## I. EARNED DEGREES

|  |  |  |  |
| --- | --- | --- | --- |
| **Degree** | **Year** | **University** | **Field** |
| Doctor of Philosophy | 2007 | Massachusetts Institute of Technology | Mechanical Engineering |
| Master of Science | 2003 | Massachusetts Institute of Technology | Mechanical Engineering |
| Bachelor of Science | 2001 | Georgia Institute of Technology | Mechanical Engineering |

## II. EMPLOYMENT

|  |  |  |
| --- | --- | --- |
| **Title** | **Organization** | **Years** |
| Assistant Professor | Georgia Institute of Technology | 2008-present |
| Program Faculty in Biomedical Engineering | Georgia Institute of Technology | 2008-present |
| Program Faculty in Bioengineering | Georgia Institute of Technology | 2008-present |
| Research Fellow in Genetics | Harvard Medical School | 2007-2008 |
| Managing Partner | Claw Hanging Systems, LLC | 2007-present |
| Graduate Research Assistant | Massachusetts Institute of Technology | 2003-2007 |
| Fellow, MESA Institute | Sandia National Laboratories, Albuquerque, NM | 2003 |
| Graduate Research Assistant | Massachusetts Institute of Technology | 2001-2003 |
| Intern | Sandia National Laboratories, Livermore, CA | 2001 |
| Undergraduate research assistant | Georgia Institute of Technology, Atlanta, GA | 2000-2001 |
| Co-operative work student | NASA, Johnson Space Center | 1998-2001 |

## III. TEACHING

### Individual Student Guidance[[1]](#footnote-1)

#### Postdoctoral/Visiting Scholars Supervised

* 1. Yu, Huiling, Ph.D

Jan 2010-Dec 2010

Project Title: 3-D micromilling and metrology for microfluidic devices

#### Ph.D. Students Supervised

1. Kodandaramaiah, Suhasa

Began Advising: Fall 2009, ME

Graduated: Fall 2012 (named to Forbes Magazine Top 30 under 30, 2012)

Dissertation: Robotics for in vivo whole cell patch clamping

Current position: Postdoctoral researcher, MIT, since January 2013

Publications/Presentations: B.a.12,17,18,19; B.b.30,32 (best paper award),35,38,39,40,45,46,50; E.b.11,14,17,22; F.b.9,12,13

1. Li, Melissa

Began Advising: Fall 2008, BME

Graduated: Spring 2013

Dissertation: Microfluidic system for thrombosis under multiple shear rates and platelet therapies

Qualifying exams completed May 2007

Fellowship: TI:GER Graduate Research Fellowship, 8/10-7/12

Publications/Presentations: B.a.10; B.b.23,24,25,29,37,42,51; E.b.13,19, F.b.8

3. Phaneuf, Chris (in progress)

Began Advising: Fall 2008, BioE

Expected Graduation: Spring 2013

Dissertation: An instrument for multi-temperature, multi-chamber, micro-liter amplification of viral RNA/DNA

Qualifying exams completed Jan 2010

Fellowship: **Dept. of Homeland Security (DHS) Graduate Research Fellowship**, 8/09-7/12

Publications/Presentations: B.a.8,11,15,16,17; B.b.22,28,30,33,34,36,43,47,48,49; E.b.12,16,18,20,24

4. Holst, Greg (in progress)

Began Advising: Fall 2011, BioE

Dissertation: Massively-parallel whole-cell patch clamping in vivo

Qualifying exams completed May 2012

Publications/Presentations: B.a.16; B.b.43,45,46,49,54; E.b.23,24

5. Henegar, Caitlin (in progress)

Began Advising: Summer 2012, BioE

Dissertation: Measurement of bacterial communication

Fellowship: **National Science Foundation (NSF) Graduate Research Fellowship**, 8/13-8/16

Publications/Presentations: B.b.54

6. Glisson, John (in progress)

Began Co-Advising (with Prof David Ku): Fall 2012, ME

Dissertation: Shear rate spectroscopy of blood clotting

Publications/Presentations: none yet

7. Stoy, William (in progress)

Began Advising: Fall 2012, BME

Dissertation: Whole-cell electrophysiology of synaptically connected neurons in vivo

Fellowship: **National Science Foundation (NSF) Graduate Research Fellowship**, 8/13-8/16

Publications/Presentations: none yet

8. Kolb, Ilya (in progress)

Began Advising: Spring 2013, BME

Dissertation: Integrated signal amplification and acquisition for scalable patch clamping

Publications/Presentations: none yet

#### Visiting Graduate Students Supervised

1. Oh, Kyudam

Jun 2011-Aug 2011

Project Title: Sensitivity and specificity of consensus-degenerate PCR reactions in microfluidic devices

Reason for visiting: Ph.D candidate at U. Virginia with collaborator Prof. James Landers

1. Blum, Kyle

Aug 2012-Dec 2012

Project Title: Patch clamping electrophysiology

Reason for visiting: Rotation student with Georgia Tech/Emory NIH Computational Neuroscience Training Grant

1. McKinnon, Michael (in progress)

Jun 2013-Aug 2013

Project Title: Signal processing for electrophysiology of neurons

Reason for visiting: Rotation student with Georgia Tech/Emory NIH Computational Neuroscience Training Grant

#### M.S. Thesis Students Supervised

1. Pak, Nikita

Began Advising: Summer 2010, ME

Graduated: Summer 2012

Thesis: Simultaneous amplification of multiple DNA targets with optimized annealing temperatures

Fellowship: **National Science Foundation (NSF) Graduate Research Fellowship**, 8/11-8/12 (Georgia Tech), 8/12-7/14 (MIT)

Publications/Presentations: B.a.8,9,11,15,16,17; B.b.28,30,31,34,36,43,47,48,49; E.b.12,15,16,18,24;

Current position: PhD candidate, MIT, since Aug 2012

2. Saunders, Daniel Curtis

Began Advising: Fall 2010, ME

Graduated: Summer 2012

Thesis: Microfluidic system with open loop control for rapid infrared reverse transcription of quantitative PCR (RT-QPCR)

Publications/Presentations: B.a.11,15,16,17; B.b.36,43,47,48,49; E.b.18,20,24;

Current position: PhD candidate, University of Vermont, since Aug 2012

#### Undergraduate Special Problems and Research Students Supervised

1. Johanna Przybylowski, Undergraduate research student, MIT, Sep 2001—Jun 2002
2. Guilluame Vincent, visiting undergraduate student from National Engineering School of Saint-Etienne, France, Feb 2002—Jun 2002, “Thin Foil Optic” (Diploma thesis work at MIT)
3. Michael R. Del Zio, Senior thesis student, MIT Jan 2004—Jun 2004, “Design and Testing of the Thermal Properties of the Structure of an Ultra High-Throughput Mutational Spectrometer”
4. Edward F. Hsieh, Undergraduate research student, MIT, Jul 2004—Dec 2004
5. Brian Woodruff, Undergraduate research student, MIT, Oct 2004—Jun 2005
6. Darragh Buckley, Undergraduate research student, MIT, Jun 2005—Sep 2005
7. Ian Collier, Undergraduate research student, MIT, Jan 2005—June 2005
8. Timothy W. Suen, Senior thesis student, MIT, Jan 2005—Jun 2005, “Temperature Response of the Ultra-High Throughput Mutational Spectrometer”
9. James J. Lin, Senior thesis student, MIT, Jan 2005—Jun 2005, “Manufacturing Improvement and Thermal Property Characterization of the Fr. Structure of an Ultra-High Throughput Mutational Spectrometer”
10. Nathan B. Ball, Senior thesis student, MIT, Jan 2004—Jun 2005, “Design and Characterization of a Gel Loading Mechanism for an Ultra-High Throughput Mutational Spectrometer”
11. Lohith Kini, Undergraduate research student, MIT, Feb 2006—Jun 2006
12. Maria Telleria, Undergraduate research student, MIT, Feb 2006—Sep 2006
13. Cynthia Lin, Undergraduate research student, MIT, Feb 2006—Jun 2006
14. Zachary Reynolds, Undergraduate research student, MIT, Jan 2006—Jun 2006
15. Michael Beltran, Senior thesis student, MIT, Jun 2006—Jun 2007, “One-hundred channel electrophoresis prototype for an ultra-high throughput mutational spectrometer”
16. Miguel Saez, Senior thesis student, MIT, Jun 2006—Jun 2007, “Microforging technique for rapid, low-cost manufacture of lens array molds and its application in a biomedical instrument”
17. Laura Nichols, Undergraduate research student, MIT, Jun 2007—Aug 2007
18. Phillip Lee, Undergraduate research assistant, Georgia Tech, BioMedical Engineering, Sep 2008—Sep 2009, winner **PURA undergraduate research award** (Fall 2009)
19. Michael Dergance, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Oct 2008-May 2010
20. Mark Kulik, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jan 2009-Aug 2009
21. Daniel Shenoda, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Mar 2009-Aug 2009, winner **PURA undergraduate research award** (Summer 2009)
22. Nikita Pak, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Mar 2009-May 2010
23. Adam Kozak, **NSF National Nanotechnology Infrastructure Network (NNIN)** Research Experience for Undergraduates Program, University of Rochester, May 2009-Aug 2009
24. Matthew Emerick, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Aug 2009-Jul 2010
25. Michael McKinnon, Undergraduate research assistant, Georgia Tech, BioMedical Engineering, Sep 2009—Jun 2012, winner **PURA undergraduate research award** (Spring 2011)
26. Saifullah Malik, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jan 2010-Jun 2011
27. Stephen Chase, **NSF National Nanotechnology Infrastructure Network (NNIN)** Research Experience for Undergraduates Program, Rose-Hulman Insititute of Technology, May 2010-Aug 2010
28. Jordan Thomas, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Aug 2010-Jan 2011, winner **PURA undergraduate research award** (Spring 2011)
29. Jamison Go, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jan 2011-Jun 2011, Aug 2012-June 2013
30. Laura Seamen, **NSF National Nanotechnology Infrastructure Network (NNIN)** Research Experience for Undergraduates Program, MIT, May 2011-Aug 2011
31. Nicholas Sondej, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jun 2011-May 2012
32. Matthew Marchese, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Nov 2011-Aug 2012, winner UROP Materials, Supplies, and Travel grant (Summer 2012)
33. Randy Kelly Hefelfinger, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jan 2012-May 2012
34. Siddarth Gurnani Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jan 2012-May 2012
35. Max Lu, Undergraduate research assistant, Georgia Tech, Biomedical Engineering, Mar 2012-Jun 2012, winner UROP Materials, Supplies, and Travel grant (Summer 2012)
36. Kevin So, Undergraduate research assistant, Georgia Tech, Biomedical Engineering, May 2012-Aug 2012
37. Akhil Kumar, Undergraduate research assistant, Georgia Tech, Biomedical Engineering, Aug 2012-Dec 2012
38. Aaron Fan, Undergraduate research assistant, Georgia Tech, Electrical and Computer Engineering, Aug 2012-Dec 2012
39. Coby Lu, Undergraduate research assistant, Georgia Tech, Electrical and Computer Engineering, Aug 2012-Dec 2012
40. Marie Harber, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Dec 2012-present, winner **PURA undergraduate research award** (Summer 2013)
41. Adam Dixon, Undergraduate research assistant, Georgia Tech, Electrical and Computer Engineering, Dec 2012
42. Christopher Harless, Undergraduate research assistant, Georgia Tech, Electrical and Computer Engineering, Jan 2013-present
43. Cam Phillips, Undergraduate research assistant, Georgia Tech, Mechanical Engineering, Jan 2013-present
44. Andy Lustig, Undergraduate research assistant, Georgia Tech, Electrical and Computer Engineering, Jan 2013-present
45. Nikita Nagpal, Undergraduate research assistant, Georgia Tech, Biomedical Engineering, Feb 2013-present, winner **PURA undergraduate research award** (Summer 2013)
46. Peter Su, **NSF National Nanotechnology Infrastructure Network (NNIN)** Research Experience for Undergraduates Program, University of California, Berkeley, May 2013-Aug 2013.

### B.  Other Teaching Activities

#### Curriculum Development

(Full list of courses taught on a separate sheet as required by Georgia Tech guidelines. Novel curriculum development is described here.)

1. Capstone Design, ME 4182: Beginning Aug 2008, I have initiated and led, collaborating with a team of faculty, an effort to overhaul the mechanical engineering capstone design course. The course has 500 students/year working on 100 projects/year in which they create, analyze, and build solutions. Major contributions as follows:

* Revamped “Capstone Design Expo” and expanded it Institute-wide for student teams to compete for cash prizes as voted on by industry and academic judges, 3000 attendees per semester, 150 teams comprising six majors participating as of 2013
* Led initiatives for multi-disciplinary capstone design teams comprising ME and BME students (Fall 2010, Fall 2011, Fall 2012) initially, and campus-wide starting Fall 2013
* Coordinated, directly-advised, or managed 200 real-world, research laboratory or industry sponsored projects
* Developed and implemented lecture component for the course focusing on entrepreneurship and invention
* Hired, collaborated with, and/or delegated authority to ~10 person team to administer the course

1. Developed new graduate level, “Applied Optics,” Course number ME 8803, offered Spring 2011, 11 students from three Schools within the College of Engineering. Spring 2013, 9 students.

## IV. INTELLECTUAL PRODUCTS

### Refereed Publications

#### a. Refereed Journal Publications:

1. Y. Sun, R.K. Heilmann, C.G. Chen, C.R. Forest and M.L. Schattenburg, Precision microcomb design and fabrication for x-ray optics assembly, *Journal of Vacuum Science and Technology B*, Vol. 21(6), p. 2970-2974, Nov/Dec 2003. (Also, B.b.4)
2. C.R. Forest, C.R. Canizares, D.R. Neal, M. McGuirk, and M.L. Schattenburg, Metrology of thin transparent optics using Shack-Hartmann wavefront sensing, *Optical Engineering*, Vol. 43(3), p. 742-753, Mar 2004. (Also, B.b.2)
3. C.R. Forest, M. Spenko, Y. Sun, A.H. Slocum, R.K. Heilmann and M.L. Schattenburg, Repeatable and accurate assembly of x-ray foil optics, *Precision Engineering*, Vol 30(1), p. 63-70, Jan 2006. (Also, B.b.5)
4. M. Akilian, C.R. Forest, A.H. Slocum, D.L. Trumper, and M.L. Schattenburg, Thin Optic Constraint, *Precision Engineering*, Vol 31(2), p. 130-138, Apr 2007. (Also, B.b.12)
5. C.R. Forest, M.A. Saez, I.W. Hunter, Microforging Technique for Rapid, Low-cost Fabrication of Lens Array Molds, *Applied Optics,* Vol 46(36), p. 8668-8673, Dec 2007 (*featured on cover*) (Also, B.b.19)
6. C.R. Forest, B. Woodruff, D. Buckley, W.G. Thilly, and I.W. Hunter, Assembly and Constraint Technology for Large Arrays of Capillaries, *Precision Engineering,* Vol 33(3), p. 275-283, Jul 2009. (Also, B.b.16)
7. H.H. Wang, F.J. Isaacs, P.A. Carr, Z.Z. Sun, G. Xu, C.R. Forest, G.M. Church, Programming cells by multiplex genome engineering and accelerated evolution, *Nature,* Vol.460, p. 894-898, Jul 2009.
8. C.R. Phaneuf, N. Pak, C.R. Forest, Modeling radiative heating of liquids in microchip reaction chambers, *Sensors and Actuators: A. Physical*, Vol. 167(2), p. 531-536, Feb 2011. (Also, B.b.34)
9. N. Pak, M. Dergance, M. Emerick, E. Gagnon, C.R. Forest, An Instrument For Controlled, Automated, Continuous Production of Micrometer Scale Fused Silica Pipettes, *ASME Journal of Mechanical Design*, Vol. 133(6), 061006, Jun 2011. (Also, B.b.31)
10. M. Li, D. Ku, C.R. Forest, Microfluidic system for simultaneous optical measurement of platelet aggregation at multiple shear rates in whole blood, *Lab on a Chip*, Vol. 12, p. 1355-1362, Feb 2012.(Also, B.b.37,42)
11. N. Pak, C. Saunders, C.R. Phaneuf, C.R. Forest, Plug-and-play infrared laser-mediated PCR in a microfluidic chip, *Biomedical Microdevices*. Vol. 14(2), p. 427-433, Apr 2012. (Also, B.b.37,43,47)
12. S. Kodandaramaiah, G. Franzesi, B. Chow, E. Boyden, C.R. Forest, Automated whole-cell patch clamp electrophysiology of neurons in vivo, *Nature Methods.* Vol 9, p. 585–587, May 2012. (Also, B.b.40) (over 50 articles in popular press, top 3 listed in below Section D.7,10,11) (Also, B.b.40)
13. N. Hotaling, B.B. Fasse, F. Bost, C. Hermann, C.R. Forest, A quantitative analysis of the effects of a multi-disciplinary engineering capstone design course, *Journal of Engineering Education*, Vol. 101(4), p. 630-656, Oct 2012. (Also, B.b.44,50)
14. I.F Akyildiz, F. Fekri, C.R Forest, B. Hammer, R. Sivakumar, MONACO: Fundamentals of Molecular Nano-Communication Networks (Invited Paper), *IEEE Wireless Communications*, Vol. 19(5), p. 12-18, Oct 2012.
15. C.R. Phaneuf, K. Oh, N. Pak, D.C. Saunders, C. Conrardy, J. Landers, S. Tong, C.R. Forest, Sensitive, microliter PCR with consensus degenerate primers for Epstein Barr virus, *Biomedical Microdevices,* Vol. 14(6), p. 1-11, Oct 2012. (Also, B.b.48)
16. D.C. Saunders, G.L. Holst, C.R. Phaneuf, N. Pak, M. Marchese, N. Sondej, M. McKinnon, C.R. Forest, Rapid, quantitative, reverse transcription PCR in a polymer microfluidic chip, *Biosensors and Bioelectronics,* Vol. 44, p. 222-228, June 2013. (Also, B.b.43)

#### Submitted Journal Publications:

1. Amy S. Chuong, Mitra L. Miri, Leah C. Acker, Suhasa B. Kodandaramaiah, Mike A. Henninger, Masaaki Ogawa, Rachel C. Bandler, Nathan C. Klapoetke, Xuan Gu, Brian D. Allen, Craig R. Forest, Brian Y. Chow, Xue Han, Jessica A. Cardin, Edward S. Boyden, Minimally invasive optogenetic neural silencing, *Nature Neuroscience* (*under review*).
2. N. Pak, C.R. Phaneuf, D.C. Saunders, S.B. Kodandaramaiah, N.M. Sondej, C.R. Forest, Thermally multiplexed polymerase chain reaction, *PLOS ONE* (*under review*). (Also, B.b.36,47)
3. M.V. Baratta, S.B. Kodandaramaiah, P.E. Monahan, P.-A. Lin, K. Kim, A. Yang, C.R. Forest, E.S. Boyden, K.A. Goosens, Stress enables reinforcement-elicited serotonergic consolidation of fear memory.*Nature Neuroscience* (*under review*).
4. C.R. Forest, E.B. Boyden, S.B. Kodandaramaiah, In vivo robotics: Towards the automation of neuroscience and other intact-system biological fields, Annals of the New York Academy of Sciences (*under review*).
5. Mel’s paper
6. Pharma review
7. Caitlin’s paper

#### b. Conference Publications, refereed based on conference abstract or full manuscript

1. C.R. Forest, D. Frakes, and W. Singhose, Input-Shaped Control of Gantry Cranes: Simulation and Curriculum Development, *Proceedings of the 18th ASME Biennial Conference on Mechanical Vibration and Noise*, V. 6B, p. 1877-1884, Pittsburgh, PA, Sep 9-12, 2001.
2. C.R. Forest, M.L. Schattenburg, C.G. Chen, R.K. Heilmann, P. Konkola, J. Przbylowski, Y. Sun, J. You, S.M. Kahn and D. Golini, Precision Shaping, Assembly and Metrology of Foil Optics for X-ray Reflection Gratings, *Proc*. *SPIE* 4851, *Conf. on X-ray and Gamma-ray Telescopes and Instruments for Astronomy*, p. 538-548, Wailoloa, HI, Aug 25-28, 2002.
3. R. Petre, W.W. Zhang, D.A. Content, T. T. Saha, J. Stewart, J.H. Hair, D.Nguyen, W.A. Podgorski, W.R. Davis, Jr., M.D. Freeman, L.M. Cohen, M.L. Schattenburg, R.K. Heilmann, Y. Sun and C. Forest, Constellation-X Spectroscopy X-ray Telescope (SXT), *Proc. SPIE* 4851*, Conf. on X-ray and Gamma-ray Telescopes and Instruments for Astronomy,* p. 433-440, Wailoloa, HI*,* Aug 25-28, 2002.
4. Y. Sun, C.G. Chen, R.K. Heilmann, C. Forest, M. Spenko, P.T. Konkola, M. McGuirk, C. Joo and M.L.Schattenburg, Precision microcomb design and fabrication for Constellation-X soft x-ray telescope segmented optic assembly, *Proceedings of the* *17th Annual Meeting of the American Society of Precision Engineering*, p. 261-266, St. Louis, MO, Oct 20-25, 2002.
5. C.R. Forest, M.J. Spenko, Y. Sun, M. McGuirk, A.H. Slocum, and M.L. Schattenburg, Precision assembly and metrology of x-ray foil optics, *Proceedings of the 17th Annual Meeting of the American Society of Precision Engineering*, p. 244-249, St. Louis, MO, Oct 20-25, 2002.
6. Y. Sun, R.K. Heilmann, C.G. Chen, M.J. Spenko, C.R. Forest and M.L. Schattenburg, Precision microcomb design and fabrication for x-ray optics, *Proceedings of the* *47h International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication* (EIPBN), Tampa, FL, May 27-30, 2003*.*
7. R.K. Heilmann, M. Akilian, C.-H Chang, C.G. Chen, C. Forest, C. Joo, P. Konkola, J.C. Montoya, Y. Sun, J. You and M.L. Schattenburg, Advances in reflection grating technology for Constellation-X, *Proc. SPIE* 5168, *Optics for EUV, X-ray, and Gamma-ray Astronomy,* p*.* 271-282, San Diego, CA, Aug 4, 2003.
8. C. Forest, M. Akilian, G. Vincent, A. Lamure and M.L. Schattenburg, Thin glass optic and silicon wafer deformation and kinematic constraint*, Proceedings of the 18th Annual Meeting of the American Society of Precision Engineering*, V. 30, p. 39-42, Portland, OR, Oct 26-31, 2003.
9. C.R. Forest, P. Reynolds-Browne, O. Blum-Spahn, J. Harris, E. Novak, C.C. Wong, S. Mani, F. Peter, and D. Adams, Static and Dynamic Optical Metrology of Micro-Mirror Thermal Deformation, *Proceedings of the* *2004 Nanotechnology Conference and Trade Show*, V. 2, p. 363-366, Boston, MA, Mar 7-11, 2004.
10. C.R. Forest, P. Reynolds-Browne, O. Blum-Spahn, J. Harris, E. Novak, C.C. Wong, S. Mani, F. Peter, and D. Adams, Measurement of Transient Thermal Response of Micro-Mirrors, *Proceedings of Hilton Head 2004: A Solid State Sensor, Actuator and Microsystems Workshop*, p. 386-391, Hilton Head Island, SC, Jun 6-10, 2004.
11. R.K. Heilmann, M. Akilian, C.-H. Chang, C.R. Forest, C. Joo, A. Lapsa, J.C. Montoya and M.L. Schattenburg, Thin-foil reflection gratings for Constellation-X, *Proc. SPIE* 5488, *UV-Gamma Ray Space Telescope Systems*, p. 283-290, Glasgow, Scotland, United Kingdom, Jun 21, 2004.
12. M. Akilian, C. Forest, A. Slocum, D. Trumper and M.L. Schattenburg, Thin optics constraint, *Proceedings of the 19th Annual Meeting of the American Society for Precision Engineering,* V. 34, p. 209-212, Orlando, FL, Oct 24-29, 2004.
13. C.R. Forest, N.B. Ball, T.A. Fofonoff, and I.W. Hunter, Two-Dimensional Capillary Array Electrophoresis End-Column Fluorescence Detection, *Proceedings of the 19th International Symposium on MicroScale Bioseparations* (MSB), p. 28, New Orleans, LA, Feb 12-17, 2005.
14. C.R. Forest, B. Crane, and I.W. Hunter, Micro-well Array Interface for Capillary Array Electrophoresis, *Proceedings of the 9th International Conference on Miniaturized Chemical and Biochemical Analysis Systems* (µTAS), V. 1, p. 141-144, Boston, MA, Oct 9-13, 2005.
15. C.R. Forest, B. Woodruff, and I.W. Hunter, Accurate, repeatable, and replaceable constraint of capillary arrays using a micro-fabricated device, *Proceedings of the 20th International Symposium on MicroScale Bioseparations* (MSB), p. 129, Amsterdam, Netherlands, Jan 22-26, 2006.
16. C.R. Forest, D. Buckley, I. Collier, and I.W. Hunter, Mass assembly technology for large arrays of capillaries, *Proceedings of the 20th International Symposium on MicroScale Bioseparations* (MSB), p. 329, Amsterdam, Netherlands, Jan 22-26, 2006.
17. C.R. Forest, M.J. Beltran, and I.W. Hunter, Passively aligned 100-port micro-fluidic connector, *Proceedings of the 21st Annual Meeting of the American Society for Precision Engineering*, V. 39, p. 443, Monterey, CA, Oct 15-20, 2006.
18. C.R. Forest, W.G. Thilly, and I.W. Hunter, End-column detector for capillary array electrophoresis: design and application to arrays of 25, 100, and 10 000 capillaries, *Proceedings of the 21st International Symposium on MicroScale BioSeparations* (MSB), p. 306, Vancouver, British Columbia, Canada, Jan 13-18, 2007.
19. C.R. Forest, M.A. Saez, and I.W. Hunter, Microforging technique for fabrication of low roughness mold masters for injection molded lens arrays, *Proc. SPIE, OptiFab 2007*, Rochester, NY, May 14-17, 2007.
20. C.R. Forest, M.A. Saez, and I.W. Hunter, Microlens characterization using contact profilometry and point-spread function measurement, *Proceedings of the 22nd Annual Meeting of the American Society for Precision Engineering*, V. 42, p. 307-309, Dallas, TX, Oct 14-19, 2007.
21. C.R. Forest, A.R. Rosenbaum, and G.M. Church, DNA sequencing by ligation on surface-bound beads in a microchannel environment, *Proceedings of the 12th International Conference on Miniaturized Chemical and Biochemical Analysis Systems* (µTAS) p. 634-636, San Diego, CA, Oct 12-16, 2008.
22. C.R. Phaneuf, D. Leslie, J.P. Landers, C.R. Forest, Modeling and experimental validation of dual microfluidic chamber, infrared laser-mediated polymerase chain reaction, *Proceedings of the 23st International Symposium on MicroScale BioSeparations* (MSB), Boston, Massachusetts, Feb 1-5, 2009.
23. A. Sodemann, M. Li, R. Mayor, C.R. Forest, Micromilling of molds for microfluidic blood diagnostic devices, *Proceedings of the Annual Meeting of the American Society for Precision Engineering 2009*, V. 47, p. 192-194, Monterey, CA, Oct 4-9, 2009.
24. M. Li, A. Sodemann, A. Para, J. Ackerman, R. Mayor, D. Ku, C. Forest, Development of a high throughput, quantitative system for formation and measurement of occlusive thrombus, *Proceedings of the Biomedical Engineering Society (BMES) 2009*, Pittsburgh, PA, Oct 7-10, 2009.
25. M. Li, A. Sodemann, J. Ackerman, R. Mayor, C. Forest, High throughput formation and measurement of occlusive thrombus in blood, *Proceedings of the 13th International Conference on Miniaturized Chemical and Biochemical Analysis Systems* (µTAS), Paper #602030, ICC Jeju, Jeju, Korea, Nov 1-5, 2009.
26. M. Kulik, D. Shenoda, C. Forest, A low-cost, two-axis, precision robot for automated fluorescence in-situ hybridiziation assays, *Proceedings of the 2009 ASME International Mechanical Engineering Congress and Exposition, IMECE 2009,* V.2, p.119-121, Lake Buena Vista, FL, Nov 13-19, 2009.
27. C.R. Forest, M.L. Furst, R. Bellamkonda, R. Vito, The InVenture Prize: An undergraduate invention competition to encourage entrepreneurship and commercialization of student technology ventures, *Proceedings of the 14th Annual Conference of the National Collegiate Inventors and Innovators Alliance* (NCIIA), San Francisco, CA, Mar 25-27, 2010.
28. C.R. Phaneuf, N. Pak, C.R. Forest, Rapid, Low-Cost, Microfluidic Thermocycler For High-Throughput Genetic Diagnostics, Oral Presentation, *Proceedings of the ASME 2010 Summer Bioengineering Conference* (SBC 2010)*,* Paper #19714, p. 57, Naples, FL, Jun 15-19, 2010.
29. M. Li, S. Chase, M. McKinnon, and C.R. Forest.  Microfabrication of circular cross-section microchannels for thrombosis assays, Proceedings of the 25th Annual Meeting of the American Society for Precision Engineering 2010, V. 50, p. 180-183, Atlanta, GA, Oct 31-Nov 4, 2010.
30. N. Pak, C.R. Phaneuf, S.B. Kodandaramaiah, and C.R. Forest, Modulation of electromagnetic radiation using a dot matrix printer, Proceedings of the 25th Annual Meeting of the American Society for Precision Engineering 2010, V. 50, p. 258-260, Atlanta, GA, Oct 31-Nov 4, 2010.
31. N. Pak, M. Dergance, M. Emerick, E. Gagnon, and C.R. Forest, An instrument for controlled, automated, continuous pulling of sub-micrometer fused silica pipettes, Proceedings of the 25th Annual Meeting of the American Society for Precision Engineering 2010, V. 50, p. 133-135, Atlanta, GA, Oct 31-Nov 4, 2010.
32. S. B. Kodandaramaiah, S. Malik, M.J. Dergance, E.S. Boyden, C. R. Forest, Design and performance of telescoping micropipette arrays for high-throughput in vivo patch clamping, *Proceedings of the 25th Annual Meeting of the American Society for Precision Engineering 2010*, V. 50, p. 246-249, Atlanta, GA, Oct 31-Nov 4, 2010. (*winner of RV Jones Scholarship for Best Paper*)
33. C.R. Phaneuf, C.R. Forest, Direct, High-Speed Milling of Polymer Microchamber Arrays, *Proceedings of the 25th Annual Meeting of the American Society for Precision Engineering 2010*, V. 50, p. 345-347, Atlanta, GA, Oct 31-Nov 4, 2010.
34. C.R. Phaneuf, N. Pak, C.R. Forest, Modeling and design of a microscale multiplexed temperature control system, *Proceedings of the 26th Annual Meeting of the American Society for Precision Engineering*, V. 52, p. 181-184, Denver, CO, Nov 13-18, 2011.
35. S. Kodandaramaiah, M. Krijnen, J. Go, S. Malik, N. Sondej, J.P. Khatait, R.G.K.M. Aarts, E. Boyden, D.M. Brouwer, C.R. Forest, Characterization of translation of fused silica micropipettes in non-rectilinear trajectories, *Proceedings of the 26th Annual Meeting of the American Society for Precision Engineering*, V. 52, p. 253-256, Denver, CO, Nov 13-18, 2011.
36. C.R. Phaneuf, N. Pak, C. Saunders, C.R. Forest, Rapid, independently controlled polymerase chain reaction via multiplexed laser radiation, *Proceedings of the 15th International Conference on Miniaturized Systems for Chemistry and Life Sciences* (μTAS), p. 1689-1692, Seattle, WA, Oct 2-6, 2011.
37. M. Li, J. Ackerman, C. Forest, Microfluidic system for multichannel optical measurement of shear induced platelet thrombosis in unfractionated blood, *Proceedings of the 15th International Conference on Miniaturized Chemical and Biochemical Analysis Systems* (µTAS), p. 541-543, Seattle, WA, Oct 2-6, 2011.
38. M.V. Baratta, S.B. Kodandaramaiah, P.E. Monahan, K. Kim, A. Yang, C.R. Forest, K.A. Goosens, E.S. Boyden, Effects of stress on aversive learning require temporally precise serotonergic signaling, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2011), Washington, DC, Nov 12-16, 2011.
39. J. Scholvin, A.N. Zorzos, G. Talei Franzesi, S.B. Kodandaramaiah, B.D. Allen, J. Kinney, C. Moore-Kochlacs, A.C. Singer, S. Wasserman, C. Wentz, M. Yamaguchi, C.R. Forest, N. Kopell, C.G. Fonstad, E.S. Boyden, High channel-count silicon neural recording probes for 3d characterization of optogenetically modulated neural dynamics, *Proceedings of the Annual Meeting of the Society for Neurocience* (Neuroscience 2011), Washington, DC, Nov 12-16, 2011.
40. S.B. Kodandaramaiah, E.S. Boyden, C.R. Forest, Automated patch clamping of neurons in the mammalian brain in vivo, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2011), Washington, DC, Nov 12-16, 2011.
41. C.R. Forest, M.L. Furst, R. Vito, An extracurricular undergraduate invention television show and competition at Georgia Tech, *Proceedings of the 16th Annual Conference of the National Collegiate Inventors and Innovators Alliance* (NCIIA), San Francisco, CA, Mar 22-24, 2012.
42. D.N. Ku, M. Li, C. Forest, K. Hefelfinger, S. Gurnani, O. Martinez, N. Turturro, P. Gahdhi, A new microfluidic point-of-care test for multi-shear platelet thrombosis, *58th annual meeting of the Scientific & Standardization Committee (SSC) of the International Society on Thrombosis and Haemostasis* (ISTH), poster BPS08, Liverpool, UK, Jun 27-30, 2012.
43. N. Pak, G.L. Holst, C.R. Phaneuf, C. Saunders, C.R. Forest, Control Schemes for Microfluidic Viral DNA/RNA Amplification, *Proceedings of the 27th Annual Meeting of the American Society for Precision Engineering*, V. 54, p. 152-155, San Diego, CA, Oct 21-26, 2012.
44. C.R. Forest, M.M. Morrison, N. Hotaling, B.B. Fasse, C. Hermann, F. Bost, A quantitative analysis of the effects of a multi-disciplinary engineering capstone design course, *Proceedings of the Capstone Design Conference 2012*, Champaign-Urbana, IL, May 30-Jun 1, 2012.
45. S.B. Kodandaramaiah, G. Holst, G.T. Franzesi, A. Singer, I. Wickersham, X. Han, E.S. Boyden, C.R. Forest, Multipatcher: a robot for automated, simultaneous whole-cell patch-clamping of multiple neurons in vivo, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2012), New Orleans, LA, Oct 13-17, 2012.
46. S.B. Kodandaramaiah, I. Wickersham, S.R. Bates, A.S. Chuong, M. Ogawa, M.V. Baratta, N. Klapoetke, G. Holst, L.C. Acker, F. Yoshida, P.E. Monahan, C.R. Forest, E.S. Boyden, Autopatcher application to single cell RNA analysis and optogenetic cell type identification, *Proceedings of the Annual Meeting of the Society for Neuroscience* (Neuroscience 2012), New Orleans, LA, Oct 13-17, 2012.
47. N. Pak, C.R. Phaneuf, D.C. Saunders, C.R. Forest, Simultaneous Amplification of Multiple DNA Targets with Optimized Annealing Temperatures, *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, pp. OP-Sat-2-20, Atlanta, GA, Oct 24-27, 2012.
48. C.R. Phaneuf, K. Oh, N. Pak, D.C. Saunders, C. Conrardy, J. Landers, S. Tong, and C.R. Forest, Sensitive, Microliter PCR with Degenerate Primers for Respiratory Virus Detection and Discovery, *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, pp. P-Th-B-206, Atlanta, GA, Oct 24-27, 2012.
49. G.L. Holst, D.C. Saunders, C.R. Phaneuf, N. Pak, C.R. Forest, Sensitive, Open-loop, rapid, laser PCR system using transient thermal analysis, optimization, and environmental control, *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, Atlanta, GA, Oct 24-27, pp. P-Th-B-219, 2012.
50. S.B. Kodandaramaiah , A.S. Chuong, M. Ogawa , N. Klapoetke , M. Baratta, L.C. Acker , P.E. Monahan , F. Yoshida , E.S. Boyden , and C.R. Forest, Integration of automated patch clamp electrophysiology system with optogenetics for cell type identification in vivo, *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, pp. OP-Sat-3-3, Atlanta, GA, Oct 24-27, 2012.
51. M. Li, N. Sondej, C.R. Forest, Experimental measurement of spectral transmission of platelet thrombus in comparison to whole blood, *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, pp. OP-Fri-3-10, Atlanta, GA, Oct 24-27, 2012.
52. B.B. Fasse, N. Hotaling, L.F. Bost, C.D. Hermann, C.R. Forest, The case for multi-disciplinary capstone design: A quantitative analysis of the impact on job placement and product quality. *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, pp. OP-Th-1-16, Atlanta, GA, Oct 24-27, 2012.
53. A.R. Jones, D.F. Miranda, Y.S. Choo, J.A. Guerra, J. Chapman, Y.M. Choi, C.R. Forest, Umbrella valve design for intravenous fluid delivery system, *Proceedings of the Biomedical Engineering Society (BMES) 2012 Annual Meeting*, pp. P-Sat-B-185, Atlanta, GA, Oct 24-27, 2012.
54. B. Krishnaswamy, C.M. Henegar, J.P. Bardill, D. Russakow, G.L. Holst, B.K. Hammer, C.R. Forest, R. Sivakumar, When Bacteria Talk: Time Elapse Communication for Super-Slow Networks, *Proceedings of The Institute of Electrical and Electronics Engineers*(IEEE) *International Conference on Communications* (ICC) - *Wireless Networking Symposium* (ICC'13 WN), Budapest, Hungary, Jun 2013. (*accepted*)
55. I. Kolb, G. Holst, B. Goldstein, S.B. Kodandaramaiah, E.S. Boyden, E. Culurciello, C.R. Forest, Automated, in-vivo, whole-cell electrophysiology using an integrated patch-clamp amplifier, *Proceedings of the 22nd Annual Computational Neuroscience Meeting* (CNS 2013), Paris, France, July 13-18, 2013. (*accepted*)
56. J. Go, A. Fan, C. Lu, S.B. Kodandaramaiah, G.L. Holst, W. Stoy, I. Kolb, E.S. Boyden, C.R. Forest, Fully-automated, in-vivo, single cell electrophysiology, *Proceedings of the 28th Annual Meeting of the American Society for Precision Engineering*, Saint Paul, MN, Oct 20-25, 2013. (*submitted*)
57. M. Li, N.A. Hotaling, C.R. Forest, Combined effects of shear rates and platelet therapy dosage on thrombosis in a microfluidic system, Proceedings of the Biomedical Engineering Society (BMES) 2013 Annual Meeting, Seattle, WA, September 25-28, 2013. (*submitted*)

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### Other Publications (Trade Journals)

1. B.S. Files and C.R. Forest, Elastomer Filled With Single-Wall Carbon Nanotubes, *NASA Tech Briefs*, Vol. 28(3), p. 46, Mar 2004.
2. M. Zecchino and C.R. Forest, Quantifying Laser-Induced Thermal Deformation of a MEMS Device, *Semiconductor Manufacturing Magazine*, Vol. 5(8), p. 52-56, Aug 2004.
3. J. Macomber and C.R. Forest, Polyimide Coated Capillary Tubing: Internal Pressure Capabilities, *Liquid Chromatrography Gas Chromatography Magazine, p. 67,* Sep 2006.
4. C.R. Forest, T.A. Fofonoff, and H. Moser, Brain Electrodes and DNA Mutation Discovery: How Charmilles EDM Made It Possible, *Electrical Discharge Machining (EDM) Today Magazine*, p. 16-19, Sep/Oct 2006.
5. **External Publications/Popular Press (selected)**
6. N. Mokey, Retractable Bike Storage Claw, *Popular Mechanics Magazine*, DIY Rally 2007 Runners-up, Published online, p. 5. Jun 19, 2007.
7. A. Konrad, Four zany ideas that could come true, *Fortune Magazine*, Vol. 165(1), p. 66, Jan 2012.
8. N. Wright, Expo of Ingenuity, *Modern Metals Magazine*, Feb 26, 2012.
9. T. Khalil, Making Makers at Georgia Tech, *White House Office of Science and Technology Policy blog,* Feb 28, 2012.
10. K. Wagstaff, Robot That Connects to Neurons Could Provide Key to Understanding the Human Brain, *TIME*, May 9, 2012.
11. G. Stix, A Robot Helps Listen In on Brain Cell Chatter, *Scientific American*, Aug 23, 2012.
12. J. Hoff, Automation and the inner workings of the brain, *Electrical Apparatus Magazine*, Sep 2012.
13. R. Kurzweil, How to Create a Mind: The Secret of Human Thought Revealed. New York:Viking, 2012.
14. G. Marcus, A Laser Light Show in the Brain, *The New Yorker*, March 19, 2013.
15. E. Landau, Top brain scientist is ‘philosopher at heart.’ *CNN*, April 3, 2013.

### Presentations

#### a. Invited:

1. C.R. Forest, M.J. Spenko, and Y. Sun, MIT precision machine design: x-ray optics alignment project, *Dover Instrument Corporation*, Westboro, MA, Oct 12, 2001.
2. C.R. Forest, Shack-Hartmann surface metrology system, *Zygo Corporation*, Milford, CT, Jul 28, 2002.
3. M. Akilian, C.-H. Chang, C. Chen, C.R. Forest, R.K. Heilmann, C. Joo, P. Konkola, J. Montoya, Y. Sun, and M.L. Schattenburg, Nanometer precision metrology and constraint of thin optics for a high resolution x-ray telescope, Institute for Experimental Physics, Technische Universität Graz, Graz, Austria, Jul 15, 2004.
4. C.R. Forest, Towards a 10,000 channel ultrahigh throughput mutational spectrometer for human genetic diagnostics, *University of California*, Berkeley, CA, Jun 17, 2005 (*invited*).
5. C.R. Forest, Ultra-high throughput DNA mutation discovery, MIT Small Talks Seminar Series, Cambridge, MA, Jul 12, 2006.
6. C.R. Forest, Ultra-high throughput instrumentation for DNA mutation detection and sequencing, *Emory University*, Atlanta, GA, Sep 15, 2008.
7. C.R. Forest, Ultra-high throughput instrumentation for DNA mutation detection and sequencing, *University of Virginia*, Charlottesville, VA, Sep 19, 2008 (*invited*).
8. C.R. Forest, Genetic instrumentation for high throughput sensing and control, *University of Michigan*, Ann Arbor, MI, Oct 27, 2009.
9. C.R. Forest, Genetic instrumentation for high throughput sensing, PCR, and control, *Centers for Disease Control and Prevention (CDC),* Atlanta, GA*,* Oct 26, 2010.
10. C.R. Forest, Genetic instrumentation for high throughput sensing and control, *MIT,* Cambridge, MA, Jan 28, 2011.
11. C.R. Forest, Automated Whole-cell Patch Clamp Electrophysiology of Neurons in vivo, Atlanta Chapter of the *IEEE Engineering in Medicine and Biology Society* (EMBS), Atlanta, GA, Apr 17, 2012.
12. C.R. Forest, Automated Whole-cell Patch Clamp Electrophysiology of Neurons in vivo, *Konkuk University*, Seoul, Korea, Apr 23, 2012.
13. C.R. Forest, Automated Whole-cell Patch Clamp Electrophysiology of Neurons in vivo, *Yonsei University*, Seoul, Korea, Apr 25, 2012.
14. C.R. Forest, Automated patch clamp electrophysiology of neurons in the living brain, *Georgia State University*, Atlanta, GA, Oct 5, 2012.
15. C.R. Forest, Microfluidics for measuring how bacteria talk, Tempere University of Technology, Tampere, Finland, May 21, 2013.

#### b. Symposia:

1. Y. Sun, O. Mongrard, C. Chen, R.K. Heilmann, C. Forest, J. You, M. Spenko and M.L. Schattenburg, Silicon microcombs for precision x-ray foil assembly, presented at the *Constellation X Mission Facility Science Team Meeting*, NASA Goddard Space Flight Center, Greenbelt, MD, Nov 15-16, 2001.
2. C.R. Forest, A. Lapsa, O. Mongrard, J. Przybylowski, M. Spenko, Y. Sun, J. You, and M.L. Schattenburg, X-ray reflection grating update, presented at the *Constellation X Mission Facility Science Team Meeting*, NASA Goddard Space Flight Center, Greenbelt, MD, Nov 15-16, 2001.
3. C.R. Forest, C.C. Henderson, B.E. Mills, and T.R. Kurfess, LIGA gold mask metrology, *Sandia National Laboratories*, Microsystems Processing Division, US Department of Energy, Livermore, CA, Jul 26, 2001.
4. C.R. Forest, M.J. Spenko, Y. Sun, A.H. Slocum, R.K. Heilmann, M.L. Schattenburg and D. Golini, X-ray reflection gratings: shaping, metrology, assembly, presented at the *Constellation X Mission Facility Science Team Meeting*, Cambridge, MA, Sep 19, 2002.
5. Y. Sun, R.K. Heilmann, C.G. Chen, M.J. Spenko, C.R. Forest, and M.L. Schattenburg, Precision microcomb design and fabrication for x-ray optics assembly, presented at the *MIT* *Microsystems Technology Laboratories Student Research Review*, Dedham, MA, Jan 28, 2003.
6. R.K. Heilmann, C.-H. Chang, Y. Sun, C.G. Chen, C.R. Forest, P.T. Konkola, C. Joo, J. Montoya, M. Akilian, J. You, E. Murphy, R. Fleming, and M.L. Schattenburg, Con-X reflection gratings: process development updates, presented at the *Constellation X Mission Facility Science Team Meeting*, Columbia University, New York, NY, May 7-8, 2003.
7. C.R. Forest, Metrology and testing of optical MEMS, *Sandia National Laboratories*, RF Microsystems Technologies Department US Department of Energy, Albuquerque, NM, Aug 25, 2003.
8. R.K. Heilmann, M. Akilian, C.-H. Chang, C.R. Forest, C. Joo, J.C. Montoya, A. Torkaman, and M.L. Schattenburg, Reflection gratings development update, presented at the *Constellation X Mission Facility Science Team Meeting*, NASA Goddard Space Flight Center, Greenbelt, MD, Nov 20, 2003.
9. A.M. Rosenbaum, C.R. Forest, G.M. Church, Next-Generation DNA sequencing with femtoliter reagent volumes per base per template, MIT-Harvard Medical School Microsystems Symposium, Boston, MA, Apr 4, 2008.
10. C.R. Forest, A.M. Rosenbaum, G.M. Church, Next-Generation DNA sequencing with femtoliter reagent volumes per base per template, Harvard Medical School Genetics Department Retreat, Newport, RI, May 27-29, 2008.
11. S. B. Kodandaramaiah, M. Dergance, C.R. Forest and E.S. Boyden, Micropipette array for scalable, parallel, in vivo patch clamping of multiple neurons in the mammalian brain. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 8, 2010.
12. C.R. Phaneuf, N. Pak, C.R. Forest, Arrayed, independently-controlled PCR thermocycling in a polymeric microchip, Poster Presentation, Georgia Tech Research and Innovation Conference (gtRIC) 2010, Atlanta, GA, Feb 8, 2010.
13. M. Li, A. Kozak, M. McKinnon, A. Sodemann, J. Ackerman, D.N. Ku, J.R. Mayor, and C.R. Forest. Low-volume, rapid instrumentation for measurement of platelet accumulation in whole blood. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 8, 2010.
14. S. B. Kodandaramaiah, C.R. Forest and E.S. Boyden, Micropipette array for scalable, automated, parallel, in vivo patch clamping of multiple neurons in the mammalian brain. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 8, 2011. (winner Travel Award for Outstanding Poster Presentation)
15. N. Pak, M.J. Dergance, M.T. Emerick, E.B. Gagnon, and C.R. Forest, An Instrument For Controlled, Automated, Continuous Production of Micrometer Scale Fused Silica Pipettes, Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 8, 2011.
16. C.R. Phaneuf, N. Pak, C.R. Forest, An instrument for multi-temperature, multi-chamber, and micro-liter amplification of RNA/DNA, Proceedings of the Workshop on Novel Sampling and Sensing for Improving Food Safety, Atlanta, GA, Jun 16-17, 2011, p. 79-80.
17. S. Kodandaramaiah, G. Franzesi, B. Chow, E.S. Boyden, C.R. Forest, Automated whole-cell patch clamp electrophysiology of neurons in vivo, 2011 Collaborative Research in Computational Neuroscience (CRCNS) PI Meeting, *Princeton University*, Princeton, NJ, Oct 9-11, 2011.
18. N. Pak, C.R. Phaneuf, D. Curtis Saunders, and C.R. Forest, Dual independent temperature control of infrared PCR . Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 7, 2012.
19. M. Li, D.N. Ku, C.R. Forest , Microfluidic system for simultaneous optical measurement of platelet aggregation at multiple shear rates in whole blood.  Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 7, 2012.
20. C. R. Phaneuf, C. Conrardy, S. Tong, C. R. Forest, Rapid, microfluidic viral screening using Consensus-Degenerate Hybrid Oligonucleotide Primer PCR. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 7, 2012.
21. D.C. Saunders, C.R. Forest, Integrated microfluidic system with open loop control for rapid and repeatable infrared RT-qPCR. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 7, 2011.
22. S. B. Kodandaramaiah, G. Talei Franzesi, B.Y. Chow, E.S. Boyden and C.R. Automated whole cell patch clamping of neurons in vivo. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 7, 2012. (won Travel Award for Outstanding Poster Presentation)
23. G. L. Holst, D. Russakow and C. R. Forest, Molecular Nano-Network. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 7, 2012.
24. N. Pak, G.L. Holst, C.R. Phaneuf, D.C. Saunders, C.R. Forest, Control schemes for microfluidic viral DNA/RNA amplification, Southern Section of Association of Official Agricultural Chemists (AOAC) International Meeting, Atlanta, GA, Apr 29-May 1, 2012.
25. G. L. Holst, S. B. Kodandaramaiah, W. Stoy, E. S. Boyden, C. R. Forest, Automated, high-throughput recording of neuron electrical activity in the living brain. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 13, 2013.
26. W. Stoy, S. Kodandaramaiah, G. Holst, I. Kolb, E. S. Boyden, C. R. Forest, Automated in-vivo Electrophysiology for Pharmacology. Georgia Tech Research and Innovation Conference (gtRIC), Atlanta, GA, Feb 13, 2013.

### Other Scholarly Accomplishments

#### a. Patents and Non-Provisional Patent Applications:

1. C.R. Forest, I.W. Hunter, N.B Ball, and W.G. Thilly, End-Column Fluorescence Detection for Capillary Array Electrophoresis.  U.S. Patent Application 11/351,669, Publication number US 2006/0176481 A1, filed Feb 10, 2006.
2. C.R. Forest, D.E. Moeller, Actuatable holding system, U.S. Patent 7,883,068, filed Oct 25, 2007 and issued Feb 8, 2011. (Licensed to Whirlpool Corporation)
3. C.R. Forest, D.E. Moeller, Body for an actuatable holding system, U.S. Patent D605,028, filed Aug 5, 2008 and issued Dec 1, 2009. (Licensed to Whirlpool Corporation)
4. C.R. Forest, D.E. Moeller, Arm for an actuatable holding system, U.S. Patent D604,596, filed Aug 5, 2008 and issued Nov 24, 2009. (Licensed to Whirlpool Corporation)
5. C.R. Forest, D.E. Moeller, Actuatable holding system, U.S. Patent D604,595, filed Aug 5, 2008 and issued Nov 24, 2009. (Licensed to Whirlpool Corporation)
6. S.M. Collins, C.R. Forest, G.E. Garrison, G.A. Gaska, D.E. Moeller, M.J. Scherzer, Lever lock slotwall storage device, U.S. Patent 8,070,118, filed Dec 18, 2009 and issued Dec 6, 2011. (Licensed to Whirlpool Corporation)
7. S.M. Collins, C.R. Forest, G.E. Garrison, G.A. Gaska, D.E. Moeller, M.J. Scherzer, Lever lock slotwall storage device, U.S. Patent 8,240,623, filed Sep 22, 2011 and issued Aug 14, 2012. (Licensed to Whirlpool Corporation)
8. C.R. Forest, D. Ku, M. Li, Microfluidic system for optical measurement of platelet aggregation, Provisional 60/249,766 filed October 1, 2011 (GTRC ID 5030), utility application 13/632,953 filed Oct 1, 2012.
9. S. Kodandaramaiah, E. Boyden, C. R. Forest, B.Y. Chow, G.T. Franzesi, Autopatcher: A robot for automated whole-cell patch clamp electrophysiology of neurons in vivo, Provisional 61558841, filed Nov 11, 2011 (MIT Docket number MIT\_15251TJ), utility application 13/676082, filed Nov 12, 2012. (ongoing licensing negotiations with Neuromatic Devices)

#### b. Provisional Patents and Invention Disclosures:

1. C.R. Forest, I.W. Hunter, Micro-well array with integrated lenslets, Invention Disclosure filed, Sep 2008 with MIT Office of Technology Licensing.
2. C.R. Forest, J.L Landers, Instrument for Independent Temperature Control of Multiple Unique Polymerase Chain Reactions In The Microfluidic Format Using Infrared Radiation, Invention Disclosure filed, March 2009 with Georgia Tech Technology Licensing Office. Provisional 61/250,690 filed Oct 12, 2009 (GTRC ID 4783).
3. C.R. Forest, M. Dergance, S.B. Kodandaramaiah, E.S. Boyden, Micropipette array for scalable, parallel, in vivo patch clamping of neurons in the mammalian brain, Invention Disclosure filed, Jan 2010 with MIT Office of Technology Licensing.
4. S. Kodandaramaiah, E. Boyden, C. R. Forest, Autopatcher: A robot for automated whole-cell patch clamp electrophysiology of neurons in vivo-CIP, Provisional 61/726008, filed Nov 12, 2012 (MIT Docket number MIT\_15251TJ-CIP)

## V. Service

### A.  Professional Contributions

Keynote speaker, National Instruments Leaders (NILeaders) event, April 14, 2011

Speaker at Smithsonian National Museum of American History, Lemelson Center for the Study of Invention and Innovation, Space of Invention Exhibit, March 23, 2013

Invited to White House along with 100 other US neuroscientists for announcement of BRAIN neuroscience initiative by President Barack Obama, April 2, 2013

#### Professional Memberships

1. Member, American Society of Mechanical Engineering (ASME)
   1. Member, American Society for Precision Engineering (ASPE)

2004- Member, California Separation Science Society (CASSS)

2011- Member, Biomedical Engineering Society (BMES)

**Professional Society / Conference Organization Activity**

2007-2009 Scholarship committee member, American Society for Precision Engineering (ASPE)

2008 Annual meeting organizing committee member, American Society for Precision Engineering (ASPE)

2008 Session chair, Biomedical Devices and BioInstrumentation, Annual meeting of the American Society for Precision Engineering (ASPE)

2010 Annual meeting organizing committee member, American Society for Precision Engineering (ASPE)

2011 Student scholarship committee member and fundraiser for Japanese researchers affected by the 2011 tsunami, The 15th Intl. Conference on Miniaturized Systems for Chemistry and Life Sciences (µTAS)

2012 Panelist at Capstone Design Conference

2012 Abstract reviewer for Biomedical Engineering Society (BMES) Annual Conference

2012 ASME iShow steering committee member

2013 Session chair, Biomedical Devices and BioInstrumentation, Annual Meeting of the American Society for Precision Engineering (ASPE)

2013 Annual meeting organizing committee member, American Society for Precision Engineering (ASPE)

2013 Session chair, Competitions track, Annual Meeting of the National Collegiate Inventors and Innovators Alliance (NCIIA)

2013 Panelist at NCIIA Conference

2013 Candidate for Board of Directors, Director-at-large, American Society for Precision Engineering ASPE)

#### Reviewer

Funding agencies

* National Science Foundation, CBET panel, Biomedical Engineering division, Jun 2010
* National Science Foundation, CBET panel, Biomedical Engineering division, Oct 2010
* National Collegiate Inventors and Innovators Alliance (NCIIA), June 2011, Jan 2012
* American Heart Association, Apr 2012, Oct 2012

Journals and associated conferences

* J. Optical Engineering
* J. Precision Engineering
* J. Chromatography A
* J. Electrophoresis
* ASME Journal of Mechanical Design
* Sensors & Actuators: A. Physical
* Sensors & Actuators: B. Chemical
* Lab on a Chip

### B.  Campus Contributions

#### Institute-wide

**The InVenture Prize @ Georgia Tech (2008-present)**

Founding member and member of faculty organizing committee with Profs. Ray Vito, Ravi Bellamkonda, and Merrick Furst. The InVenture Prize @ Georgia Tech is an undergraduate invention competition for students at Georgia Tech, and is the largest university invention competition in the United States.

Called “American Idol for Nerds” by National Public Radio (NPR), every year 500 undergraduate inventors compete for $30k in prizes and free patents in front of 1200 audience members in person (including 300 local K-12 students), and 50,000 TV viewers of a live broadcast through partnership with Georgia Public Broadcasting. The competition includes 80 faculty judges, 50 member staff, 3 members of faculty organizing committee, $200,000 budget, 9 week “InVenture Prize School” for all competitors, and direct communication with 80,000 K-12 teachers in GA.

Selected Press Coverage (Articles from over 50 references available upon request)

* “Wearing Strength,” *CNN National News*, Jul 14, 2010

### “American Idol For Nerds,” *National Public Radio*, Mar 20, 2010

### “Tech Puts Its Money Where Its Inventors Are,” *Atlanta Journal-Constitution* (front page), Mar 31, 2009

### “Georgia Tech students’ inventions could bring business, jobs,” *Atlanta Journal-Constitution* (front page), Mar 12, 2013

**Invention Studio (2008-present)**

Initiated and led the Invention Studio, a 3000 ft2 prototype fabrication facility with high-end prototyping fabrication equipment used by 500 students/month. The students use the facilities 24 hrs/day for free free-to-use for extracurricular projects as well as in 25 classes/semester from across campus. Supported the founding of and delegated authority to the Makers’ Club, a 70 undergraduate student club to operate the Invention Studio. Raised the following funds to support the facility:

* $445,263 from Georgia Tech Technology Fee funds for fabrication tools: 3-D printers, laser cutters, CNC machine tools, etc, winning grants every year since 2009.
* ~$500,000 cash and ~$100,000 in donated equipment from corporate sponsors

These facilities, infrastructure, and cultural transformation have been recognized by the White House (See IV.D.8); they are being replicated across campus (e.g., Dr. Starner in CoC, Dr. Budd in ID) and at other universities (e.g., RPI, Tallinn U. of Technology); they are laying the groundwork for campus-wide design initiatives including a proposed new building (the “Burdell Center”); and they have directly led to the funding of a $7.3M NSF AMP-IT-UP grant. The Invention Studio is demonstrating the value and sustainability of hand-on, design, build engineering education to stimulation innovation, creativity, and entrepreneurship in undergraduates.

**Other Institute-wide contributions**

* Judge for the “Ramblin’ Reck” Parade, Homecoming 2009
* Guest lecturer in ME 3141, “Cutting Edge Technologies”, Feb 11, 2010
* Guest lecturer in GT1000, Innovation and Entrepreneurship: Georgia Tech culture, opportunities, and YOU. Oct 12, 2010
* Guest lecturer in ME 6229, “Introduction to MEMS”, Sep 7, 2011
* Reviewer: Georgia Tech Fund for Innovation in Research and Education (GT-FIRE) grant program, Feb 2012
* Guest lecturer in BMED 4400: NeuroEngineering Fundamentals, Feb 20, 2012, Feb 18, 2013
* Faculty Associate in Grand Challenges Living Learning Community (GCLLC), a 110 freshmen dormitory community, 2012-2013
* Member of Qualifying Exam Committees, ME, BioE, BME, 2008-present
* Guest lecturer in ME 7757, “Teaching Practicum”, Sep 13, 2012
* Reviewer: Georgia Tech Regenerative Engineering and Medicine (REM) Center Innovative Research Grants, Aug 2012
* Collaborated with Judith Norback, Oral Communication Excellence for Engineers and Scientists, scheduled for publication by Morgan and Claypool, August 2013.
* Thesis committees: Jamie Huffman (advisor Prof. Brandon Dixon), M.S.M.E Fall 2011. Lauren Casa (advisor Prof. David Ku), Ph.D., Massimiliano Pierobon (advisor Prof. Ian Akyildiz), Ph.D
* Institute for Bioengineering and Biosciences (IBB) Bio Industry Symposium planning committee, 2013

#### Contributions to GWW School of Mechanical Engineering

* Invited and hosted guest speaker from U. Michigan, Prof. John Hart, Sep 2008
* Member, undergraduate education committee 2008-2009
* Member, instructional laboratory committee 2009-present
* Member of Director of Design Search committee 2009-2010, 2012
* Member of Mechanical Specialist (Invention studio) Search committee 2010
* Member of Burdell Center for Design planning committee 2009-2011
* Hosted faculty candidate Mr. Aaron Mazzeo on behalf of Manufacturing research area group, February 2011
* Hosted guest speaker Mr. Paul Jones, prominent in capstone design education in the United States, August 2012
* Keynote speaker: Pi Tau Sigma-Mechanical Engineering Honor Society, Annual New Member Initiation Dinner, Apr, 22, 2011; Nov 29, 2012

### C.  Other Contributions

#### Consulting/Advisory Boards

* Consultant, Polymicro Technologies, LLC, Phoenix AZ. Study of capillary bursting pressures, 2006-2007.
* Advisory Board Member. Clarendon Media, LLC, Atlanta GA. 2009-present
* Advisory Board Member, Zydx LLC, San Francisco, 2010
* Advisory Board Member, OmegaWear, Atlanta, GA, 2010
* Consultant, Bondurant Mixson & Elmore LLP, Atlanta, GA, 2011

#### Civic Activities

* Bikes not Bombs (2004-2006): Volunteered bi-weekly for four months to prepare donated bicycles for shipment to third world countries and organize part storage Boston Cares (2003-2005): Math tutor and volunteer at community events
* Science Club for Girls/Boys (2006-2007): Mentoring and teaching 5th grade boys weekly about science and engineering at Fletcher Maynard Academy. Curriculum includes design concepts, problem solving, teamwork, fabrication skills, and career guidance
* Team in Training half-ironman endurance event participant and fundraiser for The Leukemia and Lymphoma Society (LLS), the world's largest voluntary health agency dedicated to blood cancer (2011).

## VI. Grants AND CONTRACTS

**Funded Proposals**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Role | Title | Funding Organization | Level of Funding | Date |
| Co-PI | Arrayed, independent, reverse-transcription PCR by infrared radiation for sensitive detection of viruses (Co-PI Sue Tong (CDC)) | CDC/Georgia Tech joint program seed grant | $99,990 (50,000 Forest) | 7/09-7-11 |
| PI | Request for Technology Fee Funds (ME Invention Studio Equipment) | Georgia Tech Technology Fee Fund | $183,737 | 1/10-5/10 |
| Co-Invest-igator | IGERT: Stem Cell Biomanufacturing (PI’s Bob Nerem and Todd McDevitt (Georgia Tech)) (EHR 0965945) | NSF | $3,000,000 ($90,696 Forest) | 8/10-8/15 |
| PI | Gashopper Underpinnings Design | Georgia Economic Development Association | $10,000 | 8/09-5/10 |
| PI | Low-volume, rapid, point-of-care instrumentation for anti-platelet therapy optimization (10GRNT44300290) | American Heart Association | $165,000 | 8/10-8/12 |
| Co-PI | Request for Technology Fee Funds (Invention Labs with Co-PI’s Thad Starner and Clint Zeagler) | Georgia Tech Technology Fee Fund | $120,032 ($37,532 Forest) | 1/11-5/11 |
| PI | The InVenture Prize**: An undergraduate invention competition at Georgia Tech** | NCIIA | $43,000 | 5/11-5/13 |
| Co-PI | NetSE: Large: MONACO: Fundamentals of Molecular Nano-Communication Networks (PI Ian Akyildiz) (CISE 1110947) | NSF | $3,000,000 ($421,920 Forest) | 7/11-7/15 |
| PI | Point-of-care instrumentation to optimize anti-platelet therapy | Wallace H. Coulter Translational/Clinical Research Grant Program | $100,000 | 11/11-11/12 |
| PI | Request for Technology Fee Funds (ME Invention Studio Equipment) | Georgia Tech Technology Fee Fund | $240,000 ($89,540 Forest) | 1/12-5/12 |
| PI | The InVenture Prize K-12 Outreach | Fitzgerald Foundation | $30,000 | 8/12-8/13 |
| PI | Mekong Green Tech: Commercializing biomass gasification in rural Vietnam | NCIIA | $18,500 | 9/12-9/13 |
| PI | A Sixty Minute Rapid Polymerase Chain Reaction Handheld (SMRPH) for Virus Detection in Children | Georgia Tech TRIBES and Georgia Tech Research Institute (GTRI) | $36,500 | 7/12-7/12 |
| PI | High-throughput robotic analysis of integrated neuronal phenotypes  (R01EY023173) | NIH, R01 | $4,284,594 ($900,000 Forest) | 9/12-9/17 |
| Co-Invest-igator | From Cells to Systems: Computational Neuroscience Training at Emory & Georgia Tech (PI Dieter Jaeger (Emory)) (DA032466-02) | NIH, R90/T90 | ($102,375 Forest) | 9/12-9/17 |
| PI | Request for Technology Fee Funds (ME Invention Studio Equipment) | Georgia Tech Technology Fee Fund | $244,070 ($134,454 Forest) | 1/13-5/13 |
|  |  |  |  |  |
| TOTAL |  |  | $2.41M Forest |  |

#### Pending Proposals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Role | Title | Funding Organization | Level of Funding | Date |
|  |  |  |  |  |
| PI | Robotic intracellular measurement of neural network dynamics in the living brain | Georgia Tech Fund for Innovation in Research and Education | $40,000 | 6/13-6/15 |
| Co-PI | University Maker Spaces: Discovery, Optimization, and Measurement of Impacts | NSF | $396,422 | 9/13-9/17 |
| PI | Automated in vivo pharmacology at single cell resolution | NIH, R01 | $3,932,169 ($1,272,495 Forest) | 9/13-9/18 |
| PI | Robotic intracellular measurement of network dynamics in the living brain for neuro-pathology | W.M. Keck Foundation | $1,000,000 ($500,000 Forest) | 6/14-6/17 |

## Honors and Awards

* Georgia Tech Class of 1940 W. Roane Beard Outstanding Teacher Award (2013)
* Georgia Tech Class of 1934 Outstanding Innovative Use of Education Technology Award (with co-awardees Prof. Thad Starner and Clint Zeagler) (2013)
* Engineer of the Year in Education for the state of Georgia (2013)
* Lockheed-Martin Dean's Excellence in Teaching Award (2012)
* Georgia Tech Research Corporation Undergraduate Innovation Impact Award (2011)
* Georgia Tech Institute for BioEngineering and BioSciences Junior Faculty Award (2010)
* Young Scientist Award at 20th International Symposium on Microscale Bioseparations (2006)
* Teaching Fellowship awarded by MIT Computational and Systems Biology Initiative (CSBi) (2005)
* Sandia National Laboratories MEMS Campus Fellowship (2003-2006)
* National Science Foundation (NSF) Graduate Research Fellowship (2002-2004)
* R.V. Jones Memorial Scholarship for best student paper at the annual meeting of the American Society for Precision Engineering (2003)
* Sandia National Laboratories MESA Institute Fellow (2003)
* MIT Manufacturing Course Race-car Competition Winner (2002)
* NASA Invention Award (2001)
* Georgia Tech Presidential Fellowship (2001)
* MIT Presidential Fellowship (2001)
* Science Applications International Corporation (SAIC) Student Paper Competition Award (2001)
* Georgia Tech Woodruff School of Mechanical Engineering Chair’s Award (2001)
* American Society of Mechanical Engineers (ASME) President’s Award (2001)
* Georgia Tech Engineering Student of the Year (2000)
* NASA Co-op (work-study) Achievement Award (1999)

**10. SUMMARY OF INSTRUCTION OPINION SURVEY**



*Undergraduate Courses*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Sem*  *Taught* | *Course No. Course Name* | *No. Enrolled* | *No. Respond.* | *Median Score for*  *“The Instructor is an Effective Teacher” (weighted by respondants)* |
| Fall 08 | ME 4182/ Capstone Design | 18 | 6 | 4.5 |
| Spr 09 | ME 4182 | 29 | 13 | 4.9 |
| Fall 09 | ME 4182 | 24 | 14 | 4.0 |
| Spr 10 | ME 4182 | 28 | 14 | 4.3 |
| Sum 10 | ME 4182 | 25 | 6 | 4.0 |
| Fall 10 | ME 4182 | 11 ME, 20 BME | 5 (ME) | 4.7 |
| Fall 11 | ME 4182 | 8 ME, 5 BME | 4 (ME) | 4.25 |
| Spr 12 | ME 4182 | 11 | 7 | 4.92 |
| Fall 12 | ME 4182 | 5 ME, 5 BME | 1 (ME) | 5 |
|  | *Average* | 21 | 7.8 | 4.5 |

*Graduate Courses*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Sem*  *Taught* | *Course No. Course Name* | *No. Enrolled* | *No. Respond.* | *Median Score for*  *“The Instructor is an Effective Teacher” (weighted by respondants)* |
| Spr 11 | ME 8803/ Applied Optics | 11 | 7 | 4.6 |
| Spr 13 | ME 8803/ Applied Optics | 8 |  | ongoing |
|  | *Average* | 11 | 7 | 4.6 |

*Additional Information:*

The course ME 4182 has undergone significant changes starting in Fall 2008. See IIIB for more details.

1. Cited publications and contributions are in subsections of Section IV, unless otherwise noted [↑](#footnote-ref-1)