

Timothea Joanna Newman

Academic Curriculum Vitae

SUMMARY

Thea Newman is an interdisciplinary scientist and former university manager. Since 2018 she has conducted independent research, education and outreach through her company **SOLARAVUS**.

For twenty years, Thea has worked at the interface of physics and biology, applying approaches from theoretical physics to problems across the life sciences. For much of that time she was based in the United States, where she was intensively involved in interdisciplinary cultural change, in her home institutions and in various roles for the National Science Foundation and the National Institutes of Health. She was an active participant in the National Cancer Institute's \$150m PSOC initiative to bring physical science expertise into cancer research. On returning to the UK in 2011, she joined the University of Dundee's School of Life Sciences and became Editor-in-Chief for the Institute of Physics journal *Physical Biology*.

Thea entered Higher Education senior management ranks in 2013, working as Dean, College Head, and finally Vice-Principal for Research, overseeing the University of Dundee's research portfolio of £100m/year. During her time in senior management, Thea led major initiatives in research quality and research efficiency. This involved significant work in creating processes for fair and transparent change management. Thea was intensively involved in Scotland's research pooling initiatives, holding a five-year Research Chair from the Life Sciences pool, and spending several years as a member of the Board of Directors for the Physics pool.

Thea is a passionate communicator of science: in the classroom, and through research seminars, public talks, and essays. She particularly emphasises the need for scientists to maintain a broad understanding of science and an appreciation for intellectual partnership across disciplines, particularly to make impact on problems that have been refractory to disciplinary approaches.

FACULTY and RESEARCH POSITIONS

2018–present	Director, SOLARAVUS
2011–2017	Professor of Biophysics, University of Dundee
2011–2016	SULSA Chair in Systems Biology, University of Dundee
2002–2010	Professor of Physics (Associate and Full), Arizona State University
1991–2002	Postdoctoral and Research Professor positions in UK (Oxford, Manchester), Germany (Cologne) and US (Illinois, Virginia)

MANAGEMENT POSITIONS

2015–2017	Vice-Principal for Research, University of Dundee
2014–2015	Acting Head, College of Art, Science and Engineering, University of Dundee
2013–2015	Dean, School of Engineering, Physics and Mathematics, University of Dundee
2008–2010	Director, Center for Biological Physics, Arizona State University

EDUCATION

1988–1991	University of Manchester, PhD in Theoretical Physics
1985–1988	University of Oxford, New College, BA (Honours) in Physics, 1 st class

FELLOWSHIPS &c.

2014 – 2017 Honorary Non-Clinical Consultant, National Health Service (Tayside)
 2013 – 2017 Member of the Board of Directors, Scottish Universities Physics Alliance
 2012 – 2016 Member of the Biological Physics Group, Institute of Physics
 2011 – 2014 Editor-in-Chief, *Physical Biology*
 2008 – 2010 Member of the Division of Biological Physics, American Physical Society
 2007 – 2008 Visiting Fellow, IMA, University of Minnesota
 2004 Elected Fellow of the Institute of Physics

RESEARCH

Using theoretical physics methods to understand complex systems in biology and medicine, including ecology, cell & molecular biology, developmental biology and cancer; in particular:

Noise-induced oscillations in predator-prey and biochemical systems (2005, 2007)

Creation of the Subcellular Element Model for tissue simulation (2005–2011)

Evolutionary transitions in limiting DNA replication errors (2013, 2016, 2020)

Robustness in gene networks (2014, 2017)

Impact of rare events in cancer initiation and metastasis (2014, 2018)

Continuously funded over the period 2001-2016 (NSF, NIH, HFSP, Scottish Government)

Published >60 peer-reviewed papers (PNAS, eLife, PRL &c.), H-index of 31 (Google Scholar)

Presented >125 invited talks at conferences and universities in Europe and US since 2003

Supervised nine PhD students and six postdoctoral associates

RESEARCH SERVICE

Served on NSF and NIH interdisciplinary funding panels

Served as Editor-in-Chief for the UK journal *Physical Biology*

Referee for major scientific journals spanning physics and biology

Organiser of ten interdisciplinary workshops and symposia

CONTACT

Thea Newman

SOLARAVUS

tjnewman@solaravus.com

APPENDICES

A: Publications

B: Presentations

C: External Funding

D: Research Service

APPENDIX A: PUBLICATIONS

Refereed research publications (64 articles in total, >3000 citations, H index = 31)

3 Tera-Basepairs as a Fundamental Limit for Robust DNA Replication

M. A. Mamun, L. Albergante, J. J. Blow and T. J. Newman, *Physical Biology* **17** 046002 (2020).

Faster Growth with Shorter Antigens Can Explain a VSG Hierarchy During African Trypanosome Infections: a Feint Attack By Parasites

D. Liu, L. Albergante, T. J. Newman and D. Horn, *Scientific Reports* **8** 10922 (2018).

Thymic Involution and Rising Disease Incidence with Age

S. Palmer, L. Albergante, C. Blackburn and T. J. Newman, *Proceedings of the National Academy of Sciences* **115** 1883:1888 (2018).

Universal Attenuators and their Interactions with Feedback Loops in Gene Regulatory Networks

D. Liu, L. Albergante and T. J. Newman, *Nucleic Acids Research* **45** 7078:7093 (2017).

Inevitability and Containment of Replication Errors for Eukaryotic Genome Lengths Spanning Megabase to Gigabase

M. A. Mamun, L. Albergante, A. Moreno, J. J. Blow and T. J. Newman, *Proceedings of the National Academy of Sciences* **113** E5765:E5774 (2016).

Evidence that Unreplicated DNA is Segregated to Daughter Cells for Resolution in the Next Cell Cycle

A. Moreno, J. T. Carrington, L. Albergante, M. A. Mamun, E. J. Haagensen, V. G. Gourgolis, T. J. Newman and J. J. Blow, *Proceedings of the National Academy of Sciences* **113** E5757:E5764 (2016).

Quantitation of Multiclinality in Control and Drug-Treated Tumour Populations Using High-Throughput Analysis of Karyotypic Heterogeneity

J. H. S. Dayal, L. Albergante, T. J. Newman and A. P. South, *Convergent Science Physical Oncology* **1** 025001 (2015).

Buffered Qualitative Stability Explains the Robustness and Evolvability of Transcriptional Networks

L. Albergante, J. J. Blow, and T. J. Newman, *eLife* **3** e02863 (2014).

Quantifying Metastatic Inefficiency: Rare Genotypes versus Rare Dynamics

L. H. Cisneros and T. J. Newman, *Physical Biology* **11** 046003 (2014).

Replisome Stall Events Have Shaped the Distribution of Replication Origins in the Genomes of Yeasts

T. J. Newman, M. A. Mamun, C. A. Nieduszynski, and J. J. Blow, *Nucleic Acids Research* **41** 9705:9718 (2013).

Steady-State Fluctuations of a Genetic Feedback Loop: an Exact Solution

R. Grima, D. Schmidt, and T. J. Newman, *Journal of Chemical Physics* **137** 035104 (2012).

"Chemotactic Dipole" Mechanism for Large-Scale Vortex Motion during Primitive Streak Formation in the Chick Embryo

S. A. Sandersius, M. Chuai, C. J. Weijer, and T. J. Newman, *Physical Biology* **8** 045008 (2011).

Emergent Cell and Tissue Dynamics from Subcellular Modeling of Active Bio-mechanical Processes

S. A. Sandersius, C. J. Weijer, and T. J. Newman, *Physical Biology* **8** 045007 (2011).

Correlating Tissue Topology and Cell Behavior in Embryonic Epithelia

S. A. Sandersius, M. Chuai, C. J. Weijer, and T. J. Newman, *PLoS ONE* **6** e18081(2011).

Modeling Cell Rheology with the Subcellular Element Model

S. A. Sandersius and T. J. Newman, *Physical Biology* **5** 015002 (2008).

Grid-free Models of Multi-cellular Systems, with an Application to Large-Scale Vortices Accompanying Primitive Streak Formation

T. J. Newman, *Current Topics in Developmental Biology* **81** 157:182 (2008).

Amplified Biochemical Oscillations in Cellular Systems

A. J. McKane, J. D. Nagy, T. J. Newman, and M. Stefanini, *Journal of Statistical Physics*, **128** 165:191 (2007).

Connecting Genotype with Phenotype using the Genome Template Model

R. E. DeSimone, A. Boondirek, and T. J. Newman, *Artificial Life X*, pp 91:98 (MIT Press, 2006).

Spatio-temporal Fluctuations at Population Margins

J. Antonovics, A. J. McKane, and T. J. Newman, *American Naturalist* **167** 16:27 (2006).

Modeling Multi-cellular Systems using Sub-cellular Elements

T. J. Newman, *Mathematical Biosciences and Engineering* **2** 611:622 (2005).

Predator-prey Cycles from Resonant Amplification of Demographic Stochasticity

A. J. McKane and T. J. Newman, *Physical Review Letters* **94** 218102 (2005).

Single Enzyme Pathways and Substrate Fluctuations

M. Stefanini, A. J. McKane, and T. J. Newman, *Nonlinearity* **18** 1575:1595 (2005).

Many-body Theory of Chemotactic Cell-Cell Interactions

T. J. Newman and R. Grima, *Physical Review E* **70** 051916 (2004).

Stochastic Models of Population Dynamics and their Deterministic Analogs

A. J. McKane and T. J. Newman, *Physical Review E* **70** 041902 (2004).

Accurate Discretization of Advection-Diffusion Equations

R. Grima and T. J. Newman, *Physical Review E* **70** 036703 (2004).

Population Dynamics with Global Regulation: the Conserved Fisher Equation

T. J. Newman, E. B. Kolomeisky, and J. Antonovics, *Physical Review Letters* **92** 228103 (2004).

Extinction Times and Moment Closure in the Stochastic Logistic Process

T. J. Newman, J.-B. Ferdy, and C. Quince, *Theoretical Population Biology* **65** 115:126 (2004).

Population Dynamics with a Refuge: Fractal Basins and the Suppression of Chaos

T. J. Newman, J. Antonovics, and H. M. Wilbur, *Theoretical Population Biology* **62** 121:128 (2002).

Negative Frequency Dependence and the Importance of Spatial Scale

J. Molofsky, J. Bever, J. Antonovics, and T. J. Newman, *Ecology* **83** 21:27 (2002).

Reply to "Comment on 'Low-dimensional Bose Liquids: Beyond the Gross-Pitaevskii Approximation'"

E. B. Kolomeisky, T. J. Newman, J. P. Straley, and X. Qi, *Physical Review Letters* **86** 4709 (2001).

Sign-Time Distribution for a Random Walker with a Drifting Boundary

T. J. Newman, *Journal of Physics A* **34** L89:94 (2001).

Critical Dimensions of the Diffusion Equation

T. J. Newman and W. Loinaz, *Physical Review Letters* **86** 2712:2715 (2001).

Low-dimensional Bose Liquids: Beyond the Gross-Pitaevskii Approximation

E. B. Kolomeisky, T. J. Newman, J. P. Straley, and X. Qi, *Physical Review Letters* **85** 1146:1149 (2000).

Quantum Revivals and Carpets in some Exactly Solvable Systems

W. Loinaz and T. J. Newman, *Journal of Physics A* **32** 8889:8895 (1999).

Sign-Time Distributions for Interface Growth

Z. Toroczkai, T. J. Newman, and S. Das Sarma, *Physical Review E* **60** R1115:1118 (1999).

Binary Data Corruption due to a Brownian Agent II

W. Triampo and T. J. Newman, *Physical Review E* **60** 1450:1463 (1999).

Binary Data Corruption due to a Brownian Agent

T. J. Newman and W. Triampo, *Physical Review E* **59** 5172:5186 (1999).

Continuum Theory of Vacancy-Mediated Diffusion

T. J. Newman, *Physical Review B* **59** 13754:13763 (1999).

Reply to "Comment on 'Non-universal Exponents in Interface Growth'"

T. J. Newman and M. R. Swift, *Physical Review Letters* **81** 5472:5472 (1998).

Three Manifestations of the Pulsed Harmonic Potential

T. J. Newman and R. K. P. Zia, *Journal of Physics A* **31** 9621:9640 (1998).

Diffusive Persistence and the Sign-Time Distribution

T. J. Newman and Z. Toroczkai, *Physical Review E* **58** R2685:R2688 (1998).

Mixed Phases in $U(N)$ Superconductivity

M. A. Moore, T. J. Newman, A. J. Bray, and S.-K. Chin, *Physical Review B* **58** 936:943 (1998).

Non-universal Exponents in Interface Growth

T. J. Newman and M. R. Swift, *Physical Review Letters* **79** 2261:2264 (1997).

Dynamical Scaling in Dissipative Burgers Turbulence

T. J. Newman, *Physical Review E* **55** 6989:6999 (1997).

Directed Lines in Sparse Potentials

T. J. Newman and A. J. McKane, *Physical Review E* **55** 165:175 (1997).

Strong Coupling Behaviour in Discrete Kardar-Parisi-Zhang Equations

T. J. Newman and A. J. Bray, *Journal of Physics A* **29** 7917:7928 (1996).

Vortex Liquid – Vortex Crystal Transition in Type-II Superconductors

T. J. Newman and M. A. Moore, *Physical Review B* **54** 6661:6675 (1996).

Strong Coupling Probe for the Kardar-Parisi-Zhang Equation

T. J. Newman and H. Kallabis, *Journal de Physique I* **6** 373:383 (1996).

Absence of Non-trivial Asymptotic Scaling in the Kashchiev Model of Interface Growth

T. J. Newman and A. Volmer, *Journal of Physics A* **29** 2285:2289 (1996).

Critical Fluctuations and Disorder at the Vortex Liquid to Crystal Transition in Type-II Superconductors

M. A. Moore and T. J. Newman, *Physical Review Letters* **75** 533:536 (1995).

Exact Results for a Model of Interface Growth

T. J. Newman, *Physical Review E* **51** 4212:4221 (1995).

Continuously Varying Exponents in Reaction-Diffusion Systems

T. J. Newman, *Journal of Physics A* **28** L183:L190 (1995).

Exactly Solvable Model of Interface Growth

T. J. Newman, *Physical Review E* **49** R2525:R2527 (1994).

Exact Solutions for Stochastic Adsorption-Desorption Models and Catalytic Surface Processes

M. D. Grynberg, T. J. Newman, and R. B. Stinchcombe, *Physical Review E* **50** 957:971 (1994).

Non-Equilibrium Dynamics of Finite Interfaces

D. B. Abraham, T. J. Newman, and G. M. Schutz, *Physical Review Letters* **72** 3266:3269 (1994).

Burgers Turbulence and Interface Growth: the Problem of Random Initial Conditions

S. E. Esipov and T. J. Newman, *Physical Review E* **48** 1046:1050 (1993).

New Formulation of Restricted Growth Processes

S. E. Esipov and T. J. Newman, *Journal of Statistical Physics* **70** 691:702 (1993).

Fluctuations in Fragmentation Processes

S. E. Esipov, L. P. Gorkov, and T. J. Newman, *Journal of Physics A* **26** 787:806 (1993).

Kinetics of Ordering for Correlated Initial Conditions

A.J. Bray, K. Humayun, and T. J. Newman, *Physical Review B* **43** 3699:3702 (1991).

Growth of Order in Vector Spin Systems and Self-Organised Criticality

T. J. Newman, A. J. Bray, and M. A. Moore, *Physical Review B* **42** 4514:4523 (1990).

Dynamic Correlations in Domain Growth: A $1/n$ Expansion

T. J. Newman and A. J. Bray, *Journal of Physics A* **23** 4491:4507 (1990).

New Exponent for Dynamic Correlations in Domain Growth

T. J. Newman and A. J. Bray, *Journal of Physics A* **23** L279:L284 (1990).

Inertial Effects on the Escape Rate of a Particle Driven by Coloured Noise: an Instanton Approach

T. J. Newman, A. J. Bray, and A. J. McKane, *Journal of Statistical Physics* **59** 357:369 (1990).

Path Integrals and Non-Markov Processes II: Escape Rates and Stationary Distributions in the Weak-Noise Limit

A.J. Bray, A. J. McKane, and T. J. Newman, *Physical Review A* **41** 657:667 (1990).

Other publications (essays, perspective pieces, book chapters)

A Systems View of Cancer: Hard Lessons from Physics

T. J. Newman, in *Rethinking Cancer: A New Paradigm for the Post-genomics Era*, eds. M. Bissell and B. Strauss (MIT Press 2021).

Insights into Biological Complexity from Simple Foundations

L. Albergante, D. Liu, S. Palmer and T. J. Newman, in *Biophysics of Infection*, ed. M. C. Leake (Springer 2016).

Biology is Simple (Perspective on Biology Research)

T. J. Newman, *Physical Biology* **12** 063002 (2015).

Water is a Molecular Liquid (Perspective on Cancer Research)

T. J. Newman, *Physical Biology* **11** 033001 (2014).

Beyond Detection: Biological Physics Informing Progression and Treatment of Cancer

T. J. Newman and A. M. Thompson, *Physical Biology* **9** 060301 (2012).

Milking the Stroma in Triple Negative Breast Cancer (News and Views)

A. M. Thompson and T. J. Newman, *Cell Cycle* **11** 1487 (2012).

Is There a Quantitative Biology?

T. J. Newman, *Nexus* **31** 14:15 (2011).

Scales of Understanding in Biological Development (Guest Editor for Special Issue)

T. J. Newman, *Physical Biology* **8** 040301 (2011).

Life and Death in Biophysics (Editorial)

T. J. Newman, *Physical Biology* **8** 010201 (2011).

Cancer is Complex, but is it Simple?

T. J. Newman, *Physical Sciences in Oncology Perspectives* **1** 11:12 (2010).

Multi-scale Modeling of Developmental Systems

Current Topics in Developmental Biology, 81 (2008).

Editors: S. Schnell, P. Maini, S. A. Newman, and T. J. Newman

Modeling Multicellular Structures Using the Subcellular Element Model

T. J. Newman, in *Single Cell Based Models in Biology and Medicine*, eds. A. Anderson, M. Chaplain, and K. Rejniak (Birkhäuser, 2007).

Spatially Explicit Studies on the Ecology and Genetics of Population Margins

J. Antonovics, T. J. Newman, and B. J. Best, in *Integrating Ecological and Evolutionary Processes in a Spatial Context*, eds. J. Silvertown and J. Antonovics (Blackwell Science, Oxford, 2001).

Numerical Surprises in the Kardar-Parisi-Zhang Equation

T. J. Newman, in *Computer Simulation Studies in Condensed Matter Physics XI*, eds. D. P. Landau and H.-B. Schuettler (Springer-Verlag, Berlin, 1998).

Burgers' Turbulence and Dynamical Scaling

S. E. Esipov and T. J. Newman, in *Stochastic Dynamics*, eds. L. Schiemanis-Geier and T. Poeschel (Springer-Verlag, Berlin, 1997).

Press Releases, Media Appearances

Ageing Immune System May Explain Age Related Cancer Risk Increase (February 2018)

The Herald (Editorial), The Conversation, STV, BBC, Radio Sputnik, &c.

Can the Stories We Write Help Us Understand the Story that Wrote Us?

Dundee Literary Festival, Oct 24th 2015

Whither the Biomedical Revolution? Perspectives from Physics in Three Short Lessons

TEDx Symposium, University of Dundee, May 23rd 2015

Physicists Reveal Random Nature of Metastasis (July 2014)

Scottish Television (STV), BBC Good Morning Scotland (live radio interview), Radio Tay, &c.

APPENDIX B: PRESENTATIONS

(since 2003: 128 events throughout Europe and N America)

Conference Presentations

Individuals and the Collective as a Biological and Sociological Framework in the Medical Sciences
Finnish Institute of Molecular Medicine Scientific Retreat, Helsinki, closing keynote, Jun 19

Simple Model of Rare Events Giving Insights into Cancer Initiation and Metastasis
A Revised Theory of Cancer, Konrad Lorenz Institute, Vienna, invited talk, Nov 17

How Physics Thinking Can Transform Biology
Higgs and SUPA Meeting on Non-Equilibrium Dynamics, Perth, invited talk, Feb 17

Incomprehensibility of the Superorganism (a Biophysics Perspective)
Names Not Numbers, Mansfield College, Oxford, invited talk, Sept 16

Using Probability Theory to Reveal Selection Pressures on Eukaryotic DNA Replication
Physics of Living Matter Annual Symposium, University of Cambridge, invited talk, Sept 15

Revealing Simplicity in Biology Using Statistical Physics
Interdisciplinary Applications of Statistical Physics, Univ. of Manchester, invited talk, Sept 15

44 Years After Nixon Declared War of Cancer: What Physics Can Bring to Cancer Research
EPSRC Physics of Cancer Symposium, University of Bristol, invited talk, May 15

Very Rare Events Appear Wilful
Royal College of Anaesthetists Spring Symposium, Edinburgh, invited talk, May 15

Biology is Simple
University of Dundee College of Life Sciences Symposium, invited talk, March 15
IOP Physics Meets Biology 2014, University of Oxford, invited talk, Sept 14
13th Experimental Chaos and Complexity Conference, Aberdeen, invited talk, Aug 14
Physical Biology of Stem Cells, Royal Society, Chicheley Hall, invited talk, July 14

Quantifying Metastasis Using Rare Events
Physics of Cancer, 5th Annual Symposium, Leipzig, invited talk, Oct 14

Modeling Intra- and Inter-Cellular Active Processes Using the Subcellular Element Model: Cytoskeletal Adaptation, Tissue Viscosity, and Collective Cell Motility
Symposium on Mechanics of Tissue and Organ Development, 7th World Congress of Biomechanics, Boston MA, invited talk, July 14

Multicellular Modelling: 3D Cell Shape, Biomechanical Calibration, and Active Processes
University of Edinburgh, Formal Approaches to Modelling Biochemical Networks Workshop, invited talk, April 12

University of Nottingham, Mathematics of Regenerative Medicine Workshop, invited talk, July 11

University of Abertay, SISCA Systems Medicine Workshop, invited talk, May 11

Noise-Induced Oscillations
Scottish Stem Cell Network Workshop on Oscillations, Dundee, invited talk, Feb 12

Throwing Mud at the Wall of Cancer
Discovery Days, Dundee, invited talk, Jan 12

Computational Modelling of Embryogenesis: the Interplay of Biomechanics and Active Cell Response

Netherlands Consortium for Systems Biology, Annual Symposium, Amsterdam, keynote speaker, Oct 11

Challenges in Systems Biology: a Physics Perspective

SULSA Symposium on Systems Biology, Glasgow, invited talk, June 11

Metastasis Formation from Low-Fitness Cells: Rare, Explosive, and Deterministic

PS-OC Network Investigators Meeting, San Diego, invited talk, Apr 11

Theoretical Biophysics: from Fluctuations to Behaviour

University of Dundee College of Life Sciences Annual Retreat, invited talk, Mar 11

Cancer is Complex, but is it Simple?

Workshop: Cellular Differentiation and Response to Stress: Modeling Cancer Initiation and Progression, Sedona (PS-OC Network), invited talk, Aug 10

Discreteness, Heterogeneity and Stochasticity: Confronting Realities in Modeling Embryogenesis

American Association of Anatomists Annual Meeting, invited talk, Apr 10

Three-dimensional Modeling of Cell Deformations and Mechanics in Multicellular Assemblies

PS-OC Network Investigators Meeting, Washington DC, invited talk, Apr 10

Modeling Multicellular Mechanics and Organization: from Embryos to Tumors

ASU Physical Sciences and Oncology Workshop, invited talk, Feb 10

Cell Rheology and Embryogenesis Using the Subcellular Element Model

Pittsburgh, American Physical Society March Meeting, invited talk, Mar 09

Looking Ahead: Connecting Scales in Models of Embryogenesis

Focused Research Group Meeting: Multiscale Methods in Biology
Mathematical Biosciences Institute, Ohio State University, invited talk, Nov 08

Using Many-Body Theory to Describe Statistical Correlations in Self-Organizing Populations

Workshop: Pattern Formation and Development in Colonial Organisms
Mathematical Biosciences Institute, Ohio State University, invited talk, Oct 08

Modeling Multicellularity: from Cell Rheology to Gastrulation

Montreal, 2008 SIAM Conference on Life Sciences, invited talk, Aug 08

Master Equations and the Many-Body Theory: Methods to Coarse-Grain from Individual to Population Level Descriptions of Biological Phenomena

Edinburgh, Annual Meeting, European Society for Mathematical and Theoretical Biology, invited talk, July 08

The Subcellular Element Model: a Grid-Free Approach to Modeling Multicellular Systems

Edinburgh, Annual Meeting, European Society for Mathematical and Theoretical Biology, invited talk, July 08

Strong Fluctuations and Cycling in Biology Systems

New Orleans, American Physical Society March Meeting, invited talk, Mar 08

Mechanisms Underlying Primitive Streak Formation in the Chick Embryo

Workshop: Physics and Biology of Morphogenesis
 Kavli Institute of Theoretical Physics, UCSB, invited talk, Mar 08

Strong Fluctuations in Extinction and Population Cycles

Workshop: Large Deviations: Theory and Applications of Large Deviation Statistics
 University of Michigan, invited talk, June 07

Grid-free Models of Multicellular Systems, and Applications to Primitive Streak Formation in the Chick Embryo

Workshop: Quantitative Approaches to Early Development
 Arizona State University, invited talk, May 07

Modeling Multicellular Structures Using the Subcellular Element Model

Biocomplexity 9: Multiscale Modeling of Multicellular Systems
 U. Indiana, invited talk, May 06

Modeling Multicellular Interactions with the Subcellular Element Model

Workshop: Computational Approaches to Cell Motility
 U. Minnesota, invited talk, Apr 06

Modeling Multicellular Systems Using Many-Body Theory

Notre Dame, IN, 2005 Biocomplexity Conference, invited talk, Oct 05

Application of Individual-Based Models of Cell Movement to Primitive Streak Formation in the Chick Embryo

Snowbird, Utah, SIAM Dynamical Systems Meeting, invited talk, May 05

Using Many-Body Theory to Understand Chemotactic Movement in Cellular Systems, with Application to the Chick Embryo

Los Angeles, American Physical Society March Meeting, invited talk, Mar 05

A New Simple Mechanism for Cycles in Predator-Prey and Host-Pathogen Systems

FIBR meeting: "Silene and Microbotryum: Genome Dynamics and the Evolution of Sexual Systems," Mountain Lake Biological Station, Virginia, invited talk, Aug 04

Microbiology in the Context of Macrobiology

NSF Workshop on "The Role of Theory in Biological Physics and Materials,"
 Tempe, contributed talk, May 04

Towards a Continuum Theory of Movement in Interacting Cellular Systems

APS Four Corners Meeting, Tempe, Arizona, invited talk, Oct 03

Stochastic Effects in Chemotaxis: Beyond the Keller-Segel Equations

Snowbird, Utah, SIAM Dynamical Systems Meeting, invited talk, May 03

Novel Dynamics of the Conserved Fisher Equation

Austin, Texas, APS March Meeting: contributed talk, Mar 03

Invited Departmental Seminars

Quantifying Biological Catastrophes: Applications to Cancer Risk and Evolution of Development
University of Aberdeen, Biomedical Sciences Seminar, Sept 18

Biology is Simple

University of Durham, Mathematics Seminar, Dec 15

Imperial College MRC Clinical Sciences Centre, CSC Seminar, April 15

Harvard Medical School, Systems Biology Division, Theory Seminar, July 14

Throwing Mud at the Wall of Cancer

University of Dundee, Cancer Research Division Seminar, Apr 14

University of Aberdeen, Biophysics Seminar, Mar 14

Imperial College, London, Inaugural Engineering Oncology Seminar, Oct 13

Interdisciplinary Research at the Physical/Life Science Interface - Why it is Hard, and Why it is Necessary

University of Technology Sydney, Science Colloquium, Dec 13

Approaching Biology Discretely

University of Edinburgh, Mathematical Biology Seminar, May 13

University of Cambridge, Biophysics Seminar, May 13

University of Regensburg, Systems Biology Seminar, Mar 13

University of Sheffield, Physics Seminar, Mar 13

University of Bielefeld, Physics Seminar, June 12

University of Bristol, Physics Seminar, May 12

Santa Fe Institute, Colloquium, Mar 12

Throwing Mud at the Wall of Cancer: Rare Events and Metastatic Inefficiency

University of California San Francisco, Cancer Cell Biology Seminar, Oct 12

The Role of Stochasticity in Biology

University of Dundee, Mathematical Biology Seminar, May 12

Life and Death in Biophysics

Second Life, Embryo Physics Seminar Series, May 12

University of Manchester, Complex Systems Seminar, Dec 11

Multicellular Modeling Using Computers: Biomechanical Calibration, Active Processes, and Emergent Tissue Dynamics

University of Birmingham, Mathematical Biology Seminar II, Feb 12

University of Oxford, Mathematical Biology Seminar, Oct 11

Quantifying Fluctuations in Biological Systems: Surprises from the 'Lab on a Pad'

University of Birmingham, Mathematical Biology Seminar I, Feb 12

Modelling Active Cell Processes in Multicellular Sheets

Second Life, Embryo Physics Seminar Series, Jan 12

Computational Modelling of Embryogenesis: the Interplay of Biomechanics and Active Cell Response

University of Sheffield, Computational Biology Seminar, Dec 11

Theoretical Biophysics: from Fluctuations to Behaviour

University of Strathclyde, Physics Colloquium, Nov 11

University of Dundee, Physics Seminar, Mar 11

Exploring the Role of Chance in Metastatic Inefficiency

University of California San Francisco, Cancer Cell Biology Seminar, Nov 11

Calculating Cancer Using CPUs and Probability Theory

University of California Berkeley, Physical Science Oncology Seminar, Nov 11

From Fluctuations to Behaviour in Biology: How Far Can We Get with Pencils, Paper, and CPUs?

University of Aberdeen, Biology Seminar, Jun 11

Embryogenesis and Cancer Progression: Discrete Theoretical Methods Applied to Living Systems

University of York, Computational Biology Seminar, Aug 11

University of Cologne, Biophysics Seminar, Jun 11

Rare Events Versus Rare Dynamics in Metastasis

University of Dundee, Cancer Research Center Seminar, Jun 11

Modeling Active Processes in Cancer Progression and Embryogenesis

University of Southern California, Physical Science Oncology Series, Nov 10

Cancer is Complex - but is it Simple?

Moffitt Cancer Research Institute, Tampa FL, Seminar, Oct 10

University of Connecticut Health Center, CCAM Seminar, Oct 10

Geometric Order and Movement Patterns in Embryonic Epithelia: Informing Controversy Using Theory and Computation

University of Texas at Austin, Nonlinear Dynamics Seminar, Oct 10

University of California at Davis, Mathematical Biology Seminar, Apr 10

Arizona State University, Biological Physics Seminar, Apr 10

University of Oregon, Physics Colloquium, Apr 10

University of Dundee, College of Life Sciences Seminar, Mar 10

Modeling Discreteness and Stochasticity in Biology: with Applications to Embryo Development and Population Dynamics

Northern Arizona University, Physics Colloquium, Nov 09

Arizona State University Polytechnic Campus, Applied Science Colloquium, Oct 09

Computational Models of Multicellular Systems: from Cell Rheology to Gastrulation

University College London, Cell and Developmental Biology Seminar, July 09

Modeling Discreteness and Fluctuations in Biological Systems: Noise-Induced Cycles in Biochemical Networks and Large-Scale Cell Flows in Embryo Development

St Andrews University, Physics Seminar, June 09

Using Theoretical Physics to Understand Embryonic Development

University College London, Physics Seminar, June 09

Arizona State University, Department of Physics Colloquium, Oct 08

'Twixt Intuition and Reality: Modeling Discreteness and Stochasticity in Cells, Embryos, and Populations

Arizona State University, School of Life Sciences Colloquium, Apr 09

Fluctuation-Induced Cycles in Biological Systems

University of Illinois at Urbana-Champaign, Biophysics Seminar, Nov 08

Computer Modeling of Multicellular Systems: from Cell Rheology to Gastrulation

University of Manchester, Theoretical Physics Seminar, June 08

Statistics of Polygonal Cells in Proliferating Epithelia

University of Minnesota, Mathematical Biology Seminar, June 08

Mechanisms Underlying Primitive Streak Formation in the Chick Embryo: a Computational Approach

Kansas University Medical Center, Developmental Biology Seminar, May 08

Fluctuation-Induced Cycles and Spatio-Temporal Feedback in Biological Systems

Princeton University, Biophysics Seminar, Apr 08

Stochastic Dynamics in Biological Systems: Applications to Embryogenesis and Biochemical Networks

Rensselaer Polytechnic Institute, Physics Colloquium, Mar 08

Modeling Multicellularity: from Cell Rheology to Gastrulation

Ohio State University Mathematical Biosciences Institute, Seminar, Jan 08

Strong Fluctuations and Cycling in Biological Systems

UC San Diego, Center for Theoretical Biological Physics, Nov 07

University of Minnesota, IMA Seminar, Nov 07

Discrete, Mesoscale, Stochastic Dynamics in Biological Systems

University of Minnesota, Department of Physics Colloquium, Nov 07

University of Dundee, Biocentre, Sept 07

Grid-free Models of Multicellular Systems: from Cell Rheology to Gastrulation

Stowers Institute (Kansas City, MO), Oct 07

University of Notre Dame, Physics Department Seminar, Oct 07

University of Minnesota, IMA Seminar, Oct 07

John Innes Centre (Norwich, UK), Sept 07

University of Aberdeen, Institute of Medical Sciences, July 07

University of Dundee, Biocentre, July 07

Modeling Multicellularity

Arizona State University, Biological Physics Seminar, Sep 06

Modeling Multicellular Systems Using Many-Body Theory

University of Missouri at Columbia, Condensed Matter Physics Seminar, Feb 06

UCLA, Biomathematics Seminar, Oct 05

SISSA, Trieste, Italy, Biophysics Seminar, June 05

Biological Fluctuations at Small and Large Scales

Indiana University, Biological Physics Seminar, Oct 05

Using Tools from Theoretical Physics to Model Embryonic Systems

Amherst College, MA, Physics Colloquium, Oct 05

Mount Holyoke College, MA, Physics Colloquium, Oct 05

Smith College, MA, Physics Colloquium, Oct 05

Arizona State University, SPS Seminar, Sep 05

Stochastic Effects in Extinction Time Estimation and Predator-Prey Cycles

University of Cambridge, UK, Theoretical Biology Seminar, Nov 04

Using Many-body Theory to Explore Interacting Cellular Systems

University of Oxford, UK, Theoretical Physics Seminar, Nov 04

Imperial College (London), UK, Applied Mathematics Seminar, Oct 04

Virginia Polytechnic Institute, Statistical Physics Seminar, Aug 04

A Stochastic Model of Interacting Cellular Systems

University of Dundee, UK, Developmental Biology Seminar, Nov 03

Michaelis-Menten Dynamics and Maxwell's Demon

Arizona State University, Soft Condensed Matter Seminar, Oct 03

Movement and Stochasticity in Biological Systems: Insights from Theoretical Physics

Arizona State University, Joint Physics/Biology Colloquium, Apr 03

Uncertainty in Extinction Times for Small Isolated Populations

Arizona State University, Mathematical Biology Seminar, Feb 03

APPENDIX C: EXTERNAL FUNDING

2011–2016	Scottish Universities Life Sciences Alliance Research Chair Funding Scottish Government, £500,000 (PI: T. Newman)
2011–2014	“Arizona State University Physical Sciences Oncology Center” National Cancer Institute, NIH, \$5,148,865 (PI: P. Davies, Co-PIs: T. Newman and 6 others)
2011–2012	“Rheological Hotspots Drive Metastasis” (PSOC Trans-Network Project) National Cancer Institute, NIH, \$400,000 (PIs: T. Newman and 4 others)
2009–2011	“Arizona State University Physical Sciences Oncology Center” National Cancer Institute, NIH, \$3,409,687 (PI: P. Davies, Co-PIs: T. Newman and 6 others)
2009–2012	“GAANN Program at Arizona State University: Physics and biological physics moving forward in the 21 st century” US Department of Education, \$527,000 (PI: O. Sankey, Co-PI: T. Newman)
2008–2012	“Gastrulation in the chick embryo: a study using live imaging and computer modeling” Human Frontier Science Program, \$750,000 (PI: T. Newman, Co-PI: Cornelis Weijer, Biology, U. of Dundee)
2007	“Workshop: Quantitative approaches to early development” NSF (Division of Integrative Organismal Systems), \$10,367 (PI: T. Newman)
2005–2007	“Correlated cell movement in embryogenesis” (Pilot study) NSF (Division of Integrative Organismal Systems and Division of Biological Physics), \$130,357 (PI: T. Newman; Senior scientist: Cornelis Weijer, Biology, U. of Dundee)
2004–2008	“Towards an integrative and mechanistic theory of within-host disease dynamics” NSF (Division of Mathematical Sciences) and NIH (NIGMS), \$1,600,000 (PI: Yang Kuang, Math, ASU; Co-PIs: T. Newman and 4 others)
2004–2008	“Interdisciplinary training for undergraduates in biological and mathematical sciences at ASU” NSF (Division of Mathematical Sciences), \$640,000 (PI: Yang Kuang, Math, ASU; Co-PIs: T. Newman and 5 others)
2001–2005	“Spatial dynamics and fluctuations in marginal populations” NSF (Division of Environmental Biology), \$149,988 (PI: T. Newman; Co-PI: Janis Antonovics, Biology, University of Virginia)
2001–2002	“Localization transitions in directed polymer systems” Jeffress Memorial Trust, \$21,500 (PI: T. Newman)

APPENDIX D: RESEARCH SERVICE

Editor-in-Chief of Physical Biology (2011–2013)

Editorial Board of Convergent Science Physical Oncology (2015–2017)

Editorial Board of Physical Biology (2014–2017)

Editorial Board of Physical Biology (2008–2010)

Editorial Board of Reports on Progress in Physics (2002–2005)

Fellow of the Institute of Physics (2004)

Member of the Biological Physics Group, Institute of Physics (2012–2016)

Member-at-Large, Biological Physics, American Physical Society (2008–2011)

Member of the Biophysical Society (2008–2011)

Member of the American Physical Society (1997–2013)

Member of the SUPA Board of Directors (2013–2017)

Referee for Nature, Science, Proceedings of the National Academy of Sciences

Referee for physical science journals: incl. Europhysics Letters, European Physical Journal B, Journal of Physics A, Journal of Statistical Physics, Nonlinearity, Physics of Fluids, Physics Letters A, Physical Review B, Physical Review E, Physical Review Letters, Reports on Progress in Physics.

Referee for life science journals: incl. American Naturalist, BioMedical Central Systems Biology, Biophysical Journal, Bulletin for Mathematical Biology, Developmental Biology, European Biophysics Journal, Interface (Proceedings of the Royal Society), Journal of Biological Physics, Journal of Theoretical Biology, Mathematical Biosciences and Engineering, Mathematical Modeling of Natural Phenomena, Physical Biology, PLoS Computational Biology, PLoS One.

Referee for funding agencies: incl. BBSRC, EPSRC; HFSP; National Science Foundation, Divisions of Environmental Biology, Applied Mathematics, Integrative Organismal Systems, Biological Physics, Molecular and Cell Biology; National Institutes of Health, NIGMS; Israeli Science Foundation; NSERC (Canada); March of Dimes.

Chair NSF Site Visit Review Panel, UIUC Center for Physics of the Living Cell (2010)

Panelist for National Science Foundation:

Emerging Modeling and Technologies (2006)

Ecology of Infectious Disease (2007)

Physics of Living Systems (2007, 2008)

Panelist for National Institutes of Health:

National Centers for Systems Biology (2008)

Modeling and Analysis of Biological Systems (2009)

Co-organizer of “Systems Biology at the Burn”, The Burn, Angus, January 2012

Co-organizer and Chair of “Self-organization in Biological Systems” focus session, American Physical Society, March Meeting, Portland, 2010

Co-organizer of “Cellular Differentiation and Response to Stress: Modeling Cancer Initiation and Progression” workshop, Sedona, August 2010

Co-organizer of “Quantitative Methods in Early Development” workshop, ASU, May 2007

Co-organizer of “Biocomplexity 9: Multiscale Modeling of Multicellular Systems” workshop, Indiana University, May 2006

Organizer of “Advances in the Biological Physics of Morphogenesis” mini-symposium, American Physical Society, March Meeting, Los Angeles, 2005

Organizer of “Dictyostelium 2002” workshop, UVA, 2002

Co-organizer of “Distributions, Diversity, and Evolutionary Dynamics” conference, UVA, 2002