Andrew G. Clark, PhD

Junior Research Group Leader, University of Stuttgart / University of Tübingen

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Current Position

5.2021-Present **Junior Research Group Leader**
University of Stuttgart, Institute for Cell Biology and Immunology / Stuttgart Research Center Systems Biology, Stuttgart, Germany

Cell Biology of the Intestine

Joint Appointment with the University of Tübingen, Center for Personalized Medicine

Previous Research Experience

9.2014-3.2021 **Postdoctoral Fellow**
Institut Curie, Cell Biology and Cancer Unit (UMR 144), Paris, France

Regulation of Collective Cell Migration

Advisor: Dr. Danijela Matic Vignjevic

5.2013-8.2014 **Postdoctoral Fellow**
MRC Laboratory of Molecular Cell Biology (LMCB), University College London, London, UK

Regulation of Actomyosin Cortex Thickness and Organization

Advisor: Professor Ewa K. Paluch

11.2008-5.2013 **Predoctoral Research Assistant (PhD Student)**
Max Planck Institute for Molecular Cell Biology and Genetics (MPI-CBG), Dresden, Germany

Thickness, Dynamics and Mechanics of the Actomyosin Cortex

Advisor: Dr. Ewa K. Paluch

9.2004-8.2008 **Undergraduate Research Assistant / Technician**
Dept. of Zoology, University of Wisconsin-Madison, Madison, Wisconsin, USA

Identification of Novel Small-molecule Inhibitors of Cytokinesis and Wound Healing; Cooperative Multicellular Would Healing in the *Xenopus* Embryo

Advisor: Professor William M. Bement

9.2003-5.2004 **Undergraduate Research Assistant**
Dept. of Animal Health and Sciences, University of Wisconsin-Madison, Madison, Wisconsin, USA

The Relationship between Chronic Salt Loading and Serotonin Receptor Expression

Advisor: Professor Mark S. Brownfield

Education

9.2008-3.2013 **Technische Universität Dresden / Max Planck Institute for Molecular Cell Biology and Genetics**, Dresden, Germany

Ph.D.

- Department: Biology
- Final Grade: *summa cum laude*

9.2003-5.2007 **University of Wisconsin-Madison**, Madison, Wisconsin, USA

Bachelor of Science, with honors

- Major: Molecular Biology
- Cumulative GPA: 3.97/4.00

External Funding and Fellowships

2022-2023 Terra Incognita Fund, "Expansion of Cancer Stem Cells in Early Colorectal Cancer"
Terra Incognita Program, University of Stuttgart
(Lead applicant, with Philipp Rathert; 25,000 Eur)

2022-2023 Biomedical Systems Seed Funding, "Modulation of tumor stroma mechanics to enhance immunotherapy"
Biomedical Systems / Terra Incognita Program, University of Stuttgart
(Co-applicant, with Dafne Müller; 10,000 Eur)

2021-2025 Start-up Junior Group Leader Funding, "NWG Gastro Tumors"
Excellence Strategy of the University of Tübingen / BMBF / BW-MWK
(PI; 1,276,160 Eur)

2015-2017 Long-Term Postdoctoral Fellowship, "EMBO ALTF 1582-2014"
European Molecular Biology Organization (EMBO)

2014 Curie Foreign Postdoc Fellowship (*declined*)
Institut Curie

Honors and Awards

2013 Poster Prize, European Cytoskeletal Forum

2012 Travel Award, Dresden International Graduate School for Biomedicine and Bioengineering (DIGS-BB)

2011 Predoctoral Travel Award, American Society for Cell Biology (ASCB)

2003-2007 Dean's List
Wisconsin Academic Excellence Scholars Program
William F. Vilas Scholarship
Medical Scholars Statewide Summer Research Fellowship

Publications

*These authors contributed equally to this work, †Corresponding author(s).
Number of citations: via Google Scholar, as of 7 July 2022

Preprints and manuscripts under review

Staneva R and **Clark AG**† (2022, *accepted*) Analysis of collective migration patterns within tumors. *Methods in Molecular Biology*.

Primary Research Articles [926 citations]

Clark AG†, Maitra A†, Jacques C, Bergert M, Pérez-González C, Simon A, Lederer L, Diz-Muñoz A, Trepat X, Voituriez R and Vignjevic DM (2022) Self-generated gradients steer collective migration on viscoelastic collagen networks. *Nature Materials*. https://doi.org/10.1038/s41563-022-01259-5

Aparicio-Yuste R, Muenkel M, **Clark AG**, Gomez-Benito MJ and Bastounis EE (2022) A stiff extracellular matrix favors the mechanical cell competition that leads to extrusion of bacterially-infected epithelial cells. *Frontiers in Cell and Developmental Biology* **10:** 912318. https://doi.org/10.3389/fcell.2022.912318

Özgüç Ö, de Plater L, Kapoor V, Tortorelli AF, **Clark AG**, Maître J-L (2022) Cortical softening elicits zygotic contractility during mouse preimplantation development. *PLOS Biology* **20(3):** e3001593. https://doi.org/10.1371/journal.pbio.3001593

Truong Quang BA, Peters R, Cassani DAD, Chugh P, **Clark AG**, Agnew M, Charras G and Paluch EK (2021) Steric hindrance regulates myosin penetration into the actin cortex and controls cell surface mechanics. *Nature Communications*. **12:** 6511. https://doi.org/10.1038/s41467-021-26611-2 [citations: 4]

Pérez-González C, Ceada G, Greco F, Matejčić M, Gómez-González M, Castro N, Menendez A, Kale S, Krndija D, **Clark AG**, Gannavarapu VR, Álvarez-Varela A, Roca-Cusachs P, Batlle E, Vignjevic DM, Arroyo M and Trepat X. (2021) Mechanical compartmentalization of the intestinal organoid enables crypt folding and collective cell migration. *Nature Cell Biology* **23:** 745-757. https://doi.org/10.1038/s41556-021-00699-6 [citations: 33]

Staneva R†, El Marjou F, Barbazan J, Krndija D, Richon S, **Clark AG***†, and Vignjevic DM* (2019) Cancer Cells in the Tumor Core Exhibit Spatially Coordinated Migration Patterns. *Journal of Cell Science*. **132(6):**jcs220277. https://doi.org/10.1242/jcs.220277 [citations: 30]

Aizel K*, **Clark AG***, Simon A, Geraldo S, Funfak A, Vargas P, Bibette J, Vignjevic DM and Bremond N (2017) A Tuneable Microfluidic System for Long Duration Chemotaxis Experiments in a 3D Collagen Matrix. *Lab on a Chip*. **17(22):**3851-3861. https://doi.org/10.1039/C7LC00649G [citations: 20]

Attieh Y, **Clark AG**, Grass C, Richon S, Elkhatib N, Betz T, Gurchenkov B and Vignjevic DM (2017) Cancer-associated Fibroblasts Lead Tumor Invasion through Integrin β3 Dependent Fibronectin Assembly. *Journal of Cell Biology*. **216(11):**3509-3520. https://doi.org/10.1083/jcb.201702033 [citations: 183]

Chugh P*, **Clark AG***†, Smith MB*, Cassani DAD, Ragab A, Roux PP, Charras G, Salbreux G and Paluch EK† (2017) Actin Cortex Architecture Regulates Cell Surface Tension. *Nature Cell Biology*. **19(6):**689-697. https://doi.org/10.1038/ncb3525 [citations: 285]

Clark AG, Dierkes K and Paluch EK (2013) Monitoring Actin Cortex Thickness in Live Cells. *Biophysical Journal*. **105(3):**570-580. https://doi.org/10.1016/j.bpj.2013.05.057 [citations: 222]

Clark AG, Sider JR, Verbrugghe K, Fenteany G, von Dassow G and Bement WM (2012) Identification of Small Molecule Inhibitors of Cytokinesis and Single Cell Wound Repair. *Cytoskeleton.* **69(11):**1010-1020. https://doi.org/10.1002/cm.21085 [citations: 23]

Clark AG, Miller AL, Vaughan E, Yu H-YE, Penkert R, and Bement WM (2009) Integration of Single and Multicellular Wound Responses. *Current Biology.* **19:**1389-1395. https://doi.org/10.1016/j.cub.2009.06.044 [citations: 126]

Review Articles and Book Chapters [952 citations]

Pajic-Lijakovic I, Milivojevic M and **Clark AG**† (2022) Collective cell migration on collagen-I networks: the impact of matrix viscoelasticity. *Frontiers in Cell and Developmental Biology* **10:** 901026. https://doi.org/10.3389/fcell.2022.901026

Clark AG† (2021) Biophysical origins of viscoelasticity during collective cell migration. in: Pajic-Lijakovic I and Barriga E (1.ed) Viscoelasticity and Collective Cell Migration. pp. 47-77. Elsevier Science, Amsterdam, Netherlands. https://doi.org/10.1016/B978-0-12-820310-1.00007-0

Clark AG†, Simon A, Aizel K, Bibette J, Bremond N, and Vignjevic DM (2018) 3D Cell Migration in the Presence of Chemical Gradients using Microfluidics. In: Piel M., Fletcher, D. and J. Doh (1.ed) Methods in Cell Biology - Microfluidics in Cell Biology Part B: Microfluidics in Single Cells. Elsevier/Academic Press, Cambridge, MA, USA. https://doi.org/10.1016/bs.mcb.2018.06.007 [citations: 4]

Clark AG† and Vignjevic DM (2015) Modes of Cancer Cell Invasion and the Role of the Microenvironment. *Current Opinion in Cell Biology.* **36:**13-22. https://doi.org/10.1016/j.ceb.2015.06.004 [citations: 694]

Clark AG†, Wartlick O, Salbreux G and Paluch EK† (2014) Stresses at the Cell Surface during Animal Cell Morphogenesis. *Current Biology.* **24(10):**R484-R494. https://doi.org/10.1016/j.cub.2014.03.059 [citations: 124]

Clark AG and Paluch E (2011) Mechanics of Cell Shape Regulation During the Cell Cycle. In: Kubiak JZ (1.ed) Results and Problems in Cell Differentiation - Cell Cycle in Development. Springer, Berlin, Germany. https://doi.org/10.1007/978-3-642-19065-0_3 [citations: 73]

Bement, WM, Yu, H-YE, Burkel, BM, Vaughan, EM, and **Clark AG** (2007) Rehabilitation and the Single Cell. *Current Opinion in Cell Biology.* **19:**95-100. https://doi.org/10.1016/j.ceb.2006.12.001 [citations: 57]

Selected Invited Talks

"Collective migration in physiology and disease" BioMechBW, *Keynote Speaker* (07.2022, Tübingen, Germany)

"Viscoelastic relaxation of collagen networks provides a self-generated polarity cue during collective migration" DGZ Focus Workshop, Cytoskeleton and Mechanobiology (03.2022, online)

"Collective cell migration in cancer and physiology" SPP1782 International Meeting 2021 (10.2021, online)

"Viscoelastic relaxation of collagen networks provides a self-generated polarity cue during collective migration" Cell Migration Seminars (6.2021, online)

"Collective cell migration in cancer and physiology" *Invited Speaker* (12.2019, Institut Gustave Roussy, Villejuif, France)

"Collective cell dynamics in intestinal cancer and homeostasis" *Invited Speaker* (07.2019, Universitätsklinikum Erlangen, Germany)

"Dynamics and mechanics of collective cancer cell migration" Horizons in Biology - Beyond the (biological) borders (04.2019, Münster, Germany)

"Dynamics and mechanics of collective cancer cell migration" Symposium for the Science of Light (03.2019, Erlangen, Germany)

"Mechanisms of collective cell migration and the influence of the microenvironment" Physics of Cancer (10.2017, Leipzig, Germany)

"Regulation of collective cancer cell migration" Labex CelTisPhyBio Workshop: Cytoskeleton in 3D (4.2017, Paris, France)

"Regulation of actomyosin cortex architecture in animal cell morphogenesis" Annual Meeting of the American Society for Cell Biology (ASCB, 12.2013, New Orleans, LA, USA)

"Monitoring actin cortex thickness in live cells" Conference: Mechanical Manipulations and Responses at the Scale of Cells and Beyond (4.2013, Bangalore, India)

"Thickness and dynamics of the actomyosin cortex" Annual Meeting of the German Society for Cell Biology (DGZ, 3.2012, Dresden, Germany)

Selected Posters

"Viscoelastic relaxation of collagen networks provides a self-generated polarity cue during collective migration" Annual Meeting of the American Society for Cell Biology (ASCB, 12.2021, Online)

"Viscoelastic relaxation of collagen networks provides a self-generated polarity cue during collective migration" DGZ International Meeting: Life in Between, the Cell Biology of Interfaces (09.2021, Online)

"Transient mechanical reorganization of ECM networks during collective cell migration" Gordon Research Conference: Cell Contact and Adhesion (06.2019, Les Diablerets, Switzerland)

"Dynamics and mechanics of collective cell migration" Symposia on Tumor Biology: from basic biology to disease (12.2018, Lisbon, Portugal)

"Integrin function during collective and single-cell migration" Forces in cancer: interdisciplinary approaches in tumour mechanobiology (6.2018, London, UK)

"Regulation of collective cell chemotaxis during tumor invasion" The Invadosome Consortium: Integrated mechano-chemical signals during invasion (10.2015, Saint-Paul-de-Vence/Nice, France)

"Regulation of the thickness and organization of the cellular actin cortex" Annual Meeting of the American Society for Cell Biology (ASCB, 12.2013, New Orleans, LA, USA)

"Monitoring actin cortex thickness in live cells" European Cytoskeletal Forum: The Cytoskeleton in Tissue Repair and Diseases (9.2013, Fribourg, Switzerland)

"Mechanics, dynamics and organization of the actomyosin cortex" Gordon Research Conference: Motile & Contractile Systems (6.2011, New London, NH, USA)

Teaching Experience

4.2022-Present **Course Instructor**
"Quantitative Approaches in Cell Biology," University of Stuttgart
Undergraduate, 2-5 students, 14hrs/semester
Role: Designed/presented lectures/activities/seminars on quantitative biology for undergraduates and Masters students in the Technical Biology program

2.2022-Present **Course Instructor**
"Cell Biology Practical Course," University of Stuttgart
Undergraduate, 20-30 students, 48hrs/semester
Role: Designed/presented practical lectures/activities/seminars and guided lab work for a cell biology lab practical course for undergraduates in the Technical Biology program

7.2021-Present **Lecturer**
"Cell Biology," University of Stuttgart
Undergraduate, 30-40 students, 3hrs/semester
Role: Designed and presented lectures for a general cell biology course for undergraduates enrolled in the Technical Biology program

8.2016-12.2019 **Course Instructor**
"Scientific English," FdV/CRI, Université Paris Descartes
Undergraduate, 25-30 students, 10-20hrs/semester
Role: Co-organized curriculum and co-instructed course to teach scientific communication in different situations (conferences, applications, popular science writing) in English

4.2011-7.2011 **Course Instructor/Teaching Assistant**
"Physics in Biology," Technische Universität Dresden
Undergraduate, 10-15 students, 10hrs/semester
Role: Teaching assistant and lecturer for introductory biophysics

1.2015-2.2015 **Course Instructor**
"ImageJ/FIJI Macro course," Institut Curie, Paris
Informal course for laboratory members (Masters-Postdoc), 5-10 students, 5x 2hrs
Role: Organized curriculum and instructed course on introduction to programming and batch image analysis using the ImageJ Macro language

9.2009-11.2009 **Practical Course Instructor**
"Methods and analysis of FRAP experiments," Max Planck Institute for Molecular Cell Biology and Genetics, Dresden
Undergraduate/PhD, 2-4 students per tutorial, workshops over 2-3 days
Role: Co-organized and instructed laboratory practical courses on confocal microscopy and image analysis

9.2006-5.2007 **Course Instructor**
Undergraduate Research Scholars Program, University of Wisconsin-Madison
Undergraduate, ∼15 students, ∼15hrs/semester
Role: Co-organized curriculum and co-instructed course on communication of scientific research, science ethics and science in society

Training Experience

04.2022-Present **Karen Kresbach, Masters Student**
University of Stuttgart

10.2021-Present **Fabian Gärtner, Undergrduate**
University of Stuttgart

10.2021-Present **Sarbari Saha, PhD Student**
University of Stuttgart

9.2021-Present **Hoang Trinh Thao Nguyen, Postdoctoral Fellow**
University of Stuttgart

1.2018-3.2018 **Cécile Jacques, Masters Student (co-supervised w. Danijela Vignjevic)**
Institut Curie

6.2017-8.2017 **Kyu Sang Han, Undergraduate (co-supervised w. Danijela Vignjevic)**
Johns Hopkins University / Institut Curie

6.2015-4.2017 **Anthony Simon, Research Engineer (co-supervised w. Danijela Vignjevic)**
Institut Curie

9.2011-8.2014 **Priyamvada Chugh, PhD Student (co-supervised w. Ewa Paluch)**
Max Planck Institute for Molecular Cell Biology and Genetics/MRC Laboratory of Molecular Cell Biology (LMCB), University College London

2.2010-4.2011 **Steve Simmert, Master's Student (co-supervised w. Ewa Paluch)**
Max Planck Institute for Molecular Cell Biology and Genetics

Academic Citizenship

03.2022 **Conference Organization**
BioMech: Workshop on Mechanobiology, Co-organizer

2014-Present **Ad hoc reviewer for scientific journals/funding agencies (direct solicitation)**
Journals: *Science Adv., Nat. Comm., PNAS, J. Cell Biol., Lab Chip, Sci. Rep., Sem. Cell Dev. Biol., Front. Phys., PLOS One*
Funding agencies: World Wide Cancer Research, Israel Science Foundation

2012-2018 **Ad hoc reviewer for scientific journals (co-reviewed with supervisor)**
Journals: *Science, Nat. Cell Biol., Nat. Nanotech., Nat. Commun., eLife, J. Cell Sci.*

Professional Memberships

The American Society for Cell Biology (ASCB)
The German Society for Cell Biology (DGZ)

Relevant Courses/Workshops

11.2021	Grundkurs für Projektleiter und Beauftragte für Biologische Sicherheit Dechema-Forschungsinstitut, Online
04.2019	Interviewing Skills for Grant Applications Institut Curie/Scriptorium, Paris, France
03.2017	Laboratory Management EMBO/Leadership Sculptor, Heidelberg, Germany
09.2015	Research Integrity Certification and Assessment (Biomedical Sciences) Epigeum, Online

Technical Skills

- **Culture and Model Systems:** primary mouse intestinal organoids, mammalian cell lines, *Xenopus laevis*, *Dendraster excentricus*
- **Microscopy:** Long term optical timelapse, 4D high-resolution confocal
- **Analysis:** Image analysis (segmentation, quantitative data extraction, batch processing), Multi-dimensional image processing, Model fitting and analysis, High-content data visualization, Creation of graphical user interfaces
- **Cell Biology:** Transfection (various delivery systems), Microinjection, Immunohistchemistry, Functional assays for screening
- **Biophysics:** Micropipette aspiration, Traction force microscopy
- **Molecular Biology and Biochemistry:** Restriction enzyme- and recombination-based cloning, Western blotting, *in vitro* mRNA synthesis
- **Microfluidics:** Soft lithography fabrication, Preparation of PDMS microfluidic molds, Use of syringe pump systems for live cell experiments

Programming Languages

Python - Advanced
Fiji/ImageJ Macro - Advanced
Matlab - Intermediate
Java - Basic

Spoken Languages

English - Native Speaker
German - Fluent
French - Intermediate
Spanish - Basic