



## Curriculum Vitae of Louis H. Kauffman

### 1. Education

Ph.D., Princeton University, 1972 (Advisor - William Browder)

B.S., Massachusetts Institute of Technology, 1966

### 2. Employment and Teaching}

(November and December 2024) Visiting Researcher at  $\$SKCM^2\$, Hiroshima University, Hiroshima, Japan.$

(2018-2021) Visiting Researcher and Head of Research Grant at Department of Mechanics and Mathematics, Novosibirsk State University, Novosibirsk, Russia.

(4 months per year for 2018/2019/2020). Laboratory of Topology and Dynamics, Novosibirsk State University (contract no. 14.Y26.31.0025 with the Ministry of Education and Science of the Russian Federation).

Visiting Researcher at NTUA, Athens in various periods from 2005 to the present.

Supported in 2011 to 2015

by the research project THALES ``Algebraic modeling of topological and computational structures and applications" MIS 380154 with Scientific Coordinator Sofia Lambropoulou.

Visiting Researcher in Xiamen China, June 2016, June 2019.

Visiting Researcher National Technical University Athens, July 2017.

Visiting Researcher in Pune and Varanasi, India, December 2016

Visiting Researcher at National Technical University Athens, July 2016.

Visiting Researcher (Research in Pairs for Four - L. Kauffman, S. Lomonaco, J. Przytycki and R. Orwczarek) ) at MFO - Mathematisches Research Institute Oberwolfach, June 2015.

Visiting Researcher at National Technical University Athens, July 2015.

Visiting Researcher Singapore, May 2015

Visiting Researcher at National Technical University Athens, July 2014.

Visiting Researcher at Mathematisches Institute Oberwolfach, June 2014 (Research in Pairs with Vassily Manturov)

Visiting Researcher at National Technical University Athens, June 2013.

October 1, 2012 - December 24, 2012. Visiting researcher at Isaac Newton Institute, Cambridge, UK in the program "Topological Dynamics in the Physical and Biological Sciences".

June 2012 - Organizer of Conference on Low Dimensional Topology at MFO - Mathematisches Research Institute Oberwolfach and then participant in a Research in Pairs at MFO with Vassily Manturov for two weeks

May 2012, Visiting Professor, Moscow State University, Russia.

December 2011, Research in Pairs at MFO - Mathematisches Research Institute Oberwolfach with Sofia Lambropoulou and Dorothy Buck.

May 2011, Visiting Lecturer in Program on Knots and Applications at the University of Pisa and Centro di Giorgi in Pisa, Italy. Lecturer in Course on Combinatorial Knot Theory and Organizer of Workshop on Topological Quantum Computing.

July 2011, Visiting researcher at Imperial College London, Dept. of Mathematics and University of Nottingham, Dept. of Physics.

July 18 to July 31, 2010, Visiting Researcher (in program for research in pairs with Sofia Lambropoulou) at MFO - Mathematisches Research Institute Oberwolfach.

July 15-17, 2010, Visiting Researcher at Kavli Institute, UK.

June 6 - 11, 2010, Visiting Researcher at Institute Dagstuhl Germany.

June 14 - 21, 2009, Visiting Researcher at NTUA - National Technical University Athens

June 1 - 13, 2009, Visiting Research (in program for research in pairs with Vassily Manturov) at MFO - Mathematisches Research Institute Oberwolfach.

May 2009, Director of Summer School and Conference on Knot Theory, The International Center for Theoretical Physics in Trieste, May 11 - May 29, 2009.

July 2008, Visiting Researcher, Instituto Superior Tecnico (IST) Lisbon.

July 2008, Visiting Researcher, Max Planck Institute, Leipzig, Germany

June 2008, Visiting Researcher, National Technical University, Athens, Greece

May 2008, Visiting Researcher, Mathematisches Institute, Oberwolfach, Germany

August 8-24, 2007, Lecturer in 17<sup>th</sup> Summer School in Jyväskylä, Finland.

July 7-18, 2007, Visiting Researcher at University de Pernambuco, Recife, Brazil.

May 29 to June 13, 2006. Visiting Researcher at NTUA, Athens, Greece.

May 13 to May 26, 2007 Visiting Researcher ICTP, Trieste.

January 2-14, 2007 Visiting Researcher at Univ de Pernambuco, Recife, Brazil.

December 10-15, 2006, Visiting Researcher at Perimeter Institute, Waterloo Canada.

October 24 to November 3, 2006. Visiting Researcher at NTUA, Athens, Greece.

June 10 to June 23, 2006 Visiting Researcher at NTUA, Athens, Greece.

May 31 to June 10, 2006 Visiting Researcher at Instituto Superior Tecnico, Lisbon, Portugal.

May 14 to May 27, 2006, Visiting Researcher (Research in Pairs with V. Manturov) at Oberwolfach Institute.

December 2005, Visiting Researcher, NTUA, Athens.

July 2 to July 22, 2005, Visiting Researcher, ISI, Torino.

May 2005, Visiting Researcher, Independent University, Moscow.

May 14 to May 27, 2005, Visiting Researcher (Research in Pairs with S. Lambropoulou) at Oberwolfach Institute.

December 2004, Visiting Researcher, ISI, Torino

December 2004, Visiting Researcher, Universite Littoral, Calais, France

November 2004 and December 2004, Visiting Researcher, Newton Institute, Cambridge, England

October 2004, Visiting Professor Academia Sinica, Taiwan

October 2004, Visiting Professor Nankai Institute, Tianjin, China

May 2004, Visiting Professor, IUM, Moscow, Russia

May 2004, Visiting Professor Universite de Caen, Caen, France

September 2003 - August 2004, Visiting Professor, University of Waterloo and Perimeter Institute for Theoretical Physics, Waterloo, Canada.

January 2002 - July 2002, Visiting Professor, Stanford University and SLAC Physics Theory Group, Stanford, CA.

August 2001 - Visiting Researcher, NCTS - National Center for Theoretical Sciences, National Tsing-Hua University Hsinchu, Taiwan.

July 2001 - Visiting Lecturer, SUNY Potsdam - NSF Undergraduate Research Program.

June 2001 - Visiting Researcher National Technical University, Athens, Greece.

Fall 2000 - Visiting Researcher at Newton Institute, Cambridge, UK

August 2000 - Visiting Researcher National Technical University, Athens, Greece.

August 2000 - Visiting Researcher, Academia Sinica, Taipei, Taiwan and National Center for Theoretical Sciences, Hsinchu, Taipei.

June and July 2000 - Visiting Professor, State University of New York at Potsdam, Potsdam, New York.

June 2000 - Visiting Lecturer, University of Pisa, Pisa Italy

December 1999 - Visiting Professor, Mathematics Dept., Univ. Littoral, Calais, France.

July 1999 - Visiting Researcher, Institute for Theoretical Physics, Academia Sinica, Taipei, Taiwan and Physics Institute, National Tsing Wa University, Hsinching, Taiwan

June 1999 - Visiting Researcher, Institute for Theoretical Physics, University of California at Santa Barbara

October-November 1998 - Visiting Researcher at Mittag-Leffler Institute, Djursholm, Sweden

August 1998 - Visiting Researcher Physics Dept. Frei Universitat, Berlin, Gemany

Fall 1997 - Visiting Professor at Institut Henri Poincare, Paris, France.

Summer 1997 - Visiting Professor at the University of Queensland, Brisbane, Australia.

Summer 1996- Visiting Lecturer at Centre de Recerca Mathematica, Bellaterra, Spain, July 1996.

Summer 1995 - Visiting Professor at Univ. de Pernambuco, Recife, Brasil.

Fall 1993 - Visiting Professor at University College, Swansea,Wales.

Summer 1992 - Member of the Isaac Newton Institute for  
Mathematical Sciences, Cambridge, England

Summer 1992 - Visiting Professor at the Univ. de Pernambuco, Recife, Brasil.

Fall 1991 - Member of the Research Institute for Mathematical Sciences (RIMS), Kyoto Univ., Kyoto, Japan.

Spring 1991 - Member, MSRI-Berkeley, CA.

Dec. 1990 - Visiting Professor at the Steklov Institute, Leningrad, USSR

Winter 1989 - Member, MSRI-Berkeley, CA.

1988-1989 - Visiting Professor, IHES-Bures Sur Yvette, France.

Summer 1987 - Visiting Professor , Univ. de Pernambuco, Recife, Brasil

W/Fall 1986 - Visiting Professor, Univ. of Iowa, Iowa City, Iowa.

Fall 1985 - Visiting Professor, ISI and Univ Politecnico, Torino, Italy.

Fall 1985 - Visiting Professor, Univ. di Bologna, Bologna, Italy.

Winter 1984- Visiting Professor, Univ. de Zaragoza, Zaragoza, Spain.

Summer 1980-81 - Visiting Lecturer, Naropa Institute, Boulder, Colorado.

1976-1977 - Visiting Professor, Univ. of Michigan, Ann Arbor, Michigan.

Summers 1973,1975,1978,1980-82 - Visiting Scholar, Univ. of Calif. at Berkeley.

1984-1987 - Visiting Professor (five courses over this period) School of the Art Institute, Chicago, Ill.

1984-85,1989 - Lecturer , Adler Planetarium, Chicago, Illinois.

1985-2017 Professor , 2017- present Professor Emeritus , Univ. of Illinois at Chicago.

1977-1985 - Associate Professor, Univ. of Illinois at Chicago.

1971-1977 - Assistant Professor , Univ. of Illinois at Chicago.

1969-1970 - Teaching Assistant, Princeton Univ., Princeton, New Jersey.

### 3. Professional Honors

Woodrow Wilson Fellow (Honorary), 1968

National Science

Foundation Fellow, 1966-1969

Princeton National Fellow, 1966-1969

Lester R. Ford

Award of the Mathematical Association of America (1978) in expository writing for the article (with T. Banchoff) "Immersions and Mod-2 Quadratic Forms" (American Mathematical

Monthly 84, (1977), pp. 168-185).

Speaker in AMS Short Course on Knot Theory and

Natural Science, AMS Meeting, Baltimore, Maryland, January 1992.

Invited hour

address at AMS meeting, Dayton, Ohio, November 1992.

Warren McCulloch Memorial

Award for Outstanding Contributions to the Field of Cybernetics - 1993 (awarded by the American Society for Cybernetics)

University Scholar Award - University of

Illinois at Chicago, 1993-1996.

Visiting Lecturer, The Fifth William J. Spencer  
Lecture, Kansas State University, Manhattan, Kansas, March 8, 1994.  
Invited Hour  
Address at AMS Meeting in Mexico, October 1994.  
Invited Lecturer-"The Porcelli  
Lectures", Louisiana State University, Oct. 5-9, 1995.  
Organizer and Speaker in  
AMS Short Course - The Interface of Knots and Physics - San Francisco, January  
1995.  
Recipient of the Alternative Natural Philosophy Association Award for 1996.  
Invited Lecturer -"Poincare Lectures" Fields Institute, Toronto, April 8-9, 1996.  
Invited Lecturer- "33rd KAM Lecture" Charles University, Prague, March 1999.  
Speaker in AMS Short Course on Quantum Computing - Washington, D.C., January 2000.  
Winner of best Conference Paper with "Time imaginary value, paradox sign and space"  
in Computing Anticipatory Systems, CASYS -  
Fifth International Conference, Liege, Belgium (2001) ed. by Daniel Dubois,  
AIP Conference Proceedings Volume 627 (2002).  
Kent Nagle Lecturer, University of South Florida, February 15-19, 2006.  
Heinz von Foerster Lecture, University of Vienna, Austria, November 11-14, 2006.  
James Simons Lecturer, University of the State of New York at Stony Brook, November 16-  
22, 2006.  
President of the American Society for Cybernetics, 2005-2008.  
MAA Polya Lecturer, 2008 - 2010.  
Norbert Wiener Gold Medal from the American Society for Cybernetics - 2014.  
Fellow of the American Mathematical Society - 2014.  
Lester R. Ford and Paul Halmos Award of the Mathematical Association of America (2015)  
in expository writing  
for the article (with Allison Henrich) ``Unknotting Unknots."Amer. Math. Monthly 121  
(2014), no. 5, 379 - 390.  
Bertalanffy prize for outstanding work in complexity thinking (2016).  
Invited Hour Address at AMS and Indian Mathematical Society Meeting, Varanasi, India,  
December 2016.

### 3.1 Professional Organizations

Member of  
AMS  
MAA  
Sigma Xi  
American Society for  
Cybernetics, (President, 2005 - 2008).

### 3.2 Editorships

Editor-in-Chief and Founding Editor, Journal of Knot Theory and its

Ramifications, World Scientific Publishers (1991- present)

Editor of Book Series on Knots and Everything, World Scientific Publishers (1991- present)

Associate Editor Annals of Combinatorics

Member, Editorial Board of the Journal -- Cybernetics and Human Knowing , 1995-present (Kauffman also writes a column for this journal entitled "Virtual Logic")

\end{enumerate}

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### 3.3 Grant Support

NSF Grant GP 28487 (V. Guggenheim, PI), 1971-1972

NSF Grant MPS 73-088855-A02, 1975-1978

NSF Grant DMS-8701772, 1987-1989

NSF Grant DMS-8822602, 1989-1991

NSF Grant DMS-9205277, 1992-1994

NSF Grant DMS-2528707, 1995-1998

NSF Grant DMS-9802859, 1998-2001

Subcontract - Program in Mathematics and Molecular Biology, University of California at Berkeley, Berkeley, Calif. (1989-2000)

UIC University Scholar Grant 1994-1997.

NSA Grant -Knots and Graphs- MDA904-97-1-0015, 1997-1999

CoPI - Quantum Computing - Darpa Grant , 2001 - 2005.

2003-2007 NSF Grant DMS-0245588 (Virtual Knot Theory)

2009-2010 NSF Award DMS-0925541 (Travel Support for ICTP Conference)

2016 - 2020 Simons Foundation - Collaboration Grant for Mathematicians.

## 4. Selected Publications

### 4.1 Papers

Scattering of electromagnetic waves from two concentric spheres when the outer shell has a variable refractive index. (with M. Kerker and W. Farone), Journal of the Optical Society of America. 56 (1966), 1053-1056.

Cyclic branched coverings and  $S(n)$ -manifolds. Proceedings of the Second Conference on Compact Transformation Groups (Univ. Massachusetts, Amherst, Mass.,

1971), Part I, pp. 416--429. Lecture Notes in Math., Vol. 298, Springer, Berlin, 1972.

An invariant of link concordance. Proc. Topology Conf. Virginia Polytech. Inst. and State Univ., ed. by Raymond R. Dickman Jr. and Peter Fletcher, Lecture Notes in Math., Vol. 375, Springer Verlag, Berlin, 1973, pp. 153-157.

Link manifolds and periodicity. Bull. Amer. Math. Soc. 79 (1973), 570--573.

Link manifolds. Michigan Math. J. 21 (1974), 33--44.

Branched coverings, open books and knot periodicity. Topology 13 (1974), 143--160.

Products of knots. Bull. Amer. Math. Soc. 80 (1974), 1104--1107.

An invariant of link concordance. Topology Conference (Virginia Polytech. Inst. and State Univ., Blacksburg, Va., 1973), pp. 153--157. Lecture Notes in Math., Vol. 375, Springer, Berlin, 1974.

Periodicity of branched cyclic covers. (with Alan Durfee) Math. Ann. 218 (1975), no. 2, 157--174.

Signature of links. (with L. Taylor) Trans. Amer. Math. Soc. 216 (1976), 351--365.

Differential geometry of the torus and torus knots. (with Steve Jordan) Delta (Waukesha) 6 (1976), no. 1, 1--15.

A central example seminar. (with Steve Jordan) Internat. J. Math. Ed. Sci. Tech. 7 (1976), 351-365.

Immersions and mod-2 quadratic forms. (with Tom Banchoff) Amer. Math. Monthly 84 (1977), no. 3, 168--188.

Products of knots, branched fibrations and sums of singularities. (with Walter Neumann) Topology 16 (1977), no. 4, 369--393.

Signature of branched fibrations. Knot theory (Proc. Sem., Plans-sur-Bex, 1977), pp. 203--217, Lecture Notes in Math., 685, Springer, Berlin, 1978.

Twist spinning revisited. (with Deborah Goldsmith) Trans. Amer. Math. Soc. 239



(1978), 229--251.

Weaving patterns and polynomials. Topology Symposium, Siegen 1979 (Proc. Sympos., Univ. Siegen, Siegen, 1979), pp. 88--97, Lecture Notes in Math., 788, Springer, Berlin, 1980.

Planar surface immersions. Illinois J. Math. 23 (1979), no. 4, 648--665.

The Conway polynomial. Topology 20 (1981), no. 1, 101--108.

Levine's theorem - a remark. Low-Dimensional Topology (Bangor, 1979), pp. 67--69, London Math. Soc. Lecture Note Ser., 48, Cambridge Univ. Press, Cambridge-New York, 1982.

The Arf invariant of classical knots. Combinatorial methods in topology and algebraic geometry (Rochester, N.Y., 1982), 101--116, Contemp. Math., 44, Amer. Math. Soc., Providence, R.I.

Combinatorics and knot theory. Low-dimensional topology (San Francisco, Calif., 1981), 181--200, Contemp. Math., 20, Amer. Math. Soc., Providence, R.I., 1983.

Transformations in special relativity. Intl. J. Theo. Phys. 24 (1985), 223=236.

New invariants in the theory of knots. Asterisque Vol. 163-164 (1988) 137 - 219 and Amer. Math. Monthly Vol. 95, No. 3. March (1988) 195-242.

Statistical Mechanics and the Jones Polynomial, In Braids, Contemp. Math. Pub. 78, American Mathematical Society (1988), pp. 263-297.

(with J. Hart and D. Sandin) Ray tracing deterministic 3-D fractals. In Proceedings of SIGGRAPH (1989).

Polynomial invariants in knot theory. Braid group, knot theory and statistical mechanics, 27--58, Adv. Ser. Math. Phys., 9, World Sci. Publishing, Teaneck, NJ, 1989.

A Tutte Polynomial for signed graphs. Discrete Appl. Math. 25 (1989) no. 1-2, pp. 105-127.

An invariant of regular isotopy, Trans. AMS 318, No. 2 (1990), pp. 417-471.

Invariants of graphs in three-space. Trans. AMS 311, No. 2, Feb. 1989, 697-710.L.

Knots, abstract tensors and the Yang-Baxter equation, In "Knots, Topology and Quantum Field Theories", edited by L. Lussana, World Scientific Pub. (1989), pp. 179-334.

State models and the Jones polynomial, *Topology*, pp. 395-407.

State models for link polynomials,  
Louis LH Kauffman,  
*L'Enseignement mathématique.*, 1990, Vol.36(1-2), p.1-37

Problems in knot theory. Open problems in topology, 487--522, North-Holland, Amsterdam, 1990.

Statistical mechanics and the Jones polynomial. New problems, methods and techniques in quantum field theory and statistical mechanics, 175--209, Ser. Adv. Statist. Mech., 6, World Sci. Publishing, River Edge, NJ, 1990.

Super Twist Spinning, in ``Contribuciones matematicas en homenaje al profesor D. Antonio Plans Sanz de Bremond",  
edit by E. Martin - Peinador, A. Rods, Antonio Plans, Universidad de Zaragoza, 1990. pp. 139 - 154.

Spin networks and knot polynomials, *Intl. J. Mod. Phys. A*, Vol. 5, No. 1, (1990), pp. 93-115.

$SL(2)_q$  - Spin Networks. *Twistor Newsletter*  $\sharp 32$ , pp. 10-14. (March 1991).

Map coloring and the vector cross product. *J.Comb.Theo.B*, vol. 48, no.2, April 1990, p. 145-154.

Knots, Spin Networks and 3-Manifold Invariants. In *Knots 90*. ed. by A. Kawauchi. Pub. W. de Gruyter. 1992. pp. 271-287.

(with S. Lins) A 3-manifold invariant by state summation. (announcement 1991).

(with H. Saleur) Free fermions and the Alexander-Conway polynomial. *Comm. Math. Phys.* 141, 293-327 (1991).

(with P. Vogel) Link polynomials and a graphical calculus. *J. Knot Theo. and Ramif.*, Vol 1,  $\sharp 1$ , p. 59-104. (1992)

Map Coloring,  $q$ -Deformed Spin Networks, and Turaev-Viro Invariants for 3-Manifolds. *Intl. J. Mod. Phys. B*, Vol. 6, Nos. 11, 12 (1992), p. 1765-1794.

Knots and physics. article in book - New Scientific Applications of Geometry and Topology. Proceedings of Symposia in Applied Mathematics, Vol. 45. edited by D.W.Sumners. AMS Pub. (1992), p. 131-246.

(with H. Saleur) An algebraic approach to the planar coloring problem. Comm. Math. Phys., 150, pp. 1-26 (1993).

(with F. Jaeger and H. Saleur). The Conway polynomial in  $R^3$  and Thickened Surfaces - A new determinant formula. (in J. Comb. Theory 1994)

Kauffman, Louis H.; Radford, David E. A necessary and sufficient condition for a finite-dimensional Drinfeld double to be a ribbon Hopf algebra. J. Algebra 159 (1993), no. 1, 98-114.

(with J. Simon, K. Wolcott, P. Zhao) Invariants of theta-curves and other graphs in 3-space. Topology and its Applications 49 (1993), 193-216.

(with J. Goldman). Knots tangles and electrical networks. (Advances in Applied Mathematics 14, 267-306 (1993))

From knots to quantum groups (and back). In Proceedings of the CRM Workshop on Hamiltonian Systems, Transformation Groups and Spectral Transform Methods. ed. by J.Harnad and J.E. Marsden. Les Publications CRM (1990). pp. 161-176. Expanded version in the book Quantum Groups, edited by T. Curtright, D. Fairlie and C. Zachos., World Sci. (1991).

(with C. Anezeris, A.P. Balachandran and A.M. Srivastava). Novel statistics for strings and string 'Chern Simons' terms. Int. J. Mod. Phys. A, Vol. 6, No. 14 (1991), pp. 2519-2558.

Spin Networks, Topology and Discrete Physics. (in the second edition of "Braid Group, Knot Theory and Statistical Mechanics" ed. by Yang and Ge, World Sci. Pub. (1994))

Gauss Codes, Quantum Groups and Ribbon Hopf algebras, Reviews in Mathematical Physics, Vol. 5, No.4 (1993), 735-773.

(with D. Radford) Invariants of 3-manifolds derived from finite dimensional Hopf algebras. Journal of Knot Theory and its Ramifications, Vol.4, No. 1 (1995), pp. 131-162.

(with R. Baadhio). Link manifolds and global gravitational anomalies. Reviews in Mathematical Physics, Vol. 5, No. 2 (1993), 331-343.

(with L. Crane and D. Yetter). Evaluating the Crane-Yetter invariant. (In Quantum Topology (1993), ed. by Kauffman and Baadhio), pp. 131-138.

Introduction to quantum topology. In Quantum Topology, ed. by Kauffman and Baadhio. World Sci. Pub. (1993), pp. 1-77.

(with S. Lins). Computing Turaev-Viro invariants for 3-manifolds. Manuscripta Math. 72, pp. 81-94 (1991).

(with G.K.Francis). Air on the Dirac Strings (in the proceedings of the conference held in honor of Wilhelm Magnus - 1992) AMS Contemporary Mathematics Series No. 169 (1994), pp.261-276.

(with Y. Magarshak) Vassiliev Invariants and the structure of RNA folding, In Knots and Applications - ed. by L.Kauffman, World Sci. Pub., pp. 343-394. (1994).

(with Y. Magarshak). Graph invariants and the topology of RNA folding. Journal of Knot Theory and its Ramifications, Vol3,No.3, pp. 233-246.

Knot Logic. In Knots and Applications ed. by L. Kauffman, World Scientific Pub. (1994), pp. 1-110.

Vassiliev Invariants and the loop states of quantum gravity. In the Proceedings of the Quantum Gravity Conference held at Univ. of Calif. at Riverside, May 1993 - "Knots and Quantum Gravity", ed. by John Baez, Oxford University Press. (1994) ,pp. 77-95.

Space and time in computation, topology and discrete physics, In "Proceedings of the Workshop on Physics and Computation - PhysComp '94, Nov. 1994, Dallas, Texas. IEEE Computer Society Press, pp. 44-53.

Functional Integration and the Theory of Knots. Journal of Mathematical Physics, Vol. 36 (5), May 1995, pp. 2402-2429.

On Finiteness of Certain Vassiliev Invariants, (with Masahico Saito and Steve Sawin), Journal of Knot Theory and Its Ramifications, Vol. 6, No. 2 (1997), pp. 291-297.

Discrete Physics and the Derivation of Electromagnetism from the Formalism of Quantum Mechanics, (with H. P. Noyes) , Proceedings of the Royal Soc. London A, Vol. 452 (1996), pp. 81-95.

Quantum Electrodynamical Birdtracks. Twistor Newsletter No. 41. (1996)

Hopf algebras and invariants of 3-manifolds. Journal of Pure and Applied Algebra, Vol. 100 (1995), pp. 73-92.

Knots and complex systems. In Complex Systems and Binary Networks, ed. by Waelbroeck et al., Springer-Verlag (1995), pp. 33-76.

Discrete physics and the Dirac equation (with H. P. Noyes), Physics Lett. A, No. 218 (1996), pp. 139-146.

Tangle complexity and the topology of the Chinese rings. in "Mathematical Approaches to Biomolecular Structure and Dynamics" edit. by Mesirov, Shulten and Summers. IMA Volume 82, Springer Verlag (1996).

Knot Theory and Statistical Mechanics, International Journal of Modern Physics B, Vol. 11, Nos. 1,2 (1997), pp. 39-49.

Noncommutativity and discrete physics. - announcement in "PhysComp96- Proceedings of the Fourth Workshop on Physics and Computation, Boston University, 22-24 Nov. 1996." edited by Toffoli and Biafore, New England Complex Systems Institute Pub.(1996). (in Physica D: Nonlinear Phenomena, Elsevier Pub.)

Invariants of links and 3-manifolds via Hopf algebras. in the Proceedings of the Conference on Geometry and Topology - Aarhus - Summer 1995, Marcel Dekker Pub. 1996.

State Sum Invariants of 4-Manifolds (with L. Crane and D. Yetter) - Journal of Knot Theory and Its Ramifications, Vol.6 No. 2 (April 1997), pp. 177-234.

Rational Tangles. (with Jay Goldman), Advances in Applied Math. , Vol. 18, (1997), pp. 300-332.

Knots and Electricity. In the Proceedings of Knots '96 (Tokyo), World Sci. Pub., 1997. pp. 213 - 230.

Knots and Diagrams. In Lectures at Knots '96 (Tokyo) ed. by S. Suzuki, World Sci. Pub. (1997), pp. 123-194.

Functional Integration and the Theory of Knots. pp. 2402 - 2429. J. Math. Physics. May 1995. Vol 36 No. 5. Special Issue on Functional Integration. Amer. Inst. of Physics. Special Editor Cecile DeWitt Morette.

An Introduction to Knot Theory and Functional Integrals. In Functional Integration - Basics and Applications. edited by C. DeWitt Morette and Pierre Cartier and Antoine Folacci. Nato ASI Series B: Physics Vol. 361. Plenum Press. pp. 247 - 308. (1997)

Hypercomplex Fractal Distance Estimation. (with Yumei Dang) In the proceedings of "Fractal '97 - Fourth International Working Conference, April 8-11, Denver, Colorado, USA. "Fractal Frontiers" ed. by Novak and Dewey, World Scientific (1997). pp. 117-130.

Untangling knots by stochastic energy optimization (with Milana Huang and Robert Grezewszczyk) - In Proceedings of IEEE Conference on Visualization, (1996), pp. 279-286.

Self-repelling knots and local energy minima. (with Milana Huang and Robert Greszczuk) Topology and geometry in polymer science (Minneapolis, MN, 1996), 29--36, IMA Vol. Math. Appl., 103, Springer, New York, 1998.

Diagrammatics, Singularities and Their Algebraic Interpretations. (with Scott Carter and Masahico Saito) - Lecture Notes. 10-th Brazilian Topology Meeting, Sao Carlos, July 22-26, 1996, Mat. Contemp. 13 (1997) pp. 21-115.

An elementary proof that all spanning surfaces of a link are tube-equivalent. (with Dror Bar-Natan and Jason Fulman) J. Knot Theory Ramifications 7 (1998), no. 7, 873--879.

Centrality and the KRH invariant. (with David Radford and Steve Sawin) J. Knot Theory Ramifications 7 (1998), no. 5, 571--624.

Spin networks and topology. The geometric universe (Oxford, 1996), 277--289, Oxford Univ. Press, Oxford, 1998.

Spin networks and the bracket polynomial. Knot theory (Warsaw, 1995), 187--204, Banach Center Publ., 42, Polish Acad. Sci., Warsaw, 1998.

Diagrammatics, singularities, and their algebraic interpretations. (with Scott Carter and Masahico Saito) 10th Brazilian Topology Meeting (Sao Carlos, 1996). Mat. Contemp. 13 (1997), 21--115.

Statistical Mechanics and Knot Theory - In "Knot Theory and Its Applications -- Special Issue of Chaos Solitons and Fractals edited by C. Adams and M. Nasche, Vol. 9, Number 4/5, April/May (1998), pp. 599-621.

Quantum Algebra Structures on  $n \times n$  Matrices. (with David Radford) Journal of Algebra. Vol 213, (1999). pp. 405 - 436.

Witten's Integral and the Kontsevich Integral. in "Particles Fields and Gravitation" edited by Jakub Rembuelinski -- Published by the American Institute of Physics (1998). pp. 368 - 381.

Noncommutativity and Discrete Physics, Physica D 120 (1998), pp. 125 - 138.

Space and time in computation and discrete physics, Intl. J. Gen. Systems , Vol. 27, Nos 1-3 (1998), pp. 249 -273.

Hearst, John E., Kauffman, Louis H. and McClain, W. Martin. A simple mechanism for the avoidance of entanglement during chromosome replication. Trends in Genetics, June 1998, Vol. 14, No. 6, pp. 244-247.

Fourier Knots. (in the book "Ideal Knots" edited by Stasiak, Katrich and Kauffman, World Sci. Pub. 1998, pp. 364-373)

Virtual Knot Theory , European J. Comb. (1999) Vol. 20, 663-690.

Functional Integration and the Kontsevich Integral. In the Proceedings of the APCTP-Nankai Symposium on Yang-Baxter Systems, Non-Linear Models and their Applications. This conference was held in Seoul, Korea in October 1998.

Combinatorics and Topology - Francois Jaeger's Work in Knot Theory Annales de L'Institut Fourier Universite Joseph Fourier, Grenoble, Tome 49(1999)-Faisicule 3, 927-953.

On the Links-Gould Invariant of Links(with D. De Witt and J. Links) , JKTR, Vol. 8, No. 2 (1999), 165-199.

Structures and Diagrammatics of Four Dimensional Topological Lattice Field Theories(with S. Carter and M. Saito), *Advances in Math.* Vol. 146 (1999), 39-100.

Knots and Graphs I - Arc Graphs and Colorings (with F. Harary), *Advances in Applied Math.* Vol. 22 (1999), 312-337.

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In Special Issue - 30 Years of Cybersemiotics,  
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J. Knot Theory Ramifications 32 (2023), no. 8, Paper No. 2340011, 50 pp.

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J. Knot Theory Ramifications 32 (2023), no. 7, Paper No. 2350042, 27 pp.

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Ser. Knots Everything, 72  
World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, 2023, 285?311.

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Flagg, J. M.; Kauffman, Louis H.; Sahoo, Divyamaan,  
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Kauffman, Louis H.,  
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Randolph Dible, Leon Conrad, Graham Ellsbury, Andrew Crompton and Florian Grote.  
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ISBN: [9789811247422]; [9789811247439]; [9789811247446]

arXiv:2206.03056 (To Appear in AMS Contemporary Mathematics Series)

Topology of Vortex Reconnection

Authors: Louis H. Kauffman

Abstract: Knotted vortices such as those produced in water by Kleckner and Irvine tend to transform by reconnection to collections of unknotted and unlinked circles. The reconnection number  $R(K)$  of an oriented knot of link  $K$  is the least number of reconnections (oriented re-smoothings) needed to unknot/unlink  $K$ .

Submitted 10 July, 2022; v1 submitted 7 June, 2022; originally announced June 2022.

Comments: 26 pages. 22 figures. LaTeX document

MSC Class: 57M25

arXiv:2203.09797 (To Appear in AMS Contemporary Mathematics Series)

ER=EPR, Entanglement Topology and Tensor Networks

Authors: Louis H. Kauffman

Abstract: This paper discusses ER = EPR, the hypothesis of Susskind and Maldacena that entangled black holes are connected by an Einstein-Rosen bridge, and that more generally, quantum entanglement is accompanied by topological connectivity. Given a background space and a quantum tensor network, we describe how to construct a new topological space, that welds the network and the background space together.

Submitted 23 March, 2022; v1 submitted 18 March, 2022; originally announced March 2022.

MSC Class: 81P40

From knot invariants to knot dynamics

Kauffman, Louis H.

Lecture Notes in Math., 2344

Springer, Cham, 2024, 37?108.

New invariants for virtual knots via spanning surfaces

Juhász, András; Kauffman, Louis H.; Ogasa, Eiji

J. Knot Theory Ramifications 33 (2024), no. 4, Paper No. 2450009, 35 pp.

The virtual spectrum of linkoids and open curves in 3-space

Barkataki, Kasturi; Kauffman, Louis H.; Panagiotou, Eleni

J. Knot Theory Ramifications 33 (2024), no. 3, Paper No. 2450006, 33 pp.

On the operator origins of classical and quantum wave functions

Arsiwalla, Xerxes D.; Chester, David; Kauffman, Louis H.

Quantum Stud. Math. Found. 11 (2024), no. 2, 193?215.

On Vassiliev invariants of virtual knots

Moltmaker, Wout; Kauffman, Louis H.

Topology Appl. 351 (2024), Paper No. 108935, 23 pp.

Spatial graphoids

Gügümcü, Neslihan; Kauffman, Louis H.; Pongtanapaisan, Puttipong

Aequationes Math. 98 (2024), no. 1, 303?332.

A construction for Clifford algebras

Kauffman, Louis H.

Ser. Knots Everything, 75

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The Jones polynomial, knots, diagrams, and categories

Kauffman, Louis H.

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## 4.2 Books

Formal Knot Theory, Lecture Notes Series No. 30, Princeton University Press (1983). Reprinted by Dover Publications (2006).

Map Reformulation. Princeton Editions (1985).

On Knots, Annals Study No. 115, Princeton University Press (1987).

Knots and Physics, World Scientific Publishers First Edition, Second Edition, Third Edition, Fourth Edition. Series on Knots and Everything **1, 53**, World Scientific Publishing Co. Pte. Ltd., Singapore and River Edge and Hackensack, New Jersey 1991, 1994, 2001, 2013,

Temperley - Lieb Recoupling Theory and Invariants of 3-Manifolds. (with S. Lins). Princeton University Press - 1994.

Quantum Topology. (with Randy Baadhio) World Scientific (1993) (Collection of research papers).

Knots and Applications. (L. Kauffman, editor), World Scientific (1994) (Collection of research papers).

The Interface of Knots and Physics. (L. Kauffman, editor) American Mathematical Society short Course Jan. 2-3, 1995, S.F. CA. AMS Proceedings of Symposia in Applied Math. Vol. 51.

Ideal Knots. edited by Stasiak, Katrich and Kauffman, World Sci. Pub. (1998), Vol 19 Series on K and E. (414 pages)

Yumei Dang, Louis H. Kauffman, Daniel Sandin. Hypercomplex Iterations -- Distance Estimation and Higher Dimensional Fractals. World Scientific Pub. Co. K&E Series Number 17. (2002) 144 pages plus CD-ROM and website <<http://www.evl.uic.edu/hypercomplex/>>.

Intelligence of low dimensional topology 2006.  
Papers from the International Conference (ILDT 2006) held at Hiroshima University, Hiroshima,  
July 22--26, 2006. Edited by J. Scott Carter, Seiichi Kamada, Louis H.

Kauffman, Akio Kawauchi and Toshitake Kohno. Series on Knots and Everything, 40. World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, 2007. xiv+382 pp. ISBN: 978-981-270-593-8; 981-270-593-7 57-06

S. Jablan, L. Kauffman, S. Lambropoulou, J. Przytycki, `` Introductory lectures on knot theory," 248-280, Ser. Knots Everything, 46, World Sci. Publ., Hackensack, NJ, 2012.

`` Mathematics of Quantum Computation and Quantum Technology" edited by Goong Chen, L. H. Kauffman and S. J. Lomonaco, Chapman and Hall/CRC Applied Mathematics and Nonlinear Science Series (2008)

`` Scientific Essays in Honor of H. Pierre Noyes on the Occasion of His 90-th Birthday", edited by J. Amson and L. H. Kauffman, Series on Knots and Everything Vol. 54 (2014).

`` New Ideas in Low Dimensional Topology", edited by L. H. Kauffman and V. O. Manturov, Series on Knots and Everything Vol 56 (2015).

`` Unified Field Mechanics - Natural Science Beyond the Veil of Spacetime", edited by R. Amoroso, L. H. Kauffman, P. Rowlands, World Scientific Pub. Co. (2015).

`` Encyclopedia of Knot Theory" edited by C. Adams., E. Flapan, A. Henrich, L. Kauffman, S. Nelson, Chapman and Hal/CRC, 2020, 953 pages.

Scientific legacy of Professor Zbigniew Oziewicz.(2024)

Selected papers from the International Conference `` Applied Category Theory Graph-Operad-Logic". Papers related to the GOL 2021 held online, August 24?29, 2021. Edited by Hilda María Colín García, José de Jesús Cruz Guzmán, Louis H. Kauffman and Hanna Makaruk

Ser. Knots Everything, 75

World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, [2024], ©2024. xiv+752 pp. ISBN:[9789811271144] ISBN:[9789811271151] ISBN:[9789811271168]

`` Laws of Form - a fiftieth anniversary".

Papers related to the conference (LoF50) held at the University of Liverpool, Liverpool, August 9?10, 2019. Edited by Louis H. Kauffman, Fred Cummins, Randolph Dible, Leon Conrad, Graham Ellsbury, Andrew Crompton and Florian Grote

Ser. Knots Everything, 72

World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, [2023], ©2023. xx+923 pp. ISBN:[9789811247422];ISBN:[9789811247439];ISBN:[9789811247446]

### 4.3 A Selection of Papers In Preparation

\begin{enumerate}

arXiv:2409.07499

Multi-Virtual Knot Theory.

Authors: Louis H Kauffman

arXiv:2406.08253

The Mock Alexander Polynomial for Knotoids and Linkoids.

Authors: Joanna A. Ellis-Monaghan, Neslihan Ggmc, Louis H. Kauffman, Wout Moltmaker

arXiv:2401.12654

Mock Alexander Polynomials.

Authors: Neslihan Ggmc, Louis H. Kauffman

arXiv:2401.06050

Knots in  $\mathbb{R}P^3$ .

Authors: Louis H. Kauffman, Rama Mishra, Visakh Narayanan

Heather A. Dye, Louis H. Kauffman, Eiji Ogasa, Quantum Invariants of Links and 3-Manifolds with Boundary defined via Virtual Links: Calculation of some examples,

arXiv:2203.12797

arXiv:2308.02732

A state sum for the total face color polynomial

Authors: Scott Baldridge, Louis H. Kauffman, Ben McCarty

L. H. Kauffman, Knot Dynamics, arXiv:2109.12538

Louis H. Kauffman, Igor Mikhailovich Nikonov, Eiji Ogasa, Khovanov-Lipshitz-Sarkar homotopy type for links in thickened surfaces and those in  $S^3$  with new modulis,

arXiv:2109.09245

Louis H. Kauffman, Eiji Ogasa, Quantum Invariants of Links and 3-Manifolds with Boundary defined via Virtual Links, arXiv:2108.13547

L. H. Kauffman, Knot Diagrams as Higher Categories

L. H. Kauffman and Nesilhan G\"ug\"umc\"u, Mock Alexander Polynomials

L. H. Kauffman, Revisiting the Extended Bracket Polynomial

#### 4.4 A Selection of Books in Preparation

``Virtual Knot Theory".

``Topology, Knots and DNA", monograph (with Sofia Lambropoulou and Dorothy Buck), Cambridge University Press.

``Knots and Functional Integration" (to be published by the AMS)

``The Sarasota Hexalogue" (L. H. Kauffman - editor) (conference transcript)

``Low Dimensional Topology and Modern Physics", monograph (with Sofia Lambropoulou), Verlag Walter de Gruyter.

``Explorations in Logical and Topological Form"

#### 4.5. Special Publications Related to Cybernetics

Review of Laws of Form, Mathematical Reviews 54, (1977), 701-702.

Network Synthesis and Varela's Calculus, International Journal of General Systems 4,(1978), 179-187.

(with F. Varela) Form dynamics, Journal of Social and Biological Structures (1980), 171 - 206.

Sign and Space, In Religious Experience and Scientific Paradigms. Proceedings of the 1982 IASWR Conference, Stony Brook, New York: Institute of Advanced Study of World Religions, (1985), 118-164.

Map Reformulation. Princelet Edition No. 30: Princelet Editions: London(25

Princeton Street) and Zurich (1986).

On the form of self-reference. In *Systems Inquiry: Theory, Philosophy, Methodology*. edited by Bela H. Banathy. Intersystems Pub. (1985), 206-210.

Self-reference and recursive forms, Vol. 10, *Journal of Social and Biological Structures* (1987), 53-72.

Special relativity and a calculus of distinctions. *Proceedings of the 9th Annual Intl. Meeting of ANPA, Cambridge, England (1987)*. Pub. by ANPA West, pp. 290-311.

DeMorgan Algebras - Completeness and Recursion. *Proceedings of the Eighth International Conference on Multiple Valued Logic(1978)*, IEEE Computer Society Press, 82-86.

Complex numbers and algebraic logic. *Proceedings of the Tenth International Conference on Multiple Valued Logic(1980)*, IEEE Computer Society Press, 209-213.

Imaginary values in mathematical logic. *Proceedings of the Seventeenth International Conference on Multiple Valued Logic, May 26-28 (1987)*, Boston MA, IEEE Computer Society Press, 282-289.

Robbins Algebra. *Proceedings of the Twentieth International Conference on Multiple Valued Logic(1990)*, IEEE Computer Society Press, 54-60.

Knot automata. *Proceedings of the Twenty-Fourth International Conference on Multiple Valued Logic- Boston (1994)*, IEEE Computer Society Press, 328-333.

Knot set theory. (in *Proceedings of Fall 1993 meeting of the American Society for Cybernetics*)

Arithmetic in the form. *Cybernetics and Systems*, 26:1-57 (1995), pp. 1-57.

Ways of the game- play and position play. *Cybernetics and Human Knowing* Vol.2,No.3 (1994), pp.17-34.

Virtual Logic. *Systems Research*, Vol. 13 (Festschrift for Heinz von Foerster), No. 3, pp. 283-310 (1996). A short version appears in "10th IEEE Intl. Symposium on Intelligent Control", Adrem Inc. Pub. (1995), pp. 89-98.

Cybermath and {K}nots. In "Communication and Anti-Communication" published by the Amer. Soc. for Cybernetics, 1997.



What is a number. In the Proceedings of the Conference of the American Society for Cybernetics, March 1997, Urbana, Ill.

(with Hector Sabelli) The Process Equation. Cybernetics and Systems, Vol. 29. (1998) pp. 345-362.

(with Hector Sabelli) The Process Equation: Formulation and Testing the Process Theory of Systems. Cybernetics and Systems, Vol. 30,(1999), pp. 261-294.

(with Hector Sabelli) Bios -- Creative Organization Beyond Chaos. In Proceedings of the 1999 Meeting of the ISSS, edited by Bela Banathy.

What is a Number? Cybernetics and Systems, Vol. 30. (1999) pp. 113-130.

The mathematics of Charles Sanders Peirce. Cybernetics and Human Knowing, Vol. 8, Nos. 1-2, (2001), 79-110.

The Robbins Problem - Computer Proofs and Human Proofs, In Kybernetes - The International Journal of Systems and Cybernetics -- Special Issue - Gordon Pask, remembered and celebrated: Part I, editors Bernard Scott and Ranulph Glanville, Vol. 30, No. 5/6 (2001), pp. 726-751.

(with Christina Weiss) Virtual logic - the key to Frege. Cybernetics and Human Knowing, Vol. 8, No. 4, 2001, 75-86.

Reflexivity and Eigenform -- The Shape of Process. - Kybernetes, Vol 4. No. 3, July 2009.

Reflexivity, Eigenform and Foundations of Physics. In Reflexivity, Proceedings of ANPA 30, Arleta D. Ford, Editor , Published by ANPA, June 2010, pp. 158-222.

L. H. Kauffman, Cybernetics, Reflexivity and Second-Order Science, in Constructivist Foundations, 11(3):489-497, July 2016.

## 5. Teaching

Seminar on Quantum Topology (relationships among topology, quantum groups, field theory -- emphasis on invariants of links and three manifolds): I

organized this seminar in the fall of 1989. It ran successfully with active participation from graduate students and faculty in our mathematics department, our physics department, and other universities (University of Chicago, Northwestern University, De Paul University). The present incarnation of this seminar is our seminar on Quantum Topology, originally organized by myself and Dave Radford and presentation on Zoom every Thursday at noon CST.

Graduate course on Topological Visualization spring 1991.

Graduate course on Knots and Quantum Groups, 1992,1994,1996. This is a course of my own design. It parallels the structure of my book Knots and Physics.

Extension course on Fractals and Recursive Forms, 1992.

Graduate course on

Topological Quantum Field Theory, spring 1993, 1998.

Graduate course on

Topological Visualization, spring 1994, spring 1997.

Graduate course on

Knots, and Singularities of Complex Hypersurfaces, spring 1999.

Graduate courses on knot theory,  
spring 2000, spring 2001, spring 2003.

(2003-2004) One year graduate course on knot theory at the University of Waterloo, Waterloo, Canada.

(Fall 2015) Course in Differential Geometry. Preliminary Notes for a book.

(Fall 2016) Course in Elementary Number Theory with Many Examples including Knots. Preliminary notes for a book.

(2006,2007,2008,2009, 2011,2015,2017) Graduate Courses in Knot Theory (and Quantum Information), UIC.

Short Course in Knot Theory in Xiamen China (June 2016 and June 2019).

Short Course in Knot Theory in Beijing China (September 2019).

Short Course in Knot Theory in Akademgorodok, Russia (Fall 2018 and Fall 2019).

Short Course in Knot Theory at SKCM<sup>2</sup> in Hiroshima, Japan, November 2024.

## 6. Graduate Students

Wayne Zage, "Hyberbolic Geometry and the Luneberg Theory of the Binocular Visual Space", D.A. (1977) (co-advisor with D. Foulser).

Steven

Winker, "Quandles, Knot Invariants and the n-fold Branched Cover" , Ph.D. - Univ. of Ill. at Chicago (PhD. 1984).

Randall Weiss, "Detecting Ribbon Knots",  
Ph.D. - Univ. of Ill. at Chicago (PH.D. 1987).

John Mathias (Ph.D. 1995)

Yumei Dang (Ph.D. 1996)

Advised Joanna

Mason and Milana Huang (graduate students in the electronic visualization lab) on a joint project with myself and Dan Sandin about computer visualization of surfaces in 4-space. Mason received masters degree (4d visualization) in 1995. Huang received masters degree (knot energies) in 1996.

Advised Alan Verlo (graduate student in the electronic visualization lab) in a joint project about computer visualization of deformations of surfaces. Verlo received masters degree in 1995.

Fernando Souza "On the three-manifold invariants derived from Hopf objects" (Ph.D. 2002)

David Hrencecin "On filamentations and virtual knot invariants" (Ph.D. 2001)

Heather Dye "Detection and characterization of virtual knot diagrams" (Ph.D. 2003)

Daniel Carillo (Masters degree 2010)

Aaron Kaestner (PhD 2011)

Dennis Smoot (PhD 2011) - coadvisor with Lewis Licht in Physics.

Jonathan Schneider (PhD 2016)

Lena Folwaczny (Master's degree 2012)

David Simpson (PhD 2019)

## 7. Co-authors

Milton Kerker, Clarkson Univ.

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Alan Durfee, Smith College

Larry Taylor, Notre Dame

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Univ. of Ill. at Chicago

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Yumei, Dang,  
Univ. of Ill. at Chicago  
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Saraff Borelli, Frei Universitat, Berlin, Germany  
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Roger Fenn, Sussex, UK.  
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Xian'an Jin  
Eleni Panagiotou  
Wout Moltmaker  
Jo Ellis Monaghan  
Eiji Ogasa  
Igor Nikonov