Flavio H Fenton, Ph.D.

Curriculum Vitae GaTech Mandatory Style

Professor
School of Physics
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Contents

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I. Earned Degrees

1993 - 1999   Ph.D., Physics, Northeastern University, Boston, MA
Thesis title: "*Theoretical Investigation of Spiral and Scroll Wave Instabilities Underlying Cardiac Fibrillation".*
Advisor: Dr. Alain Karma

1990 - 1993   M.S., Physics, Northeastern University, Boston, MA.

1985 - 1990   B.S., Physics, Universidad Nacional Autónoma de México, (UNAM) México City.
Thesis title: "*The Antikaon-Proton Interaction At Low Energies".*
Advisor: Dr. Manuel Torres Labansat

II. Employment History

2018 –   Professor   Physics Department, Georgia Institute of Technology, Atlanta, GA.

2012 – 2018   Associate Professor   Physics Department, Georgia Institute of Technology, Atlanta, GA.

2006 – 2012   Research Associate
Veterinary School and Biomedical Sciences, Cornell University, Ithaca, NY.

2009 July   Visiting Fellow, Sir Isaac Newton Institute for Mathematical Sciences,   Cambridge, UK.

2001 – 2006   Director of Electrophysiology Research.
The Heart Institute, Beth Israel Medical Center, New York, NY

2006 July-Aug   Visiting Fellow, Kavli Institute of Theoretical Physics, Santa Barbara CA

2003 July-Aug   Visiting Fellow, Kavli Institute of Theoretical Physics, Santa Barbara CA

2001 – 2005   Visiting Research Scientist
Department of Physics, Hofstra University, Hempstead, NY

1999 – 2001   Postdoctoral fellow
Department of Mathematics, Hofstra University, Hempstead, NY

1998 – 1999   Postdoctoral fellow
Long Island Jewish Medical Center, New Hyde Park, NY

1996 – 1998   Systems Administrator
Department of Physics, Northeastern University, Boston, MA

1996 – 1998	Research Assistant Department of Physics, Northeastern University, Boston, MA
1996 – 1998	Teaching Assistant, Computational Physics, Mathematics for Engineers, and General Physics Department of Physics, Northeastern University, Boston, MA
1988 – 1990	Teaching Assistant for: Calculus, Algebra and Mathematical Methods UNAM, Mexico City, Mexico.
1988 – 1989	High School Physics Teacher. La Salle del Pedregal High School, México City.

III. Honors and Awards

1990-1995	Full scholarship (stipend and tuition) from Universidad Nacional Autónoma de México (DGAPA) for PH.D at Northeastern University.
1990	Scholarship from Fermilab to attend the course "Accelerators in Physics" at Harvard University.
1993	Scholarship from Fermilab to attend the course "Computers in Accelerator Physics" at Harvard University.
1995	Best Poster Award at the Society for Industrial and Applied Mathematics Conference on Dynamical Systems.
1996	Travel Award by the Division of Biological Physics to attend the 1996 American Physical Society March Meeting.
2004	SIAM (Society for Industrial and Applied Mathematics) Best student paper prize (Role: Advisor)
2005	The 9th Michaelem Serventus Educational Hall Award from the 2005 Madrid Arrhythmia and Myocardium Conference
2006	NSF Science and Engineering Visualization Challenge, Third Place, Interactive Media category. Published in Science, 313; 2006, 1730-1735.
2008	First Prize, International Acrobat 3D PDF Contest in Interactive Technical Publishing.
*2012-16	14 "Thank a Teacher" student's certificates
*2014	Georgia Tech Hesburgh Award Teaching Fellow.
*2014	Georgia Tech Institution Award: CETL/BP Junior Faculty Teaching Excellence Award.
*2015-16	Georgia Tech: 2015-2016 GoSTEM Faculty Fellow.
*2016	Logo design winner of the SIAM Dynamical Systems Magazine
*2017	Georgia Tech Institution Award: Junior Faculty Outstanding Undergraduate Research Mentor Award.
*2017	Georgia Tech Institution Award: Geoffrey B. Eichholz Faculty Teaching Award.
*2018	Georgia Tech Institution Award: Faculty Award for Academic Outreach.
*2018-20	Provost Teaching and Learning Fellow

IV. Research, Scholarship and Creative Activities.

* Indicates work done at GT,
# indicates GT Student or Postdoc participation,
@ Indicates GT undergraduate participation
** indicates work done at GT and senior corresponding author.

Google scholar profile (over 4,685 citations and h-index 26 as of April 2018)
http://scholar.google.com/citations?user=jKiNd-0AAAAJ&hl

A. Published Books, Parts of Books and Edited Volumes.
A1. Published Books.
** Book Chapter: Bragard J, Marin S, Cherry EM, **Fenton FH**. "*Study of cardiac defibrillation through numerical simulations*." In: Rubio RG et al. (eds.), Without Bounds: A Scientific Canvas of Nonlinearity and Complex Dynamics, Understanding Complex Systems, Springer-Verlag, Berlin, 2013, p. 649-658.

A2. Parts of Books.
A3. Edited Volumes.

B. Refereed Publications and Submitted Articles
B1. Published and Accepted Journal Articles (Total 84, 39 since joining GT)

(T) Theoretical papers	50	(Edu) Educational papers	3
(E) Experimental papers	7	(R) Review papers	4
(TE) Theoretical and Experimental papers	18	(C) Commentary papers	2

1. **(T) Fenton F**, Karma A. Vortex dynamics in three-dimensional continuous myocardium with fiber rotation: Filament instability and fibrillation. *Chaos* 1998; 8: 20-47.

2. **(T) Fenton F**, Karma A. Fiber-rotation-induced vortex turbulence in thick myocardium. *Physical Review Letters* 1998; 81: 481-484.

3. **(T)** Rappel WJ, **Fenton F**, Karma A. Spatiotemporal control of wave instabilities in cardiac tissue. *Physical Review Letters* 1999; 83: 456-459.

4. **(T) Fenton F**, Evans S, Hastings H. Memory in an excitable medium: A mechanism for spiral wave breakup in the low-excitability limit. *Physical Review Letters* 1999; 83: 3964-3967.

5. **(T)** Hastings H, **Fenton F**, Evans S, Hotomaroglu O, Geetha J, Gittelson K, Nilson J, Garfinkel A. Alternans and the onset of ventricular fibrillation. *Physical Review E* 2000; 62: 4043-4048.

6. **(T) Fenton F**, Karma A, Hastings H, Evans S. Transition from ventricular tachycardia to ventricular fibrillation as a function of tissue characteristics. IEEE Chicago 2000, World Congress on Medical Physics and Biomedical Engineering, paper no. 5617-90379 (2000).

7. **(T) Fenton F**. Numerical simulations of cardiac dynamics: What can we learn from simple and complex models? *Computers in Cardiology* (IEEE) 2000; 27: 251-254.

8. **(T) Fenton F,** Evans S, Hastings H, Karma A. Transition from ventricular tachycardia to ventricular fibrillation as a function of tissue characteristics in a computer model. *Europace* 2000; 1 (Supplement D): paper no. 109P/10.

9. **(T)** Watanabe M, **Fenton F**, Evans S, Hastings H, Karma A. Mechanisms for discordant alternans. *Journal of Cardiovascular Electrophysiology* 2001; 12: 196-206.

10. **(Edu) Fenton FH**, Cherry EM, Hastings HM, Evans SJ. Real-time computer simulations of excitable media: JAVA as a scientific language and as a wrapper for C and FORTRAN programs. *BioSystems* 2002; 64: 73-96.

11. **(T) Fenton FH**, Cherry EM, Hastings HM, Evans SJ. Multiple mechanisms of spiral wave breakup in a model of cardiac electrical activity. *Chaos* 2002; 12: 852-892.

12. **(T) Fenton FH**, Cherry EM, Hastings HM, Evans SJ. Computers and arrhythmias: Computational approaches to understanding cardiac electrical dynamics. Proceedings of the Second MIT Conference on Computational Fluid and Solid Mechanics, 2003.

13. **(E)** Hastings, MH, Sobel GS, **Fenton FH**, Chaterpaul S, Frank C, Pekor J, Russell E. The Onset of Fluctuations in the Ferroin-Catalyzed Belousov-Zhabotinski Reaction. Experimental Chaos, AIP, 2003;676, 275-280.

14. **(T)** Cherry EM, **Fenton FH**. Suppression of alternans and conduction blocks despite steep APD restitution: Electrotonic, memory and conduction velocity restitution effects. *American Journal of Physiology* 2004; 286: H2332-2341.

15. **(T) Fenton FH**., Cherry EM., Karma A., Rappel WJ. Modeling wave propagation in realistic heart geometries using the phase-field method. *Chaos* 2005; 15: 013502

16. **(T)** Chen X, **Fenton FH**, Gray RA. Head-tail interactions in numerical simulations of reentry in a ring of cardiac tissue. *Heart Rhythm* 2005; 2: 1038-46.

17. **(T)** Bueno-Orovio A., Perez-Garcia VM., and **Fenton FH**. Spectral methods for partial differential equations in irregular domains: The spectral smoothed boundary method. *SIAM Journal on Scientific Computing* 2006; 28: 886-900.

18. **(R)** Chatterjee R, Cheng R, Brown WP, Fahrig R, Reinhart C, Yager D, Palais R, Benard L, Babaian C, DuBois C, Sparwasser N, Andresen T, Reiniger S, Meisner R, Borgeat L, Blais F, Taylor J, Lahanier C, Heving M, Suh C, Rajan K, Seig S, Koblin A, Berry D, Pickett-Heaps J, Tetaz F, Brennan J, Abdalati W, Mitchell H, Meier W, Vermilye T, Humphries S, Christensen A, Salver K, Bradbury J, Iacino G, Olsen E, Grotke R, **Fenton F**, Cherry E. 2006 Visualization Challenge Winners. *Science* 2006; 313, 1730-1735.

19. **(E)** Singh R, Bien H, Entcheva E, **Fenton, FH**. Inherent Dispersion in Restitution Properties Over Space. Engineering in Medicine and Biology Society, 2006. EMBS '06. 28th Annual International Conference of the IEEE;1, 3935-3938

20. **(T)** Cherry EM, **Fenton FH**. A tale of two dogs: Analyzing two models of canine ventricular electrophysiology. *American Journal of Physiology* 2007; 292: H43-H55.

21. **(T)** Cherry EM., Ehrlich JR, Nattel S, **Fenton FH**. Pulmonary vein reentry-Properties and size matter: Insights from a computational analysis. *Heart Rhythm* 2007; 12: 1553-1562. *(Article featured on the journal cover)*

22. **(T)** Bueno-Orovio A.,Cherry EM., **Fenton FH**. Minimal model for human ventricular action potential in tissue. *Journal of Theoretical Biology* 2008; 253: 544-560.

23. **(T) Fenton FH**, Cherry EM, Glass L. Cardiac arrhythmias. *Scholarpedia* 2008; 3, 1665.

24. **(TE)** Otani NF, Mo A, Mannava S, **Fenton FH**, Cherry EM, Luther S, Gilmour RF, Jr.. Predator-prey approach to analyzing complex dynamics in cardiac tissue. *Physical Review E* 2008; 78, 021913.

25. **(T) Fenton FH**, Cherry EM, Models of cardiac cell. *Scholarpedia* 2008; 3, 1868.

26. **(E) Fenton FH**, Cherry EM, Kornreich BG, Termination of equine atrial fibrillation by quinidine: An optical mapping study. *Journal of Veterinary Cardiology* 2008; 10 87-102. *(Article featured on the journal cover)*

27. **(TE)** Cherry EM. **Fenton FH.** "Visualization of spiral waves in simulated and experimental cardiac Tissue". *New Journal of Physics* 2008; 10, 125016 (43pp).

28. **(T)** Garzon A, Roman OG, **Fenton FH**. "Model-based control of cardiac alternans on a ring". *Physical Review E* 2009; 80**,** 021932.

29. **(TE) Fenton FH**, Luther S, Otani NF, Cherry EM, Pumir A, Bodenschatz E, Krinsky V, Gilmour RF Jr. "Termination of atrial fibrillation using pulsed low-energy far field stimulation". *Circulation* 2009; 120, 467-476.

30. **(TE)** Otani NF, Singh R, **Fenton FH**, Butcher J, DW Infanger DW, Neumann A, Luther S, Gilmour Jr RF "Use of Ultrasound Imaging to Map Propagating Action Potential Waves in the Heart" *Computers in cardiology*, 2009; 36: 617-620.

31. **(C) Fenton FH**, "The Value of Simulation" Physics World 2010;23:46-47.

32. **(C)** Cherry EM and **Fenton FH**, "Realistic cardiac electrophysiology modeling: are we just a heartbeat away? J. Physiol. 2010; 588, 2689.

33. **(R)** Fink M, Niederer SA, Cherry EM, **Fenton FH**, Koivumäki JT, Seemann G, Thul R, Zhang H, Sachse FB, Beard D, Crampin EJ, Smith NP. "Cardiac cell modeling: Observations from the heart of the cardiac physiome project", *Prog Biophys Mol Biol, 2011, 104; 2-21*

34. **(R)** Clayton RH, Bernus O; Cherry EM; Dierckx H; **Fenton FH**, Mirabella L, Panfilov S V, Sachse FB, Seeman G; Zhang H. "Models of cardiac tissue electrophysiology: Progress, challenges and open questions" *Prog Biophys Mol Biol 2011;104; 22-48*

35. **(T)** Niederer SA, Kerfoot E, Benson A, Bernabeu MO, Bernus O, Bradley C, Cherry EM, Clayton R, **Fenton FH**, Garny A, Heidenreich E, Land S, Maleckar M, Pathmanathan P, Plank G, Rodriguez JF, Roy I, Sachse FB, Seemann G, Skavhaug O, Smith NP. "Verification of cardiac tissue electrophysiology simulations using an *N*-version benchmark". *Philosophical Transactions of the Royal Society A* 2011;369:4331-4351

36. **(T)** Garzon A, Roman OG**, Fenton FH**. Model-based control of cardiac alternans in Purkinje fibers. Physical Review E, 84, 041927 (2011).

37. **(E)** Luther S*****, **Fenton FH***, Kornreich BG, Squires A, Bittihn P, Hornung D, Zabel M, Flanders J, Gladuli A, Campoy L, Cherry EM, Luther GE, Hasenfuss G, Krinsky VI, Pumir A, Gilmour RF Jr., Bodenschatz E."Low-energy control of electrical turbulence in the heart" *Nature.* Jul 13;475(7355):235-9; 2011. * **Co-first authors.**

38. **(T)** Grosu R, Batt G, **Fenton FH**, Glimm J, Le Guernic C, Smolka SA, Bartocci E "From Cardiac Cells to Genetic Regulatory Networks" accepted to appear in 23rd International Conference on Computer Aided Verification, 6806, pp. 396-411, 2011

39. **(T)** Cherry EM, **Fenton FH** *"Effects of boundaries and geometry on the spatial distribution of action potential duration in cardiac tissue"* Journal of Theoretical Biology. 285; 164-76 2011.

40. **(T)** Murthy A, Bartocci E, **Fenton FH**, Glimm J, Gray RA, Smolka SA, and Grosu R, "Curvature Analysis of Cardiac Excitation Wavefronts", CMSB 2011 9th International Conference on Computational Methods in Systems Biology, pages 151-160. ACM, 2011.

41. **(T)** Bartocci E, Cherry EM, Glimm J, Grosu R, Smolka SA, **Fenton FH** *"Toward Real-time Simulation of Cardiac Dynamics"*, CMSB 2011 9th International Conference on Computational Methods in Systems Biology, pages 103-110. ACM, 2011.

42. **(Edu)** Bartocci E, (29 more authors including undergrad studnets) and **Fenton FH**. "Teaching cardiac electrophysiology modeling to undergraduate students: Lab exercises and GPU programming for the study of arrhythmias and spiral wave dynamics" Advances in Physiology Education, *35: 427-437.* 2011.

43. **(T)** Murthy A, Bartocci E, Fenton FH, Glimm J, Gray RA, Smolka SA, and Grosu R, "Curvature Analysis of Cardiac Excitation Wavefronts*"*, IEEE/ACM Trans. Comp.Biol. Bioinform. Oct. 2012

44. **(R)** Cherry EM, **Fenton FH**, Gilmour F. Jr. "Mechanisms of Ventricular Arrhythmias: a dynamical systems-based perspective" Am. J. Physiol. 302(12): H2451-63, 2012.

45. **(T)** Cherry EM, **Fenton FH**. "Contribution of the Purkinje network to wave propagation in the canine ventricle: Insights from a combined electrophysiological-anatomical model". Nonlinear Dynamics 2012; 68: 365-379.

46. ** **(TE) Fenton FH**, Gizzi A, Cherubini C, Pomella N, and Filippi S. "Role of temperature on nonlinear cardiac dynamics", Phys. Rev. E. 87 (4), 042717 2013.

47. ** **(E)** Gizzi A, Cherry EM , Gilmour Jr. RF, Luther S, Filippi S and **Fenton FH.** "Effects of pacing site and stimulation history on alternans" Frontiers in Physiology. (4) 71, 2013.

48. * **(T)** A. Murthy, E. Bartocci, **Fenton FH**, J. Glimm, R.A. Gray, E.M. Cherry, S.A. Smolka, and R. Grosu,"Curvature Analysis of Cardiac Excitation Wavefronts," IEEE/ACM Transactions on Computational Biology and Bioinformatics, vol. 10, no. 2, pp. 323-336, Mar./Apr. 2013.

49. *** (TE)** Kelly A, Ghouri IA, Kemi OJ, Bishop M, Bernus O, **Fenton FH**, Myles RC, Burton FL, Smith GL. "Sub-Epicardial Action Potential Characteristics Are a Function of Depth and Activation Sequence in Isolated Rabbit Hearts." Circ Arrhythm Electrophysiol. *2013._Circ Arrhythm Electrophysiol. 2013;6:809-817*

50. ****(T)** Bragard J., Elorza J.,Cherry EM, **Fenton FH**,"Validation of a Computational Model of Cardiac Defibrillation" Computers in Cardiology. Vol. 40, 851-854, 2013.

51. *#(E)** Uzelac I., Holcomb M., Reiserer RS, **Fenton FH,** WikswoJP. "High-Power Current Source with Real-Time Arbitrary Waveforms for In Vivo and In Vitro Studies of Defibrillation" Computers in Cardiology Vol. 40, 667-670, 2013.

52. ***#(T)** Bragard J. Simic A., Elorza J., Grigoriev RO, Cherry EM, Gilmour Jr RF., Otani NF, and **Fenton FH.** "Shock-induced termination of reentrant cardiac arrhythmias: Comparing monophasic and biphasic shock protocols" Chaos, 23 (4), 043119, 2013.

53. ***(TE)** Filippi S., Gizzi A, Cherubini C., Luther S, and **Fenton FH.**, "Mechanistic insights into hypothermic ventricular fibrillation: The role of temperature and tissue size". Euro pace, 16 (3), 424-434, 2014.

54. *(T)** Islam A., Murthy A., Bartocci E., Cherry EM, **Fenton FH,** Glimm J, Smolka SA, Grosu R. "Model-Order Reduction of Ion Channel Dynamics Using Approximate Bisimulation", Theoretical Computer Science journal, in press 2014.

55. *(T)** Garzon A., Grigoriev R.O. and **Fenton FH.** "Continuous-time control of alternans in long Purkinje fibers" Chaos 24, 022124, (2014).

56. ***# (T)** Chen D, Gray RA., **Fenton FH**. "Modeling the takeoff voltage of the action potential during fast pacing" Computers in Cardiology (2014).

57. **** (TE)** Filippi S, Cherubini C, Gizzi A, Loppini A, **Fenton FH.** "Spatio-temporal correlation of paced cardiac tissue" 8th Conference of the European Study Group on Cardiovascluar Oscillations (ESGCO) IEEE, 223-224 (2014).

58. ***(T)** Grosu R, Cherry EM, Clarke EM, Cleveland R, Dixit S, **Fenton FH**, Gao S, Glim J, Gray R. Mangharam R, Ray A, Smolka SA. "Compositional, Approximate, and Quantitative Reasoning for Medical Cyber-Physical Systems with Application to Patient-Specific Cardiac Dynamics and Devices. Leveraging Applications of Formal Methods, Verification and Validation. Specialized Techniques and Applications. Lecture Notes in Computer Science Volume 8803, pp 356-364 (2014)

59. ***(T)** Islam A, Murthy A, Bartocci E., Cherry EM, **Fenton FH**, Glimm J, Smolka SA, Grosu R. "Model-order reduction of ion channel dynamics using approximate bisimulation" Theoretical Computer Science; 599, 34-46. (2015)

60. ****(T)** Bueno-Orovio A, Cherry EM, Evans SJ, **Fenton FH,** "Basis for the Induction of Tissue-Level Phase-2 Reentry as a Repolarization Disorder in the Brugada Syndrome" BioMed Research International. 2015, 197586. (2015)

61. ****#(T)** Ji YC, Gray RA, **Fenton FH**, "Implementation of Contraction to Electrophysiological Ventricular Myocyte Models, and Their Quantitative Characterization via Post-Extrasystolic Potentiation" PloS one 10 (8), e0135699 (2015).

62. ****#(TE)** Uzelac I, **Fenton FH.** "Robust Framework for Quantitative Analysis of Optical Mapping Signal without Filtering." Computers in Cardiology, 461-464 (2015).

63. ***(T)** Hoffman MJ, LaVigne NS, Scorse ST, **Fenton FH,** Cherry EM. "Reconstructing three-dimensional reentrant cardiac electrical wave dynamics using data assimilation". Chaos: An Interdisciplinary Journal of Nonlinear Science 26 (1), 013107 (2016).

64. ***(T)** Xue S, Lim H, Glimm J, **Fenton FH**, Cherry EM, "Sharp Boundary Electrocardiac Simulations" SIAM Journal on Scientific Computing 38 (1), B100-B117 (2016)

65. ****#@(TE)** Uzelac I, Herndon C, Farmer J, **Fenton FH** "Electrocardiogram Reconstruction from High Resolution Voltage Optical Mapping. Engineering in Medicine and Biology Society (EMBC) 38th 3941-3944 (2016).

66. ****#(T,Edu)** Ji YC, **Fenton FH.** Numerical solutions of reaction-diffusion equations: Application to neural and cardiac models. American Journal of Physics 84 (8), 626-638 (2016).

67. ***#(TE)** Lombardo DM, **Fenton FH,** Narayan SM and Rappel WJ. Comparison of detailed and simplified models of human atrial myocytes to recapitulate patient specific properties. PLoS Computational Biology 12 (8), e1005060. (2016).

68. ***(T)** Cleveland R., **Fenton FH,** Grosu R, Jones PL, Smolka SA. Bifurcation Analysis of Cardiac Alternans Using δ-Decidability. Computational Methods in Systems Biology, 9859, 21-23 (2016).

69. ****#@(TE)** Herndon C, Uzelac I, Farmer JT, **Fenton FH**. Computational ECG reconstruction and validation from high-resolution optical mapping. Computers in Cardiology Vol 43, 713-716 (2016).

70. ***(T)** Islam MA, Lim H, Paoletti N, Abbas H, Jiang Z, Cyranka J, Cleaveland R, Gao S, Clarke E, Grosu R., Mangharam R, Cherry EM, **Fenton FH**, Gray RA, Glimm J, Lin S, Wang Q, Smolka SA CyberCardia project: Modeling, verification and validation of implantable cardiac devices. Bioinformatics and Biomedicine (BIBM) 1445-1452. (2016).

71. ***(T)** Islam MA, Byrne G, Kong S, Clarke EM, Cleaveland R, **Fenton FH,** Grosu R, Jones PL, Smolka SA. Bifurcation Analysis of Cardiac Alternans Using \delta –Decidability. International Conference on Computational Methods in Systems Biology. 132-146 (2016).

72. ***(T)** Cherry EM, Carins DI, Holt N, La Vigne NS, **Fenton FH,** Hoffman M. Data Assimilation for Cardiac Electrical Dynamics. CMBE Vol 1. 423-426. (2017).

73. ***#(T)** Kaboudian A, Cherry EM, **Fenton FH.** Combined 4-variable model for cardiac dynamics using WebGL. CMBE Vol 2. 1308-1311. (2017)

74. ****#(E)** Welsh AJ, Greco EF, **Fenton FH.** Dynamics of a human spiral wave. Physics Today 70 (2) 78-79 (2017).

75. ***(TE)** Gizzi A, Loppini A, Cherry EM, Cherubini C, **Fenton FH,** Filippi S. Multi-band decomposition analysis: Application to cardiac alternans as a function of temperature. Physiological Measurment 38 (5) 833-847 (2017).

76. ****#(TE)** Chen DD, Gray RA, Uzelac I, Herndon **, Fenton FH.** Mechanism for amplitude alternans in electrocardiogram and the initiation of spatiotemporal chaos. Physical Review Letters 118 (16) 168101 (2017).

77. ****#(TE)** Ji YC, Uzelac I, Otani N, Luther S, Gilmour RF, Cherry EM, **Fenton FH.** Synchronization as a Mechanisms for Low-energy Anti-fibrillation. Heart Rhythm, 14 (8) 1254-1262. (2017).

78. ***@(T)** Cairns DI, **Fenton FH**, Cherry EM. Efficient parametrization of flexible cardiac action potential models. Chaos **27**, 093922 (2017).

79. ***(T)** Barone A, **Fenton FH**, Veneziani A. Numerical Sensitivity Analysis of a Vibrational Data Assimilation Procedure for Cardiac Conductivities. Chaos **27**, 093930 (2017).

80. ***(T)** Cherry EM, **Fenton FH**, Krogh-Madsen T, Luther S. Parlitz U. "Introduction to Focus Issue: Complex Cardiac Dynamics. Chaos **27**, 093701 (2017).

81. ***@(TE)** Gurevich DR., Herdon C, Uzelac, I, **Fenton FH**, Grigoriev, R.O. "Level-set Method for Robust Analysis of Optical Mapping Recordings of Fibrillation". Computers in Cardiology (2017).

82. ****# (TE)** Uzelac I, Hornung D, Schroder-Scheteling J, Luther S., Gray R., Cherry EM, **Fenton FH**. "Simultaneous Quantification of Spatially Discordant Alternans in Voltage and Intracellular Calcium in Langendorff-perfused Rabbit Hearts and Inconsistencies with Models of Cardiac Action Potentials and Ca Transients". Frontiers in Physiology. 2017; 8: 819 (2017).

83. ****# (T)** MA Islam, R Cleaveland, **FH Fenton,** R Grosu, PL Jones, SA Smolka "Probabilistic reachability for multi-parameter bifurcation analysis of cardiac alternans". Theoretical Computer Science 2018

84. **** (TE)** J. Christoph, M. Chebbok, C. Richter, J. Schröder-Schetelig, P. Bittihn, S. Stein, I. Uzelac, **F. H. Fenton**, G. Hasenfuß, R. F. Gilmour & S. Luther. Electromechanical vortex filaments during cardiac fibrillation. Nature. 555 (7698), 667 2018

B2. Conference Presentations with Proceedings/Abstracts (Refereed).

1. **Fenton F**, Cherry EM, Banville I, Gray RA, Hastings HM, Evans SJ. Validation of realistic 3D computer models of ventricular arrhythmias with optical mapping experiments. *Pacing and Clinical Electrophysiology* 2002 (Part II); 24: 538.

2. Cherry EM, **Fenton FH**, Hastings HM, Xie F, Garfinkel A, Weiss JN, Evans SJ. The role of decreased conduction velocity in the initiation and maintenance of atrial fibrillation in a computer model of human atria. *Pacing and Clinical Electrophysiology* 2002 (Part II); 24: 538.

3. Garfinkel A, **Fenton F**, Xie F, Weiss JN, Feliciano Z, Boyle N, Evans SJ, Hastings H, Cherry E. The effects of electrical restitution on the stability of scroll wave reentry in simulated human atrium. *Pacing and Clinical Electrophysiology* 2002 (Part II); 24: 538.

4. Xie F, Garfinkel A, Qu Z, Weiss JN, **Fenton F**, Evans SJ, Hastings H, Karma A, Cherry E. The effect of electrical restitution on the stability of scroll reentry in anatomically realistic simulated rabbit ventricles. *Pacing and Clinical Electrophysiology* 2002 (Part II); 24: 628.

5. **Fenton FH**, Cherry EM, Hastings HM, Evans SJ. The APD restitution hypothesis revised: Slope >1 does not always determine alternans and spiral wave breakup. *Pacing and Clinical Electrophysiology* 2003 (Part II); 26: 1026.

6. Chen X, **Fenton FH**, Gray RA. Restitution curves can not predict the dynamics in a numerical model of reentry in a ring. *Pacing and Clinical Electrophysiology* 2003 (Part II); 26: 1024.

7. Cherry EM, **Fenton FH**, Hastings HM, Evans SJ. Differences in reentry dynamics between two human atrial cell models. *Pacing and Clinical Electrophysiology* 2003 (Part II); 26: 985.

8. Cherry EM, Rappel WJ, Evans SJ, **Fenton FH**. Effects of wall heterogeneity in an anatomically realistic model of cardiac ventricles: A simulation study. *Pacing and Clinical Electrophysiology* 2003 (Part II); 26: 1109.

9. **Fenton FH**, Bueno Orovio A, Cherry EM, Evans SJ. Basis for the induction of phase two reentry in the Brugada syndrome: Insights from computer simulations. *Heart Rhythm* 2004; 1: S224-S225.

10. **Fenton FH**, Cherry EM, Ehrlich JR, Nattel S, Evans SJ. A simulation study of atrial fibrillation initiation: Differences in resting membrane potential can produce spontaneous activation at the pulmonary vein-left atrial junction. *Heart Rhythm* 2004; 1: S187-S188.

11. Cherry EM, Ehrlich JR, Nattel S, Evans SJ, **Fenton FH**. Heterogeneous conduction in pulmonary veins: A model of atrial fibrillation due to slow reentrant circuits appearing as focal activity. *Heart Rhythm* 2004; 1: S85.

12. **Fenton FH**, Cherry EM, Gray RA, Hastings H, Evans SJ. Fibrillation without alternans in Porcine Ventricles. *Heart Rhythm* 2005; 2: S301.

13. **Fenton FH**, Bueno Orovio A, Evans SJ, Hastings HM, Cherry EM. Reentrant arrhythmias in human ventricular models. *Heart Rhythm* 2006; 3: S186.

14. Cherry EM, Gilmour RF, Jr., **Fenton FH**. Tissue dynamics of two models of canine ventricular cell electrophysiology: Restitution, memory, and reentry properties. *Heart Rhythm* 2006; 3: S227.

15. **Fenton FH**, Cherry EM, Hastings HM, Evans SJ. Web-based programs for learning cardiac electrophysiology: Interactive simulations of heart cells and tissue. *Heart Rhythm* 2006; 3: S136.

16. Dierckx H, Cherry EM, Bernus O, Gilbert S, Holden A, Gilmour RF Jr, **Fenton FH.** Detailed anatomical reconstruction of the whole canine heart including fiber and sheet architecture using MRI and DTMRI. *Heart Rhythm* 2008; 5: S106.

17. ****#** Ji Y, Cherry EM, **Fenton FH**, Experimentally-based modified cable equation to reproduce alternans measured in cardiac tissue. *Heart Rhythm* 2014.

18. ****#** **Fenton FH**, Ji Y, Cherry EM, Near-real-time interactive simulations of complex cardiac cell models in tissue over the web on desktops, laptops and cell phones. *Heart Rhythm* 2014.

19. ****#** Ji Y, Gray RA, Uzelac I, **Fenton FH**. Modeling and Experimental Investigation on Postextrasystolic Potentiation in Intracellular Calcium and Contractile Strength. . *Heart Rhythm* 2015.

B3. Other Refereed Material. N/A
B4. Submitted Journal Articles (numbers continue from published ones)

 # **(TE) Kaboudian A, Cherry EM, **Fenton FH**. High Performance Computation of Cardiac Models in Real-Time using WebGL. Submitted to Science

B5. Manuscripts in Preparation
1. ****#@** **(TE)** Davir H, Hardy N, **Fenton FH.** Optimization of cardiac pacing stimulation by current configuration, a theoretical, numerical and experimental study.

2. ****#** **(TE)** Herndon C, ,Astly H, Uzelac I, Owekowicz T, **Fenton FH.** Characterization of Voltage and Calcium Dynamics in the Alligator Heart as a Function of Temperature.

3. ****#**(E) Uzelac I, **Fenton FH** Minimizing Cross Talk in Single-Sensor Simultaneous Optical Mapping of Voltage and Calcium in Cardiac Tissue using the Semasbestic point.

B6. Journal Covers
- Heart Rhythm; 12: for article "Pulmonary vein reentry-Properties and size matter: Insights from a computational analysis" 2007

- Journal of Veterinary Cardiology, 10: for article "Termination of equine atrial fibrillation by quinidine: An optical mapping study". 2008

- *****Computational Biology and Bionformatics: Volume 10, number 10: for article "Curvature Analysis of Cardiac Excitation Wavefronts,". 2013

- ***** Numerical solutions of reaction-diffusion equations: Application to neural and cardiac models. American Journal of Physics 84 (8), 2016.

- ***** Chaos Journal, "Introduction to Focus Issue: Complex Cardiac Dynamics. Accepted, Chaos 27, 093701 (2017).

C. Other Publications and creative products
Thesis
- Ph.D. Physics Thesis *"Theoretical Investigation of Spiral and Scroll Wave Instabilities Underlying Cardiac Fibrillation".*

- B.S., Physics, Thesis **"***The Antikaon-Proton Interaction At Low Energies".*

Webpages
- TheVirtualHeart.org . Created, regularly updated and maintained by FH Fenton and EM Cherry. Indexed number one in search engines under "virtual heart" and other key words and receives between 3 to 4 thousand visits a month.

- ***** Chaos.gatech.edu Lab website.

D. Presentations (Total 211) * Indicates after joining GT (98).

D1. Invited as Keynote Speaker.

1. "Dynamics of spiral waves and their relation to cardiac arrhythmias," No-lineal meeting 2004, Toledo, Spain 2004.

2. * "Biologia Matematica del Corazon", XV Escuela de Otono de Biologia Matematica y IX Encuentro Nacional de Biologia Matematica. Universidad de Sonora, 11-15 Noviembre 2013.

3. * "Complexity, Pattern Formation and Chaos in the Heart; A combined high performance computation and experimental approach for the study and treatment of arrhythmias." 11thComputational Methods in Systems Biology. Institute of Science and Technology, Vienna, Austria.Sept 23-25,2013.

4. * "Complexity, Pattern Formation and Chaos in the heart; a combined experimental and high performance computing approach for the study and control of arrhythmias". XI SBAI and DINCON (Brazilian Symposium on Intelligent Automation and Dynamics, Control and Applications), Fortaleza Brazil, October 14-17 2013.

5. * "Towards Real Simulations of the Heart", Georgia Scientific Computing Symposium, Kennesaw State University , Kennesaw GA. February 21, 2014.

6. * "Pattern formations as a mechanism for arrhythmias in the heart" 1st BCAM Workshop on Nonlinear dynamics in Biological Systems BCAM(Basque Center for Applied Mathematics), Bilbao Spain June 19, 2014

7. * "High-performance-computing for heart simulations and its complex spatiotemporal dynamics". 3rd Conference of Computational Interdisciplinary Science, CCIS 2014. Paraguay Asuncion, Sept 30-Oct 3,2014.

8. * "The Advantages and Fun of Studying a STEM degree", 1st Step into Stem Conference. Organized by Junior STEM GT group. Atlanta Georgia. October 22, 2016.

D2. Invited presentations and colloquiums at Universities and Institutes.
Invited Colloquiums after joining GT indicted with a C (25)

1. Instabilities of vortex dynamics in 3D," Biomedical Engineering Department, Boston University, Boston, MA, 1997.

2. "Fibrillation due to vortex instabilities in 3D continuous myocardium with fiber rotation," Long Island Jewish Medical Center, New Hyde Park, NY, 1997.

3. "Instabilities of electrical vortex filaments and wave turbulence in thick cardiac muscle", Northeastern University, Boston, MA, 1998.

4. "Instabilities of spiral waves in the heart," Duke University, Durham, NC, 1999.

5. "Vortex dynamics in three-dimensional continuous myocardium with fiber rotation: Filament instability and fibrillation", State University of New York Upstate Medical Center, Syracuse, NY, 1999.

6. "Vortex dynamics in three-dimensional continuous myocardium with fiber rotation: Filament instability and fibrillation", University of California at Los Angeles, CA, 2000.

7. "Vortex dynamics in three-dimensional continuous myocardium with fiber rotation: Filament instability and fibrillation", University of California at San Diego, CA, 2000.

8. "Vortex dynamics in three-dimensional continuous myocardium with fiber rotation: Filament instability and fibrillation", Salk Institute (2000)

9. "Instabilities of spiral waves and the transition from ventricular tachycardia to ventricular fibrillation," New York Academy of Sciences, New York City, NY, 2001.

10. "Modeling cardiac electrophysiology and arrhythmias using Compaq Alphas," Beth Israel Medical Center, New York, NY, 2001.

11. "All-heart simulations of cardiac arrhythmias," University of Missouri at Saint Louis, 2001.

12. "Multiple mechanisms of spiral wave breakup in a model of the cardiac action potential," University of Alabama at Birmingham, 2002.

13. "Spiral wave breakup mechanisms and their relevance to cardiac arrhythmias," Clark University, Worcester, MA, 2002.

14. "Multiple mechanisms of spiral wave breakup and their relation to fibrillation," Cornell University, Ithaca, NY, 2002.

15. "Multiple mechanisms of spiral wave breakup and their relation to fibrillation," State University of New York Upstate Medical University, Syracuse, NY, 2002.

16. "Ventricular fibrillation in mammalian hearts," McGill University, Montréal, Canada, 2003.

17. "Reproducing the ECG in simulated canine ventricles with transmural heterogeneity," Masonic Medical Research Laboratory, Utica, NY, 2003.

18. "Computers and arrhythmias: Computational approaches to understanding cardiac electrical dynamics," Pfizer, Inc., Groton, CT, 2003.

19. "Computers and arrhythmias: Computational approaches to understanding cardiac electrical dynamics," Universidad de Castilla-La Mancha, Ciudad Real, Spain, 2003.

20. "Computers and arrhythmias: Computational approaches to understanding cardiac electrical dynamics," Federal Drug Administration, Washington, DC, 2004.

21. "Computational physics of the heart: Normal and abnormal rhythms in heart disease," Discovery Nights at Hofstra University, Hempstead, NY, 2004.

22. "Basis for the induction of phase two reentry in the Brugada syndrome: Insights from computer simulations," University of Leeds, United Kingdom, 2004.

23. "Computers and arrhythmias: Computational approaches to understanding cardiac electrical dynamics," Hofstra Summer Research Program, Hempstead, NY, 2004.

24. "Computers and arrhythmias: Computational approaches to understanding cardiac electrical dynamics," Grand Rounds, Beth Israel Medical Center, New York, NY, 2004.

25. "Computational Physics of the Heart: from normal rhythm to spiral waves" Nonlinear Science Seminar, Physics Department at Georgia Tech, Atlanta GA, 2005

26. "Alternans in cardiac ventricular myocardium", Department of Physiology, McGill University, Montreal, Canada, March 2007.

27. "Nonlinear dynamics in the heart: Modeling, simulating, and visualizing arrhythmias" Max Planck Institute for Dynamics and Self-Organization, Gottingen Germany, April 2007.

28. "Models of Ventricular Human Action Potentials", Computing Laboratory, Oxford University , United Kingdom, April 2007,

29. "Alternans and Border Collision bifurcations; Theory and Experiments", Department of Applied Physics, Universitat Politecnica de Catalunya, Barcelona, Spain. April 2007.

30. "Spiral wave dynamics and instabilities; Simulations and Experiments", Department of Mechanical & Biomedical Engineering, Kangwon National University, Chunchon, South Korea. Nov. 2007.

31. "Visualization and Simulations in Whole Hearts; Emphasis in Spatiotemporal alternans, and Brugada Syndrome" KRISS (Korean Research Institute of Standards and Science), Daejeon, South Korea. November 2007.

32. "Understanding Wave Instabilities in Cardiac Tissue", Physics Department, Georgia Tech. March 2008.

33. "Termination of fibrillation using pulsed low-energy far field stimulation", Dept. of cell Biology and Physiology. University of Pittsburgh, October 2008.

34. "Electrotonic effects due to tissue boundaries in cardiac tissue", Institute of Membrane and Systems Biology, Leeds, UK. July 2009.

35. "Towards realistic 3D modeling of the human heart I", University Hospital Goettingen, Goettingen, Germany. September 8, 2009.

36. "Towards realistic 3D modeling of the human heart II", University Hospital Goettingen, Goettingen, Germany. September 10, 2009.

37. "Spiral waves and the heart: Modeling, simulating and visualizing the spatiotemporal organization of cardiac arrhythmias", Physics Department. University of Calgary. February 5, 2010.

38. "Spiral waves in the heart: Understanding cardiac arrhythmias using tissue-level experiments and simulations" Molecular & Integrative Physiology Work-in-Progress Series" Department of Biomedical Science, Cornell University, September 30, 2010.

39. "Ondas espirales en el corazón: Usando sistemas complejos en medicina para entender el inicio, la evolución, y la terminación de arritmias" Diplomado en Medicina y Complejidad, Torre de Ciencias y Humanidades, UNAM, Mexico, Octubre 20,2010.

40. "Defibrillation Using Pulsed low energy far field stimulation: Applications for termination of atrial and ventricular fibrillation", Facolta di Ingegneria, Universita Campus Bio-Medico Di Roma. July 5, 2011.

41. "Spiral waves and the heart: A physics approach to the study and control of the complex spatiotemporal organization of cardiac arrhythmias." Physics Department, Georgia Institute of Technology, Atlanta GA, January 23th 2012.

42. "From Chaos to Cures; controlling the complex spatiotemporal dynamics of cardiac arrhythmias with a computational and experimental integrative approach." Center of Theoretical Biological Physics, University of California San Diego (UCSD), April 6, 2012.

43. **C*** "High-performance-computing challenges for heart simulations" Computational Science and Engineering Seminar, College of Computing, Georgia Institute of Technology. GA. August 31, 2012.

44. **C*** "Interactive Simulations of Complex Systems and Spiral Wave Dynamics: exploiting graphics processing units on a laptop or PC for real time calculations over the internet." Department of Computer Science, Northern Illinois University, October 4, 2012.

45. ***** "Complexity, Chaos and Pattern Formation in Physical, Mathematical, Chemical and Biological Systems." Senior Seminar Series, School of Physics Georgia Tech. October 12, 2012.

46. **C*** "From Chaos to Cures; Controlling the complex spatiotemporal dynamics of cardiac arrhythmias" Analysis and Applied Mathematics Seminar, Dept. of Mathematics and Statistics, Kennesaw University, November 16, 2012.

47. ***** "Complexity, Chaos and Pattern Formation in Physical, Mathematical, Chemical and Biological Systems." Society of Physics Students, School of Physics Georgia Tech. February2, 2012.

48. **C*** "Complexity, Pattern Formation and Chaos in the heart; a combined experimental and applied math approach for the study of arrhythmias" School of Mathematics, Georgia Tech, February 26, 2013

49. ***** "Studying heart dynamics; An experimental, theoretical and experimental integrative approach". Weekly Molecular Biophysics Research Review and Research Ethics Training. MoSE, Georgia Tech, January 13, 2014.

50. ***** "Taking Risks to Build Connections that Help Students Learn". Celebrating Teaching Day Georgia Tech GA. March 6, 2014.

51. **C*** "High-performance-computing challenges for heart simulations" Computer Science Department colloquia, Stony Brook University, NY August 11, 2014.

52. **C*** "From Chaos to Cures; controlling the complex spatiotemporal dynamics of cardiac arrhythmias" Boston University Physics Colloquia, Boston MA, Sept 16, 2014.

53. **C*** "From Chaos to Cures; controlling the complex spatiotemporal dynamics of cardiac arrhythmias" Northeastern University Physics Colloquia, Boston MA, Sept 18, 2014.

54. ***** "An integrative approach in the study and control of cardiac arrhythmias." Integrative BioSystems Institute (IBIS) Chalk-Talk series. Georgia Tech, Atlanta, Oct 8 2014.

55. **C*** Using optical mapping methods to visualize and study voltage and calcium waves in the heart and new anti-arrhythmic treatments. School of Applied Physiology Colloquium. Georgia Tech Atlanta January 28, 2015.

56. **C*** Using optical mapping methods to study Voltage and Calcium waves in the heart and to develop new Anti-Arrhythmic Treatments. School of Biology colloquium, Georgia Tech Atlanta. Feb 11 2015.

57. **C*** From Chaos to Cures: Controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a theoretical, numerical and experimental integrative approach. Duke University Physics department Colloquium. Durham, 3/25/2015

58. **C*** The complex spatiotemporal dynamics of cardiac arrhythmias. Clark University, Physics department Colloquium. Worcester, Massachusetts. 5/5/2015

59. **C*** Heart Simulations; from modeling and high-performance computing to applications. Computational Science and Engineering colloquium, GT College of Computing, Atlanta. 9/2/2015.

60. **C*** From oscillating candles to complex spatiotemporal arrhythmias in the heart. University of Maryland, Math Department, Applied Dynamics colloquia 9/15/2015.

61. **C*** From Chaos to Cures; controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a theoretical, numerical and experimental integrative approach. Ohio University, Physics & Astronomy department colloquium. Athens Ohio 2/5/2016.

62. **C*** From Chaos to Cures; controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a theoretical, numerical and experimental integrative approach. UC Davis, Department of Pharmacology Colloquium 2/15/2016.

63. ***** "Heart Dynamics; from modeling and experiments to applications". Clark Atlanta University, Department of Physics Graduate Seminar. Atlanta GA, 2/25/2016.

64. * "Chaos in the Heart; Understanding Cardiac Arrhythmias using Optical Mapping Experiments, Computer Simulations and Math" Petit Institute for Bioengineering & Bioscience, Breakfast Club Seminar Series. Atlanta GA, 3/08/2015

65. C* "Combined approach of voltage-calcium optical mapping and computer simulations for the study of: Dispersion of refractoriness and Low energy defibrillation" Johns Hopkins Hospital, Cardiology Colloquia. Baltimore, MD. 3/16/2016.

66. * "From Chaos to Cures; controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a theoretical, numerical and experimental integrative approach." Georgia Tech Silver Jackets Monthly meeting. Atlanta, GA. 5/10/2016.

67. C* "The Complex Dynamics of the Heart; a Physicist approach" Wuhan National Laboratory of Optoelectronics. Wuhan China. October 16, 2016.

68. * "Bifurcations and Complexity in the Heart" Invited class at Stony Brook College of Computing. October 27, 2016.

69. C* "High Performance Computing of Heart Dynamics with Direct Clinical Applications" Stony Brook College of Computing Colloquium. October 28, 2016.

70. C* "Mathematical modeling of reaction diffusion systems; From 0 to 3D and from forest fires to heart dynamics. Colloquia of the Department of Mathematics, Universidad Autonoma Metropolitana Iztapalapa. Mexico City, December, 5, 2016.

71. * "Complex Systems in Nature and in the Heart" Society of Physics Students seminar, School of Physics, Georgia Tech. February, 10 2017.

72. C* "Controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a theoretical, numerical and experimental integrative approach" Physics Department colloquia, Universidad of North Carolina Wilmington. March 31, 2017.

73. * "Physics of Living Systems at the School of Physics" GT College of Science meeting, March 4. 2017.

74. C Period Doubling Bifurcations in Cardiac Tissue; Experiments, Theory and Simulations" NSF-Cyberdaria Meeting. Penn State, Philadelphia. April 14, 2017

75. C* From Experiments to Theory in Cardiac Dynamics: A Route to Mathematical Modeling and Numerical Simulation. Universita Campus Bio-Medico Di Rome, Rome December 1, 2017

76. C* "Control and termination of spatiotemporal cardiac arrhythmias; Experiments and Simulations" Decision and Control Laboratory (DCL), GT 1/26/2018.

77. C* "Integrative approach to develop novel low energy defibrillation methods; toward patient specific medicine" ICES colloquium, University of Texas at Austin, Feb 8, 2018.

78. C* "Integrative approach to control and termination of cardiac arrhythmias" Rochester Institute of Technology, Physics colloquium, Rochester NY, March 22, 2018.

D3. Invited presentations at workshops

1. "Multiple mechanisms of spiral wave breakup," invited talk given at the Dynamics of Interfaces, Patterns and Domains Workshop, Los Alamos, NM, 1999.

2. "Multiple mechanisms of spiral wave breakup in a model in 2D and 3D", invited talk given at the Mapping and Control of Complex Arrhythmias Workshop, Montréal, Canada, 2000.

3. "Simulations in irregular domain for cardiac tissue using the phase field method," invited talk given at the Cardiac Nonlinear Dynamics Meeting, Vanderbilt University, Nashville, TN, 2001.

4. "Multiple mechanisms of spiral wave breakup," invited talk given at the Wave Dynamics in Biological Excitable Media Workshop, Aspen Center for Physics, Aspen, CO, 2002.

5. "Multiple mechanisms of spiral wave breakup," invited talk given at the Pattern Formation in Physics and Biology Workshop, Kavli Institute of Theoretical Physics, Santa Barbara, CA, 2003.

6. "Ten different physiological and structural mechanisms for spiral wave breakup in 2D and 3D," invited talk given at the Integrative Biology Workshop, University of Oxford, United Kingdom, 2004.

7. "Beyond Slope One: Alternans Suppression and Other Understudied Properties of APD Restitution" invited talk given at the Cardiac Dynamics Workshop, Kavli Institute of Theoretical Physics, University of California, Santa Barbara, CA, July-August 2006.

8. "Alternans, Restitution and Models of Human Ventricular Cells", invited talk given at the International Workshop on Non-linear Dynamics in Excitable Media, Gent University, Belgium, April 2007.

9. "Spatiotemporal Alternans and Control of Wave Instabilities in Cardiac Tissue", invited talk given at the APCTP (Asia Pacific Center for the Theoretical Physics) Workshop on Self-Organization in Biological Complex Systems, Pusan National University, South Korea. November 2007.

10. "Estudio de la dinámica de Ondas en el tejido cardiaco y sus instabilidades" Plenary talk given at the Biomathematics Workshop 45 anniversary of the department of Mathematics, Sonora University, Mexico. March 6, 2009

11. "Termination of fibrillation using low-energy far-field stimulation: A computational and optical mapping study" The Cardiac Physiome Project, The Isaac Newton Institute of Mathematical Sciences, Cambridge UK. July 22, 2009.

12. "Termination of fibrillation using low-energy far-field stimulation: A computational and optical mapping study" ESF (European Science Foundation) Workshop in Cardiac Dynamics, Slovakia, August 25, 2009.

13. "Caos, espirales y la dinámica del corazón" XII escuela de Otono en biologia Matematica y VI Encuentro Nacional de Biologia Matematica Pachuca Mexico, Octubre 14, 2010

14. Five lectures on "Complex Systems and the Heart; Experiments, Theory and Simulation" NSF-CMACS Workshop on Atrial Fibrillation. Lehman College, Bronx, NY Jan 3-7, 2011.

15. "Synchronization and Termination of Atrial and Ventricular fibrillation using low-energy far field stimulation; A theoretical and experimental approach" NHLBI-VCU World Congress and Workshop. Williamsburg, VA June 1st, 2011.

16. "Low energy defibrillation, theory and experiments in vitro and in vivo" TRM Forum on Computer Simulations and Experimental Assessment of Cardiac Function. Lugano, Switzerland; December 6, 2011.

17. * "From Chaos to Cures; Controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a combined computational and experimental integrative approach" From the Clinic to Partial Differential Equations and Back: Emerging challenges for Cardiovascular Mathematics *ICERM* Brown University , RI. January 20 - 24, 2014

18. * "How cardiac modeling has failed us after 52 years of simulations." Workshop on Large Scale Modeling of Cardiac Electrophysiology. Dalhousie University, Halifax, Canada June 26-27 2014.

19. ***** "Reaction Diffusion Equations for Cell Motion" Dagstuhl workshop on Multiscale Spatial Computational Systems Biology. Schloss Dagstuhl, Germany November 27, 2014.

20. ***** Simple to complex models and mechanisms of arrhythmia: historical perspective". Integrative Workshop of Heart Rhythm Disorders. Knoxville, TN, 3-5, December 2014.

21. ***** "APA alternans" Working Group in Prediction and Control of Cardiac Alternans, NIMBios (National Institute for Mathematics and Biological Systems. TN May 2, 2016

22. ***** "A mechanism for QRS alternans in the ECG and initiation of spatiotemporal chaos" BCAM Workshop on oscillations in Biological Systems BCAM(Basque Center for Applied Mathematics), Bilbao Spain. September 2, 2016.

23. *****"Mathematical modeling of cardiac arrhythmias; How close are we to the real thing?" International Symposium on Mathematical Modeling, Casa Galvan, Mexico City. Dic. 8, 2016.

24. ***** "From chaos to cures; Controlling the complex spatiotemporal dynamics of cardiac arrhythmias using a theoretical, numerical and experimental integrative approach" 6th Nonlinear Wave and Chaos Workshop. Sand Diego CA. March 23, 2017.

25. ***** "Period Doubling Bifurcations in the Heart". Analysis of Spatiotemporal Complexity in Fluids Workshop. Georgia Tech, Atlanta GA. Sept 11-13, 2017.

26. ***** "Real Time Simulations of Cardiac Models" In Silico Drug Safety and Efficacy Symposium in Oxford. Oxford University. UK. Sept 21-22. 2017.

27. ***** "Real Time Simulations of Cardiac Models. Workshop on Mathematical Methods in Cardiac EP", Ottawa, Nov. 4-6 2017.

28. *****Control of arrhythmias. 3rd meeting of the Prediction and Control of Cardiac Alternans Working Group. NIMBioS. TN 2017.

D4. Invited and Contributed Presentations at Conferences

1. "The kaon-proton interaction at low energies using Feynman diagrams," XXXII National Congress of Physics (Mexico), León, Mexico, 1989.

2. "Analyzing the Noble model and spiral waves in 3D," Society for Industrial and Applied Mathematics Conference on Applications of Dynamical Systems, Snowbird, UT, 1995 (poster, Awarded Best Poster).

3. "A new three-variable mathematical model of action potential propagation in cardiac tissue," American Physical Society March Meeting, St. Louis, MO, 1996.

4. "Multiple mechanisms of spiral wave breakup in a model of the cardiac action Potential," American Physical Society March Meeting, Atlanta, GA, 1999.

5. "Memory in an excitable medium: A mechanism for spiral wave breakup in the low-excitability limit," Dynamics Days (Santa Fe, 2000)

6. "Memory in an excitable medium: A mechanism for spiral wave breakup in the low-excitability limit," American Physical Society March Meeting, Minneapolis, MN, 2000.

7. "Transition from ventricular tachycardia to ventricular fibrillation as a function of tissue characteristics in a computer model," Cardiostim (Nice France, 2000) (poster)

8. "Breakup of spiral waves in 3D and the onset of ventricular fibrillation," Society for Industrial and Applied Mathematics Annual Meeting, Puerto Rico, 2000.

9. "Transition from ventricular tachycardia to ventricular fibrillation as a function of tissue characteristics," World Congress on Medical Physics and Biomedical Engineering, Chicago, IL, 2000.

10. "Numerical simulations of cardiac dynamics: What can we learn from simple and complex models?", Computers in Cardiology Conference, Boston, MA, 2000.

11. "Real-time computer simulations of complex systems using JAVA as a wrapper for C and FORTRAN programs," American Physical Society March Meeting, Seattle, WA, 2001.

12. "Validation of full 3D numerical simulations of electrical dynamics in rabbit ventricles with experiments," Dynamics Days, Baltimore, MD, 2002.

13. "Validation of 3D simulations of electrical dynamics in rabbit ventricles with experiments," Society for Industrial and Applied Mathematics Conference on the Life Sciences, Boston, MA, 2002.

14. "Ventricular fibrillation in mammalian hearts: Simulation results," American Physical Society March Meeting, Indianapolis, IN, 2002.

15. "Validation of realistic 3D computer models of ventricular arrhythmias with optical mapping experiments," North American Society for Pacing and Electrophysiology Scientific Sessions, San Diego, CA, 2002.

16. "The APD restitution hypothesis revised: Slope >1 does not always determine alternans and spiral wave breakup," North American Society for Pacing and Electrophysiology Scientific Sessions, Washington, DC, 2003 (poster).

17. "Ventricular fibrillation in mammalian hearts," Society for Industrial and Applied Mathematics Annual Meeting, Montréal, Canada, 2003.

18. "The APD restitution hypothesis revised: Slope >1 does not always determine alternans and spiral wave breakup," Gordon Conference on Cardiac Arrhythmia Mechanisms, New London, NH, 2003 (poster).

19. "Multiple mechanisms of ectopy: Phase two reentry and membrane potential triggers," Upstate New York Cardiac Electrophysiology Society Annual Meeting, Ithaca, NY, 2003.

20. "Alternans suppression in cardiac tissue by electrotonic effects," American Physical Society March Meeting, Montréal, Canada, 2004.

21. "Basis for the induction of phase two reentry in the Brugada syndrome: Insights from computer simulations," North American Society for Pacing and Electrophysiology Scientific Sessions, San Francisco, CA, 2004 (poster).

22. "A simulation study of atrial fibrillation initiation: Differences in resting membrane potential can produce spontaneous activation at the pulmonary vein-left atrial junction," North American Society for Pacing and Electrophysiology Scientific Sessions, San Francisco, CA, 2004 (poster).

23. "Mechanisms of phase two reentry," Society for Industrial and Applied Mathematics Conference on the Life Sciences, Portland, OR, 2004.

24. "Fibrillation without alternans in porcine ventricles: Reassessing the importance of APD restitution during fibrillation," Upstate New York Cardiac Electrophysiology Society Annual Meeting, Utica, NY, 2004.

25. "Fibrillation without alternans in porcine ventricles," Heart Rhythm Society Scientific Sessions, New Orleans, LA, 2005.

26. Fibrillation without alternans in porcine ventricles: Theory and Numerical Simulations," SIAM Conference on Applications of Dynamical Systems, Snowbird, UT, 2005.

27. "Fibrillation without alternans in porcine ventricles: Theory, Experiments and Numerical Simulations," SIAM Annual Meeting, New Orleans, LA, 2005.

28. "Data Visualization in Physics II: VRML and Java for three-dimensional imaging and fully three-dimensional movies", APS annual Meeting, Baltimore MD, 2006.

29. "Web-based programs for learning cardiac electrophysiology: Interactive simulations of heart cells and tissue," Heart Rhythm Society Scientific Sessions, Boston, MA, 2006 (poster).

30. "Reentrant arrhythmias in human ventricular models," Heart Rhythm Society Scientific Sessions, Boston, MA, 2006 (poster).

31. "Spatiotemporal Control of Wave Instabilities in Cardiac Tissue" PhysCon 2007 (3rd International IEEE Scientific Conference on Physics and Control), Potsdam, Germany, 2007.

32. "Anatomically correct heart reconstructions by using MRI/DTMRI imaging and ionic models of human action potentials" APCTP (Asia Pacific Center for the Theoretical Physics) Focus Program on Dynamic Aspects of Biological Networks. APCTP Headquarters, Pohang, South Korea. 2007.

33. "Termination of Atrial Fibrillation Using Low-energy Far-field Stimulation; A Computational and Optical Mapping Study" American Heart Association Scientific Session, New Orleans, USA 2008.

34. "Bifurcaciones de periodo doble en tejido cardíaco y control de alternacion". XIX Semana Regional de Investigacion y docencia en Matematicas. Hermosillo, Sonora, Marzo 5, 2009

35. "Low-energy Far-field Defibrillation" SIAM Conference on Applications of Dynamical Systems. Snowbird, Utah, May 18, 2009

36. "Cardiac Tissue Multistability" Isaac Newton Institute for Mathematical Sciences Cambridge, UK, July 10, 2009

37. "Termination of fibrillation using pulsed low-energy far-field stimulation: A computational and optical mapping study" Dynamics days, Goettingen, Germany August 3 2009

38. "Cardiac Alternans 3: Alternative Mechanisms" Dynamics in Systems Biology Abardeen, Scotland; September 16, 2009

39. "Spiral Waves in the Heart Space-time organization of electrical waves in the heart and relation to cardiac arrhythmias", Coherence in Health II; Heart-Brain-Heart Connection, Utrecht, Netherlands; October 9, 2009.

40. "Action Potential Restitution Curve Splitting: An Alternative Mechanism for Cardiac Alternans", Seventh Annual Cardiovascular diversity research supplement awardees session, AHA, Orlando, Florida, November 14, 2009.

41. "Multistability in cardiac tissue" SIAM: Emerging Topics in Dynamical Systems and Partial Differential Equations, Barcelona, Spain May 31, 2010.

42. "From bifurcations and spiral waves to chaos: The many dynamics of cardiac tissue", Invited speaker to the 11th Experimental Chaos and Complexity Conference, Lille, France, June 1-4, 2010.

43. "Far field low energy defibrillation" NSF Expeditions in Computing CMACS PI review meeting. U of Maryland, April 28-29 2011

44. "Report from the Workshop on Computational Modeling of Complex Systems" NSF Expeditions in Computing CMACS PI review meeting. U of Maryland, April 28-29 2011

45. "Low Voltage Atrial Defibrillation in Vitro" Heart Rhythm Society. San Francisco, May 6, 2011.

46. "Overview of Multi-Scale Modeling of Cardiac Contraction", SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah. May 25, 2011.

47. "Arrhythmia modeling in the mouse, rabbit and human heart" EUtrigTreat General Assembly; Utrecht. June 23-24; 2011

48. "Synchronization and termination of cardiac arrhythmias using low energy far field stimulation" Physcon 2011; Leon, Spain. September 5; 2011.

49. "In real time simulations of 2d and 3D cardiac dynamics using GPUs" Dynamics Days Europe 2011; Oldenburg, Germany. September 14; 2011.

50. "Atrial arrhythmia workshop: education and outreach report" NSF expeditions in Computing CMACS PI review meeting. Carnegie Mellon U. Nov 3, Pittsburgh 2011.

51. "Synchronization and termination of cardiac arrhythmias using low energy far field stimulation" Dynamics Days 2012. Baltimore January 4; 2012.

52. "Synchronization as a mechanism of chaos control; Applications to cardiac arrhythmias." German Physics Society meeting, Berlin March 28, 2012.

53. "Simulations of Complex Systems using WebGL and HTML5: Exploiting Your Computer's GPUs for Real Time and Platform-Independent Interactive Calculations", Spring 2012 CMACS Virtual PI Meeting April 20 and 27, 2012.

54. "Arrhythmia modeling in the mouse and human heart", 4th Annual meeting and general assembly of the EUTrigTreat large-scale consortium. Beatenberg/Bern, Switzerland, June 22, 2012.

55. *"Integrating partial differential equations in 2 and 3D using GPUs and a web browser: Applications to heart dynamics" 2nd Conference of Computational Interdisciplinary Science (CCIS 2012) Guanajuato Mexico, August 1, 2012.

56. *"Interactive simulations of complex systems and spiral waves dynamics: Exploring graphics processing units on a laptop or PC for real-time computations over the internet" American Mathematical Society Meeting, Rochester Institute of Technology. NY, Sept. 22, 2012

57. * "Dynamically generated complex spatiotemporal patterns in cardiac tissue" Annual Meeting of the German Biophysical Society. Gottingen, Germany Sept. 23-26, 2012.

58. * "Low Energy Defibrillation. Theory and experiments in vitro and in vivo" Annual Cardiac Electrophysiology Society. Los Angeles November 3, 2012.

59. * "Low Energy Control of the Fibrillating heart" Annual Meeting of the American Heart Association. Los Angeles November 4, 2012.

60. * "In vitro and in vivo atrial and ventricular defibrillation using low energy pulses" Biomechanics Meeting, Department of Mathematics, Emory University. January 30 2013.

61. * "Low energy Control of Electrical Turbulence", Heart Rhythm, Denver Co, May 11, 2013.

62. * "Dynamically Generated Complex Spatiotemporal Patterns in Cardiac Tissue", SIAM conference on Applications of Dynamical Systems" Snowbird, Utah, May 19, 2013.

63. * "Propagation of Electrical Activity in Cardiac Tissues; Experiment and Theoretical Validations for the Study of Spiral Waves in the Heart" XXXIII Dynamic Days, Madrid Spain, 2013.

64. ***** "Propagation Computational modeling of Na$^+$ and Ca^{++} dependent arrhythmia mechanisms in tissue and heart", EUTrig Treat General Assembly, Padua, Italy, 5-7 June 2013.

65. ***** "2013 NSF-CMACS Workshop on Atrial Fibrillation Report" CMACS PI Meeting .Pittsburgh PA, Nov 20-22, 2013.

66. ***** "Modeling of Arrhythmia Mechanisms in the Heart" EUTrig annual meeting. Berlin Germany, June 12, 2014.

67. ***** "Mapping the Complex Spatiotemporal Dynamics of Electrical Activations in the Heart" Physics of Living Systems International Meeting. Munich, Germany July 22 2014.

68. ***** "Experimentally-based Modified Cable Equation that Reproduces Alternans Measured in Cardiac Tissue" SIAM Life Sciences meeting. Charlotte, NC, August 4-7 2014.

69. ***** "The role of male allies" CUWIP Conference for Undergraduate Women in Physics. Durham NC, January 17, 2015.

70. ***** "Mathematical modeling of the complex spatiotemporal dynamics leading to cardiac arrhythmias and their validation to experimental data" SMB (Society of Mathematical Biology), Georgia State, Atlanta GA, 6/29/2015.

71. ***** "A Cellular Mechanism for QRS Alternans in the ECG", SMB (Society of Mathematical Biology), Georgia State, Atlanta GA, 7/01/2015.

72. ***** "Using optical mapping methods to study Voltage and Calcium waves in the heart and to help develop correct models of cardiac cells" CyberCardia meeting. National Science Foundation (NSF), Arlington, Virginia. 9/12/2015.

73. ***** "Mathematicas del Corazon" Sociedad Matematica Mexicana, Universidad de Sonora, Mexico Hermosillo, Sonora 10/19/2015.

74. ***** "CPS Frontiers: Compositional, Approximate, and Quantitative Reasoning for Medical CPSs: Education and Outreach". Sixth Annual CPS PI Meeting NSF Arlington VA, 11/17/2015

75. ***** "Real Time Modeling of Cardiac Tissue" CyberCardia PIs meeting. Stony Brook, NY, 04/23//2016.

76. ***** "Complex Spatiotemporal Voltage and Calcium Patterns that lead to Cardiac Arrhythmias" Experimental Chaos and Complexity Conference. Calgary CA 05/15/2016.

77. ***** "Low Energy Defibrillation" BAMM (Biology and Medicine through Mathematics) Virginia Commonwealth University. 05/21/2016.

78. ***** "A new mechanism for QRS alternans in the ECG" Working group: Prediction and control of cardiac alternas. NIMBioS: National Institute for Mathematical and Biological Synthesis. May 2 2016.

79. ***** "Real Time Modeling of Cardiac Tissue" NSF-Cybercardia meeting. Stony Brook. September 11 2016.

80. ***** "High-performance interactive computing in a web-browser; examples with heart dynamics, CCIS meeting. Sao Pablo, Brazil Nov 8, 2016.

81. ***** "Mechanism for conduction block and initiation of turbulence" NIMBioS: National Institute for Mathematical and Biological Synthesis. December 15, 2016.

82. ***** "Period doubling bifurcations in cardiac tissue; Experiments, theory and simulations". Dynamics Days annual meeting. University of Maryland, Washington DC January 5, 2017

83. ***** "How defibrillation works" 1st Undergraduate Workshop on Dynamics of Excitable Systems. RIT, Rochester NY January 11, 2017.

84. ***** "Using Physics, Math and Computers to Study the Heart", Georgia Science Teachers Association Annual Meeting. February, 3, 2017.

85. ***** "Using You-Tube Clips to Further Explain Physics Concepts in Real-World Situations" American Association of Physics Teachers, winter meeting. Atlanta GA, February 20, 2017.

86. ***** "Combined 4-variable model for cardiac dynamics using WebGL" Computational and Mathematical Biomedical Engineering meeting, Pittsburgh PA, April 12, 2017

87. ***** "Period Doubling Bifurcations in Cardiac Tissue; Experiments, Theory and Simulations" NSF-Cyberdaria Meeting. Penn State, Philadelphia. April 14, 2017.

88. ***** "A New Mechanism for Period Doubling Bifurcations in Cardiac Tissue; Experiments, Theory and Simulations" BAMM, Biology and Medicine through Mathematics Meeting. VCU, Richmond May 19, 2017.

89. ***** "Complex Dynamics of the Saline Oscillator" SIAM Dynamical Systems Meeting, Snow Bird, Utah May 24, 2017.

90. ***** "Using WebGL for simulations in the classroom" American Association of Physics Teachers. Cincinnati OH, July 22-26, 2017

91. *****"Amplitude Discordant Alternans as a mechanism for arrhythmia initiation" American Physical Society, Annual March Meeting. LA, CA, March 5-9, 2017

D5. Public Talks

1. ***** "The Physics of Frankenstein" Inquiring Minds @ Tech Public Lecture Series, Georgia Tech, Atlanta, Oct. 29 2014.

2. * "The Physics of Frankenstein" Schloss Dagstuhl, Germany November 26, 2014.

3. ***** "La Sciencia e Historia de la leyenda de Frankenstein". Public lecture at Meadowcreek High School, Gwinnett, GA, October 24, 2015.

4. * "Physics of roller coasters" talk and hands on exercises at Radloff Middle School, Duluth, GA November 3, 2015

5. * "Physics of roller coasters" talk and hands on exercises at Lilburn Middle School, Lilburn, GA November 4, 2015

6. * "Physics and Chaos in Our Everyday Life" University of North Carolina Wilmington. March 30, 2017.

7. ***** "De Newton al Caos; Aplicaciones de la Fisica no-Lineal a la Biologia y la Medicina" UNAM, Facultad de Ciencias, Mexico City. April, 7 2017.

E. Grants and Contracts (total amount brought to GT since joining $2,058,596.00)
(total amount from internal GT awards $219,000.00)

E1. AS Principal investigator
Currently funded (***** indicates grants obtained while at GT)

*NSF #1762553 FH Fenotn (PI) $333,327   08/01/2018- 07/30/21
NSF DCSD Developing a quantitative three-dimensional understanding of Cardiac Arrhythmias.

*NSF #1446675 FH Fenotn (PI) $658,781   05/01/2015- 04/30/20
NSF Cyber Physical Systems. Frontier Grant. Cyber-Heart

* NSF #1413037 FH Fenton (PI) $150,000.   08/06/14 – 07/05/18
NSF(Mathematical Biology):"Novel Data Assimilation Techniques in Mathematical Cardiology-
Development, Analysis and Validation".
Role PI

* NSF #1341190 FH Fenton (PI) $170,000   10/01/12—08/31/17
NSF (Collaborative Research: Dynamical Systems Program): "Intramural Forecasting of Cardiac
Electrical Dynamics"
Role PI

* GT# 1341190 FH Fenton (PI) $180,000   08/01/16—07/30/17
GT (Tech-Fee) Grant to update Physics Demo Room.
Role PI

* AHA#15POST25700285 FH Fenton and I. Uzelac $93,704.   10/15/2015-6/30/2017
AHA Postdoctorate Grant (A new Low-Energy real-time feedback defibrillator method)

MRI time FH Fenton (PI)   01/04/07 –
Pittsburgh NMR Center for Biomedical Research. *"Cardiac anatomy reconstruction from MRI images"*
Role: PI

Completed Grant Awards

* NSF#1347015 FH Fenton (PI) $90,594   10/01/13-- 09/30/16
NSF (FDA scholars in residence program): "Development, verification, and validation of computer
models of cardiac fibrillation". (Co-PI my postdoc Ilija Uzelac).
Role PI

* NSF#1347015 FH Fenton (PI)$ 5,000   REU supplement   06/01/14-- 09/30/14
NSF (REU to CDI grant): "Development, verification, and validation of computer models of cardiac
fibrillation".
Role PI, GT student Casey Trimble

* NIH#R01HL089271-01A2 N. Otani (PI) (Fenton, sub award to GT $118,727.00) 07/15/09--03/05/14
Dynamical Heterogeneity of Refractoriness and the Induction of Reentry Role: Co-Investigator

#NSF1028261 FH Fenton (PI) $690,107   (*193,662 transfer to GT)   09/01/10—08/31/15
NSF (Collaborative Research: CDI type II program): "Dynamics and control of Cardiac Tissue"
Role PI

* Atlanta Science Festival, GT internal grant   Role: PI $1,000.00   0 6/ 01/13
Project for both: How your heart works (or fails to work)

* Siemens Foundation $1,000.00   01/01/13

* CETL Faculty Teaching Excellence Award (GTF #410-00-0113). $3,000.00   04/11/14

* Hesburgh Fellow (GTF #410-00-0113) . $1,000.00   01/06/14

* Video card (Tesla K40) donation from NVIDEA (Aprox price $5,300.00)   03/01/14

NSF#0800793. FH Fenton (PI). $360,000   09/01/08 – 08/31/12
NSF (Dynamical Systems Program): "Nonlinear Dynamics and Bifurcations in Cardiac Tissue"
Additional supplements (Travel $3,000 and REU student $6,000)
Role: PI

NIH #HL075515-*03S, -04S, -05S and 06S.* FH Fenton (PI) *$449,608*   03/01/06 –11/30/09
NIH-NHLBI: (Supplement for diversity in health related research to R01). *"Computer Model of the Canine Ventricle".*
Role PI.

Cornell Faculty Innovation in Teaching Awards. FH Fenton (PI) $20,000   06/01/06 – 05/30/07
Cornell University. "Interactive Models for Cardiovascular Medicine".
Role PI with MS Kraus and EM Cherry.

E2. As Co-PI
<u>Currently funded</u>
* #MCB010053P. FH Fenton and EM Cherry (PIs) *55,000* CPU hours/year   01/01/02 –continued
NRSA: *"The Role of Anatomical Structure in Ventricular and Atrial Arrhythmias"*.   Successfully renewed every year since 2002.
Role: PI (from 2002-2005), Co-PI (from 2005 –) *=* renewed twice since joining GT

<u>Previously funded</u>
NSF #0926190 E.M. Clarke (PI). *$10,000,000*   09/01/09 – 08/31/15
NSF (Expeditions in Computing): *"Model Checking and Abstract Interpretation"*
Role: PI *for the Cornell-GT section and Coordinator of the Atrial arrhythmia part of the grant. $437,872.00*

EU7#241526 L. Stephan(PI). *€10,000,000 (Euros)*   10/01/09 – 09/31/15
Seventh Framework Programme EUTrigTreat: *"Identification and therapeutic targeting of common arrhythmia trigger mechanisms". Grant contains 17 projects.*
Role: Co-PI of project 11 *" Macroscopic modeling of ventricular arrhythmias initiation and termination in the heart" €217,000.00 Euros.*

* #232277 CONACYT (Mexico) Postdoctoral Grant for Elisa Nunez Acosta to work at ICAHN school of medicine at Mount Sinai and GT (PI E. Sobie, Co-PI Fenton FH)   06/1/2014-05/31/2015
$25,000.00

NSF #MRI-0320865 HM Hastings (PI). *$252,368*   08/01/03 – 07/31/06
NSF, Acquisition of a Beowulf supercomputer for physical science research.
Role: Co- PI with T Brack, and S Sobel.

NIH #HL072816-01 HM Hastings (PI). *$152,835*   05/01/03 – 04/30/05
NIH-R15 "Atrial Fibrillation: Anatomy versus Cell Physiology". Role: Co-PI with EM Cherry.

Undergraduate monetary awards:
* 9 PURA (Presidential Undergraduate Research Awards) 2014-2017 students:
 Casey Trimble, Amier Naji, Mary Elizabeth Lee, Krishma Signal, Ramprasath Rajogapal, Madeline Lazar, James T. Farmer, Neild Hardy, and Anthony Aportela.
Total: $13,500.

* PURA-travel awards 2015-2017 students:
 Mary Elizabeth Lee, Krishma Signal, James T. Farmer, Neild Hardy.
Total: $2,000.

* 3 GT-URSA (College of Science awards) 2015-2016 students: Krishma Singal, James T Farmer and Zoha Naqawe.
Total: $4,500.

* 2 Petit Scholars (GT Biomedical Engineering) 2016-2017 students: Neil Hardy and Daniel Gurevich.
Total: $19,000.

E3. As Senior Personnel or Contributor N/A

E4. Proposals under review

*# R01 NIH. Integrative Experimental and Multiscale High Resolution Modeling of Atrial Arrhythmias to Optimize Low Energy Anti-fibrillation Pacing (LEAP). PI Fenton requested amount $1,901,636.00
PI Fenton requested amount $1,901,636.00

*#R01 NIH. Complex Systems Approach to Atrial Fibrillation
PI Hiroshi Ashikaga, (Fenton, subaward requested for $804,369.00)

*# NSF 1762553. Collaborative Research: Developing a quantitative three-dimensional understanding of cardiac arrhythmias. PI Fenton requested amount $333,327.00

* # GT Petit Institute Research Seed Grant.. "Cardiomyocytes Pacemakers Bioengineering: From Monlayers to Full Hearts" PIs Fenton and Cho. $100,000.00

E5. Proposals submitted but not funded (last 2 years)

* # **HL136538-01 R01 NIH.** Integrative Experimental and Multiscale High Resolution Modeling of Cardiac Arrhythmias to Optimize Low Energy Anti-fibrillation Pacing (LEAP). PI Fenton requested amount $1,901,636.00

* #**1735116 NSF** Title: NRT: Computational- and Data-Enabled BioSciences (CoDE BioS) Across Cells, Organisms, and Ecosystems
Co-PI $3,000,000.00

* #**1633273 NSF**   NRT: Computational- and Data-Enabled BioSciences (CoDE BioS) Across Cells, Organisms, and Ecosystems $3,000,000.00. Flavio Fenton as Co-PI 2016.

*# **1642825 NSF** Collaborative Research: Expeditions in Computing for Personalized Healthcare: High-performance Biomedical Image Computing and Real-Time Physiological Modeling $1,851,329 Flavio Fenton as PI 2016

*# **1734022 NSF**. Physics Frontier Center. Center for Living Dynamical Systems. Flavio Fenton as participant. $25,000,000. 2017.

E6. Subcontracts
Previously funded
#R01HL089271-01A2 N. Otani (PI) $1,951,263   (*139,000 transfer to GT)   07/15/09 – 04/30/14
Dynamical Heterogeneity of Refractoriness and the Induction of Reentry
Role: Co-Investigator, subcontract to GT for $118,727.00

F Other Scholarly Accomplishments

- *US Patent 20150045846 (2016)
  Apparatus for terminating a high frequency arrhythmic electric state of a heart
  S Luther, E Bodenschatz, V Krinski, R Gilmour, **FH Fenton**.

- US Patent 20140107721 (2014)
  Apparatus for and method of terminating a high frequency arrhythmic electric state of a biological tissue. S Luther, E Bodenschatz, V Krinski, R Gilmour, **FH Fenton.**

G. Social and Policy Impacts

* Invited to participate in the 2104 National Workshop on Research Frontiers in Medical Cyber-Physical Systems organized by NSF, to develop future polices. Feb 6-7 2014. Washington DC.

H. Other Professional Activities N/A

V. Teaching

A. Courses Taught
- High school Physics, three courses, La Salle del Pedregal,   (3 sections , Mexico City. 1988-1989 school year.   50 students each)
- * Introductory Physics Phys-2211, Georgia Tech. Fall 2012.   (206 students)
- * Introductory Physics Phys-2211, Georgia Tech. Spring 2013.   (194 students)
- * Introductory Physics Phys-2211, Georgia Tech. Fall 2013.   (175 students)
- * Computational Physics. Phys-3266, Georgia Tech. Spring 2015.   (22 students)
- * Introductory Physics Phys-2211, Georgia Tech. Fall 2015.   (167 students)
- * Lab-based NeuroPhysics, Phys 3803/8803, Georgia Tech,. Fall 2016. (3 grads, 6 undergr.)
- * Lab-based NeuroPhysics, now called Phys 3804/8804, Georgia Tech,. Fall 2017. (4 grads, 6 undergr.)
- * Computational Physics. Phys-3266, Georgia Tech. Spring 2018.   (7 students)
- * Introductory Physics Phys-2211, Georgia Tech. Spring 2018.   (205 students)

A1. Courses developed

   * Lab-based NeuroPhysics Phys 3803/8803 Georgia Tech, in Sumer of 2016. An undergrad and Graduate mixed course.

B. Individual Student Guidance (* denotes students mentored at GT or co-mentored)

B1. Ph.D Students Directed (10)

Directed Thesis

- Alfonso Bueno-Orovio "Mathematical modeling and spectral simulation of genetic diseases in the human heart" 2003 - 2007.
    - Won best SIAM Student paper award 2007.
    - Current position: Senior Research Scientist, Oxford University since 2010.
- Fred Von Stein. "A Heterogeneous Approach to Understanding Ventricular Fribrillation 2004-2012.
    - Current position: PostDoc at the Cornell Imaging Facility.
- Rupinder Singh "Mechanical signature of cardiac electrical dynamics" 2008-2013
    - Current position: works at Applied research works.
- Alessio Gizzi, ," Spatio-temporal dynamics of cardiac physiopathology: experiments, theory and simulations"2010-2012
    - Current position: Assistant Prof. University Campus Bio-Medico of Rome.
- * Elisa Nunez "Generación de Arritmias Ventriculares en el Síndrome de Andersen-Tawil." 2009 to 2014
    - Current position: ICAHN School of medicine at Mount Sinai, NY.
- * Yan Yan Ji, Project: Calcium and contraction dynamics of cardiac tissue 2013-
- * Dian Dian Chen, Project: Saline oscillator and cell dynamics , 2013-
- * Andrea Welsh, Project: Synchronization of oscillatory systems. 2013-
- * Conner Herndon, Georgia Tech, Physics, Bifurcations in cardiac tissue. 2015-
- * Hector Augusto Velasco Perez, Georgia Tech, QBioS, GPU modeling, 2016-

Co-Directed Thesis

- Alex Chen, U Alabama, Porject: Splitting CV restitution, 2002-2004.
- Alejandro Garzon Georgia Tech, Project: alternans control 2007-2010.
- Amgad Squire Cornell University, Project: Defibrillation mechanisms, 2008-2011
- Philip Bittin Max Planck., Project: Lyapunov Vectors, 2010-2012
- Daniel Hornung, Max Planc, Project: fiber reconstruction from DTMRI 2011
- *Abishek Murthy, Stony Brook, Project: Curvature of reentrant waves 2011-2014
- *Ariful Islam, Stony Brook. Project: Model reduction 2011-2014
- * Jairo Rodriguez, Universidad de Hermosillo, Sonora Mexico. Project: Scroll wave dynamics in cardiac tissue, 2014-2018.
- * Eduardo Charles, Universidade Federal Fluminense, Sao Domingos, RJ. Brazil Project: Large scale modeling of complex ionic models in 3D heart structures. 2016-2018.

Performed Research Rotation

- Siddhartha Sinha. Project: MRI image segmentation. 2010
- Chagit Sima Braiman, Project: Conduction velocity in cardiac tissue, 2011
- Danielle Toupo, Project: Modeling complex systems, 2011
- Nicholas Braiman, Project: Conduction velocity in cardiac tissue, 2011
- * Xiong Ding, Project: "Gap junction conduction effects" 2013

- ***** Anthony Hazel. Project "dynamic patterns of excitable media" 2013

B2. M.S. Students
- Marco Piangerelli, Thesis:, hypocalcemia, 2012-2013.
- ***** Rajath Prasad,Computer Science, Project: WebGL modeling, 2013.
- ***** Archana venkatesh, Computer Science, Project: WebGL modeling, 2014.

B3. Undergraduate Students
- Catalina Peralta; Chemistry, Hofstra, BZ reaction and ionic cell modeling. 2004
    - *Won second place, Undergraduate research competition, NY sectional of APS meeting.*
- Alex Zaharakis; Physics, Hofstra, fluctuations in the BZ reaction, 2004 *(Tied second place also at the Undergraduate research competition, NY sectional of APS meeting, 2004).*
- Claudia Frank ; Physics, Hofstra, fluctuations in the BZ reaction 2004.
- Jordan Pekor; Physics, Hofstra, fluctuations in the BZ reaction 2004.
- Stephen Chaterpaul; Chemistry Hofstra, fluctuations in the BZ reaction 2004.
- Alisa Mo, Cornell Univerity Analysis of optical mapping data 2007.
- Andrew Filipski, Softwre engineer, Rochester Institute of Technology, Java codes, 2011.
- Avessie Amedome, Alan Joseph J Caceres, Juan Castillo, Evan Closser, Gabriel Deards, Andriy Goltsev, Roumwelle Sta Ines, Cem Isbilir, Joan K Marc, Diquan Moore, Dana Pardi, Sandeep Sadhu, Samuel Sanchez, Pooja Sharma, Anoopa Singh, Joshua Rogers, Aron Wolinetz, Kai Zhao, (all mentored at a 3 week workshop with a paper published at the end with all students as co-authors).
- ***** Ashley Lockwood, Biology, Georgia Tech, MRI analysis, 2013
- ***** Diane Lai, Biology, Georgia Tech, MRI analysis, 2013
- ***** Amier Naji, Computer Science, Georgia Tech, WebGL, 2013-2016
    - *PURA* award for Fall 2014*.
- ***** Casey Trimble, Physics, Georgia Tech, Touring patterns, 2013- 2015
    - *PURA* award for Spring 2014
    - *REU* award for Summer 2014
- ***** Mary Elizabeth Lee, Physics, Georgia Tech, oscillations of physical systems. 2014-
    - *PURA* award for Spring 2015
- ***** Ramprasath Rajagopa, EE/Physics, Georgia Tech, Optical mapping methods 2014-2016
    - *PURA* award for Spring 2015
- *****Krishma Singal, Physics, Georgia Institute of Technology, Swarm dynamics, 2015-2017
    - *PURA* award for Spring 2015
    - *GT-URSA* award for Summer 2015
- *****James Timothy Farmer, Physics, Georgia Institute of Technology, Zebra fish, 2015-
    - *PURA* award for Spring2016
    - *GT-URSA* award for Summer 2016
- *****Madeline Lazar, Physics, Georgia Institute of Technology, Newton Beads, 2015-
    - *PURA* award for Spring 2016
- *****Gwen Kvasnicka, Physics, Georgia Institute of Technology, Saline Oscillator, 2015
- *****Neil Hardy, Physics, Georgia Institute of Technology, electronics, 2015-2017
    - *Petit scholar* 2015-2016
    - *PURA* award for Spring 2016
- *****Sujeeth Jinesh, Physics, Georgia Institute of Technology, ECG, 2015-
- *****Tyler Tippens, Physics, Georgia Institute of Technology, Micro-controllers, 2015.
- *****Pol Canal Noguer, Physics, Universitat Politècnica de Catalunya, calcium dynamics 2016.

- *****Daniel Gurevich, Physics, Georgia Institute of Technology, dynamics of fibrillation 2016-
  - *Petit scholar* 2016-2017
  - *PURA Award 2018*
- *****Anthony Aportela, Physics, Georgia Institute of Technology, Slime Mold dynamics 2016-
  - *PURA* award for Spring 2017
  - *Petit Scholar 2017-2018.*
- *****Samuel Wiley, Physics, Georgia Institute of Technology, Control of alternans 2016-
- *****Zoha Nagawe, Physics, Georgia Institute of Technology, Brine Shrimp patterns 2016-
  - *GT-URSA* award for Summer 2017.
  - *GT-URSA award for Fall 2017.*
- *****Hunter Hakimian, Physics, Georgia Institute of Technology, Voltage-Calcium Correlation in cardiac tissue. 2016-
- *****Yanxuan Shao, School of Physics, Nankai University, Tianjin, China Summer 2017
- *****Hannah Philips, Physics, Georgia Institute of Technology, forest fire dynamics. 2017-

B4. Service on Thesis Committees
1. Kim, Youngeun, PhD, Stony Brook University. Thesis:" A simulation of the breakup of spiral waves using bidomain equations in electrical cardiology" 2005.
2. Alfonso Bueno-Orovio Engineering PhD. Universidad de Castilla-La Mancha, Spain. 2007.
3. Rebecca M. Smith, Biomedical Engineering PhD. Syracuse University, NY 2009.
4. Hans Dierckx, Physics PhD. Ghent University. Belgium 2010.
5. Philip Bittihn, Physics Ph.D. Goettingen University, Germany 2013.
6. *Cesar Flores, Physics Ph.D. Georgia Tech., Atlanta GA. 2014.
7. *Abhishek Murty, Computer Science Ph.D. Stony Brook University, Long Island NY 2014.
8. *Caitlin V. Baker, Physics Ph.D. Georgia Tech. Atlanta GA, 2015.
9. *Tingnan Zhang, Physics Ph.D. Georgia Tech, Atlanta GA, March 2016.
10. *Taylor Bradford, Physics Ph.D. Georgia Tech, Atlanta GA, August 2016.
11. *Christopher Marcotte, Physics Ph.D. Georgia Tech. Atlanta GA, November 2016.
12. *Xiong Ding, Physics, Ph.D. Georgia Tech. Atlanta Ga, March 2017.
13. *Emily Alicea-Munoz, Physics Ph.D. (to defend in 2018)
14. *Patricia Yang, Mechanical Engineering, Ph.D. 2018
15. *Yu-Hui Lin, Physics Ph.D. (to defend in 2018)
16. *Scott Douglas, Physics Ph.D. 2018.
17. *Travis Tune, Physics Ph.D. (to defend in 2020)
18. *Sandra Grijalva, Biomedical Engineering Ph.D. (to defend in 2020)

B5. Mentorship of Postdoctoral Fellows
- Wonho Oh, Bidomain simulations 2004-2005.
  - Current position: Industry
- Young-Seon Lee, Calcium dynamics 2007-2009
  - Current Position: research assistant professor in this school, Yonsei university
- Ezio Bartocci, Large scale simulations of cardiac dynamics, 2010- 2012
  - Current Position: Vienna university of Technology: Assistant Professor
- * Ilija Uzelac, Experimental optical mapping and defibrillation. 2012-
- * Greg Byrne, High performance computing in complex systems. 2014
  - Current Position: Researcher at FDA.
- * Abouzar Kaboudian, High performance computing, webGL 2016-

B6. Visiting Scholars
- Dr. Inma Cantalapiedra. Universitat Politecnica de Catalunya (3 months) 2009.
- Dr. Jean Bragard. University of Navarra (2 months) 2010.
- Dr. Daniel Olmos. Universidad de Sonora (1 week) 2011.
- * Dr. Daniel Olmos. Universidad de Sonora (1 week) 2012.
- * Dr. Jean Bragard. University of Navarra (1 weeks) 2013.
- * Dr. Humberto Arce. Universidad Autonoma de Mexico (1 week) 2013.
- * Dr. Hortensia Gonzales. Universidad Autonoma de Mexico (1 week) 2013.
- * Dr. Elizabeth Cherry, Rochester Institute of Technology (1 month) 2013.
- * Dr. Jean Bragard. University of Navarra (2 weeks) 2014.
- * Dr. Stefan Luther, Max Plank Institute (one week) 2014.
- * Dr. Niels Otani. Rochester Institute of Technology (1 week) 2014.
- * Dr. Alfonso Bueno, Oxford University (1 week) 2016.
- * Dr. Alessio Gizzi. University Campus Bio-Medico of Rome (2 weeks) 2017.

B7. High School Students
- *Emmanuel Chibuzor Aneke, Saline oscillator, 2015.
- *Teddy Chen, WebGL 3D numerical simulations, 2016.
- *Yamil Guzman, 10th grade GIFT Summer Program 2016.
- *Alexander Salazar, 10th grade GIFT Summer Program 2016
- *Mariana Vasquez, 11th grade GIFT Summer Program 2016.
- *Sophia Kurt, Saline oscillator, 2016.
- *Yamil Guzman (second time), 11th grade GIFT Summer Program 2017.
- *Jose Gonzalez, 11th grade GIFT Summer Program 2017.
- *Santiago Higuera-Gonzalez, 11th grade GIFT Summer Program 2017.

C. Other Teaching Activities
Workshops designed and taught
- Minicurso en medios excitables y sistemas complejos. Facultad de Sciencias, UNAM. Mexico Octubre 18-20,2010.
- CMACS Atrial arrhythmia workshop for underrepresented minorities. Lehman College, Bronx NY. January 3-21. 2011.
- * CMACS Atrial arrhythmia workshop for underrepresented minorities. Lehman College, Bronx NY. January 7-25. 2013.
- * Workshop on pattern formations. XV Escuela de Otoño de Biología Matemática y IX Encuentro Nacional de Biología Matemática, Universidad de Sonora, 11-15 November 2013.
- * Workshop "Matematicas del Corazon" Mexican National Mathematics Annual Meeting, Unversidad de Sonora, Octubre 19,2015.
- * Workshop "Nonlinear dynamics: Cardiac Modeling using GPUs" Universita Campus BioMedico Di Roma, Roma Italy, December 7-14 2015.
- * Undergraduate Workshop on Dynamics of Excitable Systems, RIT, Rochester January 8-16 2017.

Presentations by my GT Postdoc (PD) Graduate (G) and undergraduate (UG) students
(Partial list from 2012-214)

27 total presentations, (14 talks indicated with ^) and (8 international indicated with *).

- ^(PD) Ilija Uzelac, "Low energy feedback control to terminate arrhythmias" SIAM conference on Applications of Dynamical Systems" Snowbird, Utah, May 19, 2013.
- ^(PD) Ilija Uzelac "CARDIAC NON-LINEAR DYNAMICS AND STABILIZATION OF CARDIAC ARRHYTMIAS WITH SINUS RESTORATION USING LOW-ENERGY FEEDBACK CONTROL". PoLS meeting. GT, September 12, 2013
- ^*(PD) Ilija Uzelac ""High-Power Current Source with Real-Time Arbitrary Waveforms for In Vivo and In Vitro Studies of Defibrillation". Computers in Cardiology, Zaragoza Spain, Sept 22-25, 2013.
- *(G) Elisa Nunez, "A model for Andersen tawil" Okinawa Integrative Biology Course" Okinawa, Japan. May 13-14, 2013
- (G) Andrea Welsh, Diandian Chen and Yanyan Ji, "Three excitable systems for the study of cardiac dynamics" The Physics of Living Systems SRN III at Princeton University, Princeton, NJ, August 4-8, 2013.
- (G) Andrea Welsh " synchronization of mexican jumping beans" Dynamics Days, Atlanta, GA, Jan 4, 2014
- (G) Diandian Chen, "Dynamics of the saline oscillator",Dynamics Days, Atlanta, GA, Jan 4, 2014
- (G) Yanyan Ji "Dynamics of the Purkijne fiber conductivity with gap junctions", Dynamics Days, Atlanta, GA, Jan 4, 2014
- (G) Andrea Welsh, "Coupling induced synchronization of mexican jumping beans", Georgia Scientific Computing annual meeting, Kennesaw, GA, Feb 22, 2014.
- ^(G) Andrea Welsh ""Coupling induced synchronization of mexican jumping beans", PoLS meeting, GT, April 4, 2014
- (G) Yanyan Ji "Experimentally-based modified cable equation that reproduces alternans measured in cardiac tissue" Heart Rhythm meeting. San Francisco. May 9 2014.
- (G) Andrea Welsh, "Coupling induced synchronization of mexican jumping beans ",GTRIC, Georgia Tech, March 13, 2014
- ^*(G) Andrea Welsh, "Studies of Synchronization and Wave Solutions of the KM Model Using MJB", Advances in Cardiac Dynamics Workshop, Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany. June 12, 2014.
- ^*(G) Yanyan Ji, "Experimentally - based modified cable equation that reproduces alternate measured in cardiac tissue".Advances in Cardiac Dynamics Workshop, Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany. June 12, 2014.
- ^*(G) Diandian Chen, "Complex dynamics of the saline oscillator". Advances in Cardiac Dynamics Workshop, Max Planck Institute for Dynamics and Self-Organization, Göttingen, Germany. June 12, 2014.
- ^*(G) Andrea Welsh, ""Studies of Synchronization and Wave Solutions of the KM Model Using MJB", First BCAM Workshop on Nonlinear Dynamics in Biological Systems. Bilbao, Spain June 19. 2014.
- ^(G) Diandian Chen, "Complex dynamics of the saline oscillator". First BCAM Workshop on Nonlinear Dynamics in Biological Systems. Bilbao, Spain June 19. 2014.
- ^*(G) Yanyan Ji, "Experimentally - based modified cable equation that reproduces alternate measured in cardiac tissue", First BCAM Workshop on Nonlinear Dynamics in Biological Systems. Bilbao, Spain June 19. 2014.
- ^(G) Andrea Welsh, "Phase synchronization of nearest-neighbor coupled oscillators: A bio-inspired approach from a Mexican Jumping Beans Network" SIAM Conference on the Life Sciences Charlotte, NC August 2014.
- ^(G) Jairo Rodriguez, "An introduction to differentiable manifolds at" Wet and Wild group(Non-linear dynamics) School of Physics, Georgia Tech. September 4, 2014.

- ^(G) Andrea Welsh, "Kuramoto, the Mean Field Model, and how it fails" Wet & Wild group(Non-linear dynamics) School of Physics, Georgia Tech. September 11, 2014.
- ^(G) Jairo Rodriguez, "Scroll wave dynamics" PoLS meeting. GT, October 9, 2014
- (UG) Casey Trimble, "Alternating Wave Patterns in a Reaction Diffusion Model", Dynamics Days, Atlanta, GA, Jan 4, 2014
- (UG) Casey Trimble, "Alternating Wave Patterns in a Reaction Diffusion Model", Georgia Scientific Computing annual meeting, Kennesaw, GA, Feb 22, 2014
- (UG) Amier Naji, "Using WebGL ro solve in real time complex models of electrophysiology", Georgia Scientific Computing annual meeting, Kennesaw, GA, Feb 22, 2014
- *(UG) Casey Trimble, "Alternating Wave Patterns in a Reaction Diffusion Model" Society of Physics Students Zone 6 Meeting, University of Mayaguez, PR, Mar 18, 2014
- (UG) Amier Naji, "Simulations of human ventricular model in 2D using WebgL" 9th Annual Undergraduate Research Symposium on April 23rd. 2014.

VI. Service

A. Professional Contributions
Conferences Sessions and Workshops Organized (* denotes organized while at GT)

1.   "Models of the Whole Heart," Biomedical Engineering Society Annual Meeting, Raleigh, NC, 2001.

2.   "Cardiac Electrical Dynamics in Realistic Anatomical Models," Society for Industrial and Applied Mathematics Annual Meeting, Montréal, Canada, 2003.

3.   "Electrical Dynamics of Cardiac Tissue, Parts I, II, III, and IV," Society for Industrial and Applied Mathematics Conference on the Life Sciences, Portland, OR, 2004.

4.   "Instabilities and complexities in the heart: Models, experiments, and simulations, Parts I, II, III, and IV," Society for Industrial and Applied Mathematics Conference on Applications of Dynamical Systems, Snowbird, UT, 2005.

5.   "Cardiac Dynamics: Period-doubling Bifurcations and Arrhythmias", SIAM on Applications of Dynamical Systems, Snowbird, UT, 2009.

6.   "Cardiac Dynamics, Parts I,II,III, and IV" SIAM: Emerging Topics in Dynamical Systems and Partial Differential Equations, Barcelona, Spain 2010.

7.   "NSF-CMACS Workshop on atrial fibrillation" Lehman College, January 10-28, 2011.

8.   "Dynamics of Cardiac Contraction and Mechanical Deformation" SIAM on Applications of Dynamical Systems, Snowbird, UT, May 2011

9.   *W "Second NSF-CMACS Workshop on atrial fibrillation" Lehman College, January 7-25 2013.

10. *S "Dynamically Generated Complex Spatiotemporal Patterns in Cardiac Tissue" SIAM on Applications of Dynamical Systems, Snowbird, UT, May 2013.

11. *W Workshop on pattern formations. XV Escuela de Otoño de Biología Matemática y IX Encuentro Nacional de Biología Matemática, Universidad de Sonora, 11-15 November 2013.

12. * C "Dynamics Days 2014" (co-orgnizer), Gerogia Tech, January 2-5, 2014.

13. *S "Mechanisms for defibrillation and control of cardiac tissue" SIAM Life Sciences meeting, August 4-7 in Charlotte, NC, 2014.

14. *C "Advances in Cardiac Dynamics" (co-organizer) Max Planck Institute, Gottingen, Germany. June 9, 2014.

15. *C "Conference for Undergraduate Women in Physics" South-East Region (organized with my graduate student Andrea Welsh). Atlanta Georgia, January 16-18, 2015.

16. *W Workshop "Matematicas del Corazon" Mexican National Mathematics Annual Meeting, Unversidad de Sonora, Octubre 19,2015.

17. *W Workshop "Nonlinear dynamics: Cardiac Modeling using GPUs" Universita Campus BioMedico Di Roma, Roma Italy, December 7-14 2015.

18. *S Organized two part mini-symposium "Cardiac Dynamics" SIAM Life sciences meeting, Boston July 11-15 2016.

19. *W Undergraduate Workshop on Dynamics of Excitable Systems, RIT, Rochester January 8-16 2017.

20. *C Co-organized 4th Conference of Computational Interdisciplinary Sciences. Sao Jose dos Campos Brazil. Nov 8, 2016.

21. *C "Integrative Cardiac Dynamics" 1 month long progra at KITP (Kavli Institute for Theoretical Physics). Co-organizer of the program that will bring 60 top scientist to this 4 week meeting. Santa Barbara CA, June-July 2018.

22. *C "NSF Cyber physical Systems Meeting". Organizer, GT on April 22-23, 2018.

Conference abstract reviewer

- Computational Methods in Systems Biology.
- Computers in Cardiology (two times)

Review Editorial Board for the following journals

1. Frontiers in Cardiac Electrophysiology.
2. Frontiers in Computational Physiology and Medicine.
3. (International Scholarly Research Network) ISRN Biomathematics.
4. Scholarpedia.

Reviewer for the following journals: (~15-30 per year)

1. American Journal of Physiology
2. Annals of Biomedical Engineering
3. Applied Physics Letters
4. Biomedical Engineering OnLine
5. Biophysical Journal
6. Bulletin of Mathematical Biology
7. Cardiovascular Research
8. Circulation
9. Circulation: Arrhythmia and Electrophysiology
10. Circulation Research
11. Chaos
12. Communications in Nonlinear Science and Numerical Simulation
13. Dynamics of Continuous, Discrete and Impulsive Systems
14. Encyclopedia of Biomaterials and Biomedical Engineering
15. Europace

16. Europhysics Letters
17. Experimental Physiology
18. Frontiers in Cardiac Electrophysiology.
19. Frontiers in Computational Physiology and Medicine.
20. Heart Rhythm
21. Human Frontiers Science Program (HFSP) Journal
22. IEEE Transactions on Biomedical Engineering
23. IEEE Transactions on Magnetics
24. Interface Focus
25. ISRN Biomathematics
26. Journal of Biological Physics
27. Journal of Biomechanical Engineering
28. Journal of Biomedical Optics
29. Journal of Computational Physics
30. Journal of Molecular and Cellular Cardiology
31. Journal of the Royal Society Interface
32. Journal of Statistical Physics
33. Journal of Theoretical Biology
34. Mathematical Biosciences
35. Mathematical Medicine and Biology
36. Medical and Biological Engineering and Computing
37. Nature Communications.
38. Nature Scientific Reports.
39. New Journal of Physics
40. Physica D: Nonlinear Phenomena
41. Physical Review E
42. Physical Review Letters
43. PLoS ONE
44. PLoS Computational Biology
45. Progress in Biophysics and Molecular Biology.
46. Scholarpedia
47. SIAM Journal on Applied Dynamical Systems.
48. The Journal of Physiology.
49. Theoretical Biology and Medical Modeling.

<u>Reviewer for the following granting organizations:</u>
1. Agencia Nacional de Evaluación y Prospectiva, Ministerio de Ciencia e Innovación (Spain)
2. Austrian Science Fund, FWF (Austria)
3. Engineering and Physical Sciences Research Council (U.K.)
4. Human Frontier Science Program (International)
5. Marsden Fund from the Royal Society of New Zealand (New Zealand)
6. Mathematics of Information Technology and Complex Systems (Canada)
7. Natural Sciences and Engineering Research Council of Canada (Canada)
8. National Science Foundation, NSF, (USA)
9. Netherlands Research Council (Netherlands)
10. Vienna Science and Technology Fund (Austria)

Grant Review Panels

    (1) *NSF panelist for the Dynamical Systems program (2 times).

    (2) *NSF panelist for the Cyber Physical Systems program (3 times).

    (3) *NSF panelist for Physics of Living Systems program (2 times)

    (4) *NSF panelist for the Partnership for Innovation: Building Innovation Capacity program
        –Health-Related II (1 time)

Book Reviewer
    *Physics text book review for W.W. Norton and Company (2013).
    *Review of "Patterns in Excitable Media: Genesis, Dynamics, and Control" for Physics Today.

B. Public and Community Service

Member of Flinn Scientific Research Council

Science Competition Judge

- Syosset High School Science fair, 2005.
- *Siemens Foundation Math,Science & Technology competition, Judge for Southeast finals, November 2012.
- *Georgia Tech Research & Innovation Conference, February 2013.
- *Georgia Tech Research & Innovation Conference, February 2015.

Outreach (* since arriving to GT)

7 Public lectures (see list in talks section)

- * Meadowcreek High School Go-STEM fair. Participated with hands on activities about physics to enhance kid's interest in STEM fields and University enrolling. Atlanta, October 6, 2012
- * Co-organized CMACS Atrial arrhythmia workshop for underrepresented minorities. Lehman College, Bronx NY. January 7-25. 2013.
- * Physics Field Day, GT Physics Department. Participated with a demonstration session for the students that participated, with complex systems and chemical reactions. Apr 22, 2013.
- * Lab tour and physics demonstrations for students of CEISMC summer camp "Trill-a-minute: Roller Coaster Physics", GT Atlanta, July 23, 2013.
- * Meadowcreek High School Go-STEM fair. Participated with three of my students and postdoc with hands on activities about physics to enhance kid's interest in STEM fields and University enrolling. Atlanta, October 26, 2013
- * D2D (direct to discovery) High definition in real time online class about complex systems and the heart given to students simultaneously in two classes at: Rabun County Middle School and Osborne High School. November 7 2013.
- * Give a week long Workshop on pattern formatios at.XV Escuela de Otoño de Biología Matemática y IX Encuentro Nacional de Biología Matemática, Universidad de Sonora, 11-15 November 2013.

- * 2nd Annual Latino College and STEM Fair. Participated with three of my students with both for the Physics department, with information and physics demonstrations. GT student center, Atlanta GA. March 15 2014.
- * D2D (direct to discovery) High definition in real time online class about heart function with a dissection of a sheep heart in our lab and simultaneously by the students in their class. Rabun County Middle School, March 26, 2014.
- * Atlanta Science Festival Activity, generation of a dynamical spiral wave with 550 students, staff and faculty from GT. GT green, Atlanta GA, March 27, 2014.
- * Atlanta Science Festival. Both about the physics of the heart with hands on experiments and 3D digitized hearts from accurate MRI data. With three of my grad students. Atlanta GA, March 29 2014.
- * D2D (direct to discovery) High definition in real time online class about heart function with a dissection of a sheep heart in our lab and simultaneously by the students in their class. Meadowcreek Middle School, May 1, 2014.
- *GT Demo/Lab Tours for Middle School Teacher's, through the Newton County Mathematics and Science Partnership and CEISMC, Wednesday June 4, 2014
- *Meadowcreek High School Go-STEM fair. Participated with hands on activities about physics to enhance kid's interest in STEM fields and University enrolling. Atlanta, October 6, 2015
- *Atlanta Science Festival Activity, generation of a dynamical spiral wave with 650 students, staff and faculty from GT. GT green, Atlanta GA, March, 2015
- *Atlanta Science Festival. Both about Oscillations in Nature. With four of my grad students and one undergraduate. Atlanta GA, March 2015.
- *Tour of our lab for 40 Students from Lilburn Middle School. March 11, 2016
- *STEM Presentation at Meadowcreek High School. March 15, 2016.
- *4th Annual Latino College STEM Fair. Participated with demos and information for careers in physics. March 19, 2016
- *Talk with students about how to apply to university. Radloff Middle School. Duluth Ga, March 29, 2016.
- *Talk with students about how to apply to university. Lilburn Middle School. Librun, Ga. March 30, 2016.
- *Direct to Discovery Class. Heart dynamics and sheep heart dissection. Meadowcreek High School. GA. (two back to back classes) May 6, 2016
- *Talk at the Monthly Silver Jacket's Society Meeting. May 10, 2016.
- *Talk about studying STEM fields at GT Society Junior STEM fair event for K-12 students and parents. October 22, 2016.
- *Latino STEM Education Day event at Meadowcreek High School. Participated with physics demos. November 12, 2016.
- *Science of Beer, demonstrating science demos using yeast. Part of the Atlanta Science festival. Atlanta GA, March 16. 2017.
- *Atlanta Science Festival demo tent, with Ed Greco, showing physics demos. Atlanta GA, March 25, 2017.
- *March for Science event. Organized a human spiral event with participants (~2,000). Atlatna. GA, April 22, 2017.
- *STEM Fair, at Meadowcreek High School. October 2017.

- *STEM Night science fair, Lilburn middle school, January 2018.
- *Physics Demos to Lilburn middle school at GT, February 2018.

Research reviewed in the news (* since arriving to GT)
- "Working a Beat" in *DOE Computational Science Graduate Fellowship Magazine*, 2002.
- "Hearts Gone Wild" in *Projects in Scientific Computing,*. Pittsburgh Super Computer Center 2003 public report. Nov, 2003.
- "Excitable Media: The Belousov-Zhabotinsky Chemical Reaction and the Heart", Hofstra Horizons, 2004 19-25.
- "The beat goes on" in *Scientific Computing World Magazine* Jan/Feb 2005.
- "Critical Exponents, Cardiac Dynamics, and History in the DSWeb tutorial section" in *Dynamical Systems Magazine* October, 2005.
- "2006 Visualization Challenge" in *Science Magazine* Vol. 313, 1735 Sept 2006.
- "Cornell scientists honored for making science interactive and visually exciting" in *Cornell Chronicle*. Oct 4, 2006.
- "The Human Heart Laid Bare" in *News-journal of the Society for industrial and Applied Mathematics*, SIAM news Vol 39 Nov 9, 2006.
- "Visualization award announcement" in *The Biological Physicist* Vol 6 p 19 Oct 2006,
- "The Cardiac Museum" in *Web 3D art* 2007
- "Exploring Time" in *Discovery channel documentary*, Feb, 2007.
- "Visualization sheds light on cardiac dynamics" in *medical physics web* Dec 16, 2008.
- "Visualizing Ventricular Fibrillation" Seeing Science section in *Biomedical Computation review magazine,* Winter 2008/2009
- "Computing Luminaries Receive NSF Grant to Develop Modeling Tools for Complex Systems" *Dr. Dobb's Digest*. August 19, 2009.
- "Cornell Vet Researchers Investigate Atrial Fibrillation" TheHorse.com, Article#15624, January 12, 2010.
- "Off Bet Hearts" Pittsburgh Supercomputer Center 2010. Highlight projects in scientific computing.pg 28-31. January 2011.
- New method defibrillates heart with less electricity, pain" Cornell University Chronicle, July, 2011
- "A Gentler Defibrillator Jolt", in IEEE Spectrum inside technology, July 2011
- "Kinder, Gentler Defibrillator Uses Multiple, Small Jolts", Scientific American, July 2011
- "A kinder, gentler defibrillator", Nature News, July 2011
- "A Less Shocking Way to Reset a Broken Heart" Science, July 13, 2011
- "New technologies aim to take shock out of treating irregular hearts", Nature Medicine 17, 906, August 2011
- * "Walk or run in the rain?" TV NBC Atlanta, local 11pm news. Sept 20, 2012.
- * Howard Hughes medical institute, image of the week. "Feeding a Hungry Heart" February 11, 2014.
- * Georgia Tech Alumni Magazine. Man's (New) Best Friends; Tech researchers improve lives—animal and human alike. February 17, 2014.
- * Appeared in two Atlanta Science Festival promos, with demonstrations, WSB-TV

Channel 2, Atlanta, March 16, 2014.

- *Nonlinear Dynamics in Flavio Fenton's Lab at Georgia Tech. Dynamical Systems Magazine. January, 2015

- *Interviewed for "Heart-muscle model could help pinpoint regions of atrial fibrillation "PhysicsWorld.com Jan 26, 2015.

- *Georgia Tech Studies Spiral Waves for Heart Research. GT YouTube promotional. Published on Mar 23, 2015

- *Guest at "Inside the black box" Weekly Science show. 91.1 FM Atlanta talking about nonlinear dynamics and physics. May 27, 2015.

- *The science of Star Wars. "Physics and the Force" Georgia Tech News. Dec 17, 2015.

- *Book review "Patterns in Excitable Media: Genesis, Dynamics, and Control" in Physics Today 69, 2, 48, 2016.

- *A Physics Dream Comes True in the Chaos Lab. GaTech College of Science News web page. November 10, 2016.

- *Double Georgia Tech Honors to Flavio Fenton in 2017. GaTech College of Science News web page. April 18, 2017.

- *Researchers find new source of dangerous electrical instability in the heart. Phys.org, Science Newsline Medicine, May 13, 2017.

- *Heart researchers develop a new, promising imaging technique for cardiac arrhythmias. Medical Xpress., Feb 22, 2018.

C. Institute contributions at GT

University/School Committees

2012

- Graduate Physics Committee

2013

- GT Faculty Honors Committee (Elected).
- GoSTEM Faculty Committee.
- Physics Space Committee.
- Physics Outreach Committee.
- Undergraduate Physics committee

2014

- GT Faculty Honors Committee (Elected).
- CETLS Honors Committee.
- GoSTEM Faculty Committee.
- Exploratory Astrophysics Major Committee
- Introductory Physics Task Force (to address the withdrawals/low grades of Biology students in introductory physics).
- Physics Outreach Committee

2015

- GT Faculty Honors Committee (Elected).
- GT Senate faculty member (Elected)
- GoSTEM Faculty Committee.

- Physics Outreach Committee

2016

- GT Faculty Honors Committee (Elected).
- GT Senate faculty member (Elected)
- GT Institute Undergraduate Curriculum Committee (Elected)
- GoSTEM Faculty Committee.
- Physics Outreach Committee

2017

- GT Senate faculty member (Elected)
- GT Institute Undergraduate Curriculum Committee (Elected)
- GoSTEM Faculty Committee.
- Physics Outreach Committee
- GT Library/Faculty Advisory Board Committee

2018

- GT Institute Undergraduate Curriculum Committee (Elected)
- GoSTEM Faculty Committee.
- Physics Outreach Committee
- GT Library/Faculty Advisory Board Committee