

Anthony C. Hearn

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EDUCATION

Ph.D., Theoretical Physics, 1962, Cambridge, England
First Class Honours Science Degree, Mathematics, 1959, Adelaide, Australia
Ordinary Science Degree, 1958, Adelaide, Australia

PROFESSIONAL EXPERIENCE

1998-: Adjunct Staff Member, RAND, Santa Monica, California
1996-: Adjunct Staff Member, IDA Center for Computing Sciences, Bowie, Maryland
1990-1996: Resident Scholar for Information Sciences, RAND, Santa Monica, California
1980-1984: Department Head, Information Sciences Department, RAND, Santa Monica, California
1980-1998: Senior Computer Scientist, RAND, Santa Monica, California
1974-1980: Chairman of Department of Computer Science, University of Utah, Salt Lake City, Utah
1973-1974: Director of Computer Division, University of Utah, Salt Lake City, Utah
1973-1980: Professor of Computer Science, University of Utah, Salt Lake City, Utah
1971-1978: Professor of Physics, University of Utah, Salt Lake City, Utah
1969-1971: Associate Professor of Physics, University of Utah, Salt Lake City, Utah
1965-1969: Assistant Professor of Physics, Stanford University, Stanford, California
1964-1965: Senior Scientific Officer, Rutherford Laboratory, Didcot, England
1962-1964: Research Associate in Physics, Stanford University, Stanford, California.

COMMUNITY ACTIVITIES

Review Board, IDA Center for Computing Sciences, Bowie, Maryland, 1994-1999, Chair, 1996-1999
National Research Council Board on Assessment of NIST Programs (member of Panel on Computing and Applied Mathematics 1987-92, Vice-Chairman 91-92)

National Research Council (member of committees and panels studying export control policy, 1988-1990)

National Science Foundation (member of Program Advisory Committee for Office of Advanced Scientific Computing 1984-1986, occasional panel member for Advanced Scientific Computation Division, Networking and Communication Research Infrastructure Division and Division of Computing and Computation Research, 1987-)

Lawrence Livermore National Laboratory (consultant to Magnetic Fusion Energy Computer Center, 1980-1990)

Editorial Board, Computing in Science and Engineering, 2000- (Associate Editor in Chief, 2000-2005)

Specialist Editor for Computer Physics Communications, 1980-1999

Editorial Board, Impact of Computing in Science and Engineering, 1989-1993.

HONORS/PROFESSIONAL ORGANIZATIONS

Alfred P. Sloan Foundation Fellow, 1967-69

Listed in American Men and Women of Science, Who's Who in the West

ACM National Lecturer 1978-1980

SIAM National Lecturer 1976-1977

Association for Computing Machinery (Fellow, Elected 2006, Secretary SIGSAM, 1971-1973, Vice-chairman SIGSAM, 1979-1981, Chairman SIGSAM, 1981-83)

American Physical Society (Member, Elected 1962)

Cambridge Philosophical Society (Fellow, Elected 1962).

RESEARCH INTERESTS

Symbolic and algebraic computation, advanced scientific computation, software portability, compilation, computer security, networking.

PUBLICATIONS

"High Performance Computing Opportunities and Challenges for Army R&D," RAND Report TR-310, 2006 (coauthored with R. H. Anderson, A. Cordova, R. Lewis, J. Matsumura, I. Porche and R. Steeb).

"REDUCE: The First Forty Years," Proceedings of the A3L 2005, BoD, Norderstedt, Germany, 2005, 19-24 (invited talk).

["REDUCE User's Manual,"](#) Version 3.8 (February 2004).

"One View of the GDH Sum Rule," Proceedings of GDH 2004, World Scientific, Singapore, 2004, 3.

"Army Medical Support to the Army After Next: Issues and Insights from the Medical Technology

Workshop," RAND Report MR-2170, 2001 (coauthored with G. Cecchine, D. Johnson, W. L. Perry, C. R. Anthony, B. A. Golomb, L. H. Hilborne and J. M. Sollinger).

"[Synchronization of Distributed Development Software](#)," presented at the IMAC Workshop, ISAAC '99, Vancouver, Canada, June 1999 (coauthored with A. C. Norman).

"Computer Algebra and the World Wide Web," Proceedings of DISCO '96, Lecture Notes in Comp. Science 1128, Springer-Verlag, Berlin, 1996, 263-270.

"An Exploration of Cyberspace Security R&D Investment Strategies for DARPA: "The Day After --- in Cyberspace II," RAND Report MR-797, 1996 (coauthored with R. H. Anderson).

"A Computer Algebra System based on Order-Sorted Algebra," Journ. Symb. Computation 19, 65-77, 1995 (coauthored with E. Schroefer).

"An Order-sorted Approach to Algebraic Computation," Proceedings of DISCO '93, Lecture Notes in Comp. Science 722, Springer-Verlag, Berlin, 1993, 134-144 (coauthored with E. Schroefer).

"Cyberspace Security and Safety," RAND Report DRU-530, 1993 (coauthored with R. O. Hundley, R. H. Anderson and W. H. Ware).

"Algebraic Computation: The Quiet Revolution," Artificial Intelligence and Mathematical Theory of Computation" (edited by V. Lifschitz), Academic Press, Inc., Boston (1991) 177-186.

"Equation Solving by Symbolic Computation," Computer Aided Proofs in Analysis, The IMA Volumes in Mathematics and its Applications, 28, Springer-Verlag, New York, 1991.

"Algebraic Computation Comes of Age," Computer Algebra Nederland Newsletter 6, Computer Algebra Nederland (1990) 14-27.

"Future Directions for Research in Symbolic Computation," SIAM Reports on Issues in the Mathematical Sciences, SIAM, Philadelphia (1990), (Workshop Chair, Edited by A. Boyle and B.F. Caviness).

"The REDUCE Algebraic Computation System," Computing Tools for Scientific Problem Solving, Academic Press (1990) 57-62.

"Global Trends in Computer Technology and Their Impact on Export Control", National Academy Press, Washington, D.C. (1988), (Committee member co-author).

"REDUCE User's Manual," Version 3.3, RAND, CP-78 (July 1987). Translated into Japanese by H. Toshima and published by McGraw Hill Japan.

"Enlarging the REDUCE Domain of Computation," Proc. of SYMSAC '86, ACM, New York (1986), 100-106 (coauthored with R.J. Bradford, J.A. Padget and E. Schroefer).

"Optimal Evaluation of Algebraic Expressions," Proc. of AAEECC-3, 392-403, published as Lecture Notes on Comp. Science, No. 229, Springer-Verlag, Berlin, 1986.

"REDUCE as a LISP Benchmark," SIGSAM Bulletin, ACM, New York (1985) 19, 8-16 (coauthored with J.B. Marti).

"Structure: The Key to Improved Algebraic Computation," Proc. of the Second RIKEN International

Symposium on Symbolic and Algebraic Computation by Computers, World Scientific, Singapore (1985), 215-230.

"History and Overview of CSNET," Proc. Symposium on Data Communications, ACM SIGCOMM, ACM, New York (1983) 138-145 (coauthored with P. J. Denning and C. W. Kern).

"REDUCE - A Case Study in Algebra System Development," Proc. EUROCAM '82, 263-272, published as Lecture Notes on Comp. Science, No. 144, Springer-Verlag, Berlin, 1982.

"Current Status of a Portable LISP Compiler," Proc. SIGPLAN '82 Symp. on Compiler Construction, ACM, New York (1982) 276-283 (coauthored with M. L. Griss and E. Benson).

"A Discipline in Crisis," Communications of the ACM, 24, 370-374, 1981 (coauthored with P. J. Denning, E. Feigenbaum, P. Gilmore, R. W. Ritchie, J. Traub).

"Analytic Integration by Computer," Information Processing Society of Japan 22, 639-650, 1981 (coauthored with S. Watanabe).

"A Portable LISP Compiler," Software Practice and Experience 11, 541-605, 1981 (coauthored with M. L. Griss).

"Symbolic Computation and its Application to High-Energy Physics," Proc. 1980 CERN School of Computing, 390-406, CERN, Geneva, Switzerland, 1981.

"The Personal Algebra Machine," Information Processing 80 (Proc. IFIP Congress 80), 621-628, North-Holland, 1980.

"A One-Pass Prettyprinter," SIGPLAN Notices 50-58, No. 12, ACM, New York, 14, 1979 (coauthored with Arthur C. Norman).

"Non-Modular Computation of Polynomial GCDs Using Trial Division," Proc. EUROSAM 79, 227-239, 72, published as Lecture Notes on Comp. Science, No. 72, Springer-Verlag, Berlin, 1979.

"A Program for the Orthogonalization of Polynomials in Two Variables using the REDUCE 2 Language," Comm. of JINR, No. P10 - 11944, (in Russian), 1978 (coauthored with I. Bajla and G. A. Ososkov).

"Symbolic Computation, Past, Present and Future," Proc. of the Joint Meeting of the GI and DPG, Berlin, West Germany, Oct. 3-7, 1978.

"Standard LISP Report," SIGPLAN Notices, 48-68, No. 10, ACM, New York, 14, 1979 (coauthored with J. Marti, M. L. Griss, C. Griss).

"Applications of Symbolic Algebraic Computation," Comp. Phys. Comm. 17, 207-215, 1979 (coauthored with W. S. Brown).

"Algebraic Manipulation by Computer," Proc. Intern. Meeting on Programm. and Math. Meth. for Solving Phys. Probs., 96- 116, Dubna, USSR, 1978.

"The Structure of Algebraic Computations," Proc. of the Fourth Colloquium on Advanced Methods in Theoretical Physics, 1-15, St. Maximin, France, 1977.

"Symbolic Computation," Proc. CERN 1976 Computing School, 201-211, CERN, Geneva, Switzerland,

1976.

"A New REDUCE Model for Algebraic Simplification," Proc. SYMSAC 76, 46-52, ACM, New York, 1976.

"Scientific Applications of Symbolic Computation," Computer Science and Scientific Computation, 83-108, Academic Press, Inc., New York, 1976.

"A Mode Analyzing Algebraic Simplification Program," Proc. ACM 74, 722-724, ACM, New York, 1974.

"Polynomial and Rational Function Representations," Proc. Mathematical Software II, 211 (abstract only), Purdue University, May 29-31, 1974.

"Analytic Computation of Some Integrals in Fourth Order Quantum Electrodynamics," Journ. Comp. Phys 14, 301-317, 1974 (coauthored with J. A. Fox).

"The REDUCE Program for Computer Algebra," Proc. Third Colloq. on Advanced Computing Methods in Theoretical Physics, CNRS, Marseilles, June, 1973.

"REDUCE 2 User's Manual," 2nd edition, 1973.

"Extended Polynomial Algorithms," Proc. ACM 73, 147-152, ACM, New York, 1973 (coauthored with R. Loos).

"A REDUCE Solution of Problem 2 - The $Y(2n)$ Functions," SIGSAM Bulletin, pg. 14, ACM, New York, 1972.

"Comments on Problem 2 - The $Y(2n)$ Functions," SIGSAM Bulletin, No. 15, ACM, New York, 24, 1972 (with D. Barton).

"An Improved Non-modular Polynomial GCD Algorithm," SIGSAM Bulletin, 10-15, ACM, New York, 1972.

"Computer Solution of Symbolic Problems in Theoretical Physics," Computing as a Language as Physics, 567-596, IAEA, Vienna, 1972.

"The Computer Solution of Algebraic Problems by Pattern Matching," Proc. of the Second Colloquium on Advanced Computing Methods in Theoretical Physics, CNRS, Marseilles, June 21-25, 1971.

"Calculation of Traces of Products of Gamma Matrices," Proc. of the Second Colloquium on Advanced Computing Methods in Theoretical Physics, CNRS, Marseilles, June 21-25, 1971.

"Applications of Symbolic Manipulation in Theoretical Physics," Proc. of Second Symposium on Symbolic and Algebraic Manipulation, International Hotel, Los Angeles, March 23-25, 1971, page 511, Comm. ACM 14, 1971.

"REDUCE 2, A System and Language for Algebraic Manipulation," Proc. of Second Symposium on Symbolic and Algebraic Manipulation, International Hotel, Los Angeles, March 23-25, 1971.

"REDUCE 2 User's Manual," Stanford Artificial Intelligence Project Memo, AIM-133, October 1970.

"REDUCE: A Program for Symbolic Algebraic Computation," Proc. of SHARE XXXIV, Denver, Colorado,

March 2-6, 1970.

"Computer Solution of Algebraic Problems in Theoretical Physics," Proc. of the Joint Conference on Mathematical and Computer Aids to Design, Disneyland, Anaheim, California, October 27-31, 1970.

"Symbolic Analysis of Feynman Diagrams by Computer," J. Computational Physics 5, 280, 1970 (coauthored with J. A. Campbell).

"Determination of the Real Part of the Compton Amplitude at a Nuclear Resonance," Phys. Rev. 187, 1899, 1969, (coauthored with S. J. Brodsky and R. G. Parsons).

"STANDARD LISP," SIGPLAN Notices, ACM, New York, 4, No. 9 (Sept. 69). Reprinted in SIGSAM Bulletin, 28-49, ACM, New York, 13, 1969.

"Radiative Corrections to an Electron-Position Scattering Experiment," Phys. Rev. 187, 1950, 1969, (coauthored with P. K. Kuo and D. R. Yennie).

"The Problem of Substitution," Proc. of the IBM Summer Institute on Symbolic Mathematics by Computer, July-August 1968, IBM Programming Laboratory Report No. FSC-69-0312 (edited by R. G. Tobey, June 1969).

"REDUCE - A User Oriented Interactive System for Algebraic Simplification," Interactive Systems for Experimental Applied Mathematics, pp. 79-90 (edited by M. Klerer and J. Reinfelds, Academic Press, New York, 1968).

"REDUCE User's Manual," Institute of Theoretical Physics, Department of Physics, Stanford University, Report No. ITP- 292, 1967, rev. 1968.

"Peripheral Processes," High Energy Physics, Vol. II, p. 219 (edited by E. H. S. Burhop, Academic Press, New York, 1967), (coauthored with S. D. Drell).

"Computation of Algebraic Properties of Elementary Particle Reactions Using a Digital Computer," Communications of the ACM, No. 9, p. 573-577, 1966.

"Exact Sum Rule for Nucleon Magnetic Moments," Phys. Rev. Letters, 16, 908, 1966. Reprinted in S. L. Adler and R. F. Dashen, "Current Algebras and Applications to Particle Physics," W. A. Benjamin, 1968 (coauthored with S. D. Drell).

"Differential Cross Section for $e^+ + e^- \rightarrow W^+ + W^- \rightarrow e^- + \bar{\nu}(e) + \mu^+ + \nu(\mu)$," Phys. Rev. 140, B721, 1966 (coauthored with Y. S. Tsai). A summary of this paper may be found in the Proc. of the International Symposium on Electron and Photon Interactions at High Energies, Hamburg, II, 320, 1965.

"Backward Anomaly in π^0 Photoproduction," Proc. of the International Symposium on Electron and Photon Interactions at High Energies, p. 292, Hamburg, II, 1965 (coauthored with C. Schaerf).

"Photoproduction of π^0 from Hydrogen near the Second Pion-Nuclear Resonance," Phys. Rev. 140, B336, 1965 (coauthored with H. DeStaebler, Jr., E. F. Erickson and C. Schaerf).

"Bounds on Propagators, Coupling Constants and Vertex Functions," Phys. Rev. 136, B1439, 1964 (coauthored with S. D. Drell and A. C. Finn).

"Theory of Proton Compton Scattering," Proc. of the International Conference on Nucleon Structure,

Stanford University, pp. 314-315, Stanford University Press, 1963 (coauthored with E. Leader).

"Fixed Angle Dispersion Relations for Nucleon Compton Scattering, 1," *Physics Rev.* 126, p. 789, 1962 (coauthored with E. Leader).

"The Invariant Amplitudes of Interaction Processes," *Nuovo Cimento* 21, p. 333, 1961.

7 April 2009