

Christopher A. Fields

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Personal:

Born 1 May 1955, West Benton Township, Missouri, USA.
U. S. Citizen

Education:

B. S. Physics, Louisiana State University, 1977.
M. S. Physics, University of Colorado, 1980.
M. A. Philosophy, University of Colorado, 1983.
Ph. D. Philosophy, University of Colorado, 1985.
M. A. Molecular, Cellular, and Developmental Biology, University of Colorado, 1988.

Employment:

1987 - 1991: Research Scientist, later Project Manager, Computing Research Laboratory, New Mexico State University, Las Cruces, NM.

My group carried out contract research and prototyping projects in the areas of meteorological data fusion systems (funded by the U.S. Army), general problem solving (funded by the U.S. Army), neural network simulation (funded by NASA), plant disease simulation (funded by NSF), and genome informatics (funded by DOE).

1991 - 1992: Special Expert, Informatics, National Institute of Neurological Disorders and Stroke, Rockville, MD.

I developed information systems and performed data analysis supporting human genomic sequencing, and contributed to the development of the "Expressed Sequence Tag (EST)" strategy for rapid gene identification.

1992 - 1994: Director of Informatics, The Institute for Genomic Research (TIGR), Gaithersburg, MD.

As a founding member of TIGR, I organized the Informatics Department, developed data analysis methodologies, and performed analysis supporting large-scale gene discovery in humans and whole-genome sequencing in microbes.

1994 - 1996: Scientific Director, National Center for Genome Resources (NCGR), Santa Fe, NM.

I was responsible for the research program of NCGR, and obtained DOE funding for and served as Principal Investigator of the Genome Sequence DataBase (GSDB) project for its first two years. I served as lead scientist in developing the Molecular Informatics, Inc. spin-off from NCGR.

1996 - 1997: Vice President and Chief Scientific Officer, Molecular Informatics, Inc., Santa Fe, NM.

As CSO, I was responsible for product concepts and strategic marketing, as well as developing relationships with potential partners.

1997 - 2001: Division Vice President, Science and Technology, PE Molecular Informatics, later PE Informatics, later Informatics Division, Applied Biosystems, Inc., Santa Fe, NM.

Following the acquisition of Molecular Informatics, Inc. by Perkin Elmer Corporation, later PE Corporation, later Appera Corporation, Applied Biosystems Group (NYSE: ABI), I was responsible for scientific and application-integration aspects of Informatics products and services, including developing and maintaining relationships between Informatics and both internal and external partners.

2001 - 2003: President, HayFields Consulting Inc., later HayFields Science, Inc., Las Cruces, NM.

I advised various public and private sector entities on strategic marketing, business development, and information system issues.

2002 - 2005: Adjunct Professor, Molecular Biology, later College Professor and Director, Molecular Biology Program, New Mexico State University, Las Cruces, NM.

As Director, I expanded the Molecular Biology (MOLB) Program, an interdepartmental MS and PhD program, to include faculty from seven academic departments, revised and simplified the PhD curriculum, and integrated the MOLB Program into the planned NMSU Research Clusters.

2005 - 2006: Associate Vice Provost for Research, New Mexico State University, Las Cruces, NM.

My activities focused on strategic partnership and business development for the NMSU Research Clusters.

2006 – present: Independent Scientist.

My research focuses on applying classical and quantum information-theoretic principles in developmental biology, cognitive neuroscience and fundamental physics. Since 2015 my work has been partially supported by the Federico and Elvia Faggini Foundation, and since 2018 by the Allen Discovery Center at Tufts University.

Service Activities:

External reviewer of proposals and member of standing or *ad hoc* advisory committees for the National Institutes of Health, U. S. Department of Energy, U. S. Department of Agriculture, and National Science Foundation, 1990 – 1996. External reviewer of proposals for the Templeton World Charity Foundation, 2017.

Founding Co-editor of the *Journal of Experimental and Theoretical Artificial Intelligence*, member of the Editorial Boards of *Genome Research* and *Genome Science and Technology* (now *Comparative and Microbial Genomics*), and referee for numerous physics, biology, psychology, philosophy and computing/information science journals, including *Science*, *Nature* and *Philosophical Transactions of the Royal Society* as well as for various book publishers.

Co-organizer of the Genome Sequencing and Analysis conferences 1992 – 1995 and the After the Genome conferences 1995 – 1997, and member of organizing or program committees of several other national and international conferences in biology and computing.

Firefighter and rescue technician with the Galisteo Volunteer Fire and Rescue Department, a district of the Santa Fe County Fire Department, 1999 - 2002.

Member of the Design Committee of Las Cruces Downtown, a downtown revitalization and economic development organization, 2005 – 2006.

Member of the Board of Llano Adobe Compound, Santa Fe, NM, 2012 – 2013.

Member of the Board of Science and Non-Duality, Sebastopol, CA, 2018 – present.

Honors

New Mexico Technology AllStar, New Mexico Economic Development Department, 2005

PhD Students

Owen White, PhD Molecular Biology, New Mexico State University, 1992; now Professor and Director of Bioinformatics, University of Maryland, Baltimore.

Mark DeYong, PhD Electrical and Computer Engineering, New Mexico State University, 1992; now Vice President, Engineering, Xtera Corporation, Austin, Texas.

Postdoctoral Associates

Owen White, PhD; now Professor and Director of Bioinformatics, University of Maryland, Baltimore.

Granger Sutton, PhD; now Senior Director of Bioinformatics, J. Craig Venter Institute, Rockville, Maryland.

Carol Bult, PhD; now Professor, Jackson Laboratory, Bar Harbor, Maine.

Judith Blake, PhD; now Associate Professor, Jackson Laboratory, Bar Harbor, Maine.

Rebecca Clayton, PhD; now Instructor, New River Community and Technical College, Hillsboro, West Virginia.

Lisa FitzGerald, PhD; now Program Director, Myriad Genetics, Salt Lake City, Utah.

Publications

160+ refereed publications in nuclear physics, information physics, biophysics, cognitive science, information systems, neuroscience, and molecular and developmental biology. Recent publications and a complete list are available from <https://chrisfieldsresearch.com>.

h-index = 29, 12,000+ total citations; Erdős Number = 3.

Publications

Christopher A. Fields

1978:

Kitching, J. E., P. A. Batay-Csorba, C. A. Fields, R. A. Ristinen, and B. L. Smith (1978). High-spin states in $^{88,87,86}\text{Zr}$. *Nuclear Physics A302*: 159-172.

1979:

Fields, C. A., J. J. Kraushaar, R. A. Ristinen, and L. E. Samuelson (1979). High-spin states above 3.5 MeV in ^{91}Nb . *Nuclear Physics A326*: 55-64.

Fields, C. A. and L. E. Samuelson (1979). High-spin states of ^{89}Y studied with the $^{87}\text{Rb}(\alpha, 2n\gamma)$ reaction. *Physical Review C20*: 2442-2445.

1980:

Fields, C. A., F. W. N. de Boer, R. A. Ristinen, L. E. Samuelson and P. A. Smith (1980). A method for determining the neutron multiplicity for gamma rays from (particle, xny) reactions. *Nuclear Instruments and Methods* 169: 173-177.

Fields, C. A., F. W. N. de Boer, J. J. Kraushaar, W. W. Pratt, R. A. Ristinen and L. E. Samuelson (1980). Gamma-ray spectroscopy of ^{87}Y . *Zeitschrift für Physik A295*: 365-376.

de Boer, F. W. N., C. A. Fields, G. Marro, E. Sugarbaker, J. Konijn, H. Verheul and P. M. Walker (1980). Aligned octupole bands in deformed N=90 and N=92 nuclei. *Physics Letters* 96B: 39-42.

de Boer, F. W. N., J. J. van Ruijven, A. W. B. Kalshoven, H. Verheul, R. Vis, E. Sugarbaker, C. Fields and C. S. Zaidins (1980). The tetra-neutron revisited. *Nuclear Physics A350*: 149-156.

1981:

Konijn, J., J. B. R. Berkhout, W. H. A. Hesselink, H. Verheul, P. M. Walker, F. W. N. de Boer, C. A. Fields and E. Sugarbaker (1981). Intrinsic structure effects in the aligned octupole bands of ^{152}Sm . *Physics Letters* 99B: 449-452.

Fields, C. A., F. W. N. de Boer, J. J. Kraushaar, R. A. Ristinen, L. E. Samuelson and E. Sugarbaker (1981). High-spin states in ^{90}Nb . *Nuclear Physics A363*: 311-321.

Fields, C. A., F. W. N. de Boer, E. Sugarbaker and P. M. Walker (1981). A study of $^{82,84,86}\text{Sr}$ by $(\alpha, 2n\gamma)$ reactions. *Nuclear Physics A363*: 352-364.

Fields, C. A., F. W. N. de Boer, D. E. Prull, R. A. Ristinen, L. E. Samuelson, P. A. Smith and E. Sugarbaker (1981). Decay pathways and entry state population in (α, xny) and $(^3\text{He}, xny)$ reactions on ^{150}Nd . *Nuclear Physics A366*: 38-60.

Walker, P. M., F. W. N. de Boer and C. A. Fields (1981). Band crossing in ^{162}Dy : Characterization of negative parity yrast and yrare sequences. *Physics Letters* 104B: 19-22.

Fields, C. A., F. W. N. de Boer, R. A. Ristinen, P. A. Smith and E. Sugarbaker (1981). Fast neutron emission in $(\alpha, 2n\gamma)$ reactions: A neutron skin effect? *Physics Letters* 106B: 453-456.

Becchetti, F. D., C. A. Fields, R. S. Raymond, H. Bhang and D. Overway (1981). The ghost anomaly in ^{11}Be studied with the $^{10}\text{Be}(p, d)$ reaction at $E_p = 14.3$ MeV. *Physical Review C*24: 2401-2408.

1982:

Konijn, J., J. B. R. Berkhout, W. H. A. Hesselink, J. J. van Ruijven, P. van Nes, H. Verheul, F. W. N. de Boer, C. A. Fields, E. Sugarbaker, P. M. Walker and R. Bijker (1982). Rotational bands in ^{152}Sm observed following the $(\alpha, 2n\gamma)$ reaction. *Nuclear Physics A*373: 397-433.

Fields, C. A., F. W. N. de Boer, R. A. Ristinen, P. A. Smith and E. Sugarbaker (1982). A systematic investigation of the $(\alpha, 2n\gamma)$ reaction on medium-heavy nuclei. *Nuclear Physics A*377: 217-236.

Hicks, K. H., T. E. Ward, J. Wiggins, C. A. Fields and F. W. N. de Boer (1982). Decays of $^{194,195,196}\text{Pb}$. *Physical Review C*25: 2710-2721.

Diana, B. J., F. W. N. de Boer and C. A. Fields (1982). Gamma-ray spectroscopy of ^{89}Nb . *Zeitschrift für Physik A*306: 171-175.

Fields, C. A., K. H. Hicks, R. A. Ristinen, F. W. N. de Boer, L. K. Peker and P. M. Walker (1982). Interacting negative-parity bands in ^{164}Er . *Physical Review C*26: 290-293.

Fields, C. A., F. W. N. de Boer, R. A. Ristinen and E. Sugarbaker (1982). Breakdown of the thermal moving-source description of fast neutron emission in $(\alpha, xn\gamma)$ and $(^3\text{He}, xn\gamma)$ reactions. *Physics Letters* 114B: 81-85.

Becchetti, F. D., K. H. Hicks and C. A. Fields (1982). Thin-film cryogenic accelerator targets. *Nuclear Instruments and Methods* 203: 93-95.

Fields, C. A., R. A. Ristinen, L. E. Samuelson and P. A. Smith (1982). A study of the $^{90}\text{Zr}(^3\text{He}, t)$ reaction at 43.4 MeV. *Nuclear Physics A*385: 449-460.

de Boer, F. W. N., C. A. Fields, L. E. Samuelson and J. Sau (1982). The level structure of ^{90}Mo . *Nuclear Physics A*388: 303-316.

Fields, C. A., K. H. Hicks, R. A. Ristinen, F. W. N. de Boer, P. M. Walker, J. Borggreen and L. K. Peker (1982). A study of the rotational sidebands of ^{162}Dy . *Nuclear Physics A*389: 218-246.

Fields, C. A., K. H. Hicks, R. A. Ristinen, F. W. N. de Boer, L. K. Peker and P. M. Walker (1982). Band crossings at low rotational frequency in ^{164}Er . In: K. Ogawa and T. Tanabe (Eds.) *Dynamics of Nuclear Collective Motion*. University of Tokyo. pp. 122-127.

Emigh, R. A., C. A. Fields, M. L. Gartner, L. E. Samuelson and P. A. Smith (1982). A study of the $^{121,123}\text{Sb}(p, d)$ reactions. *Zeitschrift für Physik A*308: 165-171.

Emigh, R. A., C. A. Fields, M. L. Gartner, L. E. Samuelson and P. A. Smith (1982). A study of the $^{120}\text{Sn}(p, n\gamma)$ reaction. *Zeitschrift für Physik A*308: 173-179.

1983:

Fields, C. A., F. W. N. de Boer and J. Sau (1983). A study of the $^{84}\text{Kr}(\alpha, 2n\gamma)$ ^{86}Sr reaction. *Nuclear Physics A*398: 512-524.

Fields, C. A., J. J. Kraushaar, R. A. Ristinen and E. Sugarbaker (1983). A study of the $^{88}\text{Sr}(^3\text{He}, t)^{88}\text{Y}$ reaction. *Nuclear Physics A*398: 434-444.

Fields, C. A., F. W. N. de Boer and B. J. Diana (1983). High-spin states in ^{92}Tc . *Nuclear Physics A*401: 117-130.

Fields, C. A. and F. W. N. de Boer (1983). The 8^+ levels of ^{86}Zr revisited. *Zeitschrift für Physik A311*: 127-130.

Fields, C. A., R. J. Peterson, R. S. Raymond, J. L. Ullman, R. J. de Meijer, E. H. L. Aarts and M. B. Greenfield (1983). Deuteron projectile breakup on ^{28}Si at $E_d = 17.85$ MeV. In: H. Ogata, T. Kammamuri, and I. Katayama (Eds.) *Light Ion Reaction Mechanism*. University of Osaka. pp. 621-625.

Becchetti, F. D., K. H. Hicks, C. A. Fields, R. J. Peterson, R. S. Raymond, R. A. Ristinen, J. L. Ullman and C. S. Zaidins (1983). ^3He -induced fission of nuclei $159 < A < 232$. *Physical Review C28*: 1217-1223.

Fields, C. A., K. H. Hicks, M. A. Rumore and R. J. Peterson (1983). Interaction between the S band and the β - and γ -vibrational bands in ^{166}Yb . *Physics Letters 130B*: 157-160.

Peterson, R. J., C. A. Fields, R. S. Raymond, J. R. Thieke and J. L. Ullman (1983). A study of the $^{28}\text{Si}(d, p)^{29}\text{Si}$ reaction. *Nuclear Physics A408*: 221-238.

Fields, C. (1983). Compartmental analysis as a formal language for ecological realist psychology. *Nature and System 5*: 195-209.

Fields, C. (1983). Cognitive penetration pathways in natural language understanders. *Cognition and Brain Theory 6*: 449-461.

1984:

Fields, C. A., K. H. Hicks, R. A. Ristinen, F. W. N. de Boer, L. K. Peker, R. J. Peterson and P. M. Walker (1984). Rotational sidebands in ^{164}Er . *Nuclear Physics A422*: 215-236.

Fields, C. A., R. A. Ristinen and E. Sugarbaker (1984). The inclusive 24 to 43 MeV ($^3\text{He}, xn\gamma$) reaction on Pd and Sn targets. *Nuclear Physics A422*: 296-306.

Rumore, M. A., S. A. Dickey, C. A. Fields and J. J. Kraushaar (1984). The $^{93}\text{Nb}(p, d)^{92}\text{Nb}$ reaction at 26.3 MeV. *Nuclear Physics A423*: 350-364.

Fields, C. A., F. W. N. de Boer, R. A. Ristinen, P. A. Smith and E. Sugarbaker (1984). The 33 and 43 MeV ($^3\text{He}, xn\gamma$) exclusive reactions on targets from Zr to Pb. *Nuclear Physics A429*: 259-268.

Fields, C. A., K. H. Hicks and R. J. Peterson (1984). Bandcrossings at low rotational frequency in ^{166}Yb . *Nuclear Physics A431*: 473-485.

Fields, C. (1984). Rational procedures in goal-generating decision systems. *Cognition and Brain Theory 7*: 359-374.

Fields, C. (1984). Double on Searle's Chinese Room. *Nature and System 6*: 51-54.

1985:

Fields, C. A., K. H. Hicks and R. J. Peterson (1985). Rotational sidebands in ^{166}Er . *Nuclear Physics A440*: 301-310.

Rumore, M. A., C. A. Fields and J. J. Kraushaar (1985). Low-lying levels of ^{92}Nb from the $^{92}\text{Zr}(^3\text{He}, t)$ and $^{92}\text{Zr}(^3\text{He}, p2n\gamma)$ reactions. *Nuclear Physics A455*: 408-417.

1987:

Riezebos, H. J., M. J. A. de Voigt, C. A. Fields, X. W. Cheng, R. J. Peterson, G. B. Hagemann and A. Stolk (1987). Rotational sidebands in ^{160}Dy . *Nuclear Physics A465*: 1-24.

Fields, C. (1987). The computer as tool: A critique of a common view of the role of intelligent artifacts in society. *Social Epistemology* 1: 5-25.

Fields, C. and E. Dietrich (1987). Intentionality is a red herring. *Behavioral and Brain Sciences* 10: 756-757.

1988:

Fields, C. (1988). Background knowledge and natural language understanding. In: H. Otto and J. Tuedio (Eds.) *Perspectives on Mind*. Dordrecht: Reidel. pp. 261-273.

Fields, C., M. Coombs, E. Dietrich and R. Hartley (1988). Incorporating dynamic control into the model generative reasoning system. *Proceedings of the European Conference on Artificial Intelligence*. London: Pitman. pp. 439-441.

Fields, C., M. Coombs and R. Hartley (1988). MGR: An architecture for problem solving in unstructured task environments. In: Z. Ras and L. Saitta (Eds.) *Methodologies for Intelligent Systems*, 3. Amsterdam: Elsevier. pp. 40-49.

Dietrich, E. and C. Fields (1988). Some assumptions underlying Smolensky's treatment of connectionism. *Behavioral and Brain Sciences* 11: 29-31.

Bektesh, S., C. Fields and D. Hirsh (1988). DNA transformation in *Caenorhabditis elegans*. In: G. Malacinski (Ed.), *Developmental Genetics of Higher Organisms*. New York: Macmillan. pp. 221-236.

Fields, C. (1988). Domain organization and intron positions in *Caenorhabditis elegans* collagen genes: The 54 bp module hypothesis revisited. *Journal of Molecular Evolution* 28: 55-63.

1989:

Fields, C. (1989). Affordance perception and the Y-magnocellular pathway. *Behavioral and Brain Sciences* 12: 403-404.

Fields, C., T. Eskridge, R. Hartley and M. Coombs (1989). Experimental analysis of dynamic control strategies for the MGR architecture: Simulation environment and initial results. *Proceedings of the Seventh Conference of the Society for the Study of Artificial Intelligence and the Simulation of Behaviour*. London: Pitman. pp. 165-173.

Fields, C. (1989). Consequences of nonclassical measurement for the algorithmic description of continuous dynamical systems. *Journal of Experimental and Theoretical Artificial Intelligence* 1: 171-178.

Eskridge, T. and C. Fields (1989). Representing strategic knowledge in continuous, dynamic control functions. In: Z. Ras (Ed.) *Methodologies for Intelligent Systems*, 4. New York: Elsevier. pp. 191-198.

Fields, C. (1989). Explaining classical conditioning: Phenomenological unity conceals mechanistic diversity. *Behavioral and Brain Sciences* 12: 141-142.

Cox, G., C. Fields, J. Kramer, B. Rosenzweig and D. Hirsh (1989). Sequence comparisons of developmentally regulated collagen genes of *Caenorhabditis elegans*. *Gene* 76: 331-343.

1990:

Fields, C. (1990). Fast synaptic modulation provides a ubiquitous mechanism to support an instruction-data distinction in biological neural networks. *Proceedings of the International Joint Conference on Neural Networks, Vol. I*. Hillsdale, NJ: Erlbaum. pp. 70-73.

Fields, C. (1990). Information content of *Caenorhabditis elegans* splice site sequences varies with intron length. *Nucleic Acids Research* 18: 1509-1512.

Fields, C. and C. Soderlund (1990). **gm**: A practical tool for automated DNA sequence analysis. *Computer Applications in the Biosciences* 6: 263-270.

1991:

Fields, C., M. DeYong and R. Findley (1991). Computational capabilities of biologically-realistic analog processing elements. In: J. Delgado-Frias and W. Moore (Eds) *VLSI for Artificial Intelligence and Neural Networks*. New York: Plenum. pp. 175-184.

Fields, C. and E. Dietrich (1991). Engineering artificial intelligence applications in unstructured task environments: Some methodological issues. In: D. Partridge (Ed.) *Artificial Intelligence and Software Engineering*. Norwood, NJ: Ablex. pp. 369-381.

Fields, C., H. Pfeiffer and T. Eskridge (1991). Knowledge representation and control in **gm1**, an automated DNA sequence analysis system based on the MGR architecture. *International Journal of Man-Machine Studies* 34: 549-573.

Dietrich, E. and C. Fields (1991). The wanton module and the frame problem. In: L. Burkholder (Ed.) *Philosophy and the Computer*. Boulder: Westview. pp. 92-104.

1992:

Fields, C., J. Newberry, H. Pfeiffer, C. Soderlund, S. Kirby and G. McWilliams (1992). MERCURY: A heterogeneous system for spatial extrapolation of mesoscale meteorological data. *International Journal of Man-Machine Studies* 36: 309-326.

DeYong, M., R. Findley and C. Fields (1992). The design, fabrication, and testing of a new VLSI hybrid analog-digital neural processing element. *IEEE Transactions on Neural Networks* 3: 363-374.

DeYong, M. and C. Fields (1992). Applications of hybrid analog-digital neural networks in signal processing: Simple circuits for frequency and phase detection and shifting. *Proceedings of the International Conference on Circuits and Systems*. Los Alamitos, CA: IEEE Press. pp. 2212-2215.

DeYong, M., T. Eskridge and C. Fields (1992). Temporal signal processing with high-speed hybrid analog-digital neural networks. *Analog Integrated Circuits and Signal Processing* 2: 367-388.

Venter, J. C., M. Adams, A. Martin-Gallardo, W. R. McCombie and C. Fields (1992). Genome sequence analysis: Scientific objectives and practical strategies. *Trends in Biotechnology* 10: 8-11.

Fields, C. (1992). Data exchange and inter-database communication in genome projects. *Trends in Biotechnology* 10: 58-61.

Adams, M., M. Dubnick, A. Kerlavage, R. Moreno, J. Kelley, T. Utterback, J. Nagle, C. Fields and J. C. Venter (1992). Sequence identification of 2375 human brain genes. *Nature* 355: 632-634.

Fields, C., D. Grady and R. Moyzis (1992). The human THE-LTR(O) and *Mst* II interspersed repeats are subfamilies of a single widely-distributed, highly-variable repeat family. *Genomics* 13: 431-436.

White, O., C. Soderlund, P. Shanmugam and C. Fields (1992). Information contents and dinucleotide compositions of plant intron sequences vary with evolutionary origin. *Plant Molecular Biology* 19: 1057-1064.

Soderlund, C., P. Shanmugam, O. White, and C. Fields (1992). **gm**: A tool for exploratory analysis of DNA sequences. In: V. Milutinovic and B. Shriver (Eds), *Proceedings of the 25th Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society Press. pp. 653-662.

Martin-Gallardo, A., W. R. McCombie, J. Gocayne, M. FitzGerald, S. Wallace, B. M. Lee, J. Lamerdin, S. Trapp, J. Kelley, L.-I. Liu, M. Dubnick, L. Dow, A. R. Kerlavage, P. De Jong, A. Carrano, C. Fields and J. C. Venter (1992). Automated DNA sequencing and analysis of 106 kilobases from human chromosome 19q13.3. *Nature Genetics* 1: 34-39.

McCombie, W. R., M. D. Adams, J. M. Kelley, M. G. FitzGerald, T. R. Utterback, M. Kahn, M. Dubnick, A. R. Kerlavage, J. C. Venter and C. Fields (1992). *C. elegans* expressed sequence tags identify gene families and disease gene homologues. *Nature Genetics* 1: 124-131.

McCombie, W. R., A. Martin-Gallardo, J. Gocayne, M. FitzGerald, M. Dubnick, J. Kelley, L. Castilla, L.-I. Liu, S. Wallace, S. Trapp, D. Tagle, L. Whaley, S. Cheng, J. Gusella, A.-M. Frischauf, A. Poustka, H. Lehrach, F. Collins, A. R. Kerlavage, C. Fields and J. C. Venter (1992). Expressed genes, interspersed repeats, and polymorphisms in cosmids sequenced from 4p16.3. *Nature Genetics* 1: 348-353.

Mount, S., C. Burks, G. Hertz, G. Stormo, O. White and C. Fields (1992). Splicing signals in *Drosophila*: Intron size, information content, and consensus sequences. *Nucleic Acids Research* 20: 4255-4262.

1993:

DeYong, M. and C. Fields (1993). High-speed silicon neurons for phase and frequency detection and complex pattern generation. In: M. Zaghoul, J. Meador and R. Newcomb (Eds.) *Silicon Implementation of Pulse Coded Neural Networks*. New York: Kluwer. pp. 65 – 77.

Adams, M., A. Kerlavage, M. Dubnick, R. Moreno, C. Fields and J. C. Venter (1993). Analysis of expressed sequence tags from human brain cDNAs. In: H. Lim, J. Fickett, C. Cantor and R. Robbins (Eds) *Proceedings of the Second International Conference on Bioinformatics, Supercomputing, and Complex Genome Analysis*. New York: World Scientific. pp. 113-120.

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Adams, M. D., M. B. Soares, A. R. Kerlavage, C. Fields and J. C. Venter (1993). Rapid cDNA sequencing (Expressed Sequence Tags) from a directionally cloned human infant brain cDNA library. *Nature Genetics* 4: 373-380.

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Kerlavage, A., M. Adams, J. Kelley, M. Dubnick, J. Powell, P. Shanmugam, J. C. Venter and C. Fields (1993). Analysis and management of data from high-throughput expressed sequence tag projects. *Proceedings of the 26th Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Computer Society Press. pp. 585-594.

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Fields, C. (1993). Life and computers (review of L. Hunter, *Artificial Intelligence and Molecular Biology*, MIT, 1993). *Science* 262: 1591-1592.

1994:

DeYong, M. R., R. L. Findley, T. C. Eskridge and C. A. Fields (1994). Asynchronous temporal neural processing element. U. S. Patent # 5355435.

Fields, C. (1994). Real machines and virtual intentionality. In: E. Dietrich (Ed.) *Thinking Machines and Virtual Persons*. Orlando, FL: Academic Press. pp. 71-90.

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Fields, C. and M. D. Adams (1994). Expressed sequence tags identify a human isolog of the SUI1 translation initiation factor. *Biochemical and Biophysical Research Communications* 198: 288-291.

Fields, C., M. D. Adams, O. White and J. C. Venter (1994). How many genes in the human genome? *Nature Genetics* 7: 345 – 346.

Waterman, M., E. Uberbacher, S. Spengler, F. R. Smith, T. Slezak, R. Robbins, T. Marr, D. Kingsbury, P. Gilna, C. Fields, K. Fasman, D. Davison, M. Cinkosky, P. Cartwright, E. Branscom and H. Berman (1994) Genome informatics I: Community databases. *Journal of Computational Biology* 1: 173 – 190.

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