

CURRICULUM VITAE

Christoph Adami

Education:

B.S. (Physics/Mathematics)	University of Bonn (Germany)	1982
Diplom (Theoretical Physics)	University of Bonn (Germany)	1988
M.A. (Physics)	SUNY at Stony Brook	1988
Ph.D. (Theoretical Physics)	SUNY at Stony Brook	1991

Positions:

- Professor of Microbiology and Molecular Genetics. Michigan State University, Aug 2011-present
- Professor of Physics and Astronomy, Michigan State University, Aug 2011-present
- Visiting Professor, Beyond Center for Fundamental Concepts in Science & Complex Adaptive Systems Initiative, Arizona State University, 2018-2019
- Visiting Professor in Microbiology and Molecular Genetics, Michigan State University, 2010-2011
- Professor of Applied Life Sciences, Keck Graduate Institute, 2004-2011
- Chair of the Faculty, Keck Graduate Institute, 2009-2010
- Visiting Associate in Biology, Caltech, 2009-2011
- Extended Faculty, School of Mathematical Sciences, Claremont Graduate University, 2005-2011
- Faculty Associate in Computation and Neural Systems, Caltech, 2001 – 2008
- Instructor, Computation and Neural Systems, Caltech, 1995-2004, 2006-2007
- Principal Scientist, Jet Propulsion Laboratory, 2001- 2004
- Research Scientist (Senior Level), Jet Propulsion Laboratory, 2000 -2001
- Burroughs-Wellcome Fellow in Computational Molecular Biology, 1997 -1999
- Senior Research Fellow, Computation and Neural Systems, Caltech, 1995- 2000
- Fairchild Prize Fellow, Division of Phys., Math. & Astron., Caltech, 1992 -1995 (Advisor: Prof. Steven E. Koonin)
- Postdoctoral Research Associate, Dept. of Physics, SUNY at Stony Brook, 1991-1992 (Advisor: Prof. Gerald E. Brown)

Honors:

- Lifetime Achievement Award, International Society for Artificial Life (2019)
- Fellow of the American Physical Society (2017)
- Fellow of the American Association for the Advancement of Science (2011)
- KGI Excellence in Research Award (2005-2006)
- NASA Space Act Award (2003)
- NASA Exceptional Achievement Medal (2002)
- President's Fund Award, Caltech (1996)
- Director's Fellowship, Los Alamos National Laboratory (1995, declined)
- Fairchild Prize Fellowship, Caltech (1992)
- Diplom in Theoretical Physics with Highest Honors (“Ausgezeichnet”), University of Bonn (1988)

Memberships:

- American Association for the Advancement of Science (AAAS)
- American Physical Society (APS)
- American Society for Microbiology (ASM)
- International Society for Artificial Life (ISAL)

Professional Activities:

- Editorial Boards: Annual Review of Nonlinear Dynamics and Complexity, Artificial Life Journal, BMC Evolutionary Biology, Biology Direct, Origin of Life and Evolution of the Biospheres, Scientific Reports
- **Referee for over 80 professional journals:** Nature, Nature Genetics, Nature Chem. Biol., Nature Hum. Behav., Nature Rev. Microbiol., Nature Comm., Science, Cell Reports, PLoS Biology, PLoS Comp. Biol., PLoS Genetics, PLoS Pathogens, PLoS One, Sci. Rep., Proc. Natl. Acad. Sci. USA, Proc. Royal Society London, J. Roy. Soc. Interface, Philos. Trans. Roy. Society A,B, PeerJ, Physical Biology, J. Mol. Biol., Mol. Biol. Evol., J. Mol. Evol., J. Antimicrob. Chemother., Genome Biology, Am. Nat., Biology Direct, BMC Evol. Biol., BMC Bioinformatics, BMC Systems Biology, Bioinformatics, Briefings in Bioinformatics, Developmental Biology, J. of theor. Biol. Evolution, Naturwissenschaften, Physical Review A,B,C,D,E,X, Phys. Rev. Res., Phys. Rev. Lett., Phys. Lett. A,B, Physica A,D, Nucl. Phys. A, Annals of Physics, Europhysics Letters, European J. Phys., European Phys. J. B, J. of Physics A,B, Reports. Progr. Phys., Phys. Scripta, Quantum Inf. Proc., Quantum Inf. and Comp., Class. & Quant. Grav., IEEE Trans. Information Theory, IEEE Trans. MBMC, Proc. IEEE, Advances in Complex Systems, Artificial Life, BioEssays, Biosystems, Complex Systems, Complexity (Wiley), Genetic Programming and Evolvable Machines, Entropy, Journal of the American Chemical Society, Collection of Czechoslovak Chemical Communications, Foundations of Science, Systems and Synth. Biol., Origins of Life, Chaos, J. Econ. Behav. & Organ., Neural Computation, Palaeontology. (81)
- Program Chair of 13th International Conf. on Artificial Life, July 19-22nd, 2012, East Lansing, Michigan
- General Chair of Sixth International Conf. on Artificial Life, June 26-29th, 1998, Los Angeles, CA
- Advisory Boards:
 - External Advisory Board, Big Data in the Life Sciences Training Program, Dartmouth College 2015-
 - External Advisory Board, Quantitative Biological Modeling Initiative, Michigan State University 2003-2008.
 - Scientific Advisory Boards:
 - 14th International Conference on Artificial Life, New York, 2014
 - 2014 Genetic and Evolutionary Computing Conference
 - 11th European Conf. on Artificial Life, Paris 2011
 - 2011 Genetic and Evolutionary Computing Conference
 - 12th International Conference on Artificial Life, Odense, Denmark, 2010
 - 10th International Conference on Artificial Life, Bloomington, Indiana, 2006
 - 9th International Conference on Artificial Life, Boston, September 2004

7th International Conference on Artificial Life, August 2000.
Seventh European Conference on Artificial Life (ECAL 07), Lisbon 2007
Fifth European Conference on Artificial Life (ECAL 99).
1999 Genetic and Evolutionary Computation Conference (GECCO 99)
1st NASA Intern. Conf. on Quantum Computing and Quantum, Feb. 1998
Review Board for the Center for Integrated Space Microsystems Revolutionary
Computing Technology Program, 1999, Jet Propulsion Laboratory.

Grants:

- Co-Principal Investigator: "Application of Machine-Learning Algorithms for On-Board Asteroid Shape Model Determination" (NASA, 3/2018-10/2020).
- Principal Investigator: "The Nature of Quantum Reality and its Relation to the Classical World" (Templeton Foundation, 4/2018-10/2020)
- Co-Principal Investigator: "Evaluating Connectomes Using Measures of Complexity and Synergy" (Paul Allen Foundation, 10/2010-9/2012).
- Principal Investigator: "Statistics of Information Acquisition in Evolution" (2006-2007, Templeton Foundation)
- Co-Principal Investigator: "Structure and Origin of Functional Modules" (2005-2010, NSF Frontiers in Integrative Biological Research)
- Principal Investigator: "Digital Immune Systems" (2005-2006, Seaver Foundation)
- Principal Investigator: "Relativistic Quantum Information Theory" (2003-2007, Army Research Office)
- Principal Investigator: "Digital Life Experiments For In Situ Detection of Extraterrestrial Life", Director's Research and Development Fund Award, NASA (2001)
- Co-Principal Investigator: "Bacterial and Computational Experiments to Identify General Principles that Govern the Evolution of Complexity" (1999-2004, NSF BioComplexity Phase I)
- Principal Investigator: "Spatial and Temporal Dynamics of Simple Living Systems" (1997-1999, NSF, Physics Division)
- Principal Investigator: "Robustness and Evolvability of Computer Languages" (1997-1998, Microsoft Research)
- Founding Faculty Member: "Interfaces Between the Biological/Physical/Chemical and Computational Sciences" (1995-2000, Burroughs Wellcome Fund).
- Co-Principal Investigator: "President's Fund Award to Study Quantum Algorithms and Quantum Information Theory" (1997-1998, President's Fund)

Ph.D. Students (Graduated)

1. Charles Ofria (1999, Computation and Neural Systems, Caltech)
Now: Full Prof. in Computer Science, Michigan State U.
2. Johan Chu (1999, Physics, Caltech)
Now: Asst. Prof. of Organizations & Strategy, University of Chicago
3. Stephanie Chow (2005, Computation and Neural Systems, Caltech)
Now: unknown.
4. Evan Dorn (2005, Computation & Neural Systems, Caltech). Winner of "Innovative Electronic Thesis & Dissertation (ETD) Award"

Now: Logical Realty Inc. (Founder & CEO).

5. Robert Forster (2006, Physics, Caltech)
Now: Analyst, Tower Research Capital

6. D. A. Drummond (2006, Computation & Neural Systems, Caltech). Winner: Best Caltech thesis. Now: Associate Prof. of Biochemistry, U. of Chicago

7. J. D. Bloom (2007, Chemistry, Caltech) [co-advised with Prof. Arnold]. Winner: Best Thesis Award in Bioengineering. Now: Ass. Prof., Fred Hutchinson Cancer Research Center

8. D. Iliopoulos (2010, Applied Life Sciences, Keck Graduate Institute)
Now: Director Bioinformatics, Invitae Biotechnology, San Francisco

9. B. Østman (2010, Applied Life Sciences, Keck Graduate Institute)
Now: Staff scientist, Google.

10. J. Qian (2012, Applied Life Sciences, Keck Graduate Institute)
Now: Staff scientist, Illumina Corp. (San Diego)

11. N. Chaumont (2013, Applied Life Sciences, Keck Graduate Institute)
Now: Staff scientist, Atreca (Redwood City)

12. R. S. Olson (2015, Computer Science, Michigan State University)
Now: Senior Data Scientist, University of Pennsylvania

13. M. Mirmomeni (2015, Computer Science, Michigan State University)
Now: Data scientist at Ancestry.com

14. A. Pakanati (2015, Computer Science, Michigan State University)
Now: Xoran Technologies

15. J. Clifford (2015, Physics, Michigan State University)
Now: Ambry Genetics

16. J. Schossau (2017, Computer Science, Michigan State University)
Now: Postdoctoral Scholar, Michigan State University

17. J.R. Glick (2017, Physics, Michigan State University)
Now: Postdoctoral Research Associate, IBM Research.

18. T. LaBar (2018, Microbiology & Molecular Genetics, Michigan State University)
Now: Postdoctoral Research Associate, Harvard University.

List of Publications

164. C. Adami and A. Hintze, *Quasistrategies in Stochastic Evolutionary Games*, to be submitted.
163. C. Adami, *On the Origin of Quantum Uncertainty*. FQXi Essay contest (2020) arXiv:2005.07325.
162. C. Adami, *Neither Weak Nor Strong Entropic Leggett-Garg Inequalities Can Be Violated*. arXiv:1908.03124, Phys. Rev. A., in review.
161. C. Adami, *Leggett-Garg Inequalities Cannot Be Violated in Quantum Measurement*. arXiv:1908.02886, in review.
160. A. Tehrani-Saleh, D. McAuley, and C. Adami, *Mechanism of Perceived Event Duration in Artificial Brains Suggests Extended Model of Attentional Entrainment*. BioRxiv 870535. In review.
159. J.R. Glick and C. Adami, *Markovian and Non-Markovian Quantum Measurements*. Found. Phys. **50** (2020). arXiv 1701.05636.

158. D.K. Sydykova, T. LaBar, C. Adami, and C.O. Wilke, *Moderate Amounts of Epistasis Are Not Evolutionarily Stable in Small Populations*. *J. Mol. Evol.* **88** (2020) 435-444.
157. A. Tehrani-Saleh and C. Adami, *Can Transfer Entropy Infer Information Flow in Neuronal Circuits for Cognitive Processing?* *Entropy* **22** (2020) 385.
156. J. Lehmann, et al. *The Surprising Creativity of Digital Evolution: A Collection of Anecdotes from the Evolutionary Computation and Artificial Life Research Communities*. *Artificial Life* **26** (2020), to appear
155. T. LaBar and C. Adami, *Genome Size and the Extinction of Small Populations*. In: "Evolution in Action—Past, Present, and Future" (Springer Verlag, 2020). W. Banzhaf et al., eds., pp. 167-183.
154. A. Hintze et al., *Markov Brains: A Technical Introduction*. arXiv 1709.0560.
153. A. C. Pontes, R. B. Mobley, C. Ofria, C. Adami and F. Dyer, *The Evolutionary Origin of Associative Learning*. *Am. Nat* **195** (2020) E1-19.
152. J. Franklin, T. LaBar, and C. Adami. *Mapping the Peaks: Local Fitness Landscapes of the Fittest and the Flattest*, *Artificial Life* **25** (2019) 250-262.
151. A. Tehrani-Saleh, T. LaBar, and C. Adami, *Evolution Leads to a Diversity of Motion-Detection Neuronal Circuits*. In: *Proceedings Artificial Life 16*, T. Ikegami, N. Virgo, O. Witkowski, M. Oka, R. Suzuki and H. Iizuka, eds. (MIT Press, 2018) pp. 625-632.
150. A. Hintze, D. Kirkpatrick, and C. Adami, *The Structure of Evolved Representations Across Different Substrates for Artificial Intelligence*, In: *Proceedings Artificial Life 16*, T. Ikegami, N. Virgo, O. Witkowski, M. Oka, R. Suzuki and H. Iizuka, eds. (MIT Press, 2018) pp. 388-395.
149. C. Adami and A. Hintze, *Thermodynamics of Evolutionary Games*. *Phys. Rev. E* **97** (2018) 062136.
148. Nitash C G, T. LaBar, A. Hintze, and C. Adami, *Origin of Life in a Digital Microcosm*, *Phil. Trans. Roy. Society A* **357** (2017) 20160350.
147. T. LaBar and C. Adami, *Evolution of Drift Robustness in Small Populations of Digital Organisms*. *Nature Communications* **8** (2017) 1012.
146. S.D. Chapman, C. Adami, C.O. Wilke, and Dukka B. Kc, *The Evolution of Logic Circuits for the Purpose of Protein Contact Map Prediction*. *PeerJ* **5** (2017) e3139.
145. C. Adami and T. LaBar, *From Entropy to Information: Biased Typewriters and the Origin of Life*. In: *Information and Causality: From Matter to Life*" (S.I. Walker, P.C.W. Davies, and G. Ellis, eds.). Cambridge University Press (2017), pp 130-154.
144. B. Patra, Y. Kon, G. Yadav, A. Sevoid, J. Frumkin, R.R. Vallabhajosyula, A. Hintze, B. Østman, J. Schossau, A. Bhan, B. Marzolf, J. Tamashiro, A. Kaur, N. Baliga, E. Grayhack, C. Adami, D. Galas, A. Raval, E. Phizicky, and A. Ray. *A Genome-wide Dosage-Rescue Network Reveals Genetic Robustness*. *Nucleic Acids Research* **45** (2017) 255-270.
143. J.R. Glick and C. Adami, *Quantum Information Theory of the Bell-State Quantum Eraser*. *Phys.*

Rev. A **95** (2017) 012105.

142. A. Gupta and C. Adami, *Shared Information Between Residues is Sufficient to Detect Epistasis Between Residues in a Protein*. PLoS Genetics **12** (2016) e1006471.

141. T. LaBar and C. Adami, *Different Evolutionary Paths to Complexity for Small and Large Population of Digital Organisms*. PLoS Comp. Biol. **12** (2016) 1005066.

140. R. S. Olson, J. H. Moore, and C. Adami, *Evolution of Active Categorical Image Classification via Saccadic Eye movement*. Lecture Notes in Computer Science **9921** (2016) 581-590.

139. C. Adami, J. Schossau, and A. Hintze, *The Reasonable Effectiveness of Agent-based Simulations in Evolutionary Game Theory*. Physics of Life Reviews **19** (2016) 38-42.

138. C. Adami, J. Schossau, and A. Hintze, *Evolutionary Game Theory Using Agent-based Methods*, Physics of Life Reviews **19** (2016) 1-26.

137. T. LaBar, A. Hintze, and C. Adami, *Evolvability Tradeoffs in Emergent Digital Replicators*. Artificial Life **22** (2016) 483-498.

136. A. Tehrani-Saleh and C. Adami, *Flies as Ship Captains? Digital Evolution Unravels Selective Pressures to Avoid Collision in Drosophila*. Proc. of Artificial Life 15 (C. Gershenson, T. Froese, J.M. Sisqueiros, W. Aguilar, E.J. Izquierdo, H. Sayama, eds.) MIT Press (Cambridge, MA, 2016), pp. 554-561.

135. R. S. Olson, A. Hintze, F. C. Dyer, J. H. Moore, and C. Adami. *Exploring the Coevolution of Predator and Prey Morphology and Behavior*. Proc. of Artificial Life 15 (C. Gershenson, T. Froese, J.M. Sisqueiros, W. Aguilar, E.J. Izquierdo, H. Sayama, eds.). MIT Press (Cambridge, MA, 2016), pp 250-258.

134. R.S. Olson, D.B. Knoester, and C. Adami, *Evolution of Swarming Behavior is Shaped by How Predators Attack*. Artificial Life **22** (2016) 299-318.

133. N. Chaumont and C. Adami, *Evolution of Sustained Foraging in 3D Environments with Physics*. Genetic Programming and Evolvable Machines **17** (2016) 359-390.

132. A. Gupta, T. LaBar, M. Miyagi, and C. Adami, *Evolution of genome size in asexual populations*, Sci. Rep. **6** (2016) 25786.

131. A. Gupta and C. Adami, *Strong Selection Significantly Increases Epistatic Interactions in the Long-Term Evolution of a Protein*. PLoS Genetics **12** (2016) e1005960.

130. K. Brádler and C. Adami, *One-shot Decoupling and Pages Curves from a Dynamical Model for Black Hole Evaporation*. Physical Review Letters **116** (2016) 101301.

129. C. Adami. *What is Information?* Phil. Trans. Roy. Soc. **347** (2016) 20150230.

128. J. Schossau, C. Adami, and A. Hintze, *Neural Correlates Improve Evolution of Complex Decision Tasks*. Entropy **18** (2016) 6.

127. A. Gupta, C.T. Brown, Y. Zheng, and C. Adami, *Differentially Expressed Pseudogenes in HIV-1*

Infection. Viruses **7** (2015) 5191-5205.

126. R.S. Olson, P.B. Haley, F.C. Dyer, and C. Adami, *Exploring the Evolution of a Trade-off Between Vigilance and Foraging in Group-living Organisms*. Royal Society open science **2** (2015) 150135.

125. K. Bradler and C. Adami, *Black Holes as Bosonic Gaussian Channels*. Phys. Rev. D **92** (2015) 025030.

124. T. LaBar, C. Adami, and A. Hintze, *Does Self-Replication Imply Evolvability?* Proc. of European Conference on Artificial Life 2015 (P. Andrews, L. Caves, R. Doursat, S. Hickenbotham, F. Polack, S. Stepney, T. Taylor & J. Timmis, eds.) MIT Press (Cambridge, MA, 2015) pp. 596-602.

123. J. Clifford and C. Adami, *Discovery and Information-theoretic Characterization of Transcription Factor Binding Sites that Act Cooperatively*. Physical Biology **12** (2015) 056004.

122. C. Adami, *Information-theoretic Considerations Concerning the Origin of Life*. Origins of Life and Evolution of Biospheres **45** (2015) 9439.

121. A. Hintze and C. Adami, *Punishment in Public Goods Games Leads to Meta-stable Phase Transitions and Hysteresis*. Physical Biology **12** (2015) 046005.

120. C. Adami, *Robots with Instincts*. Nature **521** (2015) 426-427.

119. C. Adami and G. Ver Steeg, *Black Holes Are Almost Optimal Quantum Cloners*. J. Phys. A. **48** (2015) 23FT01.

118. A. Hintze, R.S. Olson, C. Adami, and R. Hertwig, *Risk Sensitivity as an Evolutionary Adaptation*. Sci. Rep. **5** (2015) 8242.

117. L. Albantakis, A. Hintze, C. Koch, C. Adami, & G. Tononi, *Evolution of Integrated Causal Structures in Animals Exposed to Environments of Increasing Complexity*. PLoS Comp. Biol. **10** (2014) e1003966

116. A.E. Johnson, E. Strauss, R. Pickett, C. Adami, I. Dworkin, & H. J. Goldsby, *More Bang For Your Buck: Quorum-Sensing Capabilities Improve the Efficacy of Suicidal Altruism*. In: Proceedings of Artificial Life 14. (H. Sayama, J. Rieffel, S. Risi, R. Doursat & Hod Lipson, eds.) MIT Press (2014) pp.120-128.

115. B. Østman, R. Lin, and C. Adami, *Trade-offs Drive Resource Specialization and the Gradual Establishment of Ecotypes*. BMC Evol. Biology **14** (2014) 113.

114. K. Bradler and C. Adami, *The Capacity of Black Holes to Transmit Quantum Information*. J. High Energy Phys. **1405** (2014) 95.

113. C. Adami and G. Ver Steeg, *Classical Information Transmission Capacity of Quantum Black Holes*. Classical and Quantum Gravity **31** (2014) 075015.

112. C. Adami. *Artificial Evolution*. In: Encyclopedia of Systems Biology (W. Dubitzky, O. Wolkenhauer, H. Yokota and K.-H Cho, eds.) Springer Verlag (2013) pp. 39-42.

111. R. Olson, M. Mirmomeni, T. Brom, E. Bruger, A. Hintze, D.B. Knoester, and C. Adami, *Evolved*

- Digital Ecosystems: Dynamic Steady State, not Optimal Fixed Point*. In "Advances in Artificial Life (ECAL 2013)" (P. Liò, O. Miglino, G. Nicosia, S. Nolfi and M. Pavone, eds.) MIT Press (2013) pp. 126-133.
110. S. Chapman, D. Knoester, A. Hintze, and C. Adami, *Evolution of an Artificial Visual Cortex for Image Recognition*. In "Advances in Artificial Life (ECAL 2013)". (P. Liò, O. Miglino, G. Nicosia, S. Nolfi and M. Pavone, eds.) MIT Press (2013) pp. 1067-1074.
109. R. S. Olson, D. K. Knoester, and C. Adami, *Critical Interplay Between Density-Dependent Predation and Evolution of the Selfish Herd*, Proceedings of the 2013 Genetic and Evolutionary Computing Conference. (C. Blum, ed.) ACM Press (2013), pp. 247-254.
108. B. Østman and C. Adami, *Predicting Evolution and Visualizing High-dimensional Fitness Landscapes*, in "Recent Advances in the Theory and Application of Fitness Landscapes" (A. Engelbrecht and H. Richter, eds.). Springer Series in Emergence, Complexity, and Computation (2013), pp. 493-510.
107. C. Adami and A. Hintze. *Evolutionary Instability of Zero-Determinant Strategies Demonstrates that Winning Is Not Everything*. Nature Communications **4** (2013) 2193.
106. R. S. Olson, A. Hintze, F. C. Dyer, D. B. Knoester, C. Adami, *Predator Confusion is Sufficient to Evolve Swarming*. J. Royal Society Interface **10** (2013) 20130305.
105. L. Marstaller, A. Hintze, and C. Adami, *Cognitive Systems Evolve Complex Representations for Adaptive Behavior*. Neural Computation **25** (2013) 2079-2107.
104. C. Adami, *Boldly Going Beyond Mathematics*, Science **338** (2012) 1421-1422.
103. C. Adami, *Adaptive Walks on the Fitness Landscape of Music*. Proc. Natl. Acad. Sci. USA **109** (2012) 11898-11899.
102. J. Qian, T. Ferguson, D.N. Shinde, A. J. Ramírez-Borrero, A. Hintze, C. Adami, A. Niemz, *Sequence Dependence of Isothermal DNA Amplification via EXPAR*, Nucleic Acids Research **40** (2012) e87.
101. C. Adami, *The Use of Information Theory in Evolutionary Biology*, Annals NY Acad. Sciences **1256** (2012) 49-56.
100. C. Adami, J. Schossau, and A. Hintze, *Evolution and Stability of Altruist Strategies in Microbial Games*, Physical Review E **85** (2012) 011914.
99. B. Østman, A. Hintze, and C. Adami, *Impact of Epistasis and Pleiotropy on Evolutionary Adaptation*, Proc. Roy. Soc. **279** (2012) 247-256.
98. E.D. Dorn and C. Adami, *Robust Monomer Distribution Biosignatures in Evolving Digital Biota*, Astrobiology **11** (2011) 959-968.
97. J. Edlund, N. Chaumont, A. Hintze, C. Koch, G. Tononi, and C. Adami, *Integrated Information Increases with Fitness in the Evolution of Animats*, PLoS Comp. Biol. **7** (2011) e1002236.
96. C. Adami, J. Qian, M. Rupp, and A. Hintze, *Information Content of Colored Motifs in Complex*

Networks. Artificial Life **17** (2011) 375-390.

95. C. Adami, *Toward a Fully Relativistic Theory of Quantum Information*, in: *From Nuclei to Stars: Festschrift in Honor of Gerald E. Brown*, edited by S. Lee (World Scientific, Singapore, 2011). Pp. 71-102.

94. J. Qian, A. Hintze, and C. Adami, *Colored Motifs Reveal Computational Building Blocks in the C. elegans Brain*. PLoS ONE **6** (2011) e17013.

93. E.D. Dorn, K.H. Neelson, and C. Adami, *Monomer Abundance Distribution Patterns as a Universal Biosignature: Examples from Terrestrial and Digital Life*, J. Mol. Evol **72** (2011) 283-295.

92. D. Iliopoulos, A. Hintze, and C. Adami, *Critical Dynamics in the Evolution of Stochastic Strategies for the Iterated Prisoner's Dilemma*, PLoS Comp. Biol. **6** (2010) e1000948.

91. B. Østman, A. Hintze, and C. Adami, *Critical Properties of Complex Fitness Landscapes*, In Proc. 12th Intern. Conference on Artificial Life, H. Fellerman et al, eds. (MIT Press, 2010), pp. 126-132,

90. A. Hintze and C. Adami, *Darwinian Evolution of Cooperation via Punishment in the "Public Goods" Game*, Proc. 12th Intern. Conference on Artificial Life, H. Fellerman et al, eds. (MIT Press, 2010) pp. 445-450.

89. A. Hintze and C. Adami, *Modularity and Anti-Modularity in Networks with Arbitrary Degree Distribution*, Biology Direct **5** (2010) 32.

88. L. Marstaller, A. Hintze, and C. Adami, *Measuring Representation*. In W. Christensen, E. Schier, & J. Sutton (Eds.), ASCS09: Proceedings of the 9th Conference of the Australasian Society for Cognitive Science (pp. 232-237). Sydney, Australia: Macquarie Centre for Cognitive Science (2009).

87. C. Adami (2009), *Biological Complexity and Biochemical Information*, in *Encyclopedia of Complexity and Systems Science*, R. Meyers, ed., Springer Verlag, pp 489-511.

86. D. Iliopoulos, P. Szor, and C. Adami, *Darwin Inside the Machines: Malware Evolution and the Consequences for Computer Security*, Proceedings of VB2008 (Ottawa), H. Martin ed., pp. 187-194 (2009).

85. C. Adami, *The Logic of Science*, The New Atlantis **19** (Winter 2008) 3-5.

84. A. Hintze and C. Adami, *Evolution of Complex Modular Biological Networks*, PLoS Comp. Biol. **4** (2008) e23.

83. C. Adami, *Who Watches the Watcher?* Science **316** (2007) 1125-1126.

82. N. Chaumont, R. Egli, and C. Adami, *Evolving Virtual Creatures and Catapults*, Artificial Life **13** (2007) 139-157.

81. R. Conduit, C. Adami, H. Lipson, V. Zykov, and J. Bongard, *To Sleep, Perchance To Dream*. Science **315** (2007) 1219-1220.

80. C. Adami, *What Do Robots Dream Of?* Science **314** (2006) 1093-1094.

79. R. Forster, C. Adami, and C.O. Wilke, *Selection for Mutational Robustness in Finite*

- Populations*, J. theor. Biology **243** (2006) 181-190.
78. C. Adami, *Three Weeks with Hans Bethe*. In *Hans Bethe and His Physics*, G.E. Brown and C.-H. Lee, eds., World Scientific (Singapore, 2006), pp. 45-111.
77. N. Chaumont, R. Egli and C. Adami, *Evolving Virtual Catapults*. Proc. 10th Conference on Artificial Life, L.M. Rocha, L.S. Yeager, M.A. Bedau, D. Floreano, R.L. Goldstone, and A. Vespignani, eds., (MIT Press, 2006) pp. 262-268.
76. C. Adami, *Reducible Complexity*, Science **312** (2006) 61-63.
75. C. Adami, *Digital Genetics: Unraveling the Genetic Basis of Evolution*, Nature Reviews Genetics **7** (2006) 109-118.
74. D.A. Drummond, J.D. Bloom, C.O. Wilke, C. Adami and F.H. Arnold. *Why Highly Expressed Proteins Evolve Slowly*, Proc. Natl. Acad. Sci. USA **102** (2005) 14338-14343.
73. D.R. Mitchell, C. Adami, W. Lue, and C.P. Williams, *A Random Matrix Model of Adiabatic Quantum Computation*, Phys. Rev. A **71** (2005) 052324.
72. R.J. Terrile, C. Adami, H. Aghazarian, S.N. Chau, V.T. Dang, M.I. Ferguson, W. Fink, T.L. Huntsberger, G. Klimeck, M.A. Kordon, S. Lee, P. von Allmen, and J. Xu, *Evolutionary Computation Technologies for Space Systems*, Proc. IEEE Aerospace Conference (2005) pp. 4284-4295.
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