

Stuart Alan Kauffman, M.D.

Personal Data

Date of Birth: 28 September 1939
 Marital Status: Married, two children (one deceased)
 Current Address: 31 N River Drive, Bragg Creek, AB, Canada, T0L 0K0
 Permanent Address: 1879 S. Camino Cruz Blanca, Santa Fe, NM 87501
 Business Address: The Institute for Biocomplexity and Informatics,
 BI547, 2500 University Drive NW
 The University of Calgary, Calgary, Alberta, Canada, T2N 1N4
 Major Research Areas: Developmental Genetics, Theoretical Biology, Evolution, Origin of Life

Career Summary

1960 B.A. Dartmouth College
 1963 B.A. Oxford University
 1968 M.D. University of California, San Francisco, CA
 1969 Intern, Cincinnati General Hospital
 1969-1975 Assistant Professor, Biophysics and Theoretical Biology, University of Chicago
 1973-75 Surgeon, National Cancer Institute, Bethesda, MD
 1975-81 Associate Professor, Biochemistry and Biophysics, University of Pennsylvania
 1981-95 Professor, Biochemistry and Biophysics, University of Pennsylvania
 1985-1989 Consultant, Los Alamos National Laboratory
 1986-1997 Professor, Santa Fe Institute
 1986-1998 Science Advisory Board, the Santa Fe Institute
 1990 Founder and President Genesys Molecular Inc.
 1992 Cofounder, Darwin Molecular Inc. (outgrowth of Genesys Molecular Inc.)
 1992-1993 President, Darwin Molecular Inc.
 1995 Early Retirement, Prof. Emeritus, University of Pennsylvania
 1996-2003 Founding General Partner, Bios Group LP, Santa Fe, NM
 1996-2003 Chief Scientific Officer, Bios Group LP then Inc, Santa Fe N.M.
 1996-present Board of Directors, Bios Group Inc.
 1996-2005 External Professor, Santa Fe Institute
 1997 Cofounder CISTem Molecular Inc. (now Genpathway)
 1997-2007 Member, Board of Directors, CISTem Molecular (now Genpathway)
 2000-present Chairman, Investigations Group-A literary not-for-profit US organization
 2001-2007 Chairman of the Board of Directors, Genpathway
 2001-2006 Science Advisory Board, The Santa Fe Institute
 2001-present Member, Science Advisory Board, Icosystems
 2001-2003 Member, Board of Directors, Gene Network Science
 2003-present Member, Science Advisory Board, Gene Network Science
 2001-present Member, Science Advisory Board, Applied Molecular Evolution
 2003-2005 Research Professor, Cell Biology and Physiology, School of Medicine, University of New Mexico
 2003-2007 Member, Board of Directors, NuTech Solutions
 2003-present Affiliate, Neurobiology, Montana State University
 2003-present Internal Visiting Professor, Krasnow Institute, George Mason University

2003-present	Adjunct Professor, Dept. Pathology, M.D. Anderson Cancer Center
2003-present	Science Advisory Board – FatKat Inc.
2004-present	Researcher in Residence, Banff Center
2004	Co-Founder, Genesis Molecular Discovery
2004-present	Science Advisory Board, Origins Institute, McMaster University
2005-present	Associate member Southern Alberta Cancer Research
2005-present	Founding Director, The Institute for Biocomplexity and Informatics, The University of Calgary, Calgary, Alberta, Canada
2005-2007	Member, Board of Directors, The National Center for Genome Resources
2005-present	Stearns Institute for Molecular Sciences-National Research Council Canada Advisory Board Member
2007-present	Senior Fellow, NuTech Solutions
2007-present	Member, Pacific Institute for Theoretical Physics
2009 Feb to 2009 June	Visiting Professor, Harvard Divinity School

Honors and Awards

1960	B.A. Summa Cum Laude, Phi Beta Kappa Reynolds Scholarship, Dartmouth College
1963	Marshall Scholarship, Oxford University
1968	Borden Prize for Research, University of California Medical School
1971	Wiener Gold Medal, American Cybernetic Society
1975	Vice-Chairman, Gordon Research Conference on Biomathematics and Theoretical Biology
1976	Chairman, Gordon Research Conference on Biomathematics and Theoretical Biology
1987-1992	John D. and Catherine T. MacArthur Fellow
1997	Gold Medal, Accademia Lincei, Rome
2000	The Herbert A. Simon Award, New England Complex Systems Institute
2008	Fellow, Royal Society of Canada, Elected
2009	Doctor Honoris Causa from the Faculty of Sciences and the Faculty of Bioengineering from Universite Catholique de Louvain

Professional Activities

1975-81	Editorial Board, Marcel Dekker Textbooks
1976-1980	Editorial Board, <i>Biosystems</i>
1976-1980	Advisory Committee for Mathematical Biology, American Mathematical Society
1979-1985	Society of Developmental Biology
1980-1987	Editorial Board, <i>Quarterly Review of Biology</i>
1983-1987	Genetics Society of America
1984-1995	Co-Chief Editor, <i>Journal of Theoretical Biology</i>
1985-1989	Consultant, Los Alamos National Laboratory
1990-1991	President, Society for Mathematical Biology
1994-1998	Consultant, Affymax Research Institute
1994-1998	Founding Member and President, Diversity Biotechnology Consortium
1994-2001	Founding Editorial Board, <i>Molecular Diversity</i>
1998-2006	Founding Editorial Board, <i>Evolution and Development</i>

2000-2001 NASA; Planetary Protection Advisory Committee of the NASA Advisory Council
2000-present Science Advisory Board, Applied Molecular Evolution
2005-present Steacie Institute for Molecular Sciences - National Research Council Canada
Advisory Board Member

Publications

Kauffman, S. A. (1967). Sequential DNA Replication and the Control of Differences in Gene Activity between Sister Chromatids – a Possible Factor in Cell Differentiation. *J Theor Biol* **17**, 483-497.

Kauffman, S. A. and McCulloch, W. S. (1967). Random Nets of Formal Genes. *Quarterly Progress Report 34, Research Laboratory of Electronics, Massachusetts Institute of Technology.*

Kauffman, S. A. (1969). Homeostasis and Differentiation in Random Genetic Control Networks. *Nature* **224**, 177-178.

Kauffman, S. A. (1969). Metabolic Stability and Epigenesis in Randomly Constructed Genetic Nets. *J Theor Biol* **22**, 437-467.

Kauffman, S. A. (1970). Articulation of Parts Explanation in Biology and the Rational Search for Them. *Boston Studies in the Philosophy of Science* **8**, 257-272.

Kauffman, S. A. (1970). Behavior of Randomly Constructed Genetic Nets: Binary Element Nets. In *Towards a Theoretical Biology*, vol. 3 (ed. Waddington, C. H.), pp. 18-37. Chicago: Aldine Pub. Co.

Kauffman, S. A. (1970). Behaviour of Randomly Constructed Genetic Nets: Continuous Element Nets. In *Towards a Theoretical Biology*, vol. 3 (ed. Waddington, C. H.), pp. 38-44. Chicago: Aldine Pub. Co.

Kauffman, S. A. (1971). Gene Regulation Networks: A Theory of Their Global Structure and Behavior. In *Current Topics in Development Biology*, vol. 6 (ed. Moscona, A. and Monroy, A.), pp. 145-182. New York: Academic Press.

Kauffman, S. A. (1971). Cellular Homeostasis, Epigenesis, and Replication in Randomly Aggregated Macromolecular Systems. *Journal of Cybernetics* **1**, 71- 96.

Kauffman, S. A. (1971). Differentiation of Malignant to Benign Cells. *J Theor Biol* **311**, 429-451.

Glass, L. and Kauffman, S. A. (1972). Cooperative Components, Spatial Localization and Oscillatory Cellular Dynamics. *J Theor Biol* **34**, 219-237.

Kauffman, S. A. (1972). Cellular Genetic Control Systems. *Lectures on Mathematics in the Life Sciences* **3**, 63-166.

Kauffman, S. A. (1972). Elsasser, Generalized Complementarity, and Finite Classes: A Critique of His Anti-Reductionism. In *Psa 1972*, (ed. Schaffner, K. F. and Cohen, R. S.), pp. 57-65. Dordrecht: Reidel.

Kauffman, S. A. (1972). What Can We Know About a Metazoan's Entire Control System? In *Towards a Theoretical Biology* vol. 4 (ed. Waddington, C. H.). Chicago: Aldine-Atherton.

Glass, L. and Kauffman, S. A. (1973). The Logical Analysis of Continuous Non-Linear Biochemical Control Networks. *J Theor Biol* **39**, 103-129.

Kauffman, S. A. (1973). Biological Homologies and Analogies. In *Dictionary of the History of Ideas*, vol. 1 (ed. Wiener, P. P.), pp. 237-243. New York: Scribners.

Kauffman, S. A. (1973). Control Circuits for Determination and Transdetermination. *Science* **181**, 310-318.

Kauffman, S. A. and Willie, J. J. (1973). A Mitotic Oscillator in the Slime Mold, *Physarum Polycephalum*. *J Cell Biol* **59**, 162a.

Willie, J. J. and Kauffman, S. A. (1973). Control of the Temporal Order of DNA Replication in the Slime Mold, *Physarum Polycephalum*. *J Cell Biol* **59**, 364a.

Kauffman, S. A. (1974). Measuring a Mitotic Oscillator: The Arc Discontinuity. *Bull Math Biol* **36**, 171-182.

Kauffman, S. A. (1974). Phase-Dependent Lobopodial Contact Paralysis. *Exp Cell Res* **86**, 217-221.

Kauffman, S. A. (1974). The Large Scale Structure and Dynamics of Gene Control Circuits: An Ensemble Approach. *J Theor Biol* **44**, 167-190.

Shires, T. K. and Kauffman, S. A. (1974). The Membron: A Functional Hypothesis for the Translational Regulation of Genetic Expression. In *Biomembranes*, vol. 5 (ed. Manson, L. A.), pp. 81-145. New York: Plenum Press.

Kauffman, S. A. (1975). Control Circuits for Determination and Transdetermination: Interpreting Positional Information in a Binary Epigenetic Code. In *Cell Patterning Ciba Foundation Symposium 29*, (ed. Porter, R. and Rivers, J.), pp. 201-221. Amsterdam: Elsevier.

Kauffman, S. A. and Tyson, J. (1975). Continuous Biochemical Control of Mitosis: Phase Synchronization and Inhomogeneous Oscillations. *J Math Biol* **1**, 289-310.

Kauffman, S. A. and Willie, J. J. (1975). Evidence That the Mitotic "Clock" in *Physarum Polycephalum*, Is a Limit Cycle Oscillator. In *Life Basis of Circadian Rhythms*, (ed. Hastings, J. W. and Schweiger, H.-G.), pp. 421-431.

Kauffman, S. A. and Willie, J. J. (1975). Premature Replication of Late Period DNA Regions in Early Nuclei Transferred to Late Cytoplasm by Fusion in *Physarum Polycephalum*. *Biochimica et Biophysica Acta* **407**, 158-173.

Kauffman, S. A. and Willie, J. J. (1975). The Mitotic Oscillator in *Physarum Polycephalum*. *J Theor Biol* **55**, 47-93.

Kauffman, S. A. (1976). Constraints on the Sociobiologist's Program. *PSA* **2**, 32-47.

Kauffman, S. A. (1977). Chemical Patterns, Compartments and a Binary Epigenetic Code in *Drosophila*. *Am Zool* **17**, 631-648.

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- Kauffman, S. A. and Ling, E.** (1980). Timing and Heritability of the Nasobemia Transformation in Drosophila. *Wilhelm Roux's Archives* **189**, 147-153.
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Smith, J. M., Burlan, R., Kauffman, S. A., Alberch, P., Campbell, J., Goodwin, B., Lande, R., Raup, D. and Wolpert, L. (1985). Developmental Constraints and Evolution. *Quart Rev Biol* **60**, 265-287.

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Kauffman, S. A. (1986). Autocatalytic Sets of Proteins. *J Theor Biol* **119**, 1-24.

Kauffman, S. A. (1986). Developmental Logic and Its Evolution. *Bioessays* **6**, 82.

Kauffman, S. A. (1986). Boolean Systems, Adaptive Automata, Evolution. In *Disordered Systems and Biological Organization*, (ed. Brenenstock, E. Fogelman-Soulie, F. and Welsbuch, G.), pp. 339-360. New York: Springer-Verlag.

Kauffman, S. A. and Smith, R. G. (1986). Adaptive Automata Based on Darwinian Selection. *Physica D* **22**, 68-82.

Kornher, S. J. and Kauffman, S. A. (1986). Variegated Expression of a Salivary Gland Gene in Larvae of *Drosophila Melanogaster*, Probed at the DNA, RNA, and Protein Levels. *Chromosoma* **94**, 205-16.

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Farmer, J. D., Kauffman, S. A., Packard, N. H. and Perelson, A. S. (1987). Adaptive Dynamic Networks as Models for the Immune System and Autocatalytic Sets. *Ann NY Acad Sci* **504**, 118-131.

Kauffman, S. A. and Levin, S. (1987). Towards a General Theory of Adaptive Walks on Rugged Landscapes. *J Theor Biol* **128**, 11-45.

Bedian, V., Summers, M. C. and Kauffman, S. A. (1988). Changes in Protein Synthetic Activity in Early *Drosophila* Embryos Mutant for the Segmentation Gene *Kruppel*. *Dev Genet* **9**, 699-713.

Kauffman, S. A. (1988). The Evolution of Economic Webs. In *The Economy as an Evolving Complex System: A Proceedings Volume in the Santa Fe Institute Studies in the Sciences of Complexity*, (ed. Anderson, P. W. Arrow, K. J. and Pines, D.), pp. 125-146. Reading, MA: Addison Wesley.

Kauffman, S. A., Weinberger, E. and Perelson, A. S. (1988). Maturation of the Immune Response Via Adaptive Walks on Affinity Landscapes. In *Theoretical Immunology*, vol. 2 (ed. Perelson, A. S.), pp. 349-383. Reading, MA: Addison Wesley.

Goodwin, B. C. and Kauffman, S. A. (1989). Bifurcation, Harmonics and the Four Color Wheel Model of *Drosophila* Development. In *Cell-to-Cell Signalling: From Experiment to Theoretical Models*, (ed. Goldbeter, A.), pp. 213-227. London: Academic Press.

Kauffman, S. A. (1989). Adaptation on Rugged Fitness Landscapes In *Lectures in the Sciences of Complexity*, vol. 1 (ed. Stein, D. L.), pp. 527-618. New York: Addison Wesley.

Kauffman, S. A. (1989). Principles of Adaptation in Complex Systems. In *Lectures in the Sciences of Complexity*, vol. 1 (ed. Stein, D. L.), pp. 619-713. New York: Addison Wesley.

Kauffman, S. A. (1989). Cambrian Explosion and Permian Quiescence: Implications of Rugged Fitness Landscapes. *Evolutionary Ecology* **3**, 274-281.

Kauffman, S. A. and Weinberger, E. (1989). The Nk Model of Rugged Fitness Landscapes and Its Application to the Maturation of the Immune Response. *J Theor Biol* **41**, 211-245.

Hunding, A., Kauffman, S. A. and Goodwin, B. C. (1990). *Drosophila* Segmentation: Supercomputer Simulation of Prepattern Hierarchy. *J Theor Biol* **145**, 369-384.

Kauffman, S. A. (1990). Requirements for Evolvability in Complex Systems: Orderly Dynamics and Frozen Components. In *Complexity, Entropy and the Physics of Information*, vol. 3 (ed. Zurek, W. H.), pp. 151-192: Addison Wesley.

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- Kauffman, S. A. and Goodwin, B. C.** (1990). Spatial Harmonics and Pattern Specification in Early Drosophila Development. Part I: Bifurcation Sequences and Gene Expression. *J Theor Biol* **144**, 303-319.
- Kauffman, S. A. and Goodwin, B. C.** (1990). Spatial Harmonics and Pattern Specification in Early Drosophila Development. Part II: The Four Color Wheel Model. *J Theor Biol* **144**, 321-345.
- Kauffman, S. A.** (1991). Random Grammars: A New Class of Models for Functional Integration and Transformation in the Biological, Neural and Social Sciences. In *Lectures on Complex Systems*, pp. 427-460.
- Kauffman, S. A.** (1991). Antichaos and Adaptation. *Sci Am* **265**, 78-84.
- Kauffman, S. A. and Johnsen, S.** (1991). Co-Evolution to the Edge of Chaos: Coupled Fitness Landscapes, Poised States, and Co-Evolutionary Avalanches. *J Theor Biol* **149**, 467-505.
- Kauffman, S. A. and Perelson, A. S.** (1991). Preface. In *Molecular Evolution on Rugged Landscapes: Proteins, RNA and the Immune System*, vol. IX (ed. Kauffman, S. A. and Perelson, A. S.), pp. xi. Reading, MA: Addison Wesley.
- Kauffman, S. A. and Weinberger, E. D.** (1991). The Nk Model of Rugged Fitness Landscapes and Its Application to the Maturation of the Immune Response. In *Molecular Evolution on Rugged Landscapes: Proteins, RNA and the Immune System*, vol. IX (ed. Perelson, A. S. and Kauffman, S. A.), pp. 135-177. Reading, MA: Addison Wesley.
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- Kauffman, S. A. and Johnsen, S.** (1992). Coevolution to the Edge of Chaos: Coupled Fitness Landscapes, Poised States, and Coevolutionary Avalanches. In *Artificial Life II*, (ed. Langton, C. G. Taylor, C. Farmer, J. D. and Rasmussen, S.), pp. 325-370. Reading, MA: Addison-Wesley.
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Talks and Seminars 2006 – June 2007

Conference presentations

Kauffman, S.A. iCore Summit, Banff, 2006 May

Interviews /Broadcasts

Interview, Fast Company magazine, 2006 November, 1h

Interview, Spanish TV REDES, Barcelona, 2006 December, 1h

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Invited Lectures - 2006

Kauffman, S.A. Chemical Biophysics Symposium, Toronto, 2006

Kauffman, S.A. University of Minnesota, 2006 April

Kauffman, S.A. Philosophy of Biology, Paris, 2006 June

Kauffman, S.A. GENSIPS 2006, Tampere, Finland, 2006 June

Kauffman, S.A. Institute on Religion and Science, Star Island NH, 2006 August

Kauffman, S.A. IBM systems biology workshop, IBM Watson Research Lab, NY, 2006 September

Kauffman, S.A. Workshop on New Directions in Genetic Regulatory Networks, Cuernavaca Mexico, 2006 September

Kauffman, S.A. Origins of Life and Evolution of Biospheres, Erice, Sicily, 2006 October

Kauffman, S.A. World Science Forum, NYC, 2006 November

Kauffman, S.A. C2B2, Columbia University, NYC, 2006 October

Kauffman, S.A. Max Planck Society and Nature Cell Biology, First Ringberg Colloquium on Self-organization and morphogenesis in biological systems, Munich, 2006 December

Kauffman, S.A. Chembiogenesis 2006, Barcelona, 2006 December

Invited Lectures - 2007

Kauffman, S.A. NAU Philosophy Dept, Flagstaff, 2007 January

Kauffman, S.A. Innovation Summit, Banff, 2006 September

Kauffman, S.A. Harvard Divinity School, Boston, 2007 February

Kauffman, S.A. Alberta Systems Biology Meeting, Banff, 2007 February

Kauffman, S.A. “TheoEcology”, Atlanta, 2007 March

Kauffman, S.A. ACS semi-annual Symposium, Chicago, 2007 March

Kauffman, S.A. IBM Almaden Institute “Navigating Complexity: Doing more with less”, Almaden, CA, 2007 April

Kauffman, S.A. New Sciences and a New Social Calculus, Kananaskis, 2007 April

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Kauffman, S.A. GENSIPS 2007, Tampere, Finland, 2007 June
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Patents

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