

Dr. rer. nat. Arend Hintze

CURRICULUM VITAE

HOME

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Education

1996 Undergraduate Diploma Biology, Westfälische Wilhelms-Universität Münster (Germany)
2001 Biology Diploma, Technische Universität Braunschweig (Germany)
2006 Dr. rer. nat. in genetics/developmental biology, Institut für Genetik, TU Braunschweig (Germany).

Positions

since Aug. 2010	Postdoctoral Research Associate, Michigan State University,
Aug. 2010 - Jul. 2011	Research Assistant Professor on Leave, Keck Graduate Institute,
since Jul. 2008	Independent Game Developer - founded "alproductions.us"
Aug. 2006 - Aug. 2010	Postdoctoral Research Associate, Keck Graduate Institute,
June 2001 - July 2006	Research Assistant, TU Braunschweig,

Membership

International Society of Artificial Life
Admin at GAMUA.com Sparrow OpenGL framework for iPhone/iPad

Professional Activities

Referee for peer review journals:

PLoS Computational Biology, Proc. Natl. Acad. Sci. USA, Physical Review Letters, Physical Review E, Artificial Life, Journal of the Royal Society - Interface

Review Committee Member for ALIFE XIII and XIV

Publications

Peer reviewed journals:

- **A. Hintze**, and C. Adami, *Punishment Enables Cooperation and Defection in the Supercritical Phase*, (submitted to New Journal of Physics).
- **A. Hintze**, R. S. Olson, C. Adami, and R. Hertwig. *Risk Aversion as an Evolutionary Adaptation*. (in review as PLoS one)
- C. Adami and **A. Hintze**, *Evolutionary Instability of Zero-Determinant Strategies Demonstrates That Winning is Not Everything* (Nature Communications 4 (2013) 2193)
- R. S. Olson, M. Mirmomeni, T. Brom, E. Brugler, **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.
- S. D. Chapman, D. B. 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
- R. Olson, **A. Hintze**, F. Dyer, D. B. Knoester, C. Adami, *Predator Confusion is Sufficient to Evolve Swarming*, (Journal of the Royal Society Interface 10: 20130305 (2013))

- **A. Hintze**, L. Marstaller, and C. Adami, *The Evolution of Representation in Simple Cognitive Networks*. *Neural Computation* 25 (2013) 2079-2105
- J. Pell, **A. Hintze**, R. Canino-Koning, A. Howe, J.M. Tiedje, T.C. Brown, *Scaling metagenome sequence assembly with probabilistic de Bruijn graphs*, (eprint arXiv:1112.4193)(PNAS, 109, 13272-13277)
- J. Qian, T. Ferguson, D. Shinde, A. Ramirez-Borrero, **A. Hintze**, C. Adami, and A. Niemi. *Sequence Dependence of Isothermal DNA Amplification via EXPAR*. *Nucleic Acids Research* 40 (2012).
- C. Adami, J. Schossau, and **A. Hintze**. *Evolution and Stability of Altruist Strategies in Microbial Games*. *Physical Review E* 85 (2012) 011914.
- B. Østman, **A. Hintze** and C. Adami. *Impact of Epistasis and Pleiotropy on Evolutionary Adaptation*. *Proc. Roy. Soc.* 279 (2012) 247-256.
- J. Edlund, N. Chaumont, **A. Hintze**, C. Koch, G. Tononi, and C. Adami. *Integrated Information Increases with Fitness in the Evolution of Animals*. *PLoS Comp. Biol.* 7 (2011) e1002236.
- C. Adami, J. Qian, M. Rupp, and **A. Hintze**. *Information content of colored motifs in complex networks*. *Artificial Life* 17 (2011) 375-390.
- J. Qian, **A. Hintze**, and C. Adami. *Colored Motifs Reveal Computational Building Blocks in the C. elegans Brain*. *PLoS ONE* 6 (2011) e17013.
- **A. Hintze**, D. Iliopoulos and C. Adami. *Critical Dynamics in the Evolution of Stochastic Strategies for the Iterated Prisoner's Dilemma*. *PLoS Comp. Biol.* 6 (2010) e1000948.
- B. Østman, **A. Hintze**, and C. Adami. *Critical Properties of Complex Fitness Landscapes*. *Proc. 12th Intern. Conference on Artificial Life*, H. Fellerman et al, eds. (MIT Press, 2010), pp. 126-132.
- **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.
- **A. Hintze** and C. Adami. *Modularity and Anti-Modularity in Networks with Arbitrary Degree Distribution*. *Biology Direct* 5 (2010) 32.
- L. Marstaller, C. Adami, and **A. Hintze**. *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 (2010).
- C. Adami, N. Chaumont, J. Edlund, **A. Hintze**, *Topological properties of evolved robot brains*, *ALIFE XI conference*, Southampton (UK), 2008
- **A. Hintze** and C. Adami. *Evolution of Complex Modular Biological Networks*. *PLoS Comp. Biol.* 4 (2008) e23
- R. Schnabel, M. Bischoff, **A. Hintze**, A.-K. Schulz, A. Hejnol, H. Meinhardt, H. Hutter, *Global cell sorting in the C. elegans embryo defines a new mechanism for pattern formation*, *Developmental biology*. 07/2006; 294(2):418-31.

Manuscripts in preparation:

- **A. Hintze**, N. Phillips, and R. Hertwig, *The Janus Face of Competition*
- **A. Hintze**, D. Iliopoulos, and C. Adami, *Evolution of Super-Reciprocal Cooperation via Communication in the Iterated Prisoner's Dilemma*
- **A. Hintze**, L. Marstaller, C. Adami, *Self Representations*
- **A. Hintze**, T. Pleskac, *Evolving Heuristics?*

- **A. Hintze**, N. Pasmanter, C. Adami, *Thermodynamics of Evolutionary Games*
- **A. Hintze**, Joel Lehman, *Orthogonally Evolved Artificial Intelligence to Improve Difficulty Adjustment in Video Games*
- **A. Hintze**, F. Bartlet, and F. Dyer, *Evolution of Resetting Behavior in Foraging Animals*

Diploma thesis:

“Eine polarisierende Induktion“ (A polarizing induction), TU Braunschweig 2001

Doctoral thesis:

“Charakterisierung der Musterbildung durch Zellwanderungen in *C. elegans*“ (Characterization of pattern formation due to cell migrations in *C. elegans*), TU Braunschweig, 2006

Posters/Talks:

- A. Hintze** and R. Schnabel, *Migration mutants in C. elegans - A screening concept*, International Worm Meeting 2003, 780
- R. Olson, C. Adami, F. Dyer, **A. Hintze**, *A bottom up approach to the evolution of swarming*, ALIFE XIII 2012
- R. Olson, F. Dyer, C. Adami, and **A. Hintze**, *The Effects of Predation in the Evolution of Swarming in an Agent-based Model* ECCS 2012
- R. Olson, **A. Hintze**, F. Dyer, D. B. Knoester, C. Adami *High-performance computing enables the study of collective animal behavior*. Cyber Infrastructure Day MSU ICER 2012
- A. Hintze** et al., *Early cell migrations in C. elegans, paradigm for patterning and form - A detailed bioinformatic analysis*, International Worm Meeting 2005, 111
- A. Hintze** and C. Adami, *Information-theoretic measure of network complexity*, NetSci08 international Workshop and Conference on Network Science 2008
- A. Hintze** and C. Adami *Game Theory Workshop BEACON 2011*

Published software applications

Scientific computation

- C. elegans* data analysis package, Windows application, 2006
- Artificial Cell Model, C++ code, 2008
- Antimodularity Toolkit, Matlab and C++ library collection, 2009
- PHI computation toolkit, C++ library, 2009
- EOS - Swarm Evolution Platform, C++ and Processing, 2012
- EvoSphere - Unity3D software framework to evolve virtual organisms in 3D physics environments, 2013

Computer Games and Apps:

- Loops Of Zen, iPhone game, rating 4 (of 5), 2008
- Loops Of Zen, FLASH, rating 4 (of 5), 2008, place 7 of all free online games (Top Gizmo Geek)
- Loops mold, iPhone game, rating 2 (of 5), 2008
- merge it, iPhone game, not rated, 2008
- blockix, FLASH, rating 3 (of 5), 2008
- loopris, FLASH, rating 3 (of 5), 2008
- entangled, FLASH, rating 4 (of 5), 2008

swirls of mind, FLASH, rating 2.5 (of 5), 2009
 Platelets, iPhone game, rating 3 (of 5), 2009
 Bad Driver, iPhone App, rating 2.5 (of 5), 2009
 Hextangled, iPhone game, rating 3 (of 5), 2009
 Om Mani Padme Hum, iPhone App, rating 2 (of 5), 2009
 entangled, iPhone game, rating 3 (of 5), 2009
 Buddha Belly, iPhone game, rating 3 (of 5), 2009
 TBAMF, iPhone game, rating 2.5 (of 5), 2009
 Hextangled, iPhone game, not rated, 2009
 Loops Of Zen III, FLASH, sponsored by King.com, rated 4 (of 5), 2009
 titriplos, iPhone game, not rated, 2009
 pleotropy, FLASH educational game, rated 2.5 (of 5), 2009
 Loops of Zen HD, iPad game, rated 4 (of 5), 2010, Apples staff favorite for 2 weeks in a row
 Zig-Zag-Zone, iPad game, rated 2.5 (of 5), 2010
 shift_It, iPad game, not rated, 2010
 Dzoop, iPhone/iPad game, rating 5 (of 5), 2011
 Battle Snakes, FLASH (global game jam contribution 2012), rating 2.5 (of 5)
 Zen-o-mania, FLASH, rating 3.5 (of 5), 2012
 Blobs of Zen, FLASH, rating 4 (of 5), 2012
 Alien Rampage, Unity3D Web, Ludum Dare 25, Game jam entry, 2012
 IL-UN-VE, Youtube interactive movie/game, THAC-X entry, 2012
 Demo: Evolve & Conquer, Unity3D, teaching evolution in action, 2013
 One Torch, Unity3D Web, Ludum Dare 27, Game jam entry, 2013
 Alien Rampage 2D, Unity3D, Global Game Jam, 2014

Games in preparation:

Ink of Zen, iPhone/iPad app
 Boulder Dash Warped, iPhone/iPad app
 Nuclides, iPad, educational game about nuclear particles
 "Evolve and Conquer", BEACON educational game to teach evolution in action
 Curve, Unity3D puzzle game
 Asteroid Field, Unity3D, physics based action and economy game

Computer language skills:

Assembler 80486, DIP micro controller Assembler and C, Basic, Borland Delphi 2000, C, C++, Objective-C, Objective-C iPhone SDK, HTML, Matlab, PHP, Processing Java, Processing for Arduino, Python, C# and Javascript for Unity3D, Sparrow and Starling OpenGL framework, AS 2.0, and 3.0

Teaching

-genetics "Tutorium" at the TU-Braunschweig
 -technical assistant for various seminars and practical courses in genetics and developmental biology also at the TU-Braunschweig

- ALS 310 “Systems Biology of Complex Diseases” at the Keck Graduate Institute (KGI), Claremont, California
- CSE 491 iPhone Game Development at the Michigan State University (MSU)
- CSE 251 Introduction to Programming in C at the Michigan State University (MSU)
- CSE 891 Methods for Big Data analysis for MSBA students (MSU)
- ZOL 890 Computational modeling for evolutionary neuroscience (MSU)
- supervised the Master thesis in Biotechnology of Volker Busskamp
- supervised the PhD students Nicolas Chaumont (KGI), Jory Schossau (KGI/MSU), Dimitris Iliopoulos (KGI), Bjorn Ostman (KGI), Marc Wiseman (MSU), and Jason Pell (MSU)

Research Support

BEACON Institute Research Proposal 6/01/2011-5/30/2012
 Evolution of the Rules Microbes Use to Play Games
 Role: Co-PI. Other Co-PIs: B. Kerr (U. Washington), C. Adami (Michigan State U.)

BEACON Institute Research Proposal 6/01/2012-5/30/2013
 Darwin vs. DARPA: Evolution of a 256-node neural controller
 Role: Co-PI. Other PIs: C. Adami (Michigan State U.), H. Miikkulainen (U. Texas, Austin)

BEACON Institute Research Proposal 6/01/2013-5/30/214
 EvoSphere: A Unified Next Dimension Digital Evolution Platform
 Role: Co-PI Other PIs: R. Miikkulainen (U. Texas, Austin), R. Pennock (Michigan State U.)

BEACON Institute Research Proposal 6/01/2013-5/30/214
 Evolution of cognition, communication, and social coordination
 Role Co-PI. Other PIs: C. Adami (Michigan State U.), R. T. Pennock (Michigan State U.), F. Dyer (Michigan State U.),

BEACON Institute Research Proposal 6/01/2013-5/30/214
 Thermodynamics of Evolutionary Games
 Role Co-PI. Other PI: C. Adami

BEACON Institute Research Proposal 6/01/2013-5/30/214
 Evolutionary Games in Action
 Role Co-PI. Other PI: C. C. Edward (U. Texas, Austin), L. Crothers (U. Texas, Austin), J. A. Fick (Michigan State U.)

in preparation:

BEACON Institute Research Proposal for 2014-2015
 Evolution of brain size
 Role PI, Other: Heather Eisthen (MSU), David Cannatella (University of Texas at Austin)

BEACON Institute Research Proposal for 2014-2015
 EvoSphere: Education and Outreach
 Role PI, Other: Heather Eisthen (MSU), David Cannatella (University of Texas at Austin)

BEACON Institute Research Proposal for 2014-2015
 Evolutionary adaptation in the transition from diurnal to nocturnal behavior

NSF- Proposal
 The Evolution and Emergence of Social Stratification
 Role Co-PI, Other PIs: Kay Holekamp (MSU), Chris Adami (MSU)

NSF- Proposal
 Evolution of Robust Intelligence

Role: Co-PI. Other PIs: C. Adami (Michigan State U.), F. Dyer (Michigan State U.), D. Knoester (Michigan State U.)