

CURRICULUM VITAE

Vasilis Z. Marmarelis

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Education

1967-72 Diploma in Electrical and Mechanical Engineering, National Technical University of Athens
1972-73 M.S. in Engineering Science (Information Science), California Institute of Technology
1973-76 Ph.D. in Engineering Science (Bio-information Systems), California Institute of Technology

Professional Experience

1976-78: Lecturer and Research Fellow of Bioinformation Systems, California Institute of Technology
1978-83: Assistant Professor of Biomedical & Electrical Engineering, University of Southern California
1983-88: Associate Professor of Biomedical & Electrical Engineering, University of Southern California
1985-2003: Founder & Director of Biomedical Simulations Resource, University of Southern California
1988-2005: Professor of Biomedical & Electrical Engineering, University of Southern California
1990-1996: Chairman of Biomedical Engineering Department, University of Southern California
2005-2020: Co-Director of Biomedical Simulations Resource, University of Southern California
2005-2010: Research Professor of Biomedical Engineering, University of Southern California
2005-2010: Chief Scientist of Mastoscopia S.A. (start-up to commercialize invented MUST technology)
2010-2018: Professor of Biomedical Engineering, University of Southern California
2018-present: Dean's Professor of Biomedical Engineering, University of Southern California

Honors

Fellow of the Institute of Electrical and Electronics Engineers
Fellow of the American Institute of Medical and Biological Engineering

Research Interests

1. Mathematical and computational modeling of nonlinear dynamic systems and advanced signal processing with applications to biomedical engineering.
2. Data-based modeling of cerebral hemodynamics with emphasis on model-based diagnostic physio-markers for neurodegenerative and cerebrovascular diseases.
3. Data-based modeling of neuronal encoding/decoding with emphasis on multi-neuronal interactions and model-based design of neuro-stimulation patterns for neural prostheses.
4. Closed-loop/nested-loop dynamic modeling of physiological autoregulation in cerebrovascular, cardio-vascular and endocrine-metabolic systems with emphasis on cerebral flow regulation, heart-rate reflex, cardio-respiratory coupling and autonomic dysfunction, as they pertain to the effects of dysregulation of cerebral perfusion in neurodegenerative diseases.
5. Diagnostic imaging for improved breast cancer detection via invented technology of 3D Multimodal Ultrasound Tomography (MUST) using fused refractivity and frequency-dependent attenuation images to differentiate malignant lesions from benign lesions and normal tissue.
6. Focused ultrasound for non-invasive neuro-stimulation and computer-guided stereotactic sono-ablation of malignant lesions.

Professional Activities

- Invited speaker, Program Committee member and Chairman of invited sessions in numerous scientific meetings of the IEEE/EMBS and the Biomedical Engineering Society (BMES).
- Associate Editor of IEEE Trans. BME (2012-2016), Annals of Biomedical Engineering (1990-1999). Editor of Special Issues (1988, 2011) and of four research volumes.
- Chairman and Organizer of several Workshops on Advanced Methods of Physiological System Modeling and Short-Courses on modeling software packages developed by the BMSR.
- Chair and Member of NIH Study Sections on biomedical systems modeling and reviewer for scientific journals and funding agencies (see lists below).

Article Reviewer for *American Journal of Physiology*
Annals of Biomedical Engineering
Automatica
Biological Cybernetics
Biophysical Journal
Hearing Research
IEEE Transactions on Biomedical Engineering
IEEE Transactions on Signal Processing
IEEE Transactions on Automatic Control
IEEE Transactions on Neural Networks
IEEE Proceedings
IEEE Transactions on Circuits and Systems
IEEE Transactions on Information Theory
Journal of Neural Engineering
Journal of Neurophysiology
Journal of Theoretical Biology
Mathematical Biosciences

Proposal Reviewer for *National Institutes of Health*
National Science Foundation
Research Council of Canada

Society Memberships Institute of Electrical and Electronics Engineers (Member # 07688369)
Biomedical Engineering Society (Member # 10261604)

University Service Chairman, Department of Biomedical Engineering (1900-1996)
Founder & Co-Director of Biomedical Simulations Resource (1985-pres)
Department of Biomedical Engineering, Task-Force Committees (several)
School of Engineering, Appointments & Promotions Committee (1985-9)
School of Engineering, Faculty Council (1998-2002, 2011-2013)
University Faculty Senate (2011-2013)

Publications

Books

1. Marmarelis, P.Z. & V.Z. Marmarelis. *Analysis of Physiological Systems: The White-Noise Approach*. Plenum, New York, 1978. *Russian translation*: Mir Press, Moscow, 1981. *Chinese Translation*: Academy of Sciences Press, Beijing, 1990.
2. Marmarelis, V.Z. (Ed.) *Advanced Methods of Physiological System Modeling: Volume I*. BMSR, Los Angeles, 1987.
3. Marmarelis, V.Z. (Ed.) *Advanced Methods of Physiological System Modeling: Volume II*. Plenum, New York, 1989.
4. Marmarelis, V.Z. (Ed.) *Advanced Methods of Physiological System Modeling: Volume III*. Plenum, New York, 1994.
5. Marmarelis, V.Z. *Nonlinear Dynamic Modeling of Physiological Systems*. Wiley Interscience, New Jersey, 2004.
6. Marmarelis V.Z. & G.D. Mitsis (Ed.) *Data-driven Modeling for Diabetes*. Springer-Verlag, Heidelberg-Berlin, 2014.

Papers in Refereed Journals

1. Marmarelis, V.Z. A family of quasi-white random signals and its optimal use in biological system identification. Part I: Theory. *Biological Cybernetics* **27**:49-56, 1977.
2. Marmarelis, V.Z. and G.D. McCann. A family of quasi-white random signals and its optimal use in biological system identification. II: Application to the photoreceptor of *Calliphora Erythrocephala*. *Biological Cybernetics* **27**:57-62, 1977.
3. Marmarelis, V.Z. The optimal use of random quasi-white signals in nonlinear system identification. *Multidisciplinary Research* **6**:112-141, 1978.
4. Marmarelis, V.Z. Random vs. pseudorandom test signals in nonlinear system identification. *IEEE Proceedings* **125**:425-428, 1978.
5. Marmarelis, V.Z. Error analysis and optimal estimation procedures in identification of nonlinear Volterra systems. *Automatica* **15**:161-174, 1979.
6. Marmarelis, V.Z., S.F. Masri, F.E. Udawadia, T.K. Caughey and G.D. Jeong. Analytical and experimental studies of the modeling of a class of nonlinear systems. *Nuclear Engineering and Design* **55**:59-68, 1979.

7. Marmarelis, V.Z. Identification of nonlinear systems by use of nonstationary white-noise inputs. *Applied Mathematical Modeling* **4**:117-124, 1980.
8. Marmarelis, V.Z. Practicable identification of nonstationary nonlinear systems. *IEE Proceedings D* **128**:211-214, 1981.
9. Marmarelis, V.Z. A single-record estimator for correlation functions of nonstationary random processes. *Proceedings of the IEEE*, **69**:841-842, 1981.
10. Marmarelis, V.Z. Non-parametric validation of parametric models. *Mathematical Modelling* **3**:305-309, 1982.
11. Marmarelis, V.Z. Practical estimation of correlation functions of nonstationary Gaussian processes. *IEEE Trans. on Information Theory* **29**:937-938, 1983.
12. Curlander, J.C. and V.Z. Marmarelis. Processing of visual information in the distal neurons of the vertebrate retina. *IEEE Trans. on Systems, Man and Cybernetics* **13**:934-943, 1983.
13. Marmarelis, V.Z., M.C. Citron and C.P. Vivo. Minimum-order Wiener modeling of spike output system. *Biological Cybernetics* **54**:115-123, 1986.
14. Ghazanshahi, S.D., V.Z. Marmarelis and S.M. Yamashiro. Analysis of the gas exchange system dynamics during high-frequency ventilation. *Annals of Biomedical Engineering* **14**:525-542, 1986.
15. Ghazanshahi, S.D., S.M. Yamashiro and V.Z. Marmarelis. Use of random forcing for high frequency ventilation. *Journal of Applied Physiology* **62**:1201-1205, 1987.
16. Citron, M.C. and V.Z. Marmarelis. Application of minimum-order Wiener modeling to retinal ganglion cell spatio-temporal dynamics. *Biological Cybernetics* **57**:241-247, 1987.
17. Curlander, J.C. and V.Z. Marmarelis. A linear spatio-temporal model of the light-to-bipolar cell system and its response characteristics to moving bars. *Biological Cybernetics* **57**:357-363, 1987.
18. Abdel-Malek, A., C.H. Markham, P.Z. Marmarelis and V.Z. Marmarelis. Quantifying deficiencies associated with Parkinson's disease by use of time-series analysis. *Journal of EEG & Clinical Neurophysiology* **69**:24-33, 1988.
19. Abdel-Malek, A. and V.Z. Marmarelis. Modeling of task-dependent characteristics of human operator dynamics during pursuit manual tracking. *IEEE Trans. on Systems, Man and Cybernetics* **18**:163-172, 1988.
20. Marmarelis, V.Z. Coherence and apparent transfer function measurements for nonlinear physiological systems. *Annals of Biomedical Engineering* **16**:143-157, 1988.
21. Sams, A.D. and V.Z. Marmarelis. Identification of linear periodically time-varying systems using white-noise test inputs. *Automatica* **24**:563-567, 1988.

22. Marmarelis, V.Z. Signal transformation and coding in neural systems. *IEEE Transactions on Biomedical Engineering* **36**:15-24, 1989.
23. Marmarelis, V.Z. Linearized models of a class of nonlinear dynamic systems. *Applied Math. Modeling* **13**:21-26, 1989.
24. Marmarelis, V.Z. Identification and modeling of a class of nonlinear systems. *Math. Comp. Model.* **12**:991-995, 1989.
25. Chen, H.P., C.P. Yang and V.Z. Marmarelis. Kinetic study on the production of cyclodextrin: Analysis of initial rate, inhibitory effect of glucose and degradation. *J. Chin. Inst. Chem. Eng.* **20**:195-199, 1989.
26. Khoo, M.C.K. and V.Z. Marmarelis. Estimation of chemoreflex gain from spontaneous sigh responses. *Annals of Biomedical Engineering* **17**:557-570, 1989.
27. Papazoglou, T.G., T. Papaioannou, K. Arakawa, M. Fishbein, V.Z. Marmarelis and W.S. Grundfest. Control of excimer laser aided tissue ablation via laser-induced fluorescence monitoring. *Applied Optics* **29**:4950-4955, 1990.
28. Marmarelis, V.Z. Wiener analysis of nonlinear feedback in sensory systems. *Annals of Biomedical Engineering* **19**:345-382, 1991.
29. Chon, K.H., Y.M. Chen, N.H. Holstein-Rathlou, D.J. Marsh and V.Z. Marmarelis. On the efficacy of linear system analysis of renal autoregulation in rats. *IEEE Trans. Biomedical Engineering* **40**:8-20, 1993.
30. Marmarelis, V.Z. Identification of nonlinear biological systems using Laguerre expansions of kernels. *Annals of Biomedical Engineering* **21**:573-589, 1993.
31. Marmarelis, V.Z., K.H. Chon, Y.M. Chen, D.J. Marsh and N.H. Holstein-Rathlou. Nonlinear analysis of renal autoregulation under broadband forcing conditions. *Annals of Biomedical Engineering* **21**:591-603, 1993.
32. Marmarelis, V.Z. and M.E. Orme. Modeling of neural systems by use of neuronal modes. *IEEE Trans. Biomed. Eng.* **40**:1149-1158, 1993.
33. Chon K.H., Y.M. Chen, V.Z. Marmarelis and N.H. Holstein-Rathlou. Detection of interactions between the myogenic and TGF mechanisms using nonlinear analysis. *Amer. J. Physiol.: Renal Fl. & Elec. Physiol.*, **265**:F160-F173, 1994.
34. Stavridi, M., V.Z. Marmarelis, and W.S. Grundfest. Spectro-temporal studies of Xe-Cl excimer laser-induced arterial wall fluorescence. *Med. Eng. & Physics* **17**:595-601, 1995.

35. French, A.S. and V.Z. Marmarelis. Nonlinear neuronal mode analysis of action potential encoding in the cockroach tactile spine neuron. *Biological Cybernetics* **73**:425-430, 1995.
36. Stavridi, M., V.Z. Marmarelis, and W.S. Grundfest. Simultaneous monitoring of spectral and temporal Xe-Cl excimer laser-induced fluorescence. *Meas. Sci. Technol.* **7**:87-95, 1995.
37. Zhao, X. and V.Z. Marmarelis. On the relation between continuous and discrete nonlinear parametric models. *Automatica* **33**:81-84, 1997.
38. Marmarelis, V.Z. Modeling methodology for nonlinear physiological systems. *Annals of Biomedical Engineering* **25**:239-251, 1997.
39. Marmarelis, V.Z. and X. Zhao. Volterra models and three-layer perceptrons. *IEEE Transactions on Neural Networks* **8**:1421-1433, 1997.
40. Chon, K.H., Y.M. Chen, N.H. Holstein-Rathlou, D.J. Marsh, and V.Z. Marmarelis. Nonlinear system analysis of renal autoregulation in normotensive and hypertensive rats. *IEEE Trans. Biomed. Eng.* **45**:342-353, 1998.
41. Zhao, X. and V.Z. Marmarelis. Nonlinear parametric models from Volterra kernels measurements. *Mathematical Computational Modeling* **27**:37-43, 1998.
42. Chon, K.H., N.H. Holstein-Rathlou, and V.Z. Marmarelis. Comparative nonlinear modeling of renal autoregulation in rats: Volterra approach vs. artificial neural networks. *IEEE Trans. on Neural Networks* **9**:430-435, 1998.
43. Marmarelis, V.Z., K.H. Chon, N.H. Holstein-Rathlou and D.J. Marsh. Nonlinear analysis of renal autoregulation in rats using principal dynamic modes. *Ann. Biomed. Eng.* **27**:23-31, 1999.
44. Iatrou, M. T.W. Berger, and V.Z. Marmarelis. Modeling of nonlinear nonstationary dynamic systems with a novel class of artificial neural networks. *IEEE Trans. Neural Networks* **10**:327-339, 1999.
45. Marmarelis, V.Z., M. Juusola, and A.S. French. Principal dynamic mode analysis of nonlinear transduction in a spider mechanoreceptor. *Ann. Biomed. Eng.* **27**:391-402, 1999.
46. Chian, M.T., V.Z. Marmarelis, and T.W. Berger. Decomposition of neural systems with nonlinear feedback using stimulus-response data. *Neurocomputing* **26**: 641-654, 1999.
47. Iatrou, M., T.W. Berger and V.Z. Marmarelis. Application of a novel modeling method to the nonstationary properties of potentiation in the rabbit hippocampus. *Ann. Biomed. Eng.* **27**:581-591, 1999.
48. Alataris, K., T.W. Berger, and V.Z. Marmarelis. A novel network for nonlinear modeling of neural systems with arbitrary point-process inputs. *Neural Networks* **13**:255-266, 2000.

49. Shehada, R.E., V.Z. Marmarelis, H.N. Mansour and W.S. Grundfest. Laser induced fluorescence attenuation spectroscopy: Detection of hypoxia, *IEEE Trans. Biomedical Eng.* **47**:301-312, 2000.
50. Berger, T.W., M. Baudry, R.D. Brinton, J.-S. Liaw, V.Z. Marmarelis, A.Y. Park, B.J. Sheu and A.R. Tanguay, Jr. Brain-implantable biomimetic electronics as the next era in neural prosthetics. *Proceedings of the IEEE* **89**: 993-1012, 2001.
51. Gholmieh, G., W. Soussou, S.H. Courellis, V.Z. Marmarelis, T.W. Berger and M. Baudry. A biosensor for detecting changes in cognitive processing based on nonlinear systems analysis. *Biosensors & Bioelectronics* **16**: 491-501, 2001.
52. Mitsis, G.D. and V.Z. Marmarelis. Modeling of nonlinear physiological systems with fast and slow dynamics. I. Methodology. *Annals of Biomedical Engineering* **30**:272-281, 2002.
53. Mitsis G.D., R. Zhang, B.D. Levine and V.Z. Marmarelis. Modeling of nonlinear physiological systems with fast and slow dynamics. II. Application to cerebral autoregulation. *Annals of Biomedical Engineering* **30**:555-565, 2002.
54. Gholmieh, G., S.H. Courellis, V.Z. Marmarelis and T.W. Berger. An efficient method for studying short-term plasticity with random impulse train stimuli. *Journal of Neuroscience Methods* **21**: 111-127, 2002.
55. Gholmieh G., S.H. Courellis, V.Z. Marmarelis and T.W. Berger. Detection and classification of neurotoxins using a novel short-term plasticity quantification method. *Biosensors & Bioelectronics* **18**:1467-1478, 2003.
56. Mitsis, G.D., M.J. Poulin, P.A. Robbins, and V.Z. Marmarelis. Nonlinear modeling of the dynamic effects of arterial pressure and CO₂ variations on cerebral blood flow in healthy humans. *IEEE Transactions on Biomedical Engineering* **51**:1932-1943, 2004.
57. Gholmieh G., S.H. Courellis, A. Dimoka, J.D.Wills, J. LaCoss, J.J. Granacki, V.Z. Marmarelis and T.W. Berger. An algorithm for real-time extraction of population EPSP and population spike amplitudes from hippocampal field potential recordings. *Journal of Neuroscience Methods* **136**:111-121, 2004.
58. Mitsis, G.D., P.N. Ainslie, M.J. Poulin, P.A. Robbins and V. Z. Marmarelis. Nonlinear modeling of the dynamic effects of arterial pressure and blood gas variations on cerebral blood flow in healthy humans. *Advances in Experimental Medicine and Biology* **551**: 259-265, 2004.
59. Gholmieh G., S.H. Courellis, V.Z. Marmarelis, and T.W. Berger. Detecting CA1 short-term plasticity variations associated with changes in stimulus intensity and extracellular medium composition. *Neurocomputing* **63**:465-481, 2005.
60. Marmarelis, V.Z. and T.W. Berger: General methodology for nonlinear modeling of neural systems with Poisson point-process inputs. *Mathematical Biosciences* **196**:1-13, 2005.

61. Zhou, Q., J.M. Cannata, H. Guo, K. Shung, C. Huang and V.Z. Marmarelis. Half-thickness inversion layer high-frequency ultrasonic transducers using LiNbO₃ single crystal. *IEEE Transactions on Ultrasonics, Ferroelectrics & Frequency Control* **52**:127-133, 2005.
62. Huang, C., V.Z. Marmarelis, Q. Zhou and K.K. Shung. An analytical model of multilayer ultrasonic transducers with an inversion layer. *IEEE Transactions on Ultrasonics, Ferroelectrics & Frequency Control* **52**:469-479, 2005.
63. Jeong, J.-W., T.-S. Kim, D.C. Shin, S. Do, M. Singh and V.Z. Marmarelis. Soft tissue differentiation using multiband signatures of high resolution ultrasonic transmission tomography. *IEEE Trans. on Medical Imaging* **24**:399-408, 2005.
64. Berger, T.W, A. Ahuja, S.H. Courellis, S.A. Deadwyler, G. Erinjippurath, G.A. Gerhardt, G. Gholmieh, J.J. Granacki, R. Hampson, M.C. Hsaio, J. LaCoss, J., V.Z. Marmarelis, P. Nasiatka, P., V. Srinivasan, D. Song, A.R. Tanguay and J. Wills. Restoring lost cognitive function: Hippocampal-cortical neural prostheses. *IEEE EMBS Mag.* **24**, 30-43, 2005.
65. Mitsis, G.D., R. Zhang, B.D. Levine and V.Z. Marmarelis. Cerebral hemodynamics during orthostatic stress assessed by nonlinear modeling. *Journal of Applied Physiology* **101**:354-366, 2006.
66. Jeong, J.-W., D.C. Shin, S. Do and V.Z. Marmarelis. Segmentation methodology for automated classification and differentiation of soft tissues in multiband images of high-resolution ultrasonic transmission tomography. *IEEE Transactions on Medical Imaging* **25**:1068-1078, 2006.
67. Mitsis, G.D., A.S. French, U. Höger, S. Courellis, and V Z. Marmarelis. Principal dynamic mode analysis of action potential firing in a spider mechanoreceptor. *Biological Cybernetics* **96(1)**:113-127, 2007.
68. Gholmieh, G., S. Courellis, V.Z. Marmarelis and T.W. Berger. Nonlinear dynamic model of CA1 short-term plasticity using random impulse train stimulation. *Annals of Biomedical Engineering* **35(5)**:847-857, 2007.
69. Katritsis, D.G., L. Kaiktsis, A. Chaniotis, J. Pantos, E.P. Efstathopoulos and V.Z. Marmarelis. Wall shear stress: theoretical considerations and methods of measurement. *Progress in Cardiovascular Diseases* **49(5)**:307-329, 2007.
70. Song D., R.H.M. Chan, V.Z. Marmarelis, R.E. Hampson, S.A. Deadwyler and T. W. Berger. Nonlinear dynamic modeling of spike train transformation for hippocampal-cortical prostheses. *IEEE Transactions on Biomedical Engineering*, **54(6)**:1053-1065, 2007.
71. Dimoka, A., S.H. Courellis, G. Gholmieh, V.Z. Marmarelis and T.W. Berger. Modeling the nonlinear properties of the *in vitro* hippocampal perforant path-dentate system using multi-electrode array technology. *IEEE Transactions on Biomedical Engineering* **55(2)**: 693-702, 2008.

72. Katritsis, D.G., E.P. Efstathopoulos, J. Pantos, S. Korovesis, G. Kourlaba, S. Kazantzidis, V.Z. Marmarelis and E. Voridis. Anatomic characteristics of culprit sites in acute coronary syndromes. *Journal of Interventional Cardiology* **21(2)**: 140-150, 2008.
73. Jeong, J.-W., D.C. Shin, S.H. Do, N.E. Klipfel, D.R. Holmes, L.J. Hovanesian-Larsen and V.Z. Marmarelis Differentiation of cancerous lesions in excised human breast specimens using multi-band attenuation profiles from ultrasonic transmission tomography. *Journal of Ultrasound in Medicine* **27(3)**: 435-451, 2008.
74. Dimoka, A., S.H. Courellis, V.Z. Marmarelis and T.W. Berger. Modeling the nonlinear dynamic interactions of afferent pathways in the dentate gyrus of the rat hippocampus. *Annals of Biomedical Engineering* **36(5)**:852-864, 2008.
75. Zanos, T.P., S.H. Courellis, R.E. Hampson, S.A. Deadwyler, T.W. Berger and V.Z. Marmarelis. Nonlinear modeling of causal interrelationships in neuronal ensembles. *IEEE Transactions on Neural Systems & Rehabilitation Engineering* **16(4)**:336-352, 2008.
76. Song, D., Z. Wang, V.Z. Marmarelis and T.W. Berger. Parametric and non-parametric modeling of short-term synaptic plasticity. Part I: Computational study. *Journal of Computational Neuroscience* **26**:1-19, 2009.
77. Song, D., Z. Wang, V.Z. Marmarelis and T.W. Berger. Parametric and non-parametric modeling of short-term synaptic plasticity. Part II: Experimental study. *Journal of Computational Neuroscience* **26**:21-37, 2009.
78. Mitsis, G.D., R. Zhang, B.D. Levine, E. Tzanalaridou, D.G. Katritsis and V.Z. Marmarelis. Nonlinear analysis of autonomic control of cerebral hemodynamics. *IEEE Engineering in Medicine & Biology Magazine* **28(6)**: 54-62, 2009.
79. Marmarelis, V.Z., T.P. Zanos, and T.W. Berger. Boolean modeling of neural systems with point-process inputs and outputs. Part I: Theory and simulations. *Annals of Biomedical Engineering* **37(8)**: 1654-1667, 2009.
80. Zanos, T.P., R.E. Hampson, S.A. Deadwyler, T.W. Berger and V.Z. Marmarelis. Boolean modeling of neural systems with point-process inputs and outputs. Part II: Application to the rat hippocampus. *Annals of Biomedical Engineering* **37(8)**: 1668-1682, 2009.
81. Mitsis G.D., Markakis, M.G. and V.Z. Marmarelis. Nonlinear modeling of the dynamic effects of infused insulin on glucose: Comparison of compartmental with Volterra models. *IEEE Transactions on Biomedical Eng.* **56(10)**: 2347-2358, 2009.
82. Song D., R.H.M. Chan, V.Z. Marmarelis, R.E. Hampson, S.A. Deadwyler and T. W. Berger. Nonlinear modeling of neural population dynamics for hippocampal prostheses. *Neural Networks* **22**:1340-1351, 2009.

83. Chaniotis A.K., L. Kaiktsis, D. Katriksis, E. Efstathopoulos, I. Pantos and V. Marmarellis. Computational study of pulsatile blood flow in prototype vessel geometries of coronary segments. *Physica Medica* **17**:1-17, 2009.
84. Jeong J.W., D.C. Shin and V.Z. Marmarellis. Image fusion methodology for efficient interpretation of multiband images in 3D high-resolution ultrasonic transmission tomography. *International Journal of Imaging Systems and Technology*, **19**:277-282, 2009.
85. Berger T.W., D. Song, R. H. M. Chan and V. Z. Marmarellis. The neurobiological basis cognition: Identification by multi-input, multi-output nonlinear dynamic modeling. *Proceedings of the IEEE* **98(3)**: 356-374, 2010.
86. Markakis, M.G., G.D. Mitsis, G.P. Papavassilopoulos, P. A. Ioannou and V.Z. Marmarellis. A switching control strategy for the attenuation of blood glucose disturbances. *Optimal Control Applications & Methods*, **32(2)**:185-195, 2011.
87. Berger T.W., R.E. Hampson, D. Song, A. Goonawardena, V.Z. Marmarellis and S.A. Deadwyler. A cortical neural prosthesis for restoring and enhancing memory. *Journal of Neural Engineering* **8(4)**:1-12, 2011.
88. Coatrieux JL, AF Frangi, GC Peng, DZ D'Argenio, A Michailova and VZ Marmarellis. Editorial of the Special Issue on Multi-Scale Modeling and Analysis in Computational Biology and Medicine. *IEEE Trans. on Biomedical Engineering*, 2011.
89. Hampson R.E., A.J. Sweatt, A.V. Goonawardena, D. Song, R.H.M. Chan, V.Z. Marmarellis, V. Z., T.W. Berger and S.A. Deadwyler. Memory encoding in hippocampal ensembles is negatively influenced by cannabinoid CB1 receptors. *Behavioral Pharmacology* **22(4)**:335-346, 2011.
90. Hampson R. E., Song, D., Chan, R. H. M., Sweatt, A. J., Fuqua, J., Gerhardt, G. A., Shin, D., Marmarellis, V. Z., Berger, T. W., & Deadwyler, S. A. A nonlinear model for hippocampal cognitive prosthesis: Memory facilitation by hippocampal ensemble stimulation. *IEEE Trans. Neural Systems & Rehab. Eng.* **20(2)**:184-197, 2012.
91. Berger T.W., D. Song, R. H.M. Chan, V.Z. Marmarellis, Fellow, R.E. Hampson, S.A. Deadwyler, J. LaCoss, J. Wills, J.J. Granacki. A hippocampal cognitive prosthesis: Multi-Input, Multi-Output nonlinear modeling and VLSI implementation. *IEEE Trans. Neural Systems & Rehab. Eng.* **20(2)**:198-211, 2012.
92. Berger, T.W., D. Song, R. Chan, D.C. Shin, V.Z. Marmarellis, R.E. Hampson, A.J. Sweatt, C.N. Heck, C.Y. Liu, J. Wills, J. LaCoss, J.J. Granacki, G.A Gerhardt and S.A. Deadwyler. Role of the hippocampus in memory formation. *IEEE Pulse* **3(5)**:17-22, 2012.
93. Zanos S., T.P. Zanos, V. Z. Marmarellis, G. A. Ojemann, E.E. Fetz. Relationships between spike-free local field potentials and spike timing in human temporal cortex. *Journal of Neurophysiology* **107**:1808-1821, 2012.

94. Hampson R. E., Song D., Chan R. H. M., Sweatt, A. J., Riley, M. R., Goonawardena, A. V., Marmarelis, V. Z., Gerhardt, G. A., Berger, T. W., & Deadwyler, S. A. Closing the loop for memory prostheses: Detecting the role of hippocampal neural ensembles using nonlinear models. *IEEE Trans. Neural Systems & Rehab. Engineering* 20(4):510-525, 2012.
95. Marmarelis V.Z., D.C. Shin and R. Zhang. Analysis of cerebral flow autoregulation using Principal Dynamic Modes: linear and nonlinear modeling. *Open Biomedical Eng. Journal* 6:42-55, 2012.
96. Hampson RE, Gerhardt GA, Marmarelis VZ, Song D, Opris I, Santos L, Berger TW, Deadwyler SA. Facilitation and restoration of cognitive function in primate prefrontal cortex by a neuroprosthesis that utilizes minicolumn-specific neural firing. *J Neural Eng.* 9(5):056012, 2012.
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1. METHOD AND APPARATUS FOR ENHANCED RESOLUTION OF RANGE ESTIMATES IN ECHO LOCATION FOR DETECTION AND IMAGING SYSTEMS
United States Patent 5,760,732 (issued June 2, 1998)
Inventors: Marmarelis, Vasilis Z. (Irvine, CA), Nikias, Chrysostomos L. (Ranch Palos Verdes, CA), Sheby, David (Cherry Hill, NJ)
2. PROCESS AND APPARATUS FOR IMPROVED INTERFERENCE SUPPRESSION IN ECHO-LOCATION AND IMAGING SYSTEMS
United States Patent 5,790,475 (issued August 4, 1998)
Inventors: Marmarelis, Vasilis Z. (Irvine, CA), Nikias, Chrysostomos L. (Ranch Palos Verdes, CA), Sheby, David (Cherry Hill, NJ)
3. METHOD AND APPARATUS FOR SITUATIONALLY ADAPTIVE PROCESSING IN ECHO-LOCATION SYSTEMS OPERATING IN NON-GAUSSIAN ENVIRONMENTS
United States Patent 6,044,336 (issued March 28, 2000)
Inventors: Marmarelis, Vasilis Z. (Irvine, CA), Nikias, Chrysostomos L. (Rancho Palos Verdes, CA), Shin, Dae Cheol (Diamond Bar, CA)
4. METHOD FOR AUTOMATIC FOCUSING OF RADAR OR SONAR IMAGING SYSTEMS USING HIGH-ORDER SPECTRA
United States Patent 6,037,892 (issued March 14, 2000)
Inventors: Nikias, Chrysostomos L. (Rancho Palos Verdes, CA), Marmarelis, Vasilis Z. (Irvine, CA), Shin, Dae Cheol (Diamond Bar, CA)
5. METHOD AND DEVICES FOR LASER INDUCED FLUORESCENCE ATTENUATION SPECTROSCOPY
United States Patent 6,124,597 (issued September 26, 2000)
Inventors: Shehada, Ramez E. N. (Los Angeles, CA), Marmarelis, Vasilis Z. (Irvine, CA), Grundfest, Warren S. (Los Angeles, CA)
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United States Patent 6,697,657 (issued February 24, 2004)
Inventors: Shehada, Ramez E. N. (Los Angeles, CA), Marmarelis, Vasilis Z. (Irvine, CA), Grundfest, Warren S. (Los Angeles, CA)
7. MULTI-MODE PROCESSING FOR ULTRASONIC IMAGING
United States Patent 6,776,760 (issued August 17, 2004)
Inventors: Marmarelis, Vasilis Z. (Irvine, CA)
8. HIGH-RESOLUTION 3D ULTRASONIC TRANSMISSION IMAGING
United States Patent 7,094,205 (issued August 22, 2006)
Inventors: Marmarelis, Vasilis Z. (Irvine, CA)

9. METHOD AND DEVICES FOR LASER INDUCED FLUORESCENCE ATTENUATION SPECTROSCOPY

United States Patent RE39,672 (issued June 5, 2007)

Inventors: Shehada, Ramez E. N. (La Mirada, CA), Marmarelis, Vasilis Z. (Irvine, CA), Grundfest, Warren S. (Calabasas, CA)

10. MODELING NONLINEAR SYSTEMS

United States Patent 8,463,582 (issued June 11, 2013)

Inventors: Song, Dong (Irvine, CA), Marmarelis, Vasilis Z. (Rancho Palos Verdes, CA), Berger, Theodore W. (Rancho Palos Verdes, CA)

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