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Publications: Textbooks and Proceedings Editor

1. Normann, R. A. *Principles of Bioinstrumentation.* New York: John Wiley and Sons, 1988 (ISBN 0-471-60514-X).
2. Yang, W., and Normann, R. A. *Solutions Manual for Principles of Bioinstrumentation.* New York: John Wiley and Sons, 1989 (ISBN 0-471-60770-3).
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2. Normann, R. A. Light- and Dark-Adaptation of Vertebrate Rods and Cones. Berkeley: University of California, 1973. Dissertation.

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1. Normann, R. A., and Werblin, F. S. Gain Control and Contrast Sensitivity in the Vertebrate Retina. *Southwest IEEE Record;* 1972.
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Publications: Articles in Refereed Journals (continued)

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108. Dowden, B.R., Wark, H.A.C., and Normann, R.A. Muscle-Selective Block using Intrafascicular High-Frequency Alternating Current. Muscle and Nerve, Sep; 42(3): 339-47. 2010

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110. Parker, R.A., Davis, T.S., House, P.A., Normann, R.A., Greger, B. "The functional consequences of chronic, physiologically effective intracortical micro-stimulation", in press.

111. Torab, K., Davis, T,S., Warren, D.J., House, P.A., Normann, R.A., Greger, B. "Multiple factors may influence the performance of a visual prosthesis based on intracortical microstimulation: nonhuman primate behavioural experimentation" J. Neural Eng. 8 (2011) 035001.

112. R A Normann, R.A., Dowden, B.R., Frankel, M.A., Wilder, A.M., S D Hiatt, S.D., Ledbetter, N.M., Warren, D.A., ClarkG.A., "Coordinated, Multi-Joint, Fatigue-Resistant Feline Stance Produced By Utah Slanted Electrode Arrays In Hind Limb Nerves", J. Neural Eng., submitted

113. Dowden, B.R, Frankel, M.A., Normann, R.A., Clark, G.A. "Non-Invasive Characterization Of Multiple High-Channel-Count Peripheral Nerve Interfaces Using Evoked Endpoint Forces", J. Neural Eng, Submitted

114. Frankel, M.A., B.R. Dowden, B.R., G.A. Clark, G.A.,. Normann, R.A., Mathews, V.J., Meek, S.G. "Multiple-Input Single-Output Closed-Loop Isometric Force Control Using Asynchronous Intrafascicular Multi-Electrode Stimulation". IEEE Trans Neur and Rehab Engrg. In press.

Publications: Abstracts, Proceedings and Invited Presentations (NOTE: I stopped adding these in 2001)

1. Normann, R. A. Equivalence of Light- and Dark-Adaptation in a Vertebrate Retina: Extracellular and Intracellular Recordings in Necturus. Paper presented at ARVO '72.
2. Normann, R. A., and Werblin, F. S. Light- and Dark-Adaptation of Necturus Rod and Cone Responses. Paper presented at ARVO '73.
3. Normann, R. A., and Pochobradsky, J. Oscillating Intracellular Potentials in the Rods and Horizontal Cells of Bufo Marinus. Paper presented at ARVO '75.
4. Normann, R. A. The Sodium Permeability of the Rods of Bufo Marinus. Paper presented at ARVO '76.
5. Normann, R. A. Isolation of Two Membrane Mechanisms Underlying the Rod Photoresponse. Paper presented at ARVO '77.
6. McBurney, R. N., and Normann, R. A. Current and Voltage Responses from Single Rods in the Toad Retina. In *J. Gen. Physiol.* 70:12a; 1977.
7. Normann, R. A., and Perlman, I. The Cytoplasmic Ionic Composition and the Plasma Membrane Permeabilities of Rod Photoreceptors in the Light and Dark. In *Invest. Opthalmol. Suppl.* to April 1978 issue, pg. 219.
8. Normann, R. A. Light Adaptation of Vertebrate Photoreceptors. Invited lecture at the British Photobiology Society Meeting, "Visual Sensitivity and Adaptation," at the University of Surrey. Surrey, England; 1978 September.
9. Normann, R. A. Orientation Sensitivity of Horizontal Cells in the Visual Streak. In Invest. Ophthalmol. Suppl. to April 1979 issue, pg. 32.

10. Baxter, B. S., Normann, R. A., and Ravindra, H. Retinal Photoreceptor Response and Contrast Discrimination. Paper presented at the twenty-seventh annual meeting of the Society of Nuclear Medicine. Detroit; 1980 June.

11. Normann, R. A. Spatial Information Processing by Horizontal Cells of the Turtle Retina. Invited lecture at the 28th International Congress of Physiological Sciences Satellite Symposium, "Information Processing in the Retina." Vienna; 1980 July.

12. Normann, R. A. Information Processing in the Vertebrate Retina. Invited lecture at the Max Planck Institute. Bad Nauheim, Germany; 1980 July.

13. Normann, R. A., Baxter, B. S., Ravindra, H., Lee, T., and Garra, B. The Role of Visual Adaptation in Diagnostic Image Interpretation. Paper presented at the 66th annual meeting of the Radiological Society of North America. Dallas; 1980 November.

14. Ravindra, H., Normann, R. A., Baxter, B. S., and Maher, T. F. Accurate Prediction of Visual Thresholds with an Electrophysiologically Based Model. Paper presented at the 89th annual meeting of the American Psychological Assn. Los Angeles; 1981August.

15. Kolb, H., and Normann, R. A. Oriented and Elongated Horizontal Cells of the Rabbit Retina. Paper presented at ARVO '82.

16. Ives, J., Barber, P., and Normann, R. A. Light Intensification Mediated by Cone Oil Droplets. Paper presented at ARVO '82.

17. Normann, R. A., and Anderton, P. J. Increment Sensitivity Curve of Turtle Cones. Paper presented at ARVO '82.

18. Ives, J., Normann, R. A., and Barber, P. The Role of Oil Droplets in Cone Action Spectra. Paper presented at the 5th annual meeting of the International Congress of Eye Research. Nijmegen, The Netherlands; 1982.

19. Normann, R. A., Baxter, B. S., and Ravindra, H. Cone Photoreceptor Origins of Sensitivity Changes Associated with Complex Background Illuminations. Paper presented at the 5th annual meeting of the International Congress of Eye Research. Nijmegen, The Netherlands; 1982.

20. Normann, R. A., and Daly, S. J. Temporal Summation by Turtle Cone Photoreceptors. Paper presented at ARVO '83.

21. Daly, S. J., and Normann, R. A. Linearity and Time-Invariance of Turtle Cone Photorecep-tors. Paper presented to the Neuroscience Society. 1983.

22. Baxter, B. S., Normann, R. A., and Blackburn, C. W. Sensory Level Mechanisms and the Interpretation of Clinical Radiographs. Paper presented at the 69th meeting of the Radiological Society of North America. 1983.

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24. Normann, R. A., Perlman, I., and Daly, S. J. Mixing of Color Signals in Turtle Red Cone Photoreceptors. Paper presented at ARVO '84.

25. Daly, S. J., and Normann, R. A. Dark and Light Adapted Turtle Cone Responses to Varying Duration Pulses: Verifications of Predictions Based on Linear System Theory. Paper presented at ARVO '84.

26. Normann, R. A., and Perlman, I. Chromatic Interactions Between Cones of Differing Spectral Classes; Anatomical and Electrophysiological Studies in the Turtle. Paper presented at the International Congress of Eye Research. Alicante, Spain; 1984 October.

27. Lipetz, L., and Normann, R. The Effect of Oil Droplets on the Spectral Sensitivities and Sensitivites of Cones in the Turtle Retina. Paper presented at ARVO '85.

28. Normann, R. A., and Perlman, I. The Effects of L-aspartate and L-glutamate on the Photoresponses of Red Cones in the Turtle Retina. Paper presented at ARVO '85.

29. Normann, R. A., Perlman, I., and Anderton, P. J. Cone to Horizontal Cell Synaptic Transmission: Effects of Continuous Superfusion of L-aspartate and L-glutamate on Horizontal Cells of the Turtle Retina. Paper presented at ARVO '86.

30. Normann, R. A., Pohl, H., Blackburn, C., Messinger, J., and Crandall, A. A Psychophysically Based System for Monitoring Ocular Light Scatter. Paper presented at ARVO '86.

31. Normann, R. A., Perlman, I., and Anderton, P. J. Depolarization of Horizontal Cells in the Turtle Retina by Superfusion with Low Calcium Solutions. Paper presented at ARVO '86.

32. Anderton, P. J., and Normann, R. A. Regenerative Hyperpolarization of Horizontal Cells and Cones in Turtle Retina Caused By Superfusions With Kynurenic Acid. Paper presented at the International Congress of Eye Research. Japan; 1986.

33. Normann, R. A., Perlman, I., and Anderton, P. J. The Effects of Acidic Amino Acids, Acidic Amino Acid Agonists and Divalent Cations on Cone to Horizontal Cell Synaptic Transmission. Paper presented at the International Congress of Eye Research. Japan; 1986.

34. Normann, R. A., and Lasater, E. Electrical Coupling Between Double Cones and Signal Propagation Along Single Cones in the Turtle Retina as Revealed by Double Electrode Patch Voltage Clamping. Invited lecture at the International Congress of Eye Research Satellite Symposium. Okazaki, Japan; 1986

35. Normann, R. A., and Lasater, E. Propagation of Signals from Cell Body to Pedicle in Turtle Cones. Paper presented at ARVO '87.

36. Normann, R. A., and Johnson, R. W. Signal Processing Strategies to Improve Cardiac Thermodilution Signal to Noise Ratios. Paper presented at the 9th annual conference of the IEEE Engineering in Medicine and Biology Society. 1987 November.

37. Johnson, R. W., and Normann, R. A. Modeling of Heat Transport Through the Heart. Paper presented at the 9th annual conference of the IEEE Engineering in Medicine and Biology Society. 1987 November.

38. Normann, R. A., and Lipetz, L. GABA, GABA agonists and antagonists have little effect on chromatic responses of chromaticity horizontal cells in the turtle retina. Paper presented at ARVO '88.

39. Campbell, P. K., Normann, R. A., and Horch, K. W. Noble Metal and Silicon Intracortical Implants: A Possible Approach to a Vision Prosthesis. Paper presented to the Society for Biomaterials. 1988. (Printed in Trans. Soc. Biomaterials V11:45; 1988).

40. Normann, R. A., Campbell, P. K., and Li, W. P. Silicon-Based Microstructures Suitable for Intracortical Electrical Stimulation. Paper presented at the 10th annual IEEE conference on Engineering in Medicine and Biology. 1988. (Printed in the Proceedings of the IEEE, pp. 714-715; 1988.)

41. Campbell, P. K., Normann, R. A., and Horch, K. W. Noble Metal Penetrating Cortical Stimulating Electrode Array: Preliminary Rresults. Paper presented at the 10th annual IEEE conference on Engineering in Medicine and Biology. 1988. (Printed in the Proceedings of the IEEE, pp. 716-717; 1988.)

42. Normann, R. A., and Perlman, I. Sensitivity Control in Luminosity Type Horizontal Cells in the Isolated Turtle Retina by Backgrounds and Bleaches. Paper presented at ARVO '89.

43. Perlman, I., and Normann, R. A. Excitatory and Inhibitory Synaptic Transmission in the Outer Plexiform Layer of Horizontal Cells in the Isolated Turtle Retina. Paper presented at ARVO '89.

44. Lipetz, L. E., Normann, R. A., Chandler, J., and Perlman, I. Prolonged Refrigeration Causes Detachment of the Turtle Retina from Pigment Epithelieum. Paper presented at ARVO '89.

45. Perlman, I., and Normann, R. A. The Effects of GABA and Related Drugs on Horizontal Cells in the Turtle Retina. Pflugers Arch. 1989.

46. Normann, R. A., Campbell, P. K., and Jones, K. E. A Silicon Based Electrode Array for Intracortical Stimulation: Structural and Electrical Properties. Paper presented at the 11th Annual IEEE Conference on Engineering in Medicine snd Biology. 1989. (Printed in the Proceedings of the IEEE, pp. 939-940; 1989.

47. Perlman, I., and Normann, R. A. Direct Action of GABA on L-Type Horizontal Cells in the Turtle Retina. Paper presented at ARVO '90.

48. Normann, R. A., and Perlman, I. A Physiologically Based Estimate of the Extracellular Calcium Concentration in the Isolated Turtle Retina. Paper presented at ARVO '90.

49. Campbell, P. K., Jones, K. E., and Normann, R. A. A 100 Electrode Intracortical Array: Structural Variability. Paper presented at the IEEE/EMBS Rocky Mountain Bioengineering Symposium. 1990 April.

50. Normann, R. A., and Perlman, I. GABA Produces Effects on Turtle Horizontal Cells which are Not Mimicked by Either Muscimol or Baclofin. Paper presented at the International Congress of Eye Research. Helsinki, Finland; 1990.

51. Normann, R. A. A Penetrating, Cortical Electrode Array: Design Considerations. Paper presented at the IEEE Conference: Systems, Man And Cybernetics. 1990 November. (Printed in Proceedings of the IEEE, pp. 918-920; 1990.)

52. Cha, K., Horch, K. W., and Normann, R. A. Simulation of a Phosphene Based Visual Prosthesis. Paper Presented at the IEEE Conference: Systems, Man And Cybernetics. 1990 November. (Printed in Proceedings of the IEEE, pp. 921-923; 1990.)

53. Jones, K. E., Campbell, P. K., and Normann R. A. Interelectrode Isolation in a Penetrating Intracortical Electrode Array. Paper presented at a meeting of the IEEE/EMBS. 1990 November. (Printed in Proceedings of the IEEE/EMBS 12:496-497; 1990.)

54. Rousche, P., and Normann, R. A. A System for Impact Insertion of a 100 Electrode Array into Cortical Tissue. Paper presented at a meeting of the IEEE/EMBS. 1990 November. (Printed in Proceedings of the IEEE/EMBS 12:494-495; 1990.)

55. Cha, K., Horch, K. T., and Normann, R. A. Studies of Visual Function with a Phosphene Simulator. Paper presented at a meeting of the IEEE/EMBS. 1990 November. (Printed in Proceedings of the IEEE/EMBS 12:2277-2278; 1990.)

56. Normann, R. A. Recent Progress in "Artificial Vision." Invited lecture at the Annual Meeting of SPIE (The Society of Photo-Optical Instrumentation Engineers). 1991. (Printed in SPIE Ophthalmic Technologies 1423:40-45; 1991.

57. Normann, R. A., Campbell, P. K., and Jones, K. E. Micromachined, Silicon Based Electrode Arrays for Electrical Stimulation of, or Recording from Cerebral Cortex. Paper presented at a Meeting of the IEEE/MEMS. 1991. (Printed in the Proceedings of the IEEE/MEMS, pp. 247-252; 1991.)

58. Normann, R. A., And Horch, K. W. Visual Cortical and Peripheral Nerve Interfaces. Invited lecture at the 22nd Neural Prosthesis Workshop, National Institute of Neurological Disorders and Stroke (NINDS) and National Institute on Deafness and Other Communication Disorders (NIDCD). Washington D.C.; 1991 October 22-24.

59. Sullivan, J. M., Perlman, I., and Normann, R. A. The Effects of Blocking of Voltage and Time Dependent Conductances in the OPL of the Turtle Retina. Paper presented at ARVO '91

60. Jones, K. E., and Normann, R. A. A Multiplexing/Demultiplexing System for Use with an Intracortical Electrode Array. Paper presented at a meeting of the IEEE/EMBS. 1992.

61. Nordhausen, C. T., Rousche, P. J., and Normann, R. A. A Method for Acute Cerebral Cortex Recording Using the Utah Intracortical Electrode Array. Paper presented at a meeting of the IEEE/EMBS. 1992.

62. Rousche, P. J., and Normann, R. A. A Cortical Auditory Prosthesis: Preliminary Considerations. Paper presented to the Bio. Mats. Eng. Soc. 1992.

63. Jones, K. E., and Normann, R. A. A Demultiplexing System for an Intracortical Electrode Array. Paper presented at the annual meeting of the BMES, 1992.

64. Christopher, C. A., and Normann, R. A. A Miniature Electrode Stimulator Used to Evaluate Chronic Biocompatibility of Stimulating Electrodes. Paper presented at the annual meeting of the BMES. 1992.

65. Ammermuler, J., Kolb, H., and Normann, R. A. Color Pathways in the Inner Plexiform Layer of the Turtle Retina. Paper presented at the International Congress of Eye Research. Stressa, Italy; 1992 September.

66. Cha, K., Horch, K., and Normann, R. A. Performance of Visually Guided Tasks Using a Pixelized Visual Sense. Paper presented at the International Congress of Eye Research. Stressa, Italy; 1992 September.

67. Perlman, I., Maynard, E., and Normann, R. A. Simplicity, Complexity and Variability of Ganglion Cell Responses in the Turtle Retina. Paper presented at ARVO '93.

68. Normann, R. A., Maynard, E., and Perlman, I. The Turtle Retinal Output: The Pattern of Ganglion Cell Responses to a Moving Bar of Light. Paper presented at ARVO '93.

69. Maynard, E., and Normann, R. A. Tracking Cat Eye Position: A Neuroprosthetic Application. Paper presented at the annual meeting of the IEEE-EMBS. 1993.

70. Shah, M. R., Phillips, R. P., and Normann, R. A. A Transcutaneous Power and Data Link for Neuroprosthetic Applications. Paper presented at the annual meeting of the IEEE-EMBS. 1993.

71. Nordhausen, C. T., Rousche, P. J., and Normann, R. A. Chronic Recording of Visually Evoked Responses Using the Utah Intracortical Electrode Array. Paper presented at the annual meeting of the BMES. 1993.

72. James, K. J., Normann, R. A. Semi-Quantitative Analysis Technique for Thin Film Adhesion. Paper presented at the annual meeting of the BMES. 1993.

73. Rousche, P. J., Nordhausen, C. T., and Normann, R. A. Neural Imaging of the Tonotopic Map of Cat Primary Auditory Cortex. Paper presented at the Society for Neuroscience meeting. 1994.

74. Nordhausen, C. T., Rousche, P. J., and Normann, R. A. Mapping of Cat Area Centralis with a 100 Microelectrode Array. Paper presented at the Soc. Neuroscience meeting. 1994.

75. Rousche, P. J., and Normann, R. A. The Cat as an Animal Model for Neuroprosthetic Design: Description of a Forced Two-choice Behavioral Protocol. Paper presented at the annual BMES meeting. 1994.

76. Shah, M. R., Phillips, R. P., and Normann, R. A. Printed Thin Film Coils for Cortical Neuroprosthetic Applications. Paper presented at the annual BMES meeting. 1994.

77. Maynard, E. M., and Normann, R. A. Multi-Unit Activity as Input to Neuroprosthetic Devices. Paper presented at the annual BMES meeting. 1994.

78. Johansson, T., Huber, R. J., and Normann, R. A. Progress Towards a Three Dimensional Silicon Retina. Paper presented at the annual BMES meeting. 1994.

79. Rousche, P., and Normann, R. Stimulation of Cat A1 with a 100-Elctrode Array. Paper presented at the Conference on Implant Audit Prostheses, Asilomar. 1995.

80. McDowell, C., Ammermuller, J., and Normann, R. A. Simultaneous Multi-Electrode, Multi-Unit Recordings of Ganglion Cell Responses to Full Field Chromatic Stimuli. Paper presented at the annual BMES meeting. 1994.

81. Nordhausen, C. T., Maynard, E. M., and Normann, R. A. Monocular and Binocular Units Mapped with a 100 Microelectrode Array in the Cat Striate Cortex. Paper presented at ARVO '95.

82. Rousche, P. J., Nordhausen, C. T., Maynard, E. M., Guillory, K. S., and Normann, R. A. Cortically Based Sensory Prostheses: Physiological Investigations. Paper presented at the annual BMES meeting. 1995.

83. James, K., Kovacs, G., Whitehurst, T., and Norman, R. A. The Use of Low Stress Silicon Nitride as a Biocompatible Insulator for Neuroprosthetic Applications. Paper presented at the annual BMES meeting. 1995

84. Rousche, P. J., Nordhausen, C. T., and Normann, R. A. Microstimulation of Auditory Cortex for a Potential Neuroprosthetic Using a 100-Electrode Array. Paper presented at the Soc. Neuroscience meeting. 1995.

85. McNaughton, T. G., Horch, K. W., and Normann, R. A. Chronically Implantable Intrafascicular Electrodes for Multiple Single Unit Recording in Feline Dorsal Rootlets. Paper presented at the Soc. Neuroscience meeting. 1995.

86. Normann, R., Maynard, E., Nordhausen, C., Rousche, P., and Guillory, S. A Silicon Based Multielectrode Array: The Foundation For A Cortically Based Visual Prosthetic. Paper presented at the JERMOV conference. Montpellier, France; 1996 October.

87. Warren, D., Hadfield, N., Rousche, P., Normann, R. Spatiotemporal Correlated Firing of V1 Neuron: Simultaneous Recordings from 16 Electrodes. Paper presented at the annual meeting of the Soc. Neuroscience. 1996.

88. Maynard, E., Hatsopoulos, N., Ojakangas, C., Acuna, B., Sanes, J., Norman, R., Donoghue, J. Simultaneous Recordings of Motor Cortical Neurons Allow Estimation of Movement Direction from Small Numbers of Neurons. Paper presented at the Soc. Neuroscience annual meeting. 1996.

89. Branner, A., Kolb, H., Normann, R. A 20 Channel Peripheral Nerve Interface: Recording and Stimulation in Mammalian Sciatic Nerve. Paper presented at the Soc. Neuroscience annual meeting. 1996.

90. Hadfield, N., Maynard, E., Normann, R. Advances in the Chronic Implantation of the Utah Intracortical Electrode Array. Paper given at the annual meeting of the Soc. Neuroscience. 1996.

91. Ammermuller, J., Shoham, S., Branner, A., Fernandez, E., and Normann, R. Representation of Color Information by a Small Network of Ganglion Cells in the Turtle Retina. Paper presented at ARVO '97.

92. Normann, R., Maynard, E., Rousche, P., Nordhausen, C., Warren, D., and Guillory, K. The Utah 100 Microelectrode Array: An Experimental Platform for a Cortically Based Vision Prosthesis. Paper presented at ARVO '97.

93. Warren, D., Maynard, E., and Normann, R. Background Cortical Activity: Correlated Firing of V1 Neurons in the Absence of Stimulation. Paper presented at ARVO '97.

94. Normann, R. A., Ammermuller, J., Osan, R., and Fernandez, E. Representations of Color, Form and Intensity by Populations of Turtle Retinal Ganglion Cells. Paper presented at the Soc. Neuroscience annual meeting. 1997.

95. Guillory, K. S., Shoham, S., Warren, D. J., Maynard, E. M., and Normann, R. A. Discrete Stimulus Classification from Multi-Channel Extracellular Recordings in Layer IV of Cat Primary Visual Cortex. Paper presented at the Soc. Neuroscience annual meeting. 1997.

96. Warren, D. J., Maynard, E. M., and Normann, R. A. Spatiotemporal Patterns of Spontaneous Activity in Cat Area 17. Paper presented at the annual meeting of the Soc. Neuroscience. 1997.

97. Branner, A., and Normann, R. A. Consequences of High Velocity Insertion of a Multielectrode Array into Peripheral Nerve. Paper presented at the Soc. Neuroscience annual meeting. 1997.

98. Shoham, S., Burr, R. B., Schmidt, R. H., Buzwell, H., and Normann, R. A. Functional MRI Study of Human Primary Motor Cortical Representations Following Traumatic Spinal Cord Injury. Paper presented at the annual meeting of the Soc. Neuroscience. 1997.

99. Shoham, S., Osan, R., Ammermuller, J., Branner, A., Fernandez, E., and Normann, R. The Classification of Spatial, Chromatic and Intensity Features of Simple Visual Stimuli by a Network of Retinal Ganglion Cells. IWANN'97, Canary Islands, June 4-6, 1997.

100. Normann, R., Ammermuller, J., Shoham, S., and Branner, A. Color and Intensity Information Representation by a Network of Turtle Retinal Ganglion Cells. ICNN'97, Houston, TX, June 9-12, 1997.

101. Guillory, K.S., Shoham, S., and Normann, R.A. Higher Order Characterization of Retinal Ganglion Cells Receptive Fields Using Principal Component Analysis. Presented at Society for Neurosciences, 1998.

102. Branner, A. and Normann, R.A. Enhanced Access to Sciatic Nerve Fibers Using and Array of Penetrating, Varying Length Electrodes. Presented at Society for Neurosciences, 1998.

103. Warren, D.J. and Normann, R. A. Variability of Neural Activity As a Result of Electrical Stimulation in Cat Primary Visual Cortex. Presented at Society for Neurosciences, 1998.

104. Normann, R. A., and Maynard, E. M. Physiological issues pertaining to cortically based artificial vision. Paper presented at the Japanese Research Congress. Beppu, Japan; January 20, 1998.

102. Normann, R. A., and Maynard, E. M. Recent Progress in Cortically Based Artificial Vision. ARVO '98.

103. Warren, D. J., Guillory, K. S., and Normann, R. A. Kindling Not Observed In Cat Visual Cortex. ARVO '98.

104. Rousche, P. J., Grieves, R. A., and Normann, R. A. Multielectrode Recordings in Monkey V1: Preliminary Testing for a Cortical Visual Prosthesis. Paper presented at ARVO '98.

105. Branner, A., Stein, R.B., and Normann, R.A. Selective and Graded Recruitment of Muscle Force with an Intrafascicular Multielectrode Array. Presented at Society for Neurosciences, 1999.

106. Shoham, S., Maynard, E.M. and Normann, R.A. Optimal Nonlinear Filtering for Directionally Tuned Neurons. Presented at Society for Neurosciences, 1999.

107. Warren, D.J. and Normann, R.A. Changes in Neural Firing Activity After Kindling in Cat Primary Visual Cortex. Presented at Society for Neurosciences, 1999.

108. Warren, D.J. and Normann, R.A. Stationariy of Receptive Field Characteristics with Non-Contextual Stimulation. Presented at ARVO, 1999.

109. Guillory, K.S., Shoham, S., and Normann, R.A. Coding Independence Between Neighboring Retinal Ganglion Cells. Presented at ARVO, 1999.

110. Clark, G.A., Normann, R.A., Tresco, et al. Neural Interfaces Laboratory. Presented at Society for Neurosciences, 2000.

111. Branner, A., Stein, R.B., and Normann, R.A. Chronic Implantation of the Utah Slant Array In Cat Sciatic Nerve. Presented at Society for Neurosciences, 2000.

112. Warren, D.J. and Normann, R.A. High Resolution Study of the Retinotopic Organization of Area 17 in the Cat. Presented at Society for Neurosciences, 2000.

113. Lehmkuhle, M, Maynard, E.M., Normann, R.A., and Lasataer, E.M. Multielectrode recordings from olfactory bulb. Presented at Society for Neurosciences, 2000.

114. Badi, A.N., Hillman, T. Shelton, C., and Normann, R.A. Anatomical Considerations for an VIII Nerve Auditory Prosthesis. Presented at Society for Neurosciences, 2000.

115. Shoham, S, Maynard, E.M., Fellows, M. R., Donoghue, J.P., and Normann, R.A. New Methods for Nonlinear Decoding of Multiple Neural Spike Trains. Presented at Society for Neurosciences, 2000.

116. Normann, R.A., Richardson, E., and Guillory, K.S. Retinal ganglion cell recording with a high density multi-electrode array. To be presented at ARVO 2001.

Note: Listing of Abstracts at scientific meetings was discontinued as of 2001.

RESEARCH FUNDING: R. A. Normann, Principal Investigator

1. College support to establish research effort upon arrival at the University of Utah (1979-1981): $20,000
2. University Research Committee (1980), Information Processing in the Vertebrate Retina: $4,450
3. Biomedical Research Support Grant (1980), Circadian Rhythms in the vertebrate Retina: $4,125
4. Deans Research Advisory Committee, Regional Variations in Receptive Field Size and Dendritic Field Size of Turtle Horizontal Cells (7/80 - 7/81): $10,111
5. Biomedical Research Support Grant (1981), A Self-Contained Device for Monitoring Cardiac Output: $5,000
6. Fight for Sight, Inc., support for graduate student (1980): $1,030
7. NIH (5/1/82 to 4/30/84), Electrophysiological Studies of the Vertebrate Retina: Three years total, ... $105,037
8. University Research Committee, A Self-Contained Device for Monitoring Cardiac Output (7/80-7/81): $5,000
9. Kistler Glass Fund, A Self-Contained Device for Monitoring Cardiac Output (5/81): $1,500
10. Donation from Deseret Co., Research on Cardiovascular Monitoring (6/82): $5,000
11. Deseret Co. (3/1/83 to 2/28/86), A Self-Contained System For The Monitoring of Cardiac Output: $159,222
12. NIH (6/86 to 6/89), Chromatic and Temporal Information Processing By Cone Photoreceptors: $300,588
13. Biomedical Research Support Grant (1987), Interactions between penetrating cortical electrodes: $5,000
14. Pfizer, Hospital Products Group (9/1/87 to 12/31/87), Basic research in cardiovascular monitoring: $13,320
15. National Science Foundation, A silicon based, three dimensional microsystem for stimulation of the visual cortex (6/88-5/91): $357,455

16. W. M. Keck Foundation, Artificial Vision (1/89-12/91): $130,000

17 University of Utah Research Committee, Diamond Dicing Saw (12/88): $15,000

18. National Science Foundation, Research Experiences for Undergraduates (Supplement to A silicon based microsystem for stimulation of the visual cortex (3/89-12/90): $10,000

19. Texaco Research Foundation, Evaluation of cortical electrode arrays built of monocrystaline silicon. (7/89): $20,000

20. National Science Foundation, Recording of Neural Activity from Sensory Cortex Using Silicon Based, Three Dimensional Electrode Arrays (7/90-12/92): $30,000

21. National Science Foundation, A Silicon Based, Three Dimensional Microsystem for Stimulation of the Visual Cortex (8/91-1/93): $336,000

22. (Donation) Texaco Research Foundation, Development of a Telemetry System for Artificial Vision Project (10/91): $20,000

23. (Donation) John Moran Trust, Support for Artificial Vision" (6/91): $120,000

24. (Donation) The William H. and Mattie Wattis Harris Foundation, Silicon Retina (10/90): $25,000

25. Whitaker Foundation Development Grant to Create an Academic Program in Biobased Engineering (6/93 to 6/98): $3,000,000

26. W. M. Keck Foundation, Visual Prosthesis Program - Phase II Human Acute Trials: Patterned Stimulation (1/94-1/97): $380,000

27. (Donation) John Moran Trust, Support for the John A Moran Laboratories for Applied Visual and Neural Sciences (4/94): $100,000

28. National Science Foundation, Establishing the Physiological Foundations for a Visual Prosthetic System: Electrical Stimulation Of The Macaque Visual Cortex With The Utah Intracortical Electrode Array (8/95-7/98): $349,611

29. State of Utah Center of Excellence Grant, Center for Neural Interfaces (6/95-5/96): $80,000

30. State of Utah Center of Excellence Grant, Center for Neural Interfaces (6/96-5/97): $130,000

31. State of Utah Center of Excellence Grant, Center for Neural Interfaces (6/97-5/98): $130,000

32. State of Utah Center of Excellence Grant, Center for Neural Interfaces (6/98-5/99): $140,000

33. Whitaker Foundation Development Grant to Create an Academic Program in Neural Engineering (6/98 to 6/00): $1,000,00

34. Research Fighting Blindness (1/1/99-12/31/99): $20,000

35. State of Utah Center of Excellence Grant, Center for Neural Interfaces (6/99-5/00): $150,000

36. National Institutes of Health, A Peripheral Nerve, Intrafascicular Multielectrode Array (1/1/00 –12/31/03) $1,263,673

37. The Wynn Charitable Foundation, Cortically Based Artificial Vision (2/01-2/02) $175,000

38. National Institutes of Health, Contract to develop 8th nerve auditory prosthesis (6/01-5/04) $1,068,278

39. National Institutes of Health, Multisite, Intrafascicular Stimulation For Stance (4/04-4/08) $2,048,000

Total amount of funded research as PI (1979-2004) $11,747,400

R. A. Normann is co-PI on these grants.

1. U.S.-Israel Binational Science Foundation, Information processing in the distal turtle retina, (10/1/91-9/30/94): $127,550
2. National Science Foundation, Acquisition of Equipment to Upgrade a Microfabrication Facility for Research and Teaching (9/15/95-8/31/98): $1,613,415
3. National Institutes of Health, Development of a Fully-Integrated, Biocompatible Micropower Chronic Neural Recording Array". $2,816,000
4. National Institutes of Health, CNS Response To Implanted Materials $1,868,000
5. National Institutes of Health, Electrode Array Reanimation of the Paralyzed Larynx". Total requested amount $411,000

Total amount of funded Co-PI research (1979-2004) $6,835,965

Total amount of funded research (1979-2004)..... .$18,583,365

PATENTS

1. Normann, R. A., inventor; University of Utah, assignee. A Self-Contained Device for Measuring Cardiac Output. U. S. Patent **4,576,182**. issued **1986 March 18.**
2. Silicon-Based Microelectrode Arrays for Cortical Stimulation. U.S. Patent Office, **5,215,088** issued **June 1, 1993.**
3. A Means for Inserting High-Density Electrode Arrays Into Cortical Tissues. U.S. Patent Office, **5,361,760** issued **November 8, 1994**
4. Cataract Replacement with Compliant Materials. Disclosure Filed.
5. A Three-Dimensional Electrode Array Using Glass as a Substrate. Disclosure Filed.
6. A Silicon Retina Based on a Three-Dimensional Silicon Architecture. Disclosure Filed.
7. A Three-Dimensional, Parallel Processing Computer Architecture. Disclosure Filed.
8. A Peripheral Nerve, 3-D, Intrafascicular Electrode Array. Disclosure Filed.

HONORS:

- University of Utah Research Award (1996): Awarded at University Commencement, 3 honored in 1996.

- Governor's Medal in Science and Technology (1996): Awarded for excellence in science.

- University of Utah, College of Engineering Patent Award (1995)

- Fellow, American Institute of Medical and Biological Engineers (inducted, 1995)

- Fellow, Biomedical Engineering Society (inducted, 2006)

- Invited and sponsored keynote lectures (1997-1999, haven't updated between 1999-2006):
  - German Ophthalmologcal Society, Berlin 1997
  - Japan Society for the Promotion of Science, "Research for the Future" Program. January 19-23, 1998, Beppu Japan
  - International symposium "International Symposium on Future of Intellectual Integrated Electronics" held in Sendai, Japan on March 14-17, (invitation declined)
  - IEEE Systems, Man, and Cybernetics Conference (SMC'99)" held in Tokyo, Japan on Oct.12-15, 1999.
  - CalTech, Neuroscience Program guest lecture, "The application of multielectrode arrays in basic and applied neuroscience research". Feb. 8, 1999
  - International Brain Research Organization meeting, "Chatting with Neural Ensembles in the Central and Peripheral Nervous Systems", Jerusalem, July 11-16, 1999.
  - NIH Workshop on "Intelligent Interfaces to the Brain", Washington, D.C. August, 1999.
  - American Neurological Assn, Chicago, Ill Oct. 2006

- Major consultant and study section participant, and major University service (haven't updated between 2001-2006)
  - NSF IGERT panels, 1998-1999
  - NIH SBIR reviewer, 1995-1999
  - Whitaker Foundation site visit committee
  - University of Utah Academic Vice President selection committee 1998
  - University of Utah, Incentive Seed Grant Program 1997-2001
  - University of Utah Conflict of Interest Committee 1999-2001
  - University of Utah Retention, Promotion and Tenure Task Force 1999-2001
  - University of Utah Academic Freedom Committee 1999-2001
  - College Retention, Promotion and Tenure Committee 2004-2006
  - University of Utah, Incentive Seed Grant Program 2004-2006

Invited Keynote Lectures by Richard A. Normann 2001-2006.

Note: These lectures were not recorded on my CV, so I have tried to recollect them from memory, from my Palm Pilot, from saved PowerPoint presentations, and from old emails. Some of the dates and the topics are, therefore, only approximate (but very close).

2001:

1) March15, "***RECENT ADVANCES IN NEUROPROSTHETIC THERAPIES: ARTIFICIAL VISION***" Natural & Artificial Intelligence Systems Organization, ISI International Congress, Dubai, UAE
2) May 18, "***VISUAL NEUROPROSTHETIC SYSTEMS BASED ON PARALLEL PROCESSING IN THE NERVOUS SYSTEM.***" ICASSP 2001, Bryce Canyon, UT, USA
3) June 20, "***APPLICATIONS OF MICROELECTRODE ARRAYS IN NEUROSCIENCE***" EU/NSF workshop on Bionics, Brussels, Belgium

2002:

1) April 1-4, "***MULTIPLE INPUT ACQUISITION OF SENSORY SIGNALS, AND MULTIPLE OUTPUT STIMULATION IN THE HIND LIMB OF THE CAT.***" Pucon Chile, Organized by Dr. Charles Gray
2) April 26, "***THE MAN OF PARTS: WHERE DO I LEAVE OFF AND MY MACHINES BEGIN***.", Utah Symposium in Science and Literature, Organized by Dr. Katherine Coles. Salt Lake City, UT, U.S.A.
3) June 6, "***CORTICALLY BASED ARTIFICIAL VISION: SYSTEMS AND SCIENCE***", The Eye and The Chip 2002: World Congress on Artificial Vision, Detroit, MI. U.S.A.
4) October 6-10, "***THE ADVANTAGES AND DISADVANTAGES OF RETINALLY AND CORTICALLY BASED VISION PROSTHESES.***" XV International Congress of Eye Research, Geneva, Switzerland
5) October 12-31, "***BIONICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM", "ARTIFICIAL VISION", "MULTIPLE INPUT ACQUISITION OF SENSORY SIGNALS, AND MULTIPLE OUTPUT STIMULATION IN THE HIND LIMB OF THE CAT.***" China Lecture Tour, Arranged by Vice President Hu of Changsha University. Gave five lectures in Beijing, Changsha, and Chungking

2003:

1) March 20, "***REPRESENTATIONS AND DYNAMICS OF REPRESENTATIONS OF SIMPLE VISUAL STIMULI BY ENSEMBLES OF NEURONS IN CAT VISUAL CORTEX STUDIED WITH A MICROELECTRODE ARRAY.***", IEEE EMBS Special Topic Conference on Neural Engineering, Capri, Italy, Organized by Dr. Metin Akay
2) June 11, "***MICROFABRICATED ELECTRODE ARRAYS FOR RESTORING LOST SENSORY AND MOTOR FUNCTIONS.***" IEEE Annual Meeting, Boston Mass, U.S.A.
3) July 4, "***BIONICS: NEW HUMAN ENGINEERED THERAPEUTIC APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM***", ESDA conference on Mechatronics London, England
4) July 17-22, "***EXPERIMENTAL STUDIES OF DIRECT AUDITORY NERVE STIMULATION VIA A PENETRATING ELECTRODE ARRAY.***" Conference on Implantable Auditory Prostheses, Asilomar, Calif., USA
5) October 21, "***FEASIBILITY OF AN INTRANEURAL AUDITORY PROSTHESIS STIMULATING ELECTRODE ARRAY."*** Neuroprosthesis Workshop, NINDS, NIH, Washington, DC

2004:

1) January 12, "***BIONICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM.*****",** ESDA conference on Mechatronics, Manchester, England.
2) Jan 28-Feb1, "***A STRATEGY FOR THE CONTROL OF MUSCLE FORCE IN CAT.*****"** Canadian Physiological Society Symposium Honoring Richard B. Stein, Silver Spur Resort, Canada
3) March 31-April 2, "***CONTROL BY MIND: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM.",*** University of Karlsrhue, Karlsrhue, Germany.
4) June 24, "***NEUROPROSTHETICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM*****",** Women's Town Club, Salt Lake City, Utah.
5) July 1, "***CORTICALLY BASED VISUAL PROSTHESIS: NEW ENGINEERING APPROACHES TO SIGHT RESTORATION***.", Retina International Society, Noordwijk Aan Zee, the Netherlands

2005:

1) March 3, "***BIONICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM.*****",** IEEE conference on BioMEMS, Monterey, Mexico
2) July 6, "***BIONICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM.*****"** Mitre Corp, Washington DC
3) August 4, "***PHYSIOLOGICAL ACTIVATION OF THE HIND LIMB MUSCLES OF THE ANESTHETIZED CAT USING THE UTAH SLANTED ELECTRODE ARRAY.***" IJCNN, Montreal, Canada
4) September 4, "***CONTROL OF SKELETAL MUSCLE FORCE WITH CURRENTS INJECTED VIA AN INTRAFASCICULAR, MICROELECTRODE ARRAY.***", EMBS, Shanghai, China
5) October 10, "***RESTORING LOST VISUAL FUNCTION BY DIRECT ELECTRICAL STIMULATION OF THE VISUAL REGIONS OF THE BRAIN.***", TATRC, Marina Del Rey, Calif, U.S.A.

2006 (invitations to deliver keynotes/plenarys at upcoming meetings)

1) June 2-4, Osaka University, Japan, Organized by Dr. Tetsu Yagi
2) July 9-11, Kunming Institute of Zoology of the Chinese Academy of Science, China, Organized by Dr. Jiping He
3) June 19-21,10th Biennial Mechatronics Forum Conference to be held at the Penn State Great Valley campus on 2006

I suspect that there were a number of other lectures I delivered that I have lost complete track of. I have also been invited to a number of Universities to deliver lectures, but I also have not recorded many of these (those that I have been able to recover from my list of power point presentations are listed below). The above list represents major keynote or plenary lectures.

Invited Lectures (Not Keynotes)

2001

1) January 19, **"*REPRESENTATIONS OF SPATIAL AND INTENSITY INFORMATION BY ENSEMBLES OF RETINAL GANGLION CELLS AND CORTICAL SINGLE UNITS.*",** George Mason University, Organized by Dr. Steven Shiff.

2) January 20, "***REPRESENTATIONS OF SPATIAL INFORMATION BY ENSEMBLES OF CORTICAL SINGLE UNITS"*,** Festschrift for Dr. Frank S. Werblin, University of California, Berkeley, California

3) April 19, "***THE VISUAL PATHWAYS: PHYSIOLOGY AND ANATOMY",*** Sandia National laboratories, Albuquerque, New Mexico

4) October 10, "***NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM: ARTIFICIAL VISION***", University of Alberta, Edmonton, Alberta

2002

1) January 23, "***NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM: ARTIFICIAL VISION***", University of Minnesota,

2003

1) January 14, **"*BIOENGINEERING AT THE UNIVERSITY OF UTAH*",** Forum on Innovation and Entrepreneurship in Biomedical Engineering Education, San Francisco, Calif.

2) Feb 17-22, "***A NEW VIEW OF THE BRAIN: UNDERSTANDING BRAIN FUNCTION USING MICROELECTRODE ARRAYS.", "BIONICS: NEW THERAPIES FOR DISORDERS OF THE NERVOUS SYSTEM.", "RESTORING LOST VISUAL FUNCTION BY DIRECT ELECTRICAL STIMULATION OF THE VISUAL REGIONS OF THE BRAIN*.",** Pennsylvania State University at Great Valley, Organized by Dr. David Russell.

3) May 19, "***NEUROPROSTHETICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM***.", Case Western Reserve University

4) May 22, "***BIONICS: NEW ENGINEERING APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM***." University of Washington, Seattle, Washington.

5) May 23, "***NEW DEVELOPMENTS AT THE BRAIN-COMPUTER INTERFACE: TACKLING DISORDERS OF THE NERVOUS SYSTEM WITH MICROELECTRODE ARRAYS***.", Microsoft, Redmond, Washington

2004

1) August 30, "***FROM THE CENTER FOR NEURAL INTERFACES TO CYBERKINETICS, INC.:NEW BIONIC APPROACHES TO DISORDERS OF THE NERVOUS SYSTEM*.",** Delivered at the University of Utah's President Michael Young Symposium on Entrepreneurial Engineering.

2005

1) November 10, "***IDEAS INTO DOLLARS: THE ENTREPRENEURIAL PROCESS AT THE UNIVERSITY OF UTAH***.", Delivered to the Subcommittee on Appropriations of the Utah State Legislature.