

Carver A. Mead

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Education

<i>Years</i>	<i>University</i>	<i>Department</i>	<i>Degree</i>
1960	The California Institute of Technology	Electrical Engineering	Ph.D.
1957	The California Institute of Technology	Electrical Engineering	M.S.
1956	The California Institute of Technology	Electrical Engineering	B.S.

Appointments

1999–	Gordon and Betty Moore Professor of Engineering and Applied Science, Emeritus
1992–1999	Gordon and Betty Moore Professor of Engineering and Applied Science
1980–1992	Gordon and Betty Moore Professor of Computer Science
1977–1980	Professor of Computer Science and Electrical Engineering
1967–1977	Professor
1962–1967	Associate Professor
1959–1962	Assistant Professor
1958–1959	Instructor

Scientific and Professional Societies

Fellow, American Physical Society
Member, National Academy of Engineering
Member, National Academy of Sciences
Foreign Member, Royal Swedish Academy of Engineering Sciences
Life Fellow, Franklin Institute
Fellow, American Academy of Arts and Sciences
Life Fellow, The Institute of Electrical and Electronics Engineers, Inc.
Fellow, National Academy of Inventors (NAI)

Honors and Awards

2015

Fellow, National Academy of Inventors (NAI) for his “unparalleled commitment to excellence in academic invention.”

2011

The Frontiers of Knowledge Award in the Category of Information and Communication Technologies, presented by Banco Bilbao Vizcaya Argentaria (BBVA), for being “the most influential thinker and pioneer” of the silicon age and for enabling “the development of the billion-transistor processors that drive the electronic devices---for example, in laptops, tablets, smartphones, DVD players---ubiquitous in our daily lives.”

2009

Inductee, National Inventors Hall of Fame.

2003

The National Medal of Technology, the nation’s highest honor for technological innovation, awarded by President George W. Bush. Mead was presented the award "for pioneering contributions to the microelectronics field, that include spearheading the development of tools and techniques for modern integrated-circuit design, laying the foundation for fabless semiconductor companies, catalyzing the electronic-design automation field, training generations of engineers that have made the United States the world leader in microelectronics technology, and founding more than 20 companies including Actel Corporation, Silicon Compilers, Synaptics, and Sonic Innovations.”

The Founders Award, National Academy of Engineering, for “visionary contributions in the field of microelectronics, including VLSI technology and computational neural systems.”

2001

The Dickson Prize in Science, awarded by Carnegie Mellon University, for “pioneering inventions and work that has helped to power the information age.”

1999

The Lemelson-MIT Award, presented by the Lemelson Foundation and the Massachusetts Institute of Technology, “For his many contributions to the field of microelectronics, which have led to a new business model for the industry and enabled a new wave of innovation in information technology.”

1997

Allen Newell Award, awarded by the Association for Computing Machinery (ACM), “For career contributions within the field of computer science, and for contributions bridging computer science and other disciplines.”

1996

Phil Kaufman Award, presented by Electronic Design Automation Companies (EDAC), “For innovative contributions to design tool technology of benefit to electronic systems and IC designers.”

IEEE John Von Neumann Medal, The Institute of Electrical and Electronics Engineers, “For leadership and innovative contributions to VLSI and creative microelectronic structures.”

1994

Secretary of the Navy Captain Robert Dexter Conrad Award, presented by Department of the Navy, “In honor of the Navy’s highest recognition of scientific achievement.”

1992

Award for Outstanding Research, International Neural Network Society (INNS).

1991

Honorary Degree, Doctor of Science, presented by The University of Southern California, “In recognition of distinguished achievement.”

1990

Best Paper Award, IEEE Signal Processing Society, “For the paper co-authored with Richard F. Lyon, entitled ‘An Analog Electronic Cochlea’.”

Walker-Ames Distinguished Visiting Professor, University of Washington.

Citation for Exceptional Contributions to Science, Technology and Education, presented by Exploratorium, “For visionary contributions to the fields of microelectronics and computer science, and for encouraging the advancement of science and technology through his distinguished role as a teacher.”

1987

Walter B. Wriston Public Policy Award, presented by the Hudson Institute, “For his role as an innovator and visionary thinker in the fields of technology and electronics.”

Honorary Doctorate, The University of Lund, “In recognition of his breakthrough in the development of structured methods for construction of microelectronic systems, and his enthusiastic work in spreading this technology.”

1985

The Harry Goode Memorial Award, presented by The American Federation of Information Processing Societies, “In recognition of his pioneering contributions to the research and education of very large scale integration (VLSI) design.”

The John Price Wetherhill Medal (with Lynn Conway), presented by the Board of Managers of The Franklin Institute, “In consideration of the major impact of their method of obtaining silicon chips in small quantities at reasonable cost.”

1984

Harold Pender Award, presented by The Faculty of the Moore School of Engineering, University of Pennsylvania, “For his insight into the potential of VLSI, for his development of CAD techniques for VLSI technology, for his co-authoring of the most respected VLSI textbook to date, and for his contributions to the state-of-the-art of this field.”

IEEE Centennial Medal, presented by The Institute of Electrical and Electronics Engineers, “For extraordinary achievement.”

1981

The Electronics Achievement Award, shared with Lynn Conway, presented by the Editors of Electronics Magazine, “For their work in structuring the methodology of the design of very large scale integrated circuits, summed up in the basic textbook on the subject, *Introduction to VLSI Systems*.”

1971

T.D. Callinan Award, presented by The Electrochemical Society, “In recognition of an outstanding contribution to the literature of dielectrics.”

Patents

1. Diorio, Christopher J. and Mead, Carver A., “pMOS Analog EEPROM cell,” U.S. Patent No. 6,452,835 B1, issued September 17, 2002. (Continuation of U.S. Patent no. 5,898,613, issued April 27, 1999.)
2. Diorio, Christopher J. and Mead, Carver A., “pMOS EEPROM nonvolatile data storage,” U.S. Patent No. 6,144,581, issued November 7, 2000.
3. Diorio, Christopher J. and Mead, Carver A., “Semiconductor structure for long-term learning,” U.S. Patent No. 6,125,053, issued September 26, 2000.
4. Mead, Carver A. and Delbruck, Tobias, “Sense amplifier for high-density imaging array,” U.S. Patent No. 6,097,432, issued August 1, 2000.
5. Mead, Carver A., Delbruck, Tobi, and Chi, Min-Hwa, “Capacitive coupled bipolar active pixel imager having overflow protection and electronic shutter,” U.S. Patent No. 6,088,058, issued July 11, 2000.
6. Stockham, Jr., Thomas G., Chabries, Douglas M., and Mead, Carver A., “Hearing aid device incorporating signal processing techniques,” U.S. Patent No. 6,072,885, issued June 6, 2000.
7. Mead, Carver A., Chabries, Douglas M., and Davis, Keith L., “Digital hearing aid using differential signal representations,” U.S. Patent No. 6,044,162, issued March 28, 2000.
8. Nise, Benjamin E., Mead, Carver A., and Fang, Xialoing, “Passive switched capacitor delta analog-to-digital converter with programmable gain control,” U.S. Patent No. 5,995,036, issued November 30, 1999.
9. Diorio, Christopher J., Hasler, Paul E., Minch, Bradley A., and Mead, Carver A., “Hole impact ionization mechanism of hot electron injection and four-terminal FET semiconductor structure for long-term learning,” U.S. Patent No. 5,990,512, issued November 23, 1999.

10. Minch, Bradley A., Hasler, Paul E., Diorio, Christopher J., and Mead, Carver A., "Autozeroing floating-gate amplifier," U.S. Patent No. 5,986,927, issued November 16, 1999.
11. Bergemont, Albert, Chi, Min-Hwa, Haggag, Hosam, Mead, Carver, "Capacitor-coupled bipolar active pixel sensor with integrated electronic shutter," U.S. Patent No. 5,932,873, issued August 3, 1999.
12. Diorio, Christopher J., Hasler, Paul E., Minch, Bradley A., and Mead, Carver A., "Method for implementing a learning function," U.S. Patent No. 5,914,894, issued June 22, 1999.
13. Diorio, Christopher J. and Mead, Carver A., "pMOS analog EEPROM cell," U.S. Patent No. 5,898,613, issued April 27, 1999.
14. Minch, Bradley A., Hasler, Paul E., Diorio, Christopher J., and Mead, Carver A., "Autozeroing floating gate amplifier," U.S. Patent No. 5,875,126, issued February 23, 1999.
15. Mead, Carver A. and Delbruck, Tobias, "Sense amplifier for high-density imaging array," U.S. Patent No. 5,844,265, issued December 1, 1998.
16. Delbruck, Tobias and Mead, Carver A., "Correlated double sampling circuit," U.S. Patent No. 5,838,176, issued November 17, 1998.
17. Bergemont, Albert, Mead, Carver A., Chi, Min-Hwa, and Haggag, Hosam, "Method of manufacturing a thin poly, capacitor coupled contactless imager with high resolution and wide dynamic range," U.S. Patent No. 5,837,574, issued November 17, 1998.
18. Diorio, Christopher J., Hasler, Paul E., Minch, Bradley A., and Mead, Carver A., "Three-terminal silicon synaptic device," U.S. Patent No. 5,825,063, issued October 20, 1998.
19. Chi, Min-Hwa, Bergemont, Albert, Mead, Carver, "Method of making a contactless capacitor-coupled bipolar active pixel sensor with integrated electronic shutter," U.S. Patent No. 5,776,795, issued July 7, 1998.
20. Mead, Carver A. and Faggin, Federico, "Integrating imaging system with phototransistor having wide dynamic range," U.S. Patent No. 5,763,909, issued June 9, 1998.
21. Chi, Min-Hwa, Bergemont, Albert, Mead, Carver, "Contactless capacitor-coupled bipolar active pixel sensor with integrated electronic shutter," U.S. Patent No. 5,734,191, issued March 31, 1998.
22. LeMoncheck, John, Allen, Timothy P., Steinbach, Gunter, and Mead, Carver A., "Writable analog reference voltage storage device," U.S. Patent No. 5,629,891, issued May 13, 1997.
23. Diorio, Christopher J., Hasler, Paul E., Minch, Bradley A., and Mead, Carver A., "Semiconductor structure for long term learning," U.S. Patent No. 5,627,392, issued May 6, 1997.
24. Bergemont, Albert, Mead, Carver A., Chi, Min-Hwa, and Haggag, Hosam, "Method of manufacturing a capacitor coupled contactless imager with high resolution and wide dynamic range," U.S. Patent No. 5,576,237, issued November 19, 1996.
25. Bergemont, Albert, Mead, Carver A., Chi, Min-Hwa, and Haggag, Hosam, "Base capacitor coupled photosensor with emitter tunnel oxide for very wide dynamic range in a contactless imaging array," U.S. Patent No. 5,566,044, issued October 15, 1996.
26. Bergemont, Albert, Mead, Carver A., Chi, Min-Hwa, and Haggag, Hosam, "Capacitor coupled contactless imager with high resolution and wide dynamic range," U.S. Patent No. 5,552,619, issued September 3, 1996.
27. LeMoncheck, Allen, Timothy P., Steinbach, Gunter, and Mead, Carver A., "Writable analog reference voltage storage device," U.S. Patent No. 5,541,878, issued July 30, 1996.
28. Mead, Carver A., Wolf, Ralph, and Allen, Timothy P., "Paintbrush stylus for capacitive touch sensor pad," U.S. Patent No. 5,488,204, issued January 30, 1996.
29. Sarpeshkar, Rahul and Mead, Carver A., "CMOS low-power, wide-linear-range, well-input differential and transconductance amplifiers," U.S. Patent No. 5,463,348, issued October 31, 1995.
30. Steinbach, Gunter, Allen, Timothy P., and Mead, Carver A., "Adaptive analog minimum/maximum selector and subtractor circuit," U.S. Patent No. 5,408,194, issued April 18, 1995.
31. Delbruck, Tobias and Mead, Carver A., "Adaptive photoreceptor including adaptive element for long-time-constant continuous adaptation with low offset and insensitivity to light," U.S. Patent No. 5,376,813, issued December 27, 1994.

32. Allen, Timothy P., Anderson, Janeen D. W., Mead, Carver A., Faggin, Federico, Platt, John C., and Wall, Michael F., "Electrically adaptable neural network with post-processing circuitry," U.S. Patent No. 5,331,215, issued July 19, 1994.
33. Mead, Carver A. and Faggin, Federico, "Integrating imaging system having wide dynamic range with sample/hold circuits," U.S. Patent No. 5,324,958, issued June 28, 1994.
34. Lyon, Richard F., Delbruck, Tobias, and Mead, Carver A., "Circuits for wide input range analog rectification and correlation," U.S. Patent No. 5,319,268, issued June 7, 1994.
35. Mead, Carver A., Anderson, Janeen D. W., and Platt, John C., "Continuous synaptic weight update mechanism," U.S. Patent No. 5,303,329, issued April 12, 1994.
36. Mead, Carver A., "High-density photosensor and contactless imaging array having wide dynamic range," U.S. Patent No. 5,289,023, issued February 22, 1994.
37. Mead, Carver A. and Faggin, Federico, "Sense amplifier," U.S. Patent No. 5,276,407, issued January 4, 1994.
38. Mead, Carver A. and Faggin, Federico, "Integrating photosensor and imaging system having wide dynamic range with varactors," U.S. Patent No. 5,260,592, issued November 9, 1993.
39. Allen, Timothy P., Greenblatt, Adam K., Mead, Carver A., and Anderson, Janeen D. W., "Writable analog reference voltage storage device," U.S. Patent No. 5,243,554, issued September 7, 1993.
40. Platt, John C., Anderson, Janeen D. W., and Mead, Carver A., "Synaptic element including weight-storage and weight-adjustment circuit," U.S. Patent No. 5,204,549, issued April 20, 1993.
41. Allen, Timothy P., Greenblatt, Adam K., Mead, Carver A., and Anderson, Janeen D. W., "Writable analog reference voltage storage device," U.S. Patent No. 5,166,562, issued November 24, 1992.
42. Platt, John C., Wall, Michael F., Gribble, Glenn E., and Mead, Carver A., "Circuits for linear conversion between currents and voltages," U.S. Patent No. 5,165,054, issued November 17, 1992.
43. Anderson, Janeen D. W., Mead, Carver A., Allen, Timothy P., and Wall, Michael F., "Adaptable MOS current mirror," U.S. Patent No. 5,160,899, issued November 3, 1992.
44. Anderson, Janeen D. W., Mead, Carver A., Allen, Timothy P., and Wall, Michael F., "CMOS winner-take all circuit with offset adaptation," U.S. Patent No. 5,146,106, issued September 8, 1992.
45. Platt, John C., Wall, Michael F., Gribble, Glenn E., and Mead, Carver A., "Circuits for linear conversion between voltages and currents," U.S. Patent No. 5,126,685, issued June 30, 1992.
46. Mead, Carver A., Faggin, Federico, Allen, Timothy P., and Anderson, Janeen D. W., "Synaptic element and array," U.S. Patent No. 5,120,996, issued June 9, 1992.
47. Anderson, Janeen D. W., Mead, Carver A., Allen, Timothy P., and Wall, Michael F., "CMOS current mirror with offset adaptation," U.S. Patent No. 5,119,038, issued June 2, 1992.
48. Mead, Carver A. and Allen, Timothy P., "CMOS amplifier with offset adaptation," U.S. Patent No. 5,109,261, issued April 28, 1992.
49. Platt, John C., Wall, Michael F., Gribble, Glenn E., and Mead, Carver A., "Linear, continuous-time, two quadrant multiplier," U.S. Patent No. 5,107,149, issued April 21, 1992.
50. Sivilotti, Massimo and Mead, Carver A., "CMOS single phase registers," U.S. Patent No. 5,103,116, issued April 7, 1992.
51. Delbruck, Tobias and Mead, Carver A., "Subthreshold MOS circuits for correlating analog input voltages," U.S. Patent No. 5,099,156, issued March 24, 1992.
52. Mead, Carver A. and Faggin, Federico, "Integrating photosensor and imaging system having wide dynamic range," U.S. Patent No. 5,097,305, issued March 17, 1992.
53. Mead, Carver A., "Subthreshold CMOS amplifier with wide input voltage range," U.S. Patent No. 5,095,284, issued March 10, 1992.
54. Mead, Carver A., Allen, Timothy P., Faggin, Federico, and Anderson, Janeen D. W., "Synaptic element and array," U.S. Patent No. 5,083,044, issued January 21, 1992.
55. Mead, Carver A. and Allen, Timothy P., "Adaptable current mirror," U.S. Patent No. 5,073,759, issued December 17, 1991.
56. Mead, Carver A. and Allen, Timothy P., "CMOS amplifier with offset adaptation," U.S. Patent No. 5,068,622, issued November 26, 1991.

57. Anderson, Janeen D. W., Mead, Carver A., Allen, Timothy P., and Wall, Michael F., "CMOS amplifier with offset adaptation," U.S. Patent No. 5,059,920, issued October 22, 1991.
58. Mead, Carver A., Lazzaro, John, Mahowald, M. A., and Ryckebusch, Sylvie, "Winner-take-all circuits for neural computing systems," U.S. Patent No. 5,059,814, issued October 22, 1991.
59. Mead, Carver A. and Allen, Timothy P., "Adaptable CMOS winner-take all circuit," U.S. Patent No. 5,049,758, issued September 17, 1991.
60. Mead, Carver A., Allen, Timothy P., and Faggin, Federico, "Dynamic synapse for neural network," U.S. Patent No. 4,962,342, issued October 9, 1990.
61. Anderson, Janeen D. W. and Mead, Carver A., "MOS device for long-term learning," U.S. Patent No. 4,953,928, issued September 4, 1990.
62. Mead, Carver A. and Allen, Timothy P., "Subthreshold CMOS amplifier with offset adaptation," U.S. Patent No. 4,935,702, issued June 19, 1990.
63. Mead, Carver A. and Allen, Timothy P., "Scanning method and apparatus for current signals having large dynamic range," U.S. Patent No. 4,876,534, issued October 24, 1989.
64. Mead, Carver A., Mahowald, Michelle A., and Sivilotti, Massimo A., "Integrated sensor and processor for visual images," U.S. Patent No. 4,786,818, issued November 22, 1988.
65. Mead, Carver A. and Lyon, Richard F., "Electronically variable active analog delay line," U.S. Patent No. 4,771,196, issued September 13, 1988.
66. Mead, Carver, Shen, Cecilia, "Electrically erasable programmable logic array (EEPLA)," U.S. Patent No. 4,745,579, issued May 17, 1988.
67. Wawrzynek, John C. and Mead, Carver A., "Electronic system for synthesizing and combining voices of musical instruments," U.S. Patent No. 4,736,663, issued April 12, 1988.
68. Mead, Carver A., Wawrzynek, John C., and Lin, Tzu-Mu, "Electronic musical instrument," U.S. Patent No. 4,736,333, issued April 5, 1988.
69. Mead, Carver A. and Wawrzynek, John C., "CMOS logic circuit," U.S. Patent No. 4,716,312, issued December 29, 1987.
70. Tanner, John E. and Mead, Carver A., "Correlating optical motion detector," U.S. Patent No. 4,631,400, issued December 23, 1986.
71. Mead, Carver A., "High level control processor," U.S. Patent No. 4,099,230, issued July 4, 1978.
72. Mead, Carver, "Processor which sequences externally of a central processor," U.S. Patent No. 3,959,774, issued May 25, 1976.
73. Goldman, Arnold J., Kurtin, Stephen L., Mead, Carver A., "Electronic text display and processing system," U.S. Patent No. 3,810,107, issued May 7, 1974.
74. Mead, Carver A., "Logic system," U.S. Patent No. 3,803,587, issued April 9, 1974.
75. Goldman, Arnold J., Kurtin, Stephen L., Mead, Carver A., "Electronic text display system which simulates a typewriter," U.S. Patent No. 3,786,429, issued January 15, 1974.
76. Mead, Carver A. and McCaldin, James O., "Electroluminescent device," U.S. Patent No. 3,786,315, issued January 15, 1974.
77. Jenkins, Robert, Mead, Carver A., McCaldin, James, "Ohmic contact to zinc sulfide devices," U.S. Patent No. 3,780,427, issued December 25, 1973.
78. Mead, Carver A. and Kurtin, Stephen, "Thermometer probe," U.S. Patent No. 3,678,751, issued July 25, 1972.
79. Mead, Carver A., "Integrated circuit character generator," U.S. Patent No. 3,656,146, issued April 11, 1972.
80. Mead, Carver A. and McCaldin, James O., "Method for processing semiconductors," U.S. Patent No. 3,650,823, issued March 21, 1972.
81. Jenkins, Robert, Mead, Carver A., McCaldin, James, "Ohmic contact to zinc sulfide devices," U.S. Patent No. 3,614,551, issued October 19, 1971.
82. Kurtin, Stephen L. and Mead, Carver A., "Disposable body temperature sensor," U.S. Patent No. 3,603,150, issued September 7, 1971.

Publications

1. Isi, Maximiliano, Weinstein, A.J., Mead, C., and Pitkin, M. **Detecting Beyond-Einstein Polarizations of Continuous Gravitational Waves**, *Physical Review D*, vol. 91(8), pp. 082002, April, 2015; arXiv:1502.00333v1 [gr-qc], Cornell University Library, February 2, 2015.
2. Mead, C., **Gravitational Waves in G4v**, arXiv:1503.04866v1 [gr-qc], Cornell University Library, March 16, 2015.
3. Mead, C., **The nature of light: What are photons?** *Proc. SPIE*, vol. 883202, October, 2013; doi: 10.1117/12.2046381; <http://dx.doi.org/10.1117/12.2046381>
4. Mead, C., **The evolution of technology**. In: 2013 IEEE International Solid-State Circuits Conference Digest of Technical Papers (ISSCC), pp. 26, 2013.
5. Mead, C., **Neuromorphic Engineering: Overview and Potential**. In: 2005 IEEE International Joint Conference on Neural Networks. IJCNN '05. Proceedings. Vol. 5, IEEE , Piscataway, NJ, p. 3334, 2005.
6. Mead, C., **The Evolution of Electronic Photography**. In: Final program and proceedings : IS & T's PICS Conference, 54th Annual conference, April 22-25, 2001, the Queen Elizabeth Hotel, Montreal, Quebec, Canada. Society for Imaging Science and Technology , Springfield, VA, p. 2, 2001.
7. Mead, C., **Collective Electrodynamics**, Cambridge, MA: The MIT Press, 2000.
8. Watts, L, Lyon, R. F., and Mead, C., **A Bidirectional Analog VLSI Cochlear Model**. In: Advanced research in VLSI : proceedings of the 1991 University of California/Santa Cruz conference. MIT Press , Cambridge, MA, pp. 153-162, 1999.
9. Mead, C., **Collective Electrodynamics I**. In: Feynman and computation: exploring the limits of computers. Perseus Books, Reading, MA, pp. 29-43, 1999.
10. Mead, C., **Feynman as a colleague**. In: Feynman and computation: exploring the limits of computers. Perseus Books, Reading, MA, pp. 21-28, 1999.
11. Mead, C., **Life Without Bits**. In: Talking back to the machine: computers and human aspiration. Copernicus , New York, NY, pp. 15-21, 1999.
12. Mead, C., **Scaling of MOS Technology to Submicrometer Feature Sizes**. In: Feynman and computation: exploring the limits of computers. Perseus Books, Reading, MA, pp. 93-115, 1999.
13. Yadid-Pecht, O., Fossum, E., and Mead, C., **Active-Pixel Sensors With "Winner-Take-All" Mode**, *NASA Tech Briefs*, 22, Jet Propulsion Laboratory, Pasadena, CA, 1998.
14. Hasler, P., Andreou, A.G., Diorio, C., Minch, B.A., and Mead, C., **Impact Ionization and Hot-electron Injection Derived Consistently from Boltzmann Transport**, *VLSI Design*, vol. 8, pp. 455-461, 1998.
15. Diorio, C., Hasler, P. and Minch, B.A. et al. **Floating-Gate MOS Synapse Transistors**. In: Neuromorphic Systems Engineering. Kluwer international series in engineering and computer science. Analog circuits and signal processing. Vol.4. No.SECS 447. Kluwer Academic, Boston, pp. 315-337, 1998.
16. Sarpeshkar, R., Lyon, R.F., and Mead, C. **A Low-Power Wide-Dynamic-Range Analog VLSI Cochlea**. *Analog Integrated Circuits and Signal Processing*, 16 (3). pp. 245-274, 1998.
17. Sarpeshkar, R., Lyon, R.F., and Mead, C. **A Low-Power Wide-Linear-Range Transconductive Amplifier**. In: Neuromorphic Systems Engineering: Neural Networks in Silicon. Springer International Series in Engineering and Computer Science. No.447. Kluwer Academic, Boston, MA, pp. 267-313, 1998.
18. Sarpeshkar, R., Lyon, R.F., and Mead, C. **A Low-Power Wide-Dynamic-Range Analog VLSI Cochlea**. In: Neuromorphic Systems Engineering: Neural Networks in Silicon. Springer Inter-

- national Series in Engineering and Computer Science. No.447. Kluwer Academic, Boston, MA, pp. 49-103, 1998.
19. Diorio, C., Hasler, P., Minch, B., and Mead, C., **A Floating-gate MOS Learning Array with Locally Computed Weight Updates**, *IEEE Transactions on Electron Devices*, vol. 44, pp. 2281–2289, December, 1997.
 20. Mead, C., **Collective Electrodynamics I**, *Proceedings of the National Academy of Sciences*, vol. 94, pp. 6013–6018, June, 1997.
 21. Chi, M-H., Delbrück, T., Mascarenhas, N., Bergemont, A., and Mead, C., **A high resolution CMOS imager with active pixel using capacitively coupled bipolar operation**, *Proceedings of 1997 International Symposium on VLSI Technology, Systems, and Applications*, Hsinchu, Taiwan, 1997, pp. 58–61.
 22. Diorio, C., Hasler, P., Minch, B.A., and Mead, C., **A Complementary Pair of Four-Terminal Silicon Synapses**, *Analog Integrated Circuits and Signal Processing*, vol. 13, pp. 153–166, 1997.
 23. Sarpeshkar, R., Lyon, R., and Mead, C., **A Low-Power Wide-Linear-Range Transconductance Amplifier**, *Analog Integrated Circuits and Signal Processing*, vol. 13, pp. 123–151, 1997.
 24. Diorio, C., Hasler, P., Minch, B.A., and Mead, C., **A Single-Transistor Silicon Synapse**, *IEEE Transactions on Electron Devices*, vol. 43, pp. 1972–1980, November, 1996.
 25. Liu, S-C., and Mead, C., **Continuous-Time Adaptive Delay System**, *IEEE Circuits and Systems*, vol. 2, pp. 744–751, November, 1996.
 26. Sarpeshkar, R., Lyon, R.F., and Mead, C.A., **An Analog VLSI Cochlea with New Transconductance Amplifiers and Nonlinear Gain Control**, *Proceedings of the 1996 IEEE International Symposium on Circuits and Systems*, Atlanta, GA, vol. 3, pp. 292–295, May, 1996.
 27. Sarpeshkar, R., Lyon, R.F., and Mead, C., **Nonvolatile Correction of Q-offsets and Instabilities in Cochlear Filters**, *Proceedings of the 1996 IEEE International Symposium on Circuits and Systems*, Atlanta, GA, vol. 3, pp. 329–332, May, 1996.
 28. Hasler, P., Minch, B.A., Diorio, C., and Mead, C.A., **An Autozeroing Amplifier using pFET Hot-Electron Injection**, *Proceedings of the 1996 IEEE International Symposium on Circuits and Systems*, vol. 3, pp. 325–328, 1996.
 29. Minch, B.A., Diorio, C., Hasler, P., and Mead, C.A., **The Matching of Small Capacitors for Analog VLSI**, *Proceedings of the 1996 IEEE International Symposium on Circuits and Systems*, vol. 1, pp. 239–241, 1996.
 30. Minch, B.A., Diorio, C., Hasler, P., and Mead, C., **Translinear Circuits using Subthreshold Floating-Gate MOS Transistors**, *Analog Integrated Circuits and Signal Processing*, vol. 9, pp. 167–179, 1996.
 31. Mead, C., **Scaling of MOS technology**. *IEEE Micro*, 16 (6). p. 48, 1996.
 32. Diorio, C., Mahajan, S., Hasler, P., Minch, B.A., and Mead, C., **A High-Resolution Nonvolatile Analog Memory Cell**, *Proceedings of the 1995 IEEE International Symposium on Circuits and Systems*, vol. 3, pp. 2233–2236, 1995.
 33. Hasler, P., Diorio, C., Minch, B.A., and Mead, C.A., **Single Transistor Learning Synapses**, *Advances in Neural Information Processing Systems*, vol. 7, pp. 817–824, 1995.
 34. Hasler, P., Diorio, C., Minch, B.A., and Mead, C.A., **Single Transistor Learning Synapse with Long-Term Storage**, *Proceedings of the 1995 IEEE International Symposium on Circuits and Systems*, vol. 3, pp. 1660–1663, 1995.
 35. Minch, B.A., Diorio, C., Hasler, P., and Mead, C.A., **A ν MOS Soft-Maximum Current Mirror**, *Proceedings of the 1995 International Symposium on Circuits and Systems*, vol. 3, pp. 2249–2252, 1995.
 36. Minch, B.A., Hasler, P., Diorio, C., and Mead, C.A., **A Silicon Axon**, Gerald Tesauro, David S. Touretzky, and Todd K. Leen (eds), *Advances in Neural Information Processing Systems 7*, Cambridge, MA: MIT Press, 1995, pp. 739–746.

37. Lee, C.H., Ravaioli, U., Hess, K., Mead, C.A., and Hasler, P., **Simulation of a Long Term Memory Device with a Full Bandstructure Monte Carlo Approach**, *IEEE Electron Device Letters*, vol. 16, pp. 360–362, 1995.
38. Douglas, R., Mahowald, M., and Mead, C., **Neuromorphic Analogue VLSI**, *Annual Reviews Neurosciences*, vol. 18, pp. 255–281, 1995.
39. Mead, C., Johnson, D., and Doherty, R. **New approach to data-path synthesis**. *Electronic Engineering Times* (852). p. 66, 1995.
40. Delbrück, T., and Mead, C., **Analog VLSI Phototransduction by Continuous-time, Adaptive, Logarithmic Photoreceptor Circuits**, *Internal Memorandum, Computation and Neural Systems*, California Institute of Technology, Pasadena, CA., 1995.
41. Liu, S.C. and Mead, C., **Continuous-Time Adaptive Delay System**, *IEEE International Symposium on Circuits and Systems '94*, London, England, May, 1994.
42. Delbrück, T. and Mead, C.A., **Adaptive photoreceptor with wide dynamic range**, *1994 IEEE International Symposium on Circuits and Systems*, vol. 4, pp. 339–42, 1994.
43. Mead, C., **Scaling of MOS Technology to Submicrometer Feature Sizes**, *Journal of VLSI Signal Processing*, vol. 8, pp. 9–25, 1994.
44. Mead, C., **Scaling of MOS Technology to Submicrometer Feature Sizes**, *Analog-Integrated-Circuits-and-Signal-Processing*, vol. 6, pp. 9–25, 1994.
45. Sarpeshkar, R., Delbrück, T., and Mead, C., **White Noise in MOS Transistors and Resistors**, *IEEE Circuits and Devices*, vol. 9, pp. 23–29, 1993.
46. Delbrück, T., and Mead, C., **Silicon Retina with Correlation-based, Velocity-tuned Pixels**, *IEEE Transactions on Neural Networks*, vol. 4, pp. 529–541, May, 1993.
47. Mead, C., and Mahowald, M. **A Silicon Model of Early Visual Processing**. In: *Computational neuroscience*. MIT Press, Boston, MA, pp. 331–339, 1993.
48. Mahowald, M., Douglas, R., LeMoncheck, J., and Mead, C., **An Introduction to Silicon Neural Analogs**, *Seminars in the Neurosciences*, vol. 4, pp. 83–92, 1992.
49. Mead, C. **Neural computing challenges the status quo**. *Computer Design*, 31 (10). pp. 98–99, 1992.
50. Watts, L., Kerns, D., Lyon, R. and Mead, C., **Improved Implementation of the Silicon Cochlea**, *IEEE Journal of Solid-State Circuits*, vol. 27, pp. 692–700, 1992.
51. Sarpeshkar, R., Watts, L., and Mead, C., **Refractory Neuron Circuits**, *Internal Memorandum, Physics of Computation Laboratory*, California Institute of Technology, Pasadena, CA., 1992.
52. Delbrück, T. and Mead, C., **Time-derivative adaptive silicon photoreceptor array**, In: *Infrared Sensors: Detectors, Electronics, and Signal Processing*. Proceedings of SPIE. No.1541, pp. 92–99, 1991.
53. Mead, C. and Delbrück, T., **Scanners for Visualizing Activity of Analog VLSI Circuitry**, *Analog Integrated Circuits and Signal Processing*, vol. 1, pp. 93–106, 1991 (Also published as Caltech CNS Memo 11, June 27, 1991.).
54. Mahowald, M. and Mead, C., **The Silicon Retina**, *Scientific American*, vol. 264, pp. 76–82, 1991.
55. DeWeerth, S., Nielsen, L., Mead, C. and Aström, K., **A Simple Neuron Servo**, *IEEE Transactions on Neural Networks*, vol. 2, pp. 248–251, 1991.
56. Watts, L., Lyon, R. and Mead, C., **A Bidirectional Analog VLSI Cochlear Model**, Sequin, C., *Proceedings of Advanced Research in VLSI Conference*, Santa Cruz, CA: MIT Press, 1991, pp. 153–163.
57. Mead, C., Arreguit, X. and Lazzaro, J., **Analog VLSI Model of Binaural Hearing**, *IEEE Transactions on Neural Networks*, vol. 2, pp. 230–236, 1991.
58. Mead, C., **Neuromorphic Electronic Systems**, *Proceedings of IEEE Special Issue*, vol. 78, pp. 1629–1636, 1990.
59. Mead, C., **Auditory processing using analog VLSI**, *Advanced Research in VLSI, Proceedings of the Sixth MIT Conference*, Cambridge, MA: MIT Press, pp. 1, 1990.

60. Mead, C. **Machines Will Understand the World.** *Fortune*, 121 (7). p. 69, 1990.
61. DeWeerth, S., Nielsen, L., Mead, C. and Aström, K., **A Neuron-based Pulse Servo for Motion Control**, *Proceedings of IEEE International Conference on Robotics and Automation*, pp. 1698–1703, 1990. (Also published as Department of Automatic Control, Lund University Document No. CODEN:LUTFD2/(TFRT-7446)/1-7/1990).
62. DeWeerth, S. and Mead, C., **An Analog VLSI Model of Adaptation in the Vestibulo-Ocular Reflex**, Touretzky, D., *Advances in Neural Information Processing Systems, 2*, San Mateo, CA: Morgan Kaufmann, 1990, pp. 1–8.
63. Lyon, R.F., and Mead, C. **An Analog Electronic Cochlea.** In: *Artificial neural networks: electronic implementations.* IEEE Computer Society Press, Los Alamitos, CA, pp. 79-94, 1990.
64. Sivilotti, M.A., Emerling, M., and Mead, C. **A Novel Associative Memory Implemented Using Collective Computation.** In: *Artificial neural networks: electronic implementations.* IEEE, Piscataway, NJ, pp. 11-21, 1990.
65. Lazzaro, J. and Mead, C., **A Silicon Model of Auditory Localization**, Zornetzer, Davis, and Lau (eds), *An Introduction to Neural and Electronic Networks*, New York, NY: Academic Press, 1990, pp. 158–173.
66. Faggin, F. and Mead, C., **VLSI Implementation of Neural Networks**, Zornetzer, Davis, and Lau (eds), *An Introduction to Neural and Electronic Networks*, New York, NY: Academic Press, 1990, pp. 275–292.
67. Mead, C., **Neural computation in analog VLSI**, *Twenty-Third Asilomar Conference on Signals, Systems and Computers*, San Jose, CA: Maple Press, 1989, pp. 1.
68. Lazzaro, J. and Mead, C., **Silicon Modeling of Pitch Perception**, *Proceedings of National Academy of Science*, 1989, pp. 9597–9601.
69. Ryckebusch, S. and Mead, C., **Analog VLSI Models of Oscillatory Biological Neural Circuits**, *Journées d'Electronique 1989: Reseaux de Neurones Artificiels*, Lausanne, Switzerland: Presses Polytechniques Romandes, 1989, pp. 303–312.
70. Lazzaro, J. and Mead, C., **Circuit Models of Sensory Transduction in the Cochlea**, Mead, C. and Ismail, M. (eds), *Analog VLSI Implementation of Neural Systems*, Boston, MA: Kluwer, 1989, pp. 85–101.
71. Mead, C., **Adaptive Retina**, Mead, C. and Ismail, M. (eds), *Analog VLSI Implementation of Neural Systems*, Boston, MA: Kluwer Academic, 1989, pp. 239–246.
72. Sivilotti, M.A., Mahowald, M.A., and Mead, C. **Real-time visual computations using analog CMOS processing arrays.** In: *Neurocomputing.* MIT Press, Cambridge, MA, pp. 703-711, 1989.
73. Mead, C., **Analog VLSI and Neural Systems**, Reading, MA: Addison-Wesley, 1989.
74. Lazzaro, J. and Mead, C., **A Silicon Model of Auditory Localization**, *Neural Computation*, vol. 1, pp. 47–57, 1989.
75. Ryckebusch, S., Bower, J.M. and Mead, C., **Modeling Small Oscillating Biological Networks in Analog VLSI**, Touretzky, D., *Advances in Neural Information Processing Systems, 1*, San Mateo, CA: Morgan Kaufmann, 1989, pp. 384–393.
76. Delbrück, T. and Mead, C., **An Electronic Photoreceptor Sensitive to Small Changes in Intensity**, Touretzky, D., *Advances in Neural Information Processing Systems, 1*, San Mateo, CA: Morgan Kaufmann, 1989, pp. 720–727.
77. Maher, M., DeWeerth, S., Mahowald, M.A. and Mead, C., **Implementing Neural Architectures Using Analog VLSI Circuits**, *IEEE Transactions on Circuits and Systems*, vol. 36, pp. 643–652, 1989.
78. Koch, C., Luo, J., Hutchinson, J. and Mead, C., **Optical Flow and Surface Interpolation in Resistive Networks: Algorithms and Analog VLSI Chips**, *IEEE Computer*, vol. 22, pp. 52–63, 1989.

79. Lazzaro, J., Ryckebusch, S., Mahowald, M. and Mead C., **Winner-Take-All Networks of $O(N)$ Complexity**, Touretzky, D., *Advances in Neural Information Processing Systems, 1*, San Mateo, CA: Morgan Kaufmann, 1989, pp. 703–711 (Also published as *Caltech Computer Science Technical Report CS-TR-88-21*).
80. Allen, T., Faggin, F., Gribble, G. and Mead, C., **Orientation-Selective VLSI Retina**, Hsing, R., *Visual Communications and Image Processing '88: Third in a Series: 9–11 November 1988*, Cambridge, MA, Bellingham, WA Society for Optical Engineering, 1988, pp. 1040–1046.
81. Lyon, R. and Mead, C., **Cochlear Hydrodynamics Demystified**, *Caltech Computer Science Technical Report*, CS-TR-88-4, Pasadena, CA, 1988.
82. Mahowald, M. and Mead, C., **A Silicon Model of Early Visual Processing**, *Neural Networks*, vol. 1, pp. 91–97, 1988.
83. Mead, C.A., **Analog VLSI for Auditory and Vision Signal Processing**, *International Electron Devices Meeting, Technical Digest*, pp. 11–12, 1988.
84. Lyon, R. and Mead, C., **An Analog Electronic Cochlea**, *IEEE Transactions on Acoustics, Speech and Signal Processing*, vol. 36, pp. 1119–1134, 1988.
85. Lyon, R.F. and Mead, C., **A CMOS VLSI Cochlea**, *Proceedings from International Conference on Acoustics, Speech, and Signal Processing*, pp. 2172–2175, 1988.
86. DeWeerth, S. and Mead, C., **A Two-Dimensional Visual Tracking Array**, Allen, J. and Thomson Leighton, F. (eds), *Advanced Research in VLSI; Proceedings of Fifth MIT Conference*, Cambridge, MA: MIT Press, 1988, pp. 259–275.
87. Allen, T.P., and Mead, C. **A silicon retina for computing local edge orientations**. *Neural Networks*, 1 (S1). p. 481, 1988.
88. Hutchinson, J., Koch, C., Luo, J. and Mead, C., **Computing Motion Using Analog and Binary Resistive Networks**, *IEEE Computer*, vol. 21, pp. 52–63, 1988.
89. Koch, C., Luo, J., Mead, C. and Hutchinson, J., **Computing Motion Using Resistive Networks**, *Society of Photo-Optical Instrumentation Engineers; Proceedings*, vol. 882, pp. 108–113, 1988.
90. Mead, C., **Silicon models of neural computation**, *IEEE First International Conference on Neural Networks*, 1987, pp. 93–106.
91. Mead, C., **Neural Hardware for Vision**. *Engineering and Science*, 50 (5). pp. 2-7, 1987.
92. Maher, M.A. and Mead, C., **A Physical Charge-Controlled Model for MOS Transistors**, Losleben, P., *Advanced Research in VLSI: Proceedings of the 1987 Stanford Conference*, Cambridge, MA: MIT Press, 1987, pp. 211.
93. Sivilotti, M.A., Mahowald, M.A. and Mead, C., **Real-Time Visual Computations Using Analog CMOS Processing Arrays**, Losleben, P., *Advanced Research in VLSI: Proceedings of the 1987 Stanford Conference*, Cambridge, MA: MIT Press, 1987, pp. 295–312.
94. Nielsen, L., Mahowald, M. and Mead, C., **SeeHear**, *International Association for Pattern Recognition: Proceedings of the Fifth Scandinavian Conference on Image Analysis*, July, 1987.
95. Whitney, T. and Mead, C., **An integer-based hierarchical representation for VLSI**, *Advanced Research in VLSI: Proceedings of the Fourth MIT Conference*, Cambridge, MA: MIT Press, 1986, pp. 241–257.
96. Tanner, J. and Mead, C., **An Integrated Analog Optical Motion Sensor**, Kung, S., Owen, R.E. and Nash, J.G. (eds), *VLSI Signal Processing, II*, New York, NY: IEEE Acoustics, Speech, and Signal Processing Society, 1986, pp. 59–76.
97. Sivilotti, M.A., Emerling, M.R. and Mead, C., **VLSI Architectures for Implementation of Neural Networks**, Denker, J.S., *AIP Conference Proceedings 151, Neural Networks for Computing, Snowbird, Utah*, New York, NY: American Institute of Physics, 1986, pp. 408–413.
98. Lin, T.M. and Mead, C., **A Hierarchical Timing Simulation Model**, *IEEE Transactions on Computer-Aided Design*, CAD-5, pp. 188–197, 1986.

99. Maher, M.A. and Mead, C.A., **Modelling and simulation of integrated circuits**, *Computer Aided Design*, vol.18, pp. 472–477, 1986.
100. Chen, M.C. and Mead, C.A., **Concurrent algorithms as space-time recursion equations**, *VLSI and modern signal processing*, pp. 224–240, 1985.
101. Wawrzynek, J. and Mead, C., **A New Discipline for CMOS Design: an Architecture for Sound Synthesis**, Fuchs, H., *1985 Chapel Hill Conference on Very Large Scale Integration*, Rockville, MD: Computer Science Press, 1985, pp. 87–104.
102. Sivilotti, M., Emerling, M. and Mead, C., **A Novel Associative Memory Implemented Using Collective Computation**, Fuchs, H., *1985 Chapel Hill Conference on Very Large Scale Integration*, Rockville, MD: Computer Science Press, 1985, pp. 329–342.
103. Mead, C., **A Sensitive Electronic Photoreceptor**, Fuchs, H., *1985 Chapel Hill Conference on Very Large Scale Integration*, Rockville, MD: Computer Science Press, 1985, pp. 463–471.
104. Wawrzynek, J., Mead, C., Lin, T.M., Liu, H. and Dyer, L., **A VLSI Approach to Sound Synthesis**, Buxton, W., *Proceedings of the International Computer Music Conference, IRCAM*, San Francisco, CA: Computer Music Association, 1985, pp. 53–64.
105. Wawrzynek, J. and Mead, C., **A VLSI Approach to Sound Synthesis**, Denyer, P.B., *VLSI Signal Processing: A Bit-Serial Approach*, Reading, MA: Addison-Wesley, 1985 (Also published as a *Caltech Computer Science Technical Report, 5158:TR:84*).
106. Wawrzynek, J., and Mead, C. **A VLSI Architecture for Sound Synthesis**. In: *VLSI signal processing: a bit-serial approach*. Addison-Wesley, Reading, MA, pp. 277–297, 1985.
107. Chen, M. and Mead, C., **The Semantics of a Functional Language for VLSI Systems**, Giloi, W.K. and Shriver, B.D. (eds), *Methodologies for Computer System Design: Proceedings for the IFIP WG 10.1 Working Conference, Lille, France, 1983*, North Holland, Amsterdam: Elsevier Science, 1985, pp. 1–18.
108. Chen, M. and Mead, C., **A Methodology for Hierarchical Simulation and Verification of VLSI Systems**, Giloi, W.K. and Shriver, B.D. (eds), *Methodologies for Computer System Design: Proceedings for the IFIP WG 10.1 Working Conference, Lille, France, 1983*, North Holland, Amsterdam: Elsevier Science, 1985, pp. 165–181.
109. Mead, C., **The Wolery**, *Caltech Computer Science Technical Report 5113:TR:84*, California Institute of Technology, Pasadena, 1984.
110. Tanner, J. and Mead, C., **A Correlating Optical Motion Detector**, Penfield, P., *Proceedings, Conference on Advanced Research in VLSI 1984*, Dedham, MA: Artech House, 1984, pp. 57–64.
111. Lin, T.M. and Mead, C., **Signal Delay in General RC Networks with Application to Timing Simulation of Digital Integrated Circuits**, Penfield, P., *Proceedings, Conference on Advanced Research in VLSI*, Dedham, MA: Artech House, 1984, pp. 93–99.
112. Lin, T.M. and Mead C., **Signal Delay in General RC Networks**, *IEEE Transactions on Computer-Aided Design*, CAD-3, pp. 331–349, 1984.
113. Mead, C., and Rem, M. **Correction to "Minimum Propagation Delays in VLSI"**. *IEEE Journal of Solid-State Circuits*, 19 (1). p. 162, 1984.
114. Chen, M. and Mead, C., **A Hierarchical Simulator Based on Formal Semantics**, Bryant, R., *Third Caltech Conference on Very Large Scale Integration, 1983*, Rockville, MD: Computer Science Press, 1983, pp. 207–223 (Also published as *Caltech Computer Science Technical Report, 5068:TM:83*).
115. Mead, C., **VLSI and the Foundations of Computation**, Mason, R., *Information Processing 83: Proceedings of the IFIP 9th World Computer Congress, Paris, France, 1983*, North Holland, Amsterdam: Elsevier Science, 1983, pp. 271–274.
116. Lin, T.M. and Mead C., **Signal Delay in General RC Networks with Application to Timing Simulation of Digital Integrated Circuits**, *Caltech Computer Science Technical Report, 5089:TR:83*, California Institute of Technology, Pasadena, 1983.

117. Chen, M. and Mead, C., **VLSI Circuits as Communicating Processes: A Universal Simulator**, *International Symposium on VLSI Technology, Systems and Applications*, March 30–April 1, 1983, Taipei, Taiwan, Hsinchu, Taiwan: ERSO, ITRI, pp. 302–306, 1983.
118. Whitney, T. and Mead, C., **Pooh: A Uniform Representation for Circuit Level Designs**, Anceau, F. and Aas, E.J. (eds), *Proceedings of the International Conference on VLSI, Trondheim, Norway*, North Holland, Amsterdam: Elsevier Science, 1983, pp. 401–411.
119. Mead, C., **Structural and Behavioral Composition of VLSI**, Anceau, F. and Aas, E.J. (eds), *Proceedings of the International Conference of VLSI, Trondheim, Norway*, North Holland, Amsterdam: Elsevier Science, 1983, pp. 3–8.
120. Chen, M. and Mead, C., **Formal Specification of Concurrent Systems**, *Caltech Computer Science Technical Report, 5042:TR:82*, California Institute of Technology, Pasadena, 1982 (Contains two papers: *VLSI Signal Processing and Formal Semantics*, *Concurrent Algorithms as Space-Time Recursion Equations*.)
121. Rem, M. and Mead, C., **A Notation for Designing Restoring Logic Circuitry in CMOS**, *Microelectronics Journal*, vol. 13, pp. 5–10, 1982. (Also published In: *Proceedings of the Second Caltech Conference on Very Large Scale Integration*. California Institute of Technology, Pasadena, CA, pp. 399-411, 1981.)
122. Rem, M. and Mead, C., **Minimum Propagation Delays in VLSI**, *IEEE Journal of Solid-State Circuits*, vol. 17, pp. 773–775, 1982.
123. Mead, C.A. and Lewicki, G., **Silicon Compilers and Foundries Will Usher in User-Designed VLSI**, *Electronics*, vol. 55, pp. 107–111, 1982.
124. Mead, C.A., **VLSI and technological innovations**, *Proceedings of the First International Conference on Very Large Scale Integration*, pp. 3–11, 1981.
125. Rem, M. and Mead, C., **Minimum Propagation Delays in VLSI**, Seitz, C., *Proceedings of Second Caltech Conference on Very Large Scale Integration*, Pasadena, CA: California Institute of Technology, 1981, pp. 433–439 (Also published as *Caltech Computer Science Technical Report, 4601:TR:81*.)
126. Buric, M. and Mead, C., **Bit-Serial Inner Product Processors in VLSI**, Seitz, C., *Proceedings of Second Caltech Conference on Very Large Scale Integration*, Pasadena, CA: California Institute of Technology, 1981, pp. 155–164.
127. Rem, M. and Mead, C., **Cost and Performance of VLSI Computing Structures**, Elmasry, M.I., *Digital MOS Integrated Circuits*, New York, NY: IEEE Press, 1981, pp. 196–203, (Reprinted from: *IEEE Journal of Solid State Circuits*, SC-14, pp. 455–462, 1979; Also published as *Caltech Computer Science Technical Report, 1584:TR:78*.)
128. Rem, M. and Mead, C. **A Notation for Designing Restoring Logic Circuitry in CMOS**. In: *Proceedings of the Second Caltech Conference on Very Large Scale Integration*. California Institute of Technology, Pasadena, CA, pp. 399-411, 1981.
129. Mead, C. and Conway, L., **Introduction to VLSI Systems**, Reading, MA: Addison-Wesley, 1980.
130. Mead, C., **Challenges Raised by VLSI Technology**, *Military Electronics/Countermeasures*, pp. 35–38, 1980.
131. Mead, C., **The Impact of VLSI on Computer Science Education**, *IEEE Transactions on Education*, vol. 22, pp. 43, 1979.
132. Mead, C., **VLSI and Technological Innovation**, In: *Proceedings of Caltech Conference on Very Large Scale Integration*, Pasadena, CA: California Institute of Technology, pp. 15–28, 1979.
133. Mohsen, A.M. and Mead, C., **Delay-time optimization for driving and sensing of signals on high-capacitance paths of VLSI systems**, *IEEE Journal of Solid-State Circuits*, vol.14 (2), pp. 462–470, 1979.
134. Mead, C. and Rem, M. **Cost and Performance of VLSI Computing Structures**. *IEEE Transactions on Electron Devices*, 26 (4). pp. 533-540, 1979.

135. Mead, C. and Rem, M. **Cost and performance of VLSI computing structures.** *IEEE Journal of Solid-State Circuits*, 14 (2). pp. 455-462, 1979.
136. Mohsen, A. and Mead, C. **Delay-time optimization for driving and sensing of signals on high-capacitance paths of VLSI systems.** *IEEE Transactions on Electron Devices*, 26 (4). pp. 540-548, 1979.
137. Cheng, E.K. and Mead, C., **A MOS Cursive-Character Generator**, *IEEE Journal of Solid State Circuits*, SC-13, pp. 832-837, 1978.
138. Mead, C.A. and Rem, M., **Cost and performance of VLSI computing structures**, *3rd USA-Japan Computer Conference Proceedings*, pp. 462-467, 1978.
139. Mead, C.A., **The impact of VLSI on computer science education**, *Conference Record of the Twelfth Asilomar Conference on Circuits, Systems and Computers*, pp. 350-351, 1978.
140. Sutherland, I.E. and Mead, C., **Microelectronics and Computer Science**, *Scientific American*, vol. 237, pp. 210-228, 1977.
141. Eisenberg, M., Hall, J.E. and Mead, C., **The Nature of the Voltage-Dependent Conductance Induced by Alamethicin in Black Lipid Membranes**, *Journal of Membrane Biology*, vol. 14, pp. 143-176, 1976.
142. Mead, C., **ESP, A Distributed Architecture LSI Machine**, Spencer, J.P., *Distributed Systems*, Maidenhead, England: Infotech International Ltd., 1976, pp. 351-362 (Also published in *COMPCON 74, Ninth Annual IEEE Computer Society International Conference*, 195, 1974.).
143. Sutherland, I.E., Everhart, T. and Mead, C., **Basic Limitations in Microcircuit Fabrication Technology**, *Rand Corporation Technical Report, R-1956*, ARPA, 1976.
144. Best, J.S., McCaldin, J.O., McGill, T.C., Mead, C. and Mooney, J.B., **HgSe, A Highly Electronegative Stable Metallic Contact for Semiconductor Devices**, *Applied Physics Letters*, vol. 29, pp. 433-434, 1976.
145. Mead, C., Pashley, R.D., Britton, L.D., Daimon, Y.T. and Sando, S.F., **128-Bit Multicomparator**, *IEEE Solid-State Circuits*, SC-11, pp. 692-695, 1976.
146. McGill, T.C. and Mead, C., **Schottky Barrier Heights on P-Type Diamond and Silicon Carbide (6H)**, *Physics Letters*, vol. 58A, pp. 249-251, 1976.
147. McCaldin, J.O., McGill, T.C. and Mead, C., **Schottky Barriers on Compound Semiconductors: The Role of the Anion**, *Journal of Vacuum Science Technology*, vol. 13, pp. 802-806 1976.
148. Scranton, R.A., Mooney, J.B., McCaldin, J.O., McGill, T.C. and Mead, C., **Highly Electronegative Metallic Contacts to Semiconductors Using Polymeric Sulfur Nitride**, *Applied Physics Letters*, vol. 29, pp. 47-48, 1976.
149. Cheng, E.K. and Mead, C., **A Two's Complement Pipeline Multiplier**, *Conference Record, 1976 IEEE International Conference on Acoustics, Speech, and Signal Processing, Philadelphia, PA*, New York, NY, pp. 647-650, 1976.
150. McCaldin, J.O., McGill, T.C. and Mead, C., **Correlation for III-V and II-VI Semiconductors of the Au-Schottky Barrier Energy With Anion Electronegativity**, *Physical Review Letters*, vol. 36, pp. 56-58, 1976.
151. Cheng, E.K. and Mead, C., **Single-Chip Cursive Character Generator**, Winner, L., *Digest of Technical Papers, IEEE International Solid-State Circuits Conference*, New York, NY: Lewis Winner, 1975, pp. 32-33.
152. McGill, T.C. and Mead, C., **Electrical Interface Barriers**, *Journal of Vacuum Science Technology*, vol. 11, pp. 122-127, 1974.
153. Mohsen, A.M., McGill, T.C. and Mead, C., **Charge Transfer in Overlapping Gate Charge-Coupled Devices**, *IEEE Journal of Solid-State Circuits*, SC-8, pp. 191-206, 1973.
154. Mohsen, A.M., McGill, T.C., Daimon, Y. and Mead, C., **The Influence of Interface States on Incomplete Charge Transfer in Overlapping Gate Charge-Coupled Devices**, *IEEE Journal of Solid-State Circuits*, SC-8, pp. 125-138, 1973.

155. Mohsen, A.M., McGill, T.C., Anthony, M. and Mead, C., **Push Clocks: A New Approach to Charge-Coupled Devices Clocking**, *Applied Physics Letters*, vol. 22, pp. 172–175, 1973.
156. Hall, J.E., Mead, C. and Szabo, G., **A Barrier Model for Current Flow in Lipid Bilayers Membranes**, *Journal of Membrane Biology*, vol. 11, pp. 75–97, 1973.
157. Eisenberg, M., Hall, J.E., and Mead, C. **The nature of the voltage-dependent conductance induced by alamethicin in black lipid membranes**. *Journal of Membrane Biology*, 14 (1). pp. 143-176, 1973.
158. Mead, C., **Computers That Put the Power Where it Belongs**, *Engineering Science*, vol. 35, pp. 4–9, 1972.
159. Mohsen, A.M., McGill, T.C. and Mead, C., **Charge Transfer in Charge-Coupled Devices**, Winner, L., *Digest of Technical Papers, 1972 IEEE International Solid-State Circuits Conference*, New York, NY: Lewis Winner, 1972, pp. 248–249.
160. Neville, R.C. and Mead, C., **Surface Barrier Energies on Strontium Titanate**, *Journal of Applied Physics*, vol. 43, pp. 4657–4663, 1972.
161. Neville, R.C., Hoeneisen, B. and Mead, C., **Anomalous Resonance of Strontium Titanate**, *Journal of Applied Physics*, vol. 43, pp. 3903–3905, 1972.
162. Hoeneisen, B. and Mead, C., **Limitations in Microelectronics–II, Bipolar Technology**, *Solid-State Electronics*, vol. 15, pp. 891–897, 1972.
163. Neville, R., Hoeneisen, B. and Mead, C., **Permittivity of Strontium Titanate**, *Journal of Applied Physics*, vol. 43, pp. 2124–2131, 1972.
164. Lewicki, G., Maserjian, J. and Mead, C., **Barrier Energies in MIM Structures from Photoresponse: Effect of Scattering in the Insulating Film**, *Journal of Applied Physics*, vol. 43, pp. 1764–1767, 1972.
165. Hoeneisen, B. and Mead, C., **Current-Voltage Characteristics of Small Size MOS Transistors**, *IEEE Transactions on Electron Devices*, ED-19, pp. 382–383, 1972.
166. Hoeneisen, B. and Mead, C., **Fundamental Limitations in Microelectronics–I, MOS Technology**, *Solid-State Electronics*, vol. 15, pp. 819–829, 1972.
167. Mead, C., **Electronic Current Flow Through Ideal Dielectric Films**, Diggle, J.W., *Oxides and Oxide Films, Volume 1*, New York, NY: Marcel Dekker, 1972, pp. 287–318.
168. Mead, C.A., **Current flow through thin insulating films: basic principles and device applications**, *Journal-of-Vacuum-Science-and-Technology*, vol.8, Jan.-Feb. 1971, pp. 98.
169. Hoeneisen, B. and Mead, C., **Power Schottky Diode Design and Comparison With the Junction Diode**, *Solid-State Electronics*, vol. 14, pp. 1225–1236, 1971.
170. Hoeneisen, B., Mead, C. and Nicolet, M.A., **Permittivity of β -Ga₂O₃ at Low Frequencies**, *Solid-State Electronics*, vol. 14, pp. 1057–1060, 1971.
171. McColl, M., Millea, M.F. and Mead, C., **Zero-Bias Contact Resistances of Au-GaAs Schottky Barriers**, *Solid-State Electronics*, vol. 14, pp. 677–683, 1971.
172. Kurtin, S.L., McGill, T.C. and Mead, C., **Direct Interelectrode Tunneling in GaSe**, *Physical Review Letters*, vol. 3, pp. 3368–3379, 1971.
173. Neville, R.C. and Mead, C., **Tunneling Currents in Zinc Oxide**, *Journal of Applied Physics*, vol. 41, pp. 5285–5290, 1970.
174. Kurtin, S.L., McGill, T.C. and Mead, C., **Tunneling Currents and the E-k Relation**, *Physical Review Letters*, vol. 25, pp. 756–759, 1970.
175. Neville, R.C. and Mead, C., **Surface Barriers on Zinc Oxide**, *Journal of Applied Physics*, vol. 41, pp. 3795–3800, 1970.
176. Kauffman, J.W. and Mead, C., **Electrical Characteristics of Sphingomyelin Bilayer Membranes**, *Biophysical Journal*, vol. 10, pp. 1084–1089, 1970.
177. Kurtin, S.L., Mueller, W.A., Kurtin, B.C., Woff, E.D. and Mead, C., **“Polywater”: A Hydrosol?**, *Science*, vol. 167, pp. 1720–1722, 1970.

178. Hsu, S.T., Whittier, R.J. and Mead, C., **Physical Model for Burst Noise in Semiconductor Devices**, *Solid-State Electronics*, vol. 13, pp. 1055–1071, 1970.
179. McGill, T.C., Kurtin S., Fishbone, L. and Mead, C., **Contact-Limited Currents in Metal–Insulator–Metal Structures**, *Journal of Applied Physics*, vol. 41, pp. 3831–3839, 1970.
180. Caywood, J.M., Mayer, J.W. and Mead, C., **Influence of Carrier Diffusion Effects on Window Thickness of Semiconductor Detectors**, *Nuclear Instruments and Methods*, vol. 79, pp. 329–332, 1970.
181. Caywood, J.M. and Mead, C., **Charge Transport Through α -Monoclinic Selenium**, *Journal of Physics and Chemistry of Solids*, vol. 31, pp. 983–994, 1970.
182. Yu, A.Y.C. and Mead, C., **Characteristics of Aluminum-Silicon Schottky Barrier Diode**, *Solid-State Electronics*, vol. 13, pp. 97–104, 1970.
183. Caywood, J.M., Mayer, J.W. and Mead, C., **Origin of Field-Dependent Collection Efficiency in Contact-Limited Devices**, *Bulletin der Schweizerische, Physikalische Gesellschaft*, 1969.
184. Caywood, J. and Mead, C., **Origin of Field-Dependent Collection Efficiency in Contact-Limited Photoconductors**, *Applied Physics Letters*, vol. 15, pp. 14–16, 1969.
185. Kurtin, S., McGill, T.C. and Mead C., **Fundamental Transition in the Electronic Nature of Solids**, *Physical Review Letters*, vol. 22, pp. 1433–1436, 1969.
186. Kurtin, S. and Mead, C., **Surface Barriers on Layer Semiconductors: GaS, GaSe and GaTe**, *Journal of Physics and Chemistry of Solids*, vol. 30, pp. 2007–2009, 1969.
187. Parker, G.H. and Mead, C., **Tunneling in CdTe Schottky Barriers**, *The Physics Review*, vol. 184, pp. 780–787, 1969.
188. Parker, G.H. and Mead, C., **The Effect of Trapping States on Tunneling in Metal-Semiconductor Junctions**, *Applied Physics Letters*, vol. 14, pp. 21–23, 1969.
189. Millea, M.F., McColl, M. and Mead, C., **Schottky Barriers on GaAs**, *The Physical Review*, vol. 177, pp. 1164–1172, 1969.
190. Mead, C., **Some Properties of Exponentially Damped Wave Functions**, Burstein, E. and Lundqvist, S., *Tunneling Phenomena in Solids; Lectures*, New York, NY: Plenum Press, 1969, pp. 127–134.
191. Mead, C., **Physics of Interfaces**, Schwartz, B., *Ohmic Contacts to Semiconductors*, New York, NY: Electrochemical Society, 1969, pp. 3–16.
192. Hunsperger, R.G., Marsh, O.J. and Mead, C., **The Presence of Deep Levels in Ion Implanted Junctions**, *Applied Physics Letters*, vol. 13, pp. 295–297, 1968.
193. Parker, G.H. and Mead, C., **Energy-Momentum Relationship in InAs**, *Physical Review Letters*, vol. 21, pp. 605–607, 1968.
194. Kurtin, S. and Mead, C., **Surface Barriers on Layer Semiconductors: GaSe**, *Journal of Physics and Chemistry of Solids*, vol. 29, pp. 1865–1867, 1968.
195. Kurtin, S. and Mead, C., **GaSe Schottky Barrier Gate FET**, *Proceedings of IEEE*, vol. 56, pp. 1594–1595, 1968.
196. Lewicki, G. and Mead, C., **Currents Through Thin Films of Aluminum Nitride**, *Journal of Physics and Chemistry of Solids*, vol. 29, pp. 1255–1267, 1968.
197. Parker, G.H., McGill, T.C., Hoffman, D. and Mead, C., **Electric Field Dependence of GaAs Schottky Barriers**, *Solid-State Electronics*, vol. 11, pp. 201–204, 1968.
198. Hartman, T.E., Blair, J.C., and Mead, C., **Electrical Conduction Through Thin Amorphous SiC Films**, *Thin Solid Films*, vol. 2, pp. 79–93, 1968.
199. Thornber, K.K., McGill, T.C. and Mead, C., **The Tunneling Time of an Electron**, *Journal of Applied Physics*, vol. 38, pp. 2384–2385, 1967.
200. Maserjian, J. and Mead, C., **Conduction Through TiO₂ Thin Films With Ionic Space Charge**, *Journal of Physics and Chemistry of Solids*, vol. 28, pp. 1971–1983, 1967.

201. Yariv, A., Parker, J.V. and Mead, C., **5C3-GaAs an Electro-optic Modulator at 10.6 Microns**, *Journal of IEEE Quantum Electronics*, QE-2, pp. 243–245, 1966.
202. Deal, B.E., Snow, E.H. and Mead, C., **Barrier Energies in Metal-Silicon Dioxide-Silicon Structures**, *Journal of Physics and Chemistry of Solids*, vol. 27, pp. 1873–1879, 1966.
203. Snow, E.H., Deal, B.E. and Mead, C., **Barrier Lowering and Field Penetration at Metal-Dielectric Interfaces**, *Applied Physics Letters*, vol. 9, pp. 53–55, 1966.
204. Lewicki, G. and Mead, C., **Experimental Determination of E-k Relationship in Electron Tunneling**, *Physical Review Letters*, vol. 16, pp. 939–941, 1966.
205. Stratton, R., Lewicki, G. and Mead, C., **The Effect of Non Parabolic Energy Bands on Tunneling Through Thin Insulating Films**, *Journal of Physics and Chemistry Solids*, vol. 27, pp. 1599–1604, 1966.
206. Surhig, J.W. and Mead, C., **Surface Barriers on SnO₂**, *Physics Letters*, vol. 20, pp. 367, 1966.
207. Mead, C., **Metal-Semiconductor Surface Barriers**, *Solid-State Electronics*, vol. 9, pp. 1023–1033, 1966.
208. Mead, C., **Schottky Barrier Gate Field Effect Transistor**, *Proceedings of IEEE*, vol. 54, pp. 307–308, 1966.
209. Lewicki, G. and Mead, C., **Voltage Dependence of Barrier Height in AlN Tunnel Junctions**, *Applied Physics Letters*, vol. 8, pp. 98–99, 1966.
210. Leung, P.C., Anderman, G., Spitzer, W.G. and Mead, C., **Dielectric Constants and Infrared Absorption of GaSe**, *Journal of Physics and Chemistry of Solids*, vol. 27, pp. 849–855, 1966.
211. Yariv, A. and Mead, C. **Semiconductors as Electrooptic Modulators for Infrared Radiation**. *IEEE Journal of Quantum Electronics*, 2 (4). p. 124, 1966.
212. Mead, C., **Electron Transport in Thin Insulating Films**, *Proceedings of the International Symposium*, Clausthal, Germany, September 1965, pp. 674–678.
213. Mead, C., **Surface Barriers on ZnSe and ZnO**, *Physics Letters*, vol. 18, pp. 218, 1965.
214. Aven, M. and Mead, C., **Electrical Transport and Contact Properties of Low Resistivity n-Type Zinc Sulfide Crystals**, *Applied Physics Letters*, vol. 7, pp. 8–10, 1965.
215. Thornber, K.K. and Mead, C., **Electronic Processes in α -Sulphur**, *The Journal of Physics and Chemistry of Solids*, vol. 26, pp. 1489–1495, 1965.
216. Mead, C., **Surface States on Semiconductor Crystals; Barriers on the Cd(Se:S) System**, *Applied Physics Letters*, vol. 6, pp. 103–104, 1965.
217. Braunstein, A., Braunstein, M., Picus, G.S. and Mead, C., **Photoemissive Determination of Barrier Shape in Tunnel Junctions**, *Physical Review Letters*, vol. 14, pp. 219–221, 1965.
218. McColl, M. and Mead, C., **Electron Current Through Thin Mica Films**, *Transactions of the Metallurgical Society of AIME*, vol. 233, pp. 502–511, 1965.
219. Mead, C., **Energy Gap in Sulphur**, *Physics Letters*, vol. 11, pp. 212–213, 1964.
220. Mead, C., **Photothresholds in Mg₂Ge**, *Journal of Applied Physics*, vol. 35, pp. 2460–2462, 1964.
221. Spitzer, W.G. and Mead, C., **Conduction Band Minimum of CdTe**, *The Journal of Physics and Chemistry of Solids*, vol. 25, pp. 443–447, 1964.
222. Spitzer, W.G. and Mead, C., **Fermi Level Position at Metal-Semiconductor Interfaces**, *The Physical Review*, vol. 134, pp. A713–A716, 1964.
223. Spitzer, W.G. and Mead, C., **Conduction Band Minima of Ga (As_{1-x}P_x)**, *Physical Review Letters*, vol. 133, pp. A872–A875, 1964.
224. Spitzer, W.G. and Mead, C., **Conduction Band Minima in AlAs and AlSb**, *Physical Review Letters*, vol. 11, pp. 358–359, 1963.
225. Spitzer, W.G. and Mead, C., **Barrier Height Studies on Metal-Semiconductor Systems**, *Journal of Applied Physics*, vol. 34, pp. 3061–3069, 1963.
226. Mead, C., **Metal Contact Double Injection in GaAs**, *Proceedings of the IEEE*, vol. 51, pp. 954–955, 1963.

227. Spitzer, W.G. and Mead, C., **Fermi Level Position at Semiconductor Surfaces**, *Physical Review Letters*, vol. 10, pp. 471–472, 1963.
228. Spitzer, W.G. and Mead, C., **Photoemission from Au and Cu into CdS**, *Applied Physics Letters*, vol. 2, pp. 74–75, 1963.
229. Mead, C., **Electron Transport Mechanisms in Thin Insulating Films**, *The Physical Review*, vol. 128, pp. 2088–2093, 1962.
230. Mead, C., **Pulse Characteristic Display for Tunnel Emission Devices**, *The Review of Scientific Instruments*, vol. 33, pp. 376–377, 1962.
231. Mead, C., **Transport of Hot Electrons in Thin Gold Films**, *Physical Review Letters*, vol. 8., pp. 56–57, 1962.
232. Mead, C., **Anomalous Capacitance of Thin Dielectric Structures**, *Physical Review Letters*, vol. 6, pp. 545–546, 1961.
233. Mead, C., **Operation of Tunnel-Emission Devices**, *Journal of Applied Physics*, vol. 32, pp. 646–652, 1961.
234. Mead, C., **Tunneling Physics**, *Colloquium of Solid State Devices*, Office for Industrial Associates, pp. 13–21, 1961.
235. Fisk, J. B., Dacey, G.C., and Mead, C. et al. **Colloquium on Solid State Devices**. In: *Colloquium on Solid State Devices*, February 20-21, 1961, Pasadena, CA. (Unpublished).
236. Mead, C., **The Operation of Junction Transistors at High Currents and in Saturation**, *Solid-State Electronics*, vol. 1, pp. 211–224, 1960.
237. Mead, C., **Transistor Switching Analysis (Part 3)**, *Semiconductor Products*, vol. 2, pp. 28–32, 1960.
238. Mead, C., **Transistor Switching Analysis (Part 2)**, *Semiconductor Products*, vol. 2, pp. 38–42, 1960.
239. Mead, C., **Transistor Switching Analysis (Part 1)**, *Semiconductor Products*, vol. 2, pp. 43–47, 1960.
240. Mead, C., **A Note on Tunnel Emission**, *Proceedings of the IRE*, vol. 48, pp. 1478, 1960.
241. Mead, C., **Relativity and the Scientific Method**, *Proceedings of the IRE*, vol. 48, pp. 1160, 1960.
242. Mead, C., **The Tunnel Emission Amplifier**, *Proceedings of the IRE*, vol. 48, pp. 359–361, 1960.
243. Middlebrook, R.D. and Mead, C., **Transistor AC and DC Amplifiers With High Input Impedance**, *Semiconductors Products*, vol. 2, pp. 26–35, 1959.
244. Middlebrook, R. D., and Mead, C. **Optimum Noise Performance of Transistor Input Circuits / Transistor AC and DC Amplifiers with High Input Impedance**. California Institute of Technology, Pasadena, CA, 1959. (Unpublished)