, MSE 501 Microsystems Principles, Louisiana Tech (3 h) (67 students)
Winter 2000-2001	Instructor, BIEN 550C Biomedical Microsystems, Louisiana Tech (3 h)
Spring 2000 and 2001	Instructor, BIEN 420 Biomaterials and Biomechanics, Louisiana Tech (3 h)
Winter 1999-2000	Instructor, BIEN 515 Biosensors and Their Applications, Louisiana Tech (3 h)
Fall 1999 and 2000	Instructor, BIEN 500 Physiology for Engineers, Louisiana Tech, (4 h)
Fall 1998	Co-Instructor, BE 6900 & EE 6960: Micromachined Instrumentation Systems University of Utah. (3 h)

Graduate Students Graduated

University of Utah

No.	Name	Thesis Topic	Degree	Dept	Defense Date
1	Nithin Narayanan	Microscale SPLITT Fractionation	MS	ME	Aug 2004
2	Aju Badardeen	Oxygen Sensing Using Electrostatic Layer by Layer Assembly	MS	ME	December, 2004
3	David Chang-yen	Design of Microscale Fluidic Sensing Arrays	PhD	ME	April 2005
4	Ameya Kantak	Microscale Cyclical Electrical Field Flow Fractionation	PhD	ME	July 2005
5	Rajesh Gopalakrishnan	Nanoassembled Glucose Sensing	MS	ECE	Nov 2005
6	Siddharth Chakravarthy	Polymerized Liposome Analysis with FFF	MS	ME	Dec 2005
7	Ryan Sincic	DNA Extraction from Cancer Cells	MS	Bioen	May 2006
8	Casey Pehrson	Microneedle Arrays	MS	ME	May 2006
9	Josh Eckman	Microfluidic Spotter Design	MS	ME	Dec 2006

10	John Maxwell	Integrated Electronics and Pneumatics	MS	ME	Aug 2007
11	Tammy Ho	A Novel Paraffin-Based Microactuator	MS	Bioen	Dec 2007
12	Sriram Natarajan	High density biomolecule spotting systems	PhD	ChemE	April 2008
13	Niel Crews	Ultra High Speed DNA Analysis	PhD	ME	May 2008
14	Himanshu Sant	Microscale Field Flow Fractionation	PhD	Bioen	June 2008
15	Mark Eddings	Integrated biomolecule spotting systems	PhD	Bioen	Aug 2008
16	Jungkyu Kim	Integrated High Density DNA Extraction and Analysis	PhD	Bioen	Sept 2008
17	Clint Holtey	Microvalves Integrated into Printed Circuit Boards	MS	ME	Dec. 2008
18	Merugu Srinivas	Modeling of Cyclical Electrical Field Flow Fractionation	PhD	ECE	April 2009
19	Rahul Sonkul	Hybrid PDMS/PMMA Microfluidic Systems	MS	ME	May 2009
20	Rajesh Surapaneni	DNA Extraction	MS	ME	Dec 2009
21	Rohit Sharma	Real time DNA extraction measurement	MS	ME	Dec 2009
22	Venu Arremsetty	Microscale Flow SPLITT System	MS	ME	May 2010
23	Austin Welborn	Modeling of microfluidic eye implants	MS	ME	Aug 2010
24	Scott Sundberg	High density arrays for Homogenous RT-PCR	PhD	Bioen	Dec 2010
25	Doug Anjewierden	Electrostatic Integrated Valves for Microfluidics	MS	ME	May 2011
26	Keng-Min Lin	A Novel Drug Delivery Device for the Eye	MS	ME	May 2011
27	Erik Liddiard	Microfluidic Worm Sorting	MS	Bioen	Aug 2011
28	Victoria Ragsdale	Heat Transfer Analysis of Polymers for Flow PCR	MS	ME	Dec 2011
29	Cody Gehrke	Vascular Coupling Device	MS	ME	May 2012
30	Onur Tasci	Nanoparticle Characterization using Electrical FFF	PhD	Bioen	May 2013
31	BJ Minson	Polycarbonate Microfluidic DNA Analysis Systems	MS	ME	May 2013
32	Nathan Gooch (co)	Intraocular Drug Delivery Device	PhD	Bioen	May 2013
33	Michael Johnson	Microfluidic Systems for Rapid Biological Assays	PhD	ME	Aug 2013
34	Raheel Samuel	Microfluidic Systems for Neurotechnology	PhD	ME	April 2014
35	Keng Min Lin	Miniature Drug Delivery Devices	PhD	ME	April 2014
36	Harikrishnan Jayamohan	Nanoscale Bacteria Sensing Systems	PhD	ME	May 2015
37	Huizhong Li	A Vascular Coupling Device	PhD	ME	May 2015
38	Scott Ho	Manufacture of Nerve Regeneration Devices	MS	ME	June 2015
39	Russ Reid	Contact Lens Biofuel Cell	PhD	ME	Dec 2015
40	Jiyoung Son	Microfluidic Cell Separations	PhD	ECE	May 2017
41	Pratima Labroo	Nerve Regeneration Devices	PhD	ME	May 2017
42	Ryan Brewster	PLGA Vessel Anastomosis	MS	ME	May 2017
43	Kevin Petersen	Exosome Separations	PhD	ME	May 2018
44	Arlen Chung	Zebrafish Genotyping Chip Optimization	MS	ME	May 2018
45	Valentin Romanov	Synthesis of Lipid Vesicles using Rapid Prototyping	PhD	ME	Dec 2018
46	Joshua Burton	Novel Nerve Regeneration Devices	MS	BME	Dec 2018
47	Farhad Shiri	Separation of Virus Like Particles	PhD	ME	May 2020
48	Marzieh Chaharlang	Modeling of Sperm Transport in Inertial Microfluidics	PhD	Physics	May 2020
49	John Nelson	Simulation of a Vascular Coupling Device	MS	Bioen	May 2020
50	Haidong Feng	Inertial Microfluidics for Cell Processing	PhD	ME	Aug 2020
51	Alex Jafek	Sperm Separations using Inertial Microfluidics	PhD	ME	Aug 2020
52	Mike Beeman	Electrochemical Pathogren Detection	PhD	ME	May 2021
53	Brett Davis	Nerve Regerneration Devices	PhD	Bioen	May 2021
54	Ugochukwu Nze	Cell Separation Devices	PhD	ME	May 2021
55	Susan Wojtalewicz	Drug Delivery Particles	MS	ME	May 2022
56	Dhruv Patel*	Pathogen Analysis using Cavitation	PhD	ME	Dec 2022

Total PhD: 28; Total MS 27 *Co-Chair PhD: 1

Louisiana Tech University

No.	Name	Thesis Topic	Degree	Dept	Defense Date
1	Mengyan Li	Microstructures for Tissue Engineering	MS	BME	April 2002
2	Avinash Saldanha	Viral Separations using a Micro SPLITT	MS	ECE	April 2002

3	Krishnan Padmanabhan	Impedance Spectroscopy Detection of Nanoparticles	MS	ECE	April 2002
4	Himanshu Sant	Scaling In EFFF	MS	BME	April 2002
5	David Chang-yen	Oxygen Sensitive Self Assembled Films	MS	BME	August 2002
6	Merugu Srinivas	Cyclical Electrical Field Flow Fractionation	MS	ECE	August 2002

Mahidol University, Bangkok, Thailand (Co-Advisor)

No.	Name	Thesis Topic	Degree	Dept	Defense Date
1	Wilaiwan Somchue	Nanoparticle Characterization using ElFFF	PhD	Chemistry	April 2012
2	Mathuros Ornthai	Improved CyElFFF for Nanoparticle Analysis	PhD	Chemistry	January 2016

Graduate Students Currently Supervised

#	Name	Thesis Topic	Degree	Dept	Expected Grad. Date
1	Jesus Arellano	Continuous Flow Cells Integrated with Microscopy	PhD	Bioen	May 2023
2	Chris Lambert	High throughput Zebrafish Genotyping	PhD	ME	Dec 2022
3	Matt Nelson	Organ on a Chip Systems	PhD	Bioen	May 2023
4	Brady Goenner	96 Channel Valve Card	PhD	ME	May 2023
5	Utpal Saha	Microfluidic Sperm Analysis Devices	PhD	ECE	May 2023
6	Tawsif Mahmood	Electrochemical Detection of Pathogens	PhD	ME	Dec 2022
7	Nusrat Tazin	Zebrafish Instrumentation	PhD	ECE	Dec 2022
8	Sabin Nepal	Microfluidic RNA analyasis	PhD	ME	May 2024
9	Bahar Kazemi	Sample Preparation for Sequencing	PhD	ME	May 2024
10	Munawar Jawad	Microfluidic RNA-seq	PhD	ME	May 2026
11	Greg Liddiard	Microfluidic RNA-seq instrumentation	PhD	ECE	May 2024
12	Shamima Juthi	Reconfigurable Antenna	PhD	ECE	May 2024
13	Ata Ullah	Spermatogenisis in a Microfluidic Device	PhD	BME	May 2026

Post Doctoral Training Supervised

#	Name	Dates
1	David Chang-yen	April 2005- April 2007
2	Himanshu Sant	July 2008 – June 2013
3	Jungkyu Kim	September 2008 – August 2009
4	John Elsnab	September 2008 – December 2009
5	Merugu Srinivas	October 2009 – September 2010
6	Scott Sundberg	December 2010 – May 2011
7	Raheel Samuel	May 2014 – December 2018
8	Harikrishnan Jayamohan	July 2015 – March 2016
9	Mohammad Rajesh Khan	December 2017 – July 2018
10	Farhad Shiri	January 2020 – present
11	Haidong Feng	May 2020 – Feb 2021

Undergraduate Student Research Projects Advised

#	Name	Dates
1	Adam Miles	2004-2006
2	Andrew Christensen	2004-2005
3	Jenny Greer	2005-2007
4	John Brady	2005
5	Ahmed Bradshaw	2005-2006
6	Joel Marsh	2005-2006
7	Chris Morrow	2006-2007
8	Dieter Bevans	2006-2007
9	Phillip Brough	2007-2008
10	Avdo Cutic	2008-2009

#	Name	Dates
11	Darren Johnson	2009-2010
12	Johnny Lop Ng	2009-2010
13	Cory Shorr	2010-2011
14	Chao Gao	2010-2011
15	Faris Ali	2010-2012
16	Rinchen	2011-2012
17	Scott Ho	2011- 2013
18	Chris Lambert	2011- 2014
19	Rebecca Klaus	2012-2013
20	John Nelson	2013- 2016

#	Name	Dates
21	Ryan Brewster	2014- 2016
22	Naveen Rathi	2014-2018
23	Megan Roach	2014-2016
24	Jordan Davis	2014-2020
25	Sean Jones	2014-2015
26	Rainey Cornaby	2014-2016
27	Taylor Howell	2014-2015
28	Matthew Givens	2014
29	Brody King	2015-2020
30	Derek Dunford	2015-2016
31	Susan Wojtalewicz	2015-2018
32	Travis White	2015-2017
33	Kristina Royzman	2015-2016
34	Blair Gerratt	2014-2015
35	Edgar Vasquez	2015-2016
36	Nicholas Miller	2014-2016
37	Nika Belova	2015-2016
38	Daniel Zhu	2016-2018
39	Carlos Vinatea	2016

#	Name	Dates
40	Connor Morgan	2016-2017
41	Sierra Erickson	2016-2020
42	Sean Harbertson	2016-2020
43	Hayden Brady	2016-2020
44	Polly Creveling	2017
45	Jesse Griffin	2017-2018
46	Kade Lansford	2017-2018
47	Gareth Graves	2018-2020
48	Hyonoo Joo	2018-2019
49	Chidi Ahanonu	2018-2020
50	Elaine Wong	2020-2020
51	Madison Hansen	2020-2022
52	Derek Dunford	2019-2022
53	Heather Wilaby	2020-2021
54	Zachary Lin	2019-2021
55	Daniel Broadhead	2020-2021
56	Cameron Mercer	2020-2022

Senior Design Projects Advised

#	Project	Dates	Students
1	Microneedles	2003-2004	Matthew Bown, Mark Eddings, Marc Leatherman, Casey Pehrson Scott Sundberg, Scot Waye, Mike Wyatt
2	DNA Extraction System	2004-2005	Lisa Bailey, Robert Bell, Jensen Dobbs, Brendan Perkins
3	Neurotap Mechanical Inserter	2004-2005	Daniel Cooley, Matt Mikkelsen, James Harris Richard Kiser, Ted Holt, Ryan Davis
4	Desalinization Device	2005-2006	Bryon Conner, Greg Hansen, Brad Tippetts, Richard Allen, Matt Goodro, Adam Pyper
5	Microfluidic Spotter	2005-2006	Jacob Browning, Louis Monaco, Todd Andelin, Christopher Weaver
6	DNA Melting Analysis	2007-2008	Christian Sellers, Steven Rabe, Seth Plazier, Jenny Greer, Dan Torgerson, Chad Meeks
7	DNA Haplotyping Disk	2008-2009	Avdo Cutic, Stuart Burton, Nellie Huynh
8	Arterial Coupler	2009-2010	Brian Stauffer, Lam Nguyen, Cory Shorr, Cody Gehrke
9	Mechanical Leech	2012-2013	Scott Ho, Jessica Kuhlman, Ladan Jiracek, Vic Walker, Andy Thompson
10	Rheumatoid Arthritis Sensor	2014-2015	Jaron Peck, Sarah Bentley, Rachel Ware, Parker Vance
11	96 Channel Pump	2015-2016	Bryan Luke, Rodolfo Garcia, Tanner Hatch, Brian Butler
12	Rising Toilet Seat	2015-2016	Cody Mitchell, Khoa Dinh, Brandon Wilstead, Jose Garcia
13	Low Cost Insulin Pump	2016-2017	Mckayla Whitehead, Josh Stubbs, Cherry Gregory, Young-Jun Jeon
14	Stem Cell Separations	2016-2017	Megan Roach, Joelle Hardy, Brianna Potter, Nelson Nieto, Travis Gowen
15	Sperm Cell Processing	2018	Trevor Teerlink, Cameron Hendricks, Jaron Ortega, Daniel Folsom, Mitch Shepherd
16	96 Channel Peristaltic Pump	2018	Connor Wade, Brian Lee, Evan Smail, Joseph Blash
17	Zebrafish Embryo Dispenser	2018-2019	Brett Reeder, Hanna Nizam, Daniel Lee
18	Drum Screen for Municipal Wastewater Treatment	2019	Adnan Khan, Kyle Mays, Jeremy Nguyen, Alik Nielsen, Thomas Pembroke
19	Andrology Clinic in a Box	2019	Daniel Mochizuki, Travis Simpson, Natalia Dominguez, Gabriel Milla
20	3D Printed Nerve Regeneration Device	2021	Tanner Dixon, Abby Fawbush, Ryan Lundell, Stephen Morgan, Reid Rouse

High School Student Research Projects Advised

#	Name	Dates
1	Dani Roush	Summer 2008
2	Bryan Cerda	Spring 2010
3	Matthew Bohman	Summer 2010
4	Kristen Johnsen	Summer 2011
5	Parker Awerkamp	Summer 2011
6	Naveen Rathi	Summer 2013 & 2014
7	Jacob Alder	Spring 2013
8	Lia Gale	Summer 2014
9	Sam Bonkowsky	May 2017-May 2020
10	Connor Nuibe	Summer 2021

Consulting

August 2022 – present	Adhesive Dispensing Patent Infringement Case
February 2021 – present	Abcellera, Patent Infringement Cases
September - Dec 2020	Aline Inc
November 2018 – Sep 2021	Qiagen, Patent Infringement Cases
July 2018 – October 2019	Confluent Surgical, Patent Infringement Cases
October 2014 - present	BioRad, Inc. Patent Infringement Cases
Sept 2010 – June 2011	Alcon Pharmaceuticals, Patent Infringement Case
August 2010 – June 2011	Roche Diagnostics, Patent Infringement Case
July 2007 – December 2011	Early Warning, Inc.
September 2005 – 2009	Member scientific advisory board for Center for BioModular Multi-Scale Systems (Louisiana State University); Paid position
December 2004 – present	Chief Technology Officer, Carterra (formerly Wasatch Microfluidics LLC)
October, 2004 – July 2005	Roche Diagnostics, Patent Infringement Case

Honors and Awards

May 2022	Named Merit Medical Systems Inc. Endowed Professor of Engineering
May 2022	Governor's Medal (Utah) for Science and Technology in Academia/Research
November 2021	Fellow of the National Academy of Inventors
August 2021	Fulbright Specialist in Microfluidics
April 2020	University of Utah Distinguished Research Award
April 2019	Honoree in the Entrepreneur Category at the 2019 Celebrate U event
April 2018	Honoree in the Entrepreneur Category at the 2018 Celebrate U event
August 2017	Researcher of the Year for 2016, Mechanical Engineering Department
September 2016	Technology Transfer Office Star Award
August 2014	Researcher of the Year for 2013, Mechanical Engineering Department
May 2014	Distinguished Mentor Award, University of Utah
August 2013	Researcher of the Year for 2012, Mechanical Engineering Department
Fall 2004, 2010, 2011	Top 15% Instructor Commendation, College of Engineering
April, 2004	Nominated for Student Choice Teaching Award
September 2001	Louisiana Tech College of Engineering Outstanding Researcher Award
1996-1999	NSF Graduate Research Fellowship
March 1996	Awarded Whitaker Foundation Graduate Research Fellowship
1995-1996	Whitaker Foundation Biobased Engineering Internship
August 1995	Mechanical Engineering Student Speaker at Graduation Award

Proposal and Research Activities

Currently Funded Projects

EAGER: Microfluidic Design Automation, NSF, PI, $300,000, Sep 2021 – Mar 2023.

A Biodegradable Vascular Coupling Device for End-to-End Anastomosis, NIH/Microsurgical Innovations, co-PI, $1,650,000, August 2016 – July 2022

An Integrated Biohazard Analyzer for Multiplexed Food and Water Pathogens, Espira/DOD, co-PI, $2,050,000, April 2017-August 2022.

University of Utah Manufacturing Extension Partnership Center, NIST, co-PI, $9,000,000, October 2021-September 2026.

Microfluidic Sample Processing, Viome, PI, $XXX,XXX, April 2022-Nov 2022.

Completed Projects

Rapid processing of zebrafish embryos for mutant generation, wFluidx/NIH, PI, $219,000, Aug 2020 – Jan 2022.

Sperm sample preparation for point of care applications, Nanonc/NIH, co-PI, $1,225,000, April 2018 – December 2022.

University of Utah Manufacturing Extension Partnership Center, NIST, co-PI, $12,000,000, October 2016-September 2021.

Microfluidic COVID Test Manufacturing, PI, $26,000, March – April 2021.

Ion Separations using Electrical Field Flow Fractionation, Metrohm, PI, $79,000, April 2020 – May 2021

Reconfigurable Antenna, L3/Harris, PI, $40,000, Aug 2020 – Jan 2021.

Epilepsy Diagnostics using Nanopores, EBS/NIH, PI, $40,000, Sep 2020 – Feb 2021.

Multiplexed Ion Detection, EBS/NIH, PI, $50,000, Sep 2020 – Feb 2021.

Rapid Detection of Legionella, Espira/EPA, co-PI, $150,000, March 2020 – Sep 2020.

Standard Microfluidic Chip, Medic.life, PI, $19,000, April 2020-July 2020.

Ion Current Rectification (ICR) Biosensing Biomedical Technologies, EBS (NIH), PI, $117,000, September 2017- August 2019.

Microfluidic Sensor Enhancement, Qorvo, PI, $44,000, May 2018 – December 2018.

Microfluidic Valve Card Array, Carterra, PI, $48,000, January 2018 – December 2018.

Nanopore Tools for RNA Analysis, EBS (NIH), PI, $50,000, September 2017- June 2018.

Nanotoxicology Assays Using a Microfluidic Array, UURF, PI, $17,500, July 1, 2017-June 30, 2018.

A Vascular Coupling Device, Utah TCIP, co-PI, $150,000, April 2016-March 2018.

Continuous Separations of Oncosomes from Exosomes, Espira/NIH, co-PI, $300,000, October 2016- Sept 2017.

Microfluidic Devices for Early (less than 48 hpf), non-destructive Zebrafish Genotyping, co-PI, $225,000, September 2016 – August 2017.

HT Label-Free Screening and Kinetic Analysis of Small Molecules and Biologics, NIH, co-PI, $1,300,000, May 2014 – April 2017

Enhancing Peripheral Nerve Regeneration with a Novel Drug-Delivering Nerve Conduit, DOD, co-PI, $750,000, October 2013 – September 2016.

Rapid sperm separations using inertial microfluidics, NSF STTR, co-PI, $225,000, January 2016-December 2016.

Passive microfluidic flow cells, Becton Dickinson/Boston University, PI, $25,000, March 2015-October 2016.

Nanopore Enabled Exonuclease Sequencing, NIH/Electronic Bioscience, subcontract PI, $15,000, October 2016-April 2017.

Tacrolimus Release in a Nerve Regeneration Device, UURF Engine, $25,000, June 2015 – May 2016.

Continuous Separation of Melanoma Exosomes Using Field-Flow Fractionation, NIH, PI, $560,000, August, 2013 – July, 2016.

Multiplexed bacteria, virus, and protozoa detection, DOD/Espira, co-PI, $100,000, October 2015 –September 2016.

Microfluidic GWAS, Mayo Clinic, $79,000, September 2015 – August 2016.

Nanoparticle Characterization, Pfizer, PI, $50,000, October 2015 – September 2016.

High Sensitivity Bacteria Detection, TCIP State of Utah, co-PI, $50,000, Jan 2015 – June 2016.

High Sensitivity Virus Detection, Espira Inc, PI, $30,000, May 2014 – April 2016.

Multiplexed Ovarian Cancer Microfluidic Tissue Microarray, NIH, co-PI, $225,000, June 2014 – December 2015.

Microfluidics Shared Equipment, UURF RIF, PI, $62,600, January 2015-December 2015.

IGERT: Nanobiosensors, Nanomaterials, and Microfluidics, NSF, co-PI, $3,000,000, August 2009 – July 2015.

Raman Laser Tweezers, UURF RIF, co-PI, $65,000, January 2015-December 2015.

Keck Center for Scaling Engineering Education: Transforming Undergraduate Micro/Nano Education through Scaling Engineering, Keck Foundation, co-PI, $200,000, December 2012 – May 2015.

Arterial Coupling Device, GOED, TCIP, co-PI, $120,000, May 2011 – May 2015.

A Drug Delivery Conduit for Nerve Regeneration, DOD, co-PI, $186,000, September, 2013 – May, 2015.

Arterial Coupling Device, UURF, Engine, co-PI, $30,000, January 2014 – May 2014.

Rapid bacteria detection from wastewater effluent, UURF, Engine, co-PI, $33,000, November 2013 – September 2014.

SBIR: 96 Channel Continuous Flow Print head and Integrated Flow Cell System, NIH/NIMH, PI, $1,056,000, August 1, 2008 – September 30, 2014.

SBIR: Submerged Printing of Lipid and Membrane Protein Arrays, NIH/NIGMS, PI, $350,000, September 1, 2012 – August 31, 2014.

SPLITT-based detection and monitoring of engineered nanomaterials in aquatic systems, NSF, co-PI, $418,000, September 2010 – August 2013.

K-Wire Drug Delivery Device, UofU TCP, co-PI, $35,000, January 2012-December 2013.

Nerve Regeneration Drug Delivery Device, UofU Seed Grant, co-PI, $31,000, July 2012 – June 2013

Near-Time Effluent Quality Sensor Technology for Organics and Bacteria for Shipboard Wastewater Treatment Systems, DOD SBIR, co-PI, $80,000, February, 2013 – August, 2013.

A Power-Free Complete Blood Count, I-Calc, PI, $36,000, August 15, 2012 – December 31, 2012.

Arterial Coupling Device, UofU TCP, co-PI, $70,000, January 2011 – December 2012.

Microfluidics for multiple engineering disciplines. NSF, PI, $60,000, December 1, 2008 – November 30, 2012.

Microneedle Arrays for Drug Delivery, PI, Hong Kong University, $15,700, July – October 2011.

Early Cancer Detection Platform: Sample In, Answer Out, U of U TCP/USTAR, PI, $120,000, January 2010 – December 2011.

Combined Flow Cytometry, Confocal Microscopy, and Highly Parallel Microfluidic Flow Cells, RIF, PI, $120,000, February 2010 – December 2010.

In Vivo Pressure Measurement and Drug Delivery for the Eye, UofU Seed, PI, $31,000, January 2011 – December 2011.

Rapid Detection of Foot and Mouth Disease, Indian Immunologicals, PI, $54,500, February 2010 – August 2011.

A High-throughput Flow-cell for Biosensor Platforms, NSF, PI, $600,000, July 1, 2008 – August 31, 2011.

Impact, Detection, and Tracking of Nanoparticles in Agriculture: A Focus on Crops and Rhizosphere Microbes, USDA, co-PI, $442,086, January 2009 – December 2011. USDA-CSREES grant 2009-35603-05037

Spinning Disk Digital Microfluidics, UofU TCP, co-PI, $70,000, July 1, 2008-June 30, 2010

SBIR: Parallel Microfluidic System for High Throughput Label Free Cytokine Analysis, NIH/NIAID, PI, $200,000, July 1, 2008 – December 30, 2009

SBIR: Highly Parallel AIDS Assays Using A Microfluidic Flow Cell Array Integrated with SPR, NIH, PI, $100,000, April 2009 – March 2010.

SPLITT-based detection and monitoring of engineered nanomaterials in aquatic systems, U of U Seed, co-PI, $22,000, July 2009 – June 2010.

Instruments for detection of bacteria in environmental water, Early Warning Inc, PI, $775,000, August 1, 2007-November 30, 2009

Generic Platform for DNA Sample Preparation, Univ of Utah TCP, PI, $70,000, Aug 1, 2007 – July 31, 2009.

Integrated Pneumatic and Electrical Systems, Idaho Technology, PI, $103,557, February 1, 2006 – September 30, 2008.

DNA Melting Analysis in High Speed Microfluidic Chips, Canon US Life Sciences, co-PI, $135,000, April 1, 2007 – March 31, 2008.

Small Molecule Removal Using SPLITT Techniques, Hallandia Ventures, PI, $20,000, May 1, 2007 – October 31, 2007

Microfluidics Based Braille Cell, Tactile Response, PI, $20,000, November 1, 2006- October 31, 2007.

State of Utah Center of Excellence for Biomedical Microfluidics, GOED, PI, $455,000, July 1, 2004 – June 30, 2007.

Synergy: Development of a Technology for Personalized Medicine, U of U Synergy Program, PI, $100,000, July 1, 2006- June 30, 2007

Microneedle Development, ZARS, PI, $25,000, June 22, 2006 – November 21, 2006

Volume Manufacturing of 48 Spot CFM Devices, Wasatch Microfluidics, PI, $49,335, October 1, 2006 – March 31, 2007.

University TA, U of U, co-PI, $12,000, August 2006 – May 2007.

Development of an International Engineering Experience Course, U of U, $4,000, PI, August 2006 – May 2007.

A Graduate Training Program in Micro Thermal Fluids, NSF-IGERT, co-PI, $3,500,000, August 1, 2000 – July 30, 2006.

Osmotic Pumps, Foxboro, co-PI, $37,000, January, 2005 – August, 2005.

High Resolution Laser Micromachining System, U of U RIF, PI, $35,000, July 1, 2004 – June 30, 2005.

Pressure Compensation in Micropumps, Ceramatec, co-PI, $5,000, June 1, 2004 – May 31, 2005.

Viscous Microscale Pump, University of Utah– TCP Program, co-PI, $70,000, July 1, 2003 – June 30, 2005.

Planning Grant for Center of Excellence in Biomedical Microfluidics, State COEP, $5,000, November 2003 – February, 2004, PI.

University TA, U of U, $11,000, August, 2003 – May, 2004, co-PI.

High Throughput Nanoparticle Separations Using Highly Parallel Electrical SPLITT Technology, University of Utah TTO – TCP Program, PI, $70,000, July 1, 2002 – June 30, 2004.

Microstructures for Directed Smooth Muscle Cell Growth, Louisiana Board of Regents RCS Program, PI, $130,500, July 1, 2001- June 30, 2004.

One-Two Three Go: A Strategic Initiative for Rapid Research Competitiveness in Microsystems Development (Salary and Research Enhancements), Louisiana BoR DEFE Program, co-PI, $910,000, Jun 2000 - May 2005.

Louisiana EPSCoR Research Infrastructure Improvement Award, NSF EPSCoR and Louisiana BoR, $13,500,000 ($2,850,000 under my direction), co-PI (coordinate activities of 12 investigators at seven research institutions and interface with other PIs), June 1, 2001- May 31, 2004.

Microfabricated Electrical Field Flow Fractionation Systems for Detection of Biowarfare Agents, United Engineering Foundation, PI, $25,000, January 2001 – December 2001.

Microstructures for Directed Cardiac Muscle Cell Growth, Rockefeller Brothers Foundation, PI, $25,000, January 1, 2001-December 31, 2001.

Biosensor Array, Los Alamos National Lab, PI, $16,053, May 1, 2001- July 15, 2001.

Optical Devices using X-ray Lithography, 3M Corporation, $70,000, co-PI, Sep 2000 - Mar 2001

Scholarly Activities and Publications

Submitted Journal Articles

1. Wilaiwan Somchue, Atitaya Siripinyanond, and Bruce K. Gale, "Cyclical Electrical Field-Flow Fractionation for Metal Nanoparticles Characterization," *Electrophoresis*, submitted.

Published Journal Articles

1. Zhiqiang Tan, Weichen Zhao, Yongguang Yin, Ming Xu, Wenxiao Pan, Yanwanjing Liu, Qinghua Zhang, Bruce K. Gale, Yukui Rui, and Jingfu Liu, "Insight into the formation and biological effects of natural organic matter corona on silver nanoparticles in water environment using biased cyclical electrical field-flow fractionation," *Water Research*, Vol. 228, Part A, pp. 119355, 1 January 2023. https://doi.org/10.1016/j.watres.2022.119355
2. Haidong Feng, Dhruv Patel, Jules J. Magda, Sage Geher, Paul A. Sigala, and Bruce K. Gale, "Multiple-Streams Focusing-Based Cell Separation in High Viscoelasticity Flow," *ACS Omega*, on the web: doi.org/10.1021/acsomega.2c06021
3. Dhruv Patel, Ugochukwu Nze; Christopher Lambert, Harikrishnan Jayamohan, Haidong Feng, Bruce Gale, Himanshu Sant, "Design of a Hydrodynamic Cavitation System for the Extraction and Detection of Escherichia coli (O157:H7) from Ground Beef," *Sensors and Actuators B: Chemical*, accepted.
4. Nusrat Tazin, Dhruv Patel, Christopher Jordon Lambert, Mohammad H.M. Shad , Jeff Campbell, Bruce K. Gale, "Automated passive serial dilution microfluidic chip for calcium quantification based on the Arsenazo III method," *Sensors & Diagnostics*, 2022, DOI: 10.1039/D2SD00022A.
5. Susan Wojtalewicz, Jonathon Vizmeg, Sierra Erickson, Caleb Lade, Jill Shea, Himanshu Sant, Jules Magda, Brett Davis, Bruce Gale, Jayant Agarwal, "Evaluating the influence of particle morphology and density on the viscosity and injectability of a novel long-acting local anesthetic suspension," *J Biomater. Appl.*, Online ahead of print: https://doi.org/10.1177/08853282221106486.
6. Farhad Shiri, Haidong Feng, Kevin E. Petersen, Himanshu Sant, Gina T. Bardi, Luke A. Schroeder, Michael L. Merchant, Bruce K. Gale & Joshua L. Hood, "Separation of U87 glioblastoma cell-derived small and

medium extracellular vesicles using elasto-inertial flow focusing (A spiral channel)," *Scientific Reports*, Vol. 12:6146, 2022. doi.org/10.1038/s41598-022-10129-8

7. Haidong Feng, Alexander R Jafek, Bonan Wang, Hayden Brady, Jules J Magda, Bruce K Gale, "Viscoelastic Particle Focusing and Separation in a Spiral Channel," *Micromachines*, Vol. 33, No. 3, pp. 361, 2022. DOI: 10.3390/mi13030361
8. Kevin E Petersen, Farhad Shiri, Tonguc Onur Tasci, Himanshu Sant, Joshua Hood, Bruce Gale, "Experiment, Theory, and Simulation of a Flow-Electrical-Split Flow Thin Particle Separation Device", *Journal of Chromatography A*, Vol. 1659, pp. 462634, 2021. DOI: 10.1016/j.chroma.2021.462634
9. John Nelson, Dev Patel, Himanshu Sant, Jill Shea, Bruce Gale, Jay Agarwal, "Compression of the Vascular Wall to Create a Friction Fit in a Vascular Anastomotic Coupler," *Journal of the Mechanical Behavior of Biomedical Materials*, Vol. 123, Nov 2021, pp. 104681, 2021. DOI: 10.1016/j.jmbbm.2021.104681.
10. Haidong Feng, Alex Jafek, Raheel Samuel, James Hotaling, Timothy G. Jenkins, Kenneth I. Aston, and Bruce K. Gale, "High efficiency rare sperm separation from biopsy samples in an inertial focusing device," *Analyst*, Vol. 146, pp. 3368 – 3377, 2021. DOI: 10.1039/d1an00480h
11. Farhad Shiri, Bruce Gale, Himanshu Sant, Brody King, Gina Bardi, Joshua Hood, Kevin Petersen, "Development and Testing of a Continuous Flow-Electrical-Split-Flow Lateral Transport Thin Separation System (Fl-El-SPLITT)," *Anal. Chem.*, Vol. 93, pp. 2888-2897, 2021. DOI: 10.1021/acs.analchem.0c04345.
12. Pratima Labroo, Scott Ho, Himanshu Sant, Jill E Shea, Jayant Agarwal, Bruce Gale, "Modelling diffusion based drug release inside a nerve conduit-*In vitro* and *In vivo* validation study," *Drug Delivery and Translational Research*, Vol. 11, pp. 154–168, 2021. doi: 10.1007/s13346-020-00755-y
13. Harikrishnan Jayamohan, Christopher J. Lambert, Himanshu J. Sant, Alexander Jafek, Dhruv Patel, Haidong Feng, Michael Beeman, Tawsif Mahmood, Ugochukwu Nze, & Bruce K. Gale, "SARS-CoV-2 pandemic: a review of molecular diagnostic tools including sample collection and commercial response with associated advantages and limitations," *Anal. Bioanal. Chem.*, Vol. 413, pp. 49-71, 2021. https://doi.org/10.1007/s00216-020-02958-1
14. Farhad Shiri, Bruce K. Gale, Himanshu Sant, Gina Bardi, Joshua Hood, Kevin Petersen, "Characterization of Human Glioblastoma versus Normal Plasma-derived Extracellular Vesicles Pre-isolated by Differential Centrifugation using Cyclical Electrical Field-flow Fractionation, *Anal. Chem.*, Vol. 92, pp. 9866-9876, 2021.
15. Brett Davis, Sierra Erickson, Susan Wojtalewicz, Andrew Simpson, Cameron Metcalf, Himanshu Sant, Jill Shea, Bruce Gale, Jay Agarwal, "Entrapping bupivacaine-loaded emulsions in a crosslinked-hydrogel increases anesthetic effect and duration in a rat sciatic nerve block model," *International Journal of Pharmaceutics*, Vol. 588, pp. 119703, 2021. https://doi.org/10.1016/j.ijpharm.2020.119703
16. Sabin Nepal, Haidong Feng, Bruce K. Gale, "Optimization of a microfluidic spiral channel used to separate sperm from blood cells," *Biomicrofluidics*, Vol. 14, No. 6, pp. 064103, 2020.
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18. Alex Jafek, Haidong Feng, Hayden Brady, Kevin Petersen, Marzieh Charharlang, Kenneth Aston, Bruce Gale, Timothy Jenkins, Raheel Samuel, "An Automated Instrument for Intrauterine Insemination Sperm Preparation," *Scientific Reports*, Vol. 10, 21385, pp. 1-9, 2020. doi.org/10.1038/s41598-020-78390-3.
19. Alex Jafek, Haidong Feng, Dallin Broberg, Bruce Gale, Raheel Samuel, Kenneth Aston, Timothy Jenkins, "Optimization of Dean-flow microfluidic chip for sperm preparation for intrauterine insemination," *Microfluidics and Nanofluidics*, Vol. 24, No. 8, pp. 60, 2020. Doi: /10.1007/s10404-020-02366-y
20. Cathy L. Mangum, Darshan P. Patel, Alexander R. Jafek, Raheel Samuel, Tim G. Jenkins, Kenneth I. Aston, Bruce K. Gale, and James M. Hotaling, "Towards a better testicular sperm extraction: novel sperm sorting

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122. Himanshu J. Sant and Bruce K. Gale, “Improved Scaling Models for Electrical and General Field Flow Fractionation Systems,” in *Proc. 9th International Symposium on Field- Flow Fractionation*, Boulder, CO, June 26-29, 2001.

123. Avinash Saldanha and Bruce K. Gale, “A Microfabricated Electrical SPLITT System,” in *Proc. 9th International Symposium on Field- Flow Fractionation*, Boulder, CO, June 26-29, 2001.

124. Bruce K. Gale and Mahesh Thoppil, “A Microfabricated Cyclical Electrical Field Flow Fractionation System,” in *Proc. 9th International Symposium on Field- Flow Fractionation*, Boulder, CO, June 26-29, 2001.

125. Bruce K. Gale, “Microfabricated FFF and SPLITT Systems,” in *Proc. Tex MEMS III*, Dallas, TX, June 7, 2001.

126. Himanshu J. Sant and Bruce K. Gale, "Improved Models for Geometric Scaling in Field- Flow Fractionation," in *Proc. of the Nineteenth Annual Houston Conference on Biomedical Engineering Research*, Houston, TX, February 8-9, 2001.

127. Bruce K. Gale, Karin D. Caldwell, and A. Bruno Frazier, "Blood and Protein Separations Using a Micromachined Electrical Field- Flow Fractionation System," in *Proc. of the Eighteenth Annual Houston Conference on Biomedical Engineering Research*, Houston, TX, Feb 10-11, 2000.

128. Bruce K. Gale, Karin D. Caldwell, and A. Bruno Frazier, "Scaling Effects in a Micromachined Electrical Field Flow Fractionation System," in *Proc. 8th International Symposium on Field- Flow Fractionation*, Paris, France, Sep. 6-8, 1999.

129. Bruce K. Gale, Karin D. Caldwell, and A. Bruno Frazier, "Characterization of a Micromachined Electrical Field- Flow Fractionation System," in *Proc. 7th International Symposium on Field-flow Fractionation*, Salt Lake City, UT, Feb. 8-11, 1998.

130. Bruno Frazier, Karin Caldwell, Tim Ameel, Bruce K. Gale, and Ian Papautsky, "Micro scale fluid analysis systems: applications and engineering issues," in *Proc. 7th International Symposium on Field-flow Fractionation*, Salt Lake City, UT, Feb. 8-11, 1998.

Invited Workshop Presentations

1. Bruce K. Gale, “Rapid and Inexpensive Microfluidics-Based Tools for Clinical and Environmental Applications,” at the Digital PCR Shortcourse, Molecular Medicine Tri-Con 2013, San Francisco, CA, February 12, 2013.
2. Bruce K. Gale, "Active Components for Microfluidic Manipulation," CAMD / CBM2 2005 Summer Workshop, Baton Rouge, Louisiana, July 25-29, 2005.
3. Bruce K. Gale, Ian Harvey, and Tim Ameel, “MEMS Workshop” sponsored by Korean Government, January 12-16, 2004. Full week course involving lectures and labs for 8 Professors from Korea on MEMS and MEMS education.
4. Bruce K. Gale and Michael J. McShane, “BioMEMS and Biomedical Optics,” Shortcourse Sponsored by Government of Taiwan (ROC), March 6-8, 2001 (Full three days of presentations: Over 100 paid attendees).
5. Bruce K. Gale, “Advanced Bio-MEMS Techniques and Research Applications” BioMEMS workshop at Chicago 2000, the World Congress on Medical Physics and Biomedical Engineering, Chicago, IL, July 22, 2000.
6. Bruce K. Gale, “Introduction to BioMEMS,” Microfabrication Short Course held with the First Annual Louisiana Microsystems Conference, Ruston, LA, April 4, 2000.
7. Bruce K. Gale, Laboratory Instruction in Microfabrication, MEMS Bootcamp, University of Utah, May 1999.

Patents (*licensed)

1. Patent No. 6,136,171, Micromachined Electrical Field- Flow Fractionation System; Bruce K. Gale, A. Bruno Frazier, and Karin D. Caldwell
2. *Patent No. 8,210,119, Spotting device and method for high concentration spot deposition on microarrays and other microscale devices; Bruce Gale, David Chang-Yen, and David Myszka.
3. *Patent No. 8,211,382, Microassay with internal referencing; David Myszka, Bruce Kent Gale, Joshua Wayne Eckman, and Sriram Natarajan.
4. *Patent No. 8,263,392, Methods and compositions related to continuous flow thermal gradient PCR; Bruce Kent Gale, Niel Davenport Crews, Carl Thomas Wittwer.
5. Patent No. 8,269,497, Enhanced fill-factor NMR coils and associated methods; James C. Stephenson, Bruce K. Gale, and Cynthia Furse.
6. Patent No. 8,277,759, Microfluidic Flow Cell, Scott O. Sundberg, Carl T. Wittwer, Bruce K. Gale.
7. *Patent No. 8,383,059, Microfluidic interface for highly parallel addressing of sensing arrays, David A. Chang-Yen, Sriram Natarajan, Josh Eckman, Bruce K. Gale, David Myszka.
8. Patent No. 8,395,468, High Field Strength Magnetic Field Generation System and Associated Methods, James C. Stephenson, Bruce K. Gale, and Cynthia Furse.
9. Patent No. 8,535,536 Cross-flow split-thin-flow cell, Bruce K. Gale, Himanshu Sant, Venu Madhav, Srinivas Merugu.
10. Patent No. 8,663,194, Intraocular Drug Delivery Device and Associated Methods, Balamurali K. Ambati, Bruce K. Gale and Srinivas Rao Chennamaneni.
11. *Patent No. 8,975,027 Methods and compositions related to continuous flow thermal gradient PCR; Bruce Kent Gale, Niel Davenport Crews, Carl Thomas Wittwer.
12. *Patent No. 8,999,726 B2, Microfluidic interface for highly parallel addressing of sensing arrays, David A. Chang-Yen, Sriram Natarajan, Josh Eckman, Bruce K. Gale, David Myszka.
13. Patent No. 9,095,404, Intraocular Drug Delivery Device and Associated Methods, Balamurali K. Ambati, Bruce K. Gale and Srinivas Rao Chennamaneni.
14. *Patent No. 9,642,623B2 Methods, devices and apparatus for performing a vascular anastomosis, Jayant P. Agarwal, Bruce K. Gale, Lam Nguyen, Cory Shorr, Brian Stauffer, Cody Lee Gehrke
15. *Patent No. 9,682,372, Tip overlay for continuous flow spotting apparatus, Bruce K. Gale, Adam Miles, Joshua Wayne Eckman, Sriram Natarajan, Jim Smith Mark Eddings
16. *Patent No. 9,682,396, Dual flow cell fluid delivery systems, Joshua W. Eckman, Adam Miles, James Smith, Christopher Morrow, Bruce K. Gale
17. Patent No. 9,877,973, Intraocular Drug Delivery Device and Associated Methods, Balamurali K. Ambati, Bruce K. Gale and Srinivas Rao Chennamaneni.
18. *Patent No. 9,931,121B2, Methods and devices for connecting nerves, Jayant P. Agarwal, Bruce Kent Gale, Himanshu Jayant Sant, Keng-Min Lin
19. Patent 10,064,819B2 Intraocular Drug Delivery Device and Associated Methods, Balamurali K. Ambati, Bruce K. Gale and Srinivas Rao Chennamaneni.
20. *Patent No.10,300,450 Method and device for depositing a substance on a submerged surface, Bruce K. Gale, Joshua W. Eckman, Adam Miles, Christopher Morrow, James Smith, Sriram Natarajan, Mark Eddings.
21. Patent No. 10,300,479 Tip overlay for continuous flow spotting apparatus, Bruce K. Gale, Adam Miles, Joshua Wayne Eckman, Sriram Natarajan, Jim Smith Mark Eddings
22. *Patent No. 10,434,515B2 Thermal gradient plug flow microfluidic devices for extreme PCR, Raheel Samuel, Bruce Gale, Alex Jafek, James Trauba, Kenneth Aston
23. Patent 10,588,855B2 Intraocular Drug Delivery Device and Associated Methods, Balamurali K. Ambati, Bruce K. Gale and Srinivas Rao Chennamaneni.
24. *Patent No. 10,667,816 Vascular Coupling Device, Jay Agarwal, Bruce K. Gale, Huizhong Li, Himanshu Sant.
25. *Patent No. 10,772,633B2 Methods and devices for connecting nerves, Jayant P. Agarwal, Bruce Kent Gale, Himanshu Jayant Sant, Keng-Min Lin
26. *Patent No. 10,842,494B2 Methods and devices for connecting nerves, Jayant P. Agarwal, Bruce Kent Gale, Himanshu Jayant Sant, Keng-Min Lin

27. *Patent No. 11,434,481 Rapid non-destructive genetic material collection, Raheel Samuel, Christopher J. Lambert, Bruce K. Gale, Joshua L. Bonkowsky, Briana Freshner, Tak Chi Arlen Chung

Pending Patent Applications

1. Appl. No. 20070059156, Rotary centrifugal and viscous pumps: Danny Blanchard, Phil Ligrani, Bruce Gale
2. Diffusion Membrane Micropump, Mark Eddings and Bruce Gale
3. Ultra-Fast PCR Microchip with Real Time Melting Analysis, Niel Crews, Bruce Gale, Carl Wittwer
4. *Automated Arterial Anastomotic Device (multiple applications for different designs), Jay Agarwal, Bruce Gale, Himanshu Sant, Huizhong Li, Cody Gehrke, et. al.
5. Biodegradable Drug-Delivering Nerve Conduit, Jay Agarwal, Bruce Gale, Himanshu Sant, Keng Min Lin
6. *Endo-Contact Lens to Protect the Cornea During Cataract Surgery, Bala Ambati, Bruce Gale, Nathan Gooch
7. Circuit Modification of Electrical Field Flow Fractionation Systems for High Resolution Separations of Sub 100nm Nanoparticles and Macromolecules, Bruce Gale, Onur Tasci, William Johnson
8. *Multiplexed Cell/Tissue Response Assays-Integrated Microfluidic Spotting and Imaging Technology, Bruce Gale, Josh Eckman, Jim Smith
9. Sperm Separation Device, Bruce Gale, Jim Hotaling, Douglas Carrell, Kristin Murphy, Jiyoung Son
10. Methods and devices for connecting nerves, US 2019 / 0038290 A1, Jayant P. Agarwal, Bruce Kent Gale, Himanshu Jayant Sant, Pratima Labroo, Jill Shea.
11. Thermal gradient plug flow microfluidic devices for extreme PCR, US20180093273A1, Raheel Samuel, Bruce Gale, Alex Jafek, James Trauba, Kenneth Aston
12. Opioid independent surgical anesthetic, Brett Davis, Andrew M. Simpson, Jayant P. Agarwal, Jill E. Shea, Himanshu Jayant Sant, Bruce K. Gale, Susan Wojtalewicz, Glenn Prestwich, WO2021051080A1.

Other Invention Disclosures

U-3430	Parallel and Serial SPLITT Systems (or combinations)
U-3431	FFF Channel Design to Reduce end Effects
U-3432	Design for SPLITT System with no Splitter (Or Some Version of a Microfabricated Electrical SPLITT System)
U-3433	Cyclical Thermal FFF
U-3434	Design of Thermal FFF
U-3435	Design of Thermal Electrical FFF
U-3550	Single and Double Disk Viscous Micro-Pump
U-3684	A Method for Creating Monolithic PDMS Waveguides Structures Within a PDMS Microfluidic System
U-3685	A Thermally-defined Monolithic Polydimethylsiloxane Waveguide Fabricated on a Polydimethylsiloxane Substrate
U-3686	Integrated Optical Waveguide Chemical and Particle Detection Method Relying on Evanescent Interactions
U-3708	Polydimethylsiloxane (PDMS) Fluidic Packaging with a Reusable Syringe Needle Compression Fitting
U-3744	Process/Technique for Fabricating a Microneedle Array
U-3810	Osmotically-Driven Dispense Pump for Use in High Pressure and High Temperature Applications
U-3862	Method of Patterning Aluminum Oxide Membranes
U-3863	Multi-DNA Extraction Chip Based on an Aluminum Oxide Membrane
U-3893	Novel Manufacturing of Microdispenser or Microneedles: Materials and Methods
U-3894	Diffusion Membrane Micropump
U-3896	Sample Collection and Spot Cleaning Technique Using a Continuous-Flow PDMS Microfluidic System

U-3963	Use of Permanent Magnets and Flux Concentrators/Shunts to Utilize NMR for In-Ground Measurements
U-4140	Integrated Pneumatics and Electronics Card
U-4154	In-situ Heating and Actuation Mechanism Using Conductive Waxes (or Similar Materials), Methods and Applications Thereof
U-4234	CFM Flow Cell with Switching of Solutions
U-4281	DNA Quantification Method with Nanoporous Aluminum Oxide Membrane
U-4282	High Diodicity Microvalve
U-4283	Shuttle Gradient Multiplex MicroPCR Chip
U-4460	Continuous Protein Separations Using SPLITT System
U-4464	Surface Modified Nanoporous Substrate for High Sensitivity and High Density Microspot
U-4499	Continuous Protein Separations Using SPLITT System
U-4689	Nanoscale Electrochemical Biosensor
U-4944	Refilling Mechanism to Stabilize a Free-Floating Intraocular Capsule Drug Ring (CDR)
U-4945	Refilling Mechanism to Stabilize a Free-Floating Intraocular Capsule Drug Ring (DCR)
U-4956	Electrostatically Actuated High Density Pneumatic Microvalve Array
U-4959	An Intraocular Capsular Drug Ring With Biosensing Capabilities
U-5143	Shorts/Pants with Integrated Pressure Alleviating Bladders
U-5144	Annular Device for Intramedullary Infusion and Aspiration
U-5532	A Novel Ferrofluidic Magnetic Micromixer
U-4638	Assays for Anti-drug Antibodies Using Label-free Detection and Continuous Flow Microfluidics
U-4715	Multichamber Disposable Microfludics Device
U-5035	Subconjunctival Drug Delivery Device for Long-Term Glaucoma Therapy
U-5027	High Throughput Intestinal Permeability Assay
U-4959	An Intraocular Capsular Drug Ring With Biosensing Capabilities
U-5534	Cyclical Electrical SPLITT Systems for High Resolution Continuous Separations of Sub 100nm Nanoparticles and Macromolecules
U-5531	Utilization of Microfluidics Technology for Extraction of Chorionic Fluid of Zebrafish Embryos for Genotyping Zebrafish
U-5616	Complete blood count device
U-5631	Schlemm's Stent-Sieve
U-5653	Automated Pathogen Detection System
U-5082	Endo-Contact Lens to Protect the Cornea During Cataract Surgery
U-5720	Interstitial Fluid Extraction Device
U-5742	Microfluidics-based human sperm cell separation, sorting, and cryopreservation device
U-5889	Wearable device for pressure ulcer prevention
U-6163	Thermal Gradient Plug Flow Microfluidic Chip for Extreme PCR
U-6183	Bioresorbable Drug Delivery Peripheral Nerve Wrap
U-6221	Self contained bioreactor for repair of segmental bone defects
U-6337	Bioresorbable Drug Loaded Peripheral Nerve Wrap Capable of Extended Localized Delivery of FK506
U-6361	Microfluidic system for sperm separation and enrichment from various types of sperm samples
U-6389	Rapid non-destructive genetic material collection for genotyping of zebrafish
U-6470	Injectable Hyaluronic Acid Hydrogel Drug Delivery System for Extended Release of a Local Anesthetic to Treat Post-Operative Pain

Service to the Department and University

September 2022 – present	Member, PIVOT advisory committee
January 2019 – present	Advisor, University of Utah National Society of Black Engineers Chapter
July 2018 – present	Member, ME Department Data, ABET, and Alumni/Industry Committees
July 2018 – present	Member, College Executive Committee and College Council
July 2018 – present	Chair, Department of Mechanical Engineering
August 2013 – June 2018	Executive Director, University of Utah Nanofabrication Lab
October 2016 – May 2017	Member, ME Dept Design Search Committee (hired Yong-lin Kong)
August 2016- July 2018	Member of College of Engineering RPT Committee
June 2015 – March 2018	Member, Senate Advisory Committee of Review of Administration
August 2014- August 2017	Member of ME Research Committee
August 2013 – May 2014	Chair, ME Dept Design Faculty Search Committee, (hired Jiyoung Chang and Roseanne Warren)
May 2012 – August 2013	Associate Director, University of Utah Nanofabrication Lab
October 2010 – May 2011	Member, ME Dept Design Search Committee (hired Shad Roundy)
August 2010 – July 2013	Senator, Faculty Senate
June 2010 – July 2016	Member, Innovation Scholars Academic Steering Committee
October 2009 – May 2010	Member, ME Dept Manufacturing Search Committee (hired Bart Raeymakers)
August 2009 – June 2018	Chair, University Conflict of Interest Committee
August 2006 – June 2018	Member, University Conflict of Interest Committee
November 2005 – 2008	University of Utah Technology Review Board
September 2005 – July 2008	University International Requirement Committee
August 2004 – May 2005	ME Seminar Coordinator
January 2004 – May 2004	URT Selection Committee
August 2003- August 2004	Member of ME External Relations Committee
August 2003- May 2004	Member of Design Faculty Search Committee (hired Will Provancher)
August 2003 – May 2004	IGERT Seminar Coordinator
August 2002- July 2015	Member of ME Curriculum Committee
February 2002- June 2018	Member of College of Engineering Nanofabrication Lab Executive Committee
January 2002- August 2003	Member of ME Public Relations Committee
1999- 2001	Internal advisory committee for the Institute for Micromanufacturing (La Tech)
1999- 2001	Biomedical Engineering program Webmaster (La Tech)

Service to the Academic Community

April 2019 – Nov 2019	Member of Organizing Committee IMECE 2019, Salt Lake City, Utah.
June 2017 – May 2018	Member of Organizing Committee for18th International FFF Symposium
Dec 2016 - October 2017	Member of Organizing Committee (Sponsorship Committee) for MicroTAS 2017 in Savannah, GA. Served as Session Chair.
February 2017	Alternate Separations Workshop (AltSep) on Electrical Separations
June 2015 – May 2016	Member of Organizing Committee for17th International FFF Symposium
February 2015 – present	Member of CBMM advisory board, (Chair 2022-present)
June 2013 – present	Tenure and promotion external reviews (11 completed)
January 2013 – present	Associate Editor, *Journal of Micromechanics and Microengineering*
June, 2013 – October 2014	Chair, FFF 2014 Organizing Committee
January 2012 – present	Permanent Member of the Scientific Committee for FFF (sponsor organization of international field flow fractionation symposia)
June 2010 – May 2011	Member of Organizing Committee for15th International FFF Symposium
Nov 2010 – Oct 2011	Member of the NanoUtah 2011 Organizing Committee
Feb 2010 – present	Organizer of science fairs and judge at Viewmont Elementary and Riverview Jr High
Feb 2010 – Nov 2011	Session Organizer, AICHE Annual Meeting 2010 in Salt Lake City, November 2010
October 2009 – Oct 2010	Chair of the NanoUtah 2010 Organizing Committee

January – October 2009	Member of the NanoUtah 2009 Organizing Committee
November 2007	Member of the Program Committee - Invited Speakers for American Physical Society – Division of Fluid Dynamics Annual Meeting, 2007
June 2007	Chair of Organizing Committee for13th International FFF Symposium
November 2006	Session co-chair BioMEMS and Microfluidics: Biomedical Diagnostics, AICHE 2006
September 2006	Proposal Reviewer for Canadian Foundation for Innovation
June 2006 to present	Proposal Reviewer for NIH (16 panels and site visits)
January 2005 to present	Program committee for Microfluidics, BioMEMS, and Medical Microsystems III - XII
March 2004	Organizer of Nanoscale Separations Track at ACS National Meeting
April 2003 to present	NSF Panel Reviewer (20 separate panels, over 200 proposals reviewed)
January 2003	Chair of BioMEMS and Nanofabrication Session at SPIE 2003
May 2001	Reviewer of research proposals for DOE
February 2001	Chair of BioMEMS session at HSEMB Conference
November 2000	Chair at two sessions of Advanced Technology Workshop on MEMS Packaging
October 1999	Chair at several sessions of Joint BMES/EMBS Conference
1997-1999	Co-President, IEEE Engineering in Medicine and Biology Chapter, Univ. of Utah
October 2002-present	Reviewer for *Journal of Nanoscience and Nanotechnology, Journal of Microelectromechanical Systems, Clinical Chemistry, Journal of Micromechanics and Microengineering, Journal of Measurement Science and Technology, Electrophoresis, Analytical Chemistry, IEEE- Transactions on Biomedical Engineering, Journal of Microfluidics and Nanofluidics, Sensors and Actuators A: Physical, Sensors and Actuators B: Chemical, Lab on a Chip, Applied Physics A, IEEE Sensors, Physics of Fluids, Journal of Fluids Engineering, Integrative Biology, Pharmacogenomics, Langmuir, Journal of Materials Engineering and Performance, Nanomedicine & Nanobiotechnology, Chromatography, Analytical Methods*

Professional Affiliations

2023-present	Fellow, American Institute for Medical and Biomedical Engineers
2022-present	Fellow, National Academy of Inventors
2018-present	Member, American Society of Mechanical Engineers (ASME)
2001-2003	Member American Society for Engineering Education (ASEE)
2001-2003	Member, American Chemical Society (ACS)
2000-2002	Member, Institute for Microelectronics and Packaging Systems (IMAPS)
1997-present	Member, Institute for Electrical and Electronics Engineers (IEEE)
1997-present	Member, IEEE Engineering in Medicine and Biology Society (EMBS)