BSYT Alumni day November 2014

Jens Karschau

career path and projects from 2008 up to today

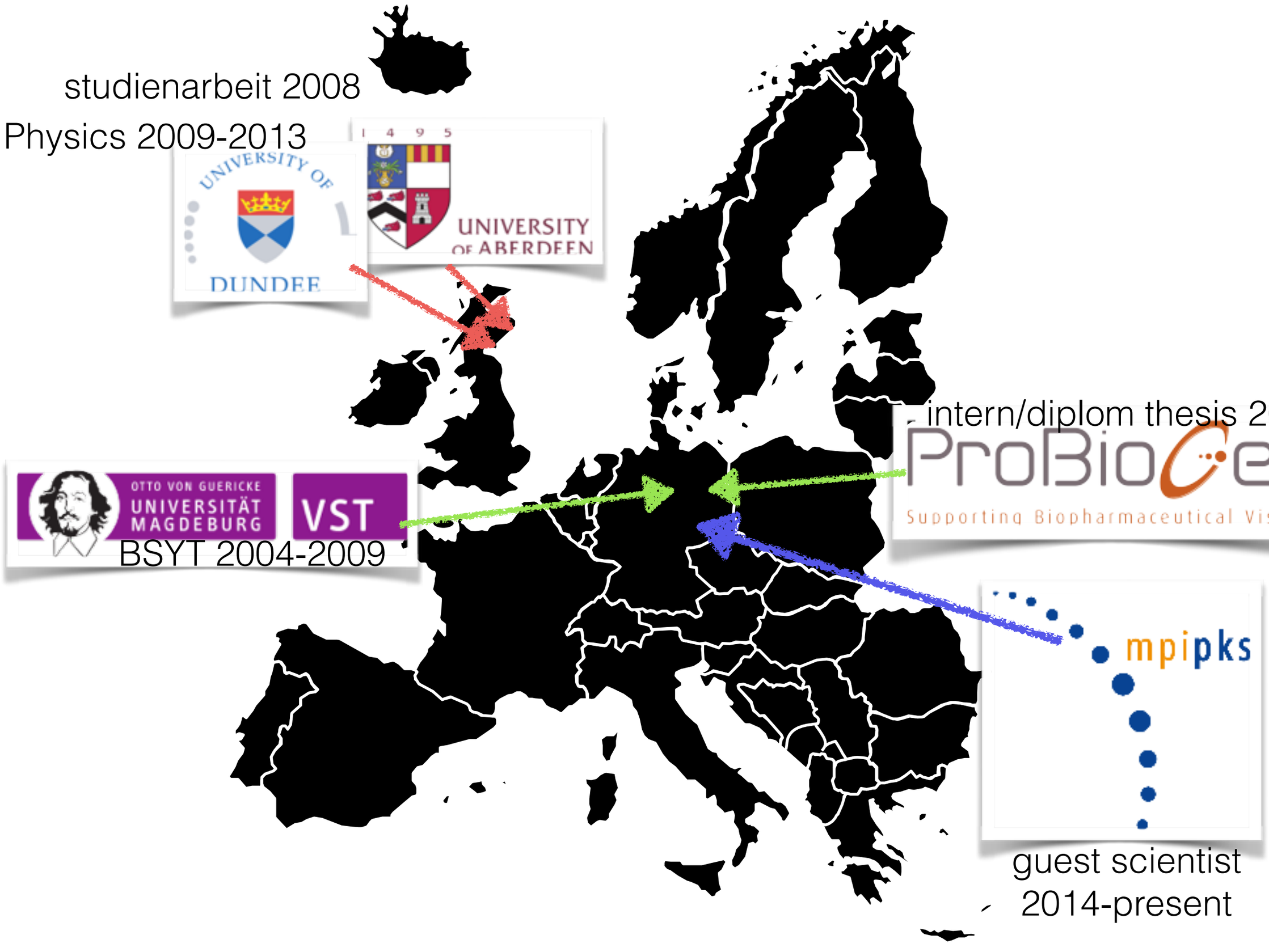
studienarbeit 2008

PhD Physics 2009-2013

intern/diplom thesis 2009

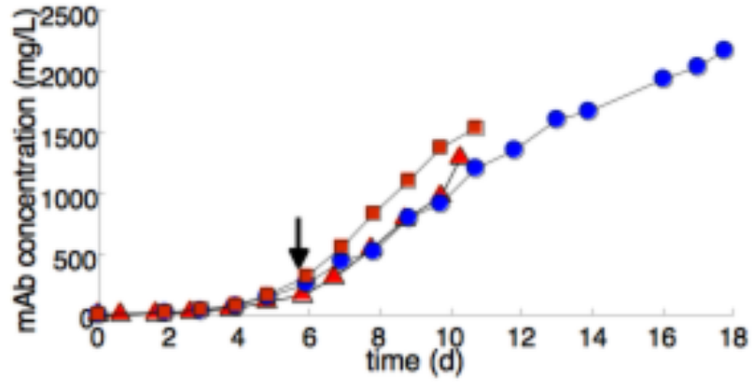
BSYT 2004-2009

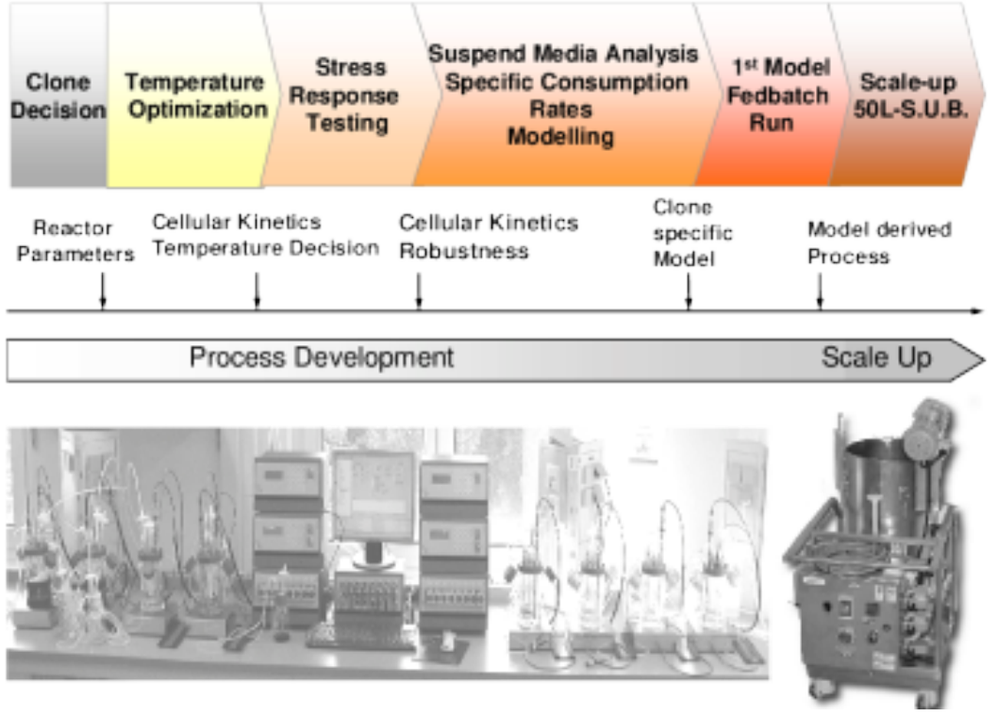
guest scientist
2014-present



Animal Cell Process Engineering

How to increase product yield of a process for monoclonal antibody production?





- Design of experiments
- Experimental and theoretical investigation of clonal diversity
- Identification of growth condition dependant nutrient needs along with metabolic flux-balance modelling
- Optimal process control for maximal product yield

ProBioGen
Supporting Biopharmaceutical Visions

René Brecht
Michael Thiele

OTTO VON GUERICKE UNIVERSITÄT MAGDEBURG
VST FACULTY FOR PROCESS AND SYSTEMS ENGINEERING

MAX-PLANCK-INSTITUT DYNAMIKKOMPLEXER TECHNISCHERSYSTEME MAGDEBURG

Udo Reichl
Andreas Kremling
Yvonne Genzel

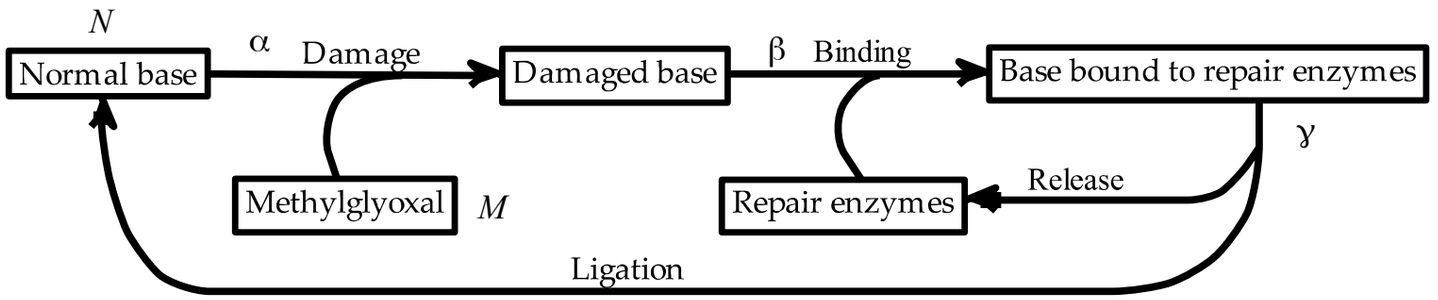
DNA damage and repair

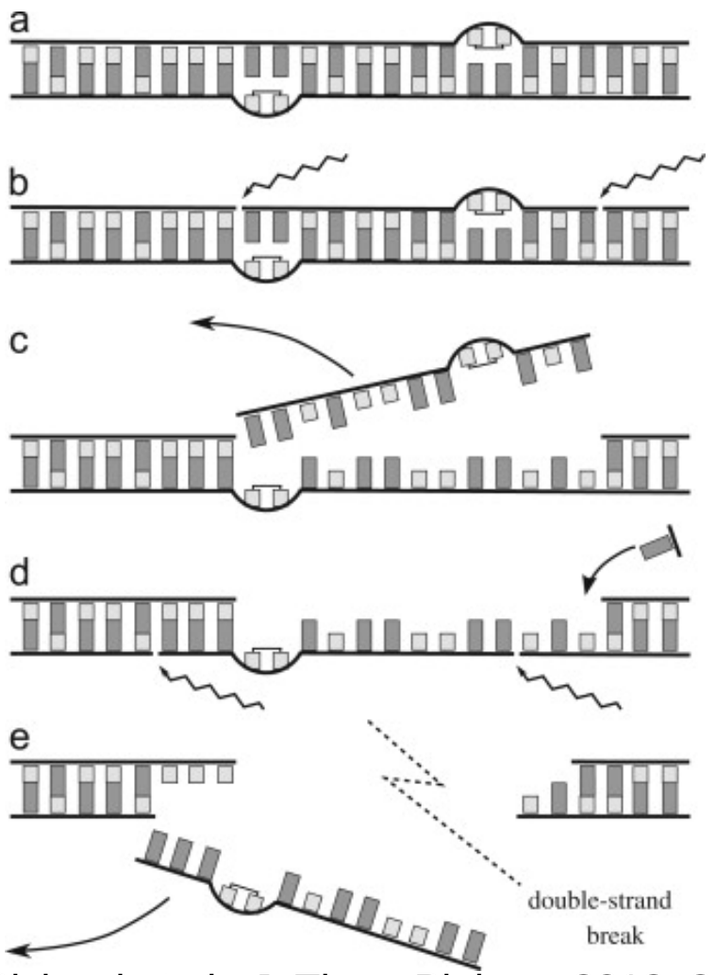
A Matter of Life and Death

Stochastic Modelling of E. coli Exposed to Methylglyoxal Stress

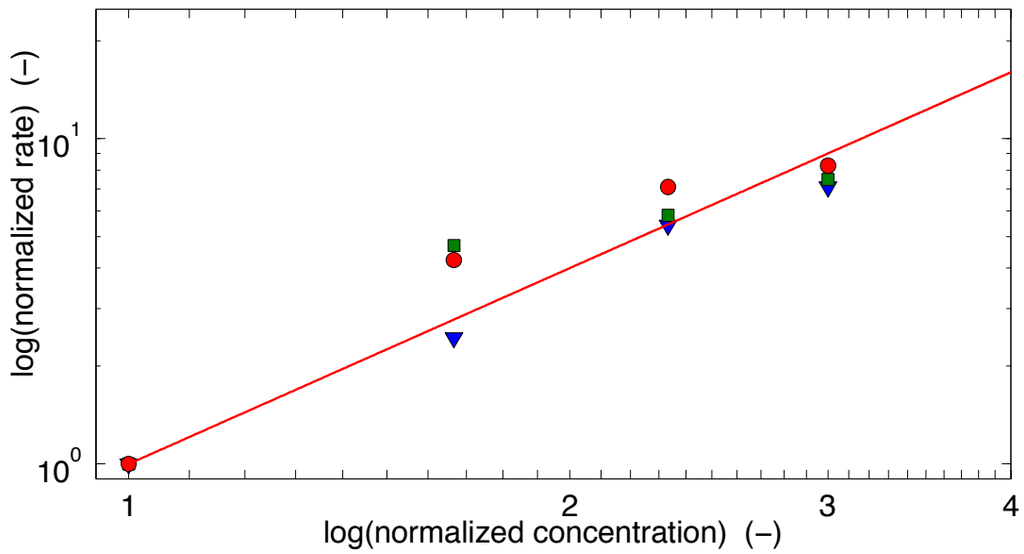
J. Karschau *et al.*, Biophysical Journal. 2011; 100(4) 814-21

Survival: $$T = \frac{2\gamma \ln 2}{\alpha^2 L} N^{-1} M^{-2}$$





M. Richard et al., J. Theo. Biology. 2012; 292 39-43



UNIVERSITY OF ABERDEEN

Ian R. Booth
Alessandro de Moura
Celso Grebogi

SysMO
Systems Biology of Microorganisms

MAX–PLANCK–INSTITUT
DYNAMIK KOMPLEXER
TECHNISCHER SYSTEME
MAGDEBURG

Andreas Kremling
(now TU Munich)

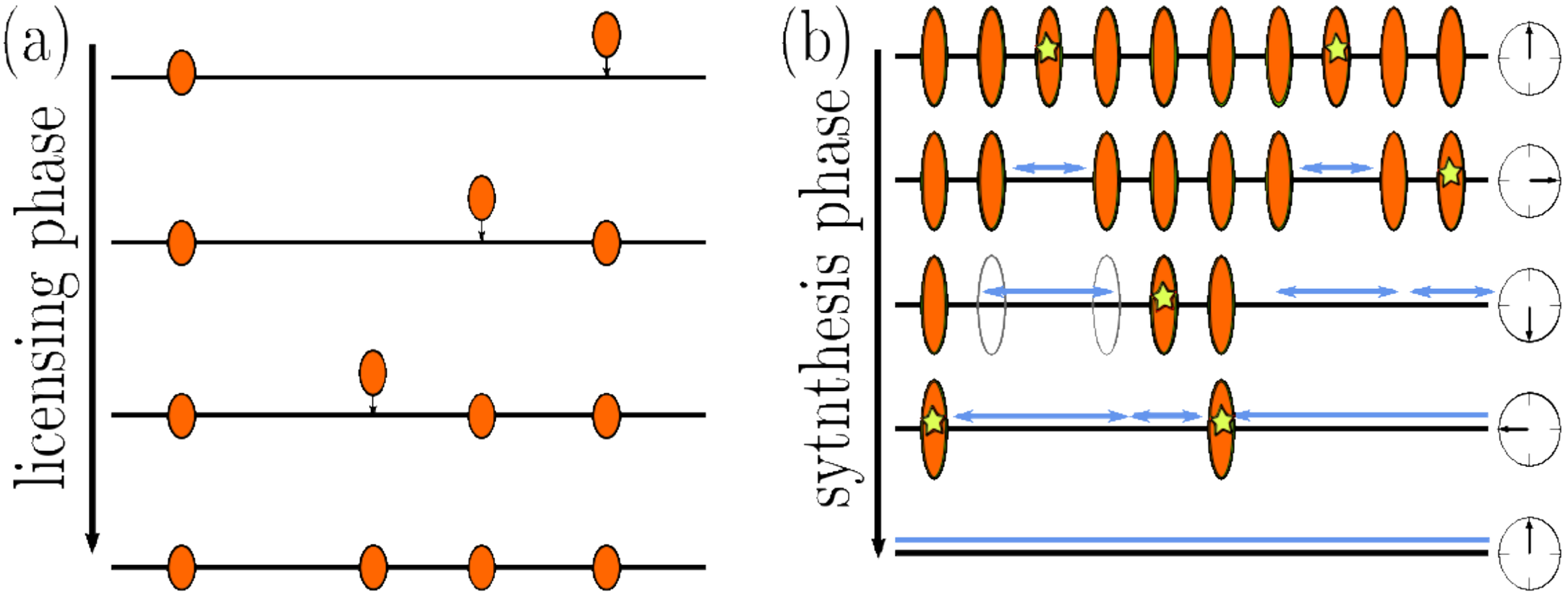
Mechanisms of DNA replication

Origin licensing and their activation are timely separated.

DNA replication is divided into two distinct phases
to avoid re-replication of already replicated DNA.

1) Origin licensing

2) Origin activation and DNA synthesis in S-phase



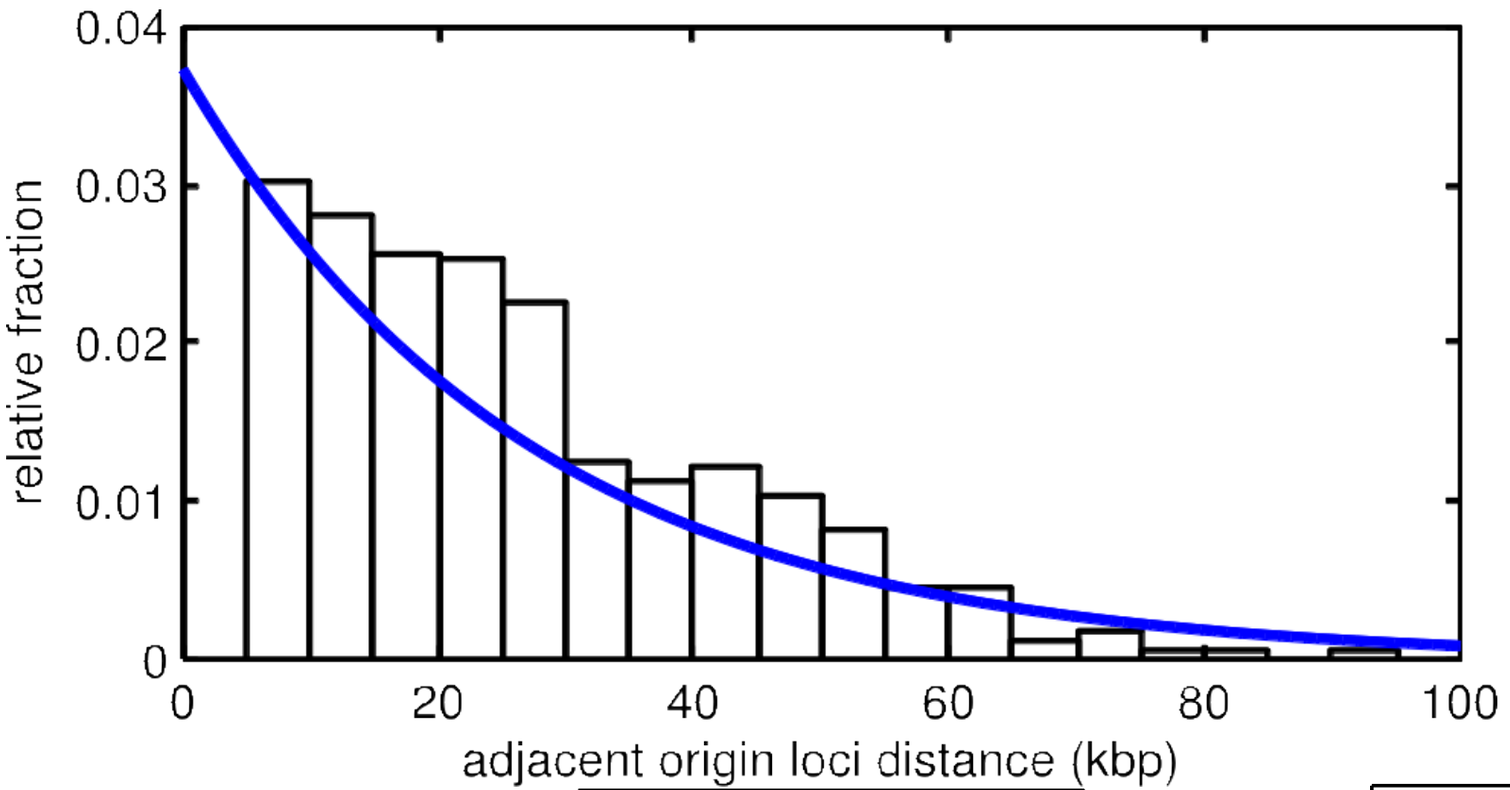
Minimum Replication Time

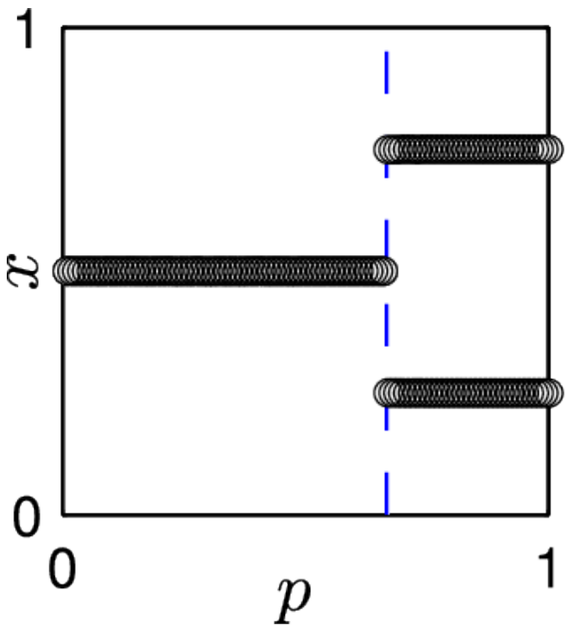
Optimal Placement of Origins for DNA Replication

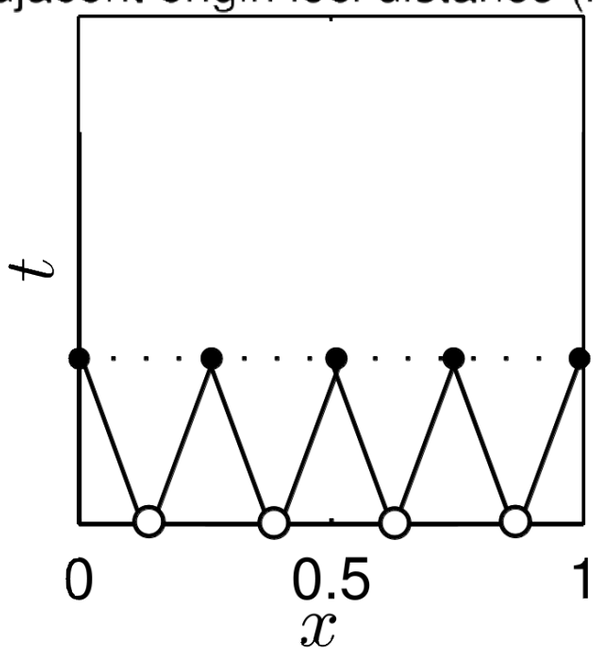
J. Karschau, J.J. Blow, and A.P.S. de Moura.Physical Review Letters. 2012; 108(5):058101.

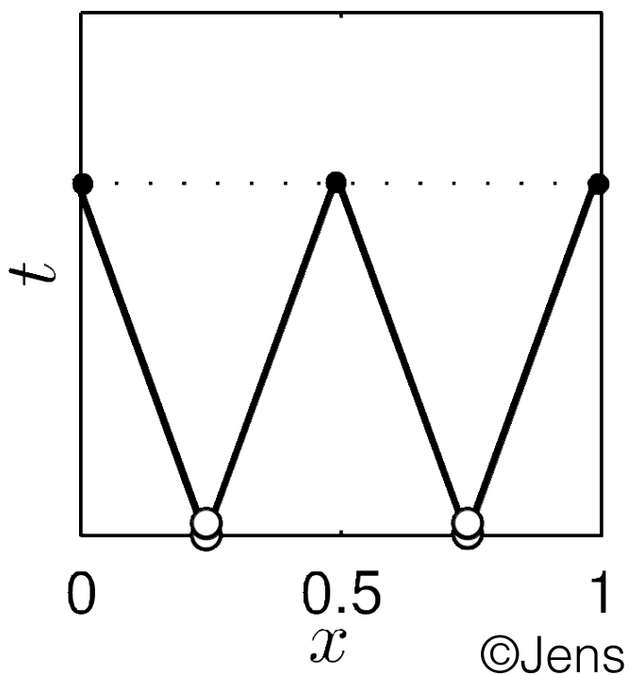
What are preferred locations for origins

if their licensing and activation are stochastic?









J. Julian Blow

UNIVERSITY OF DUNDEE

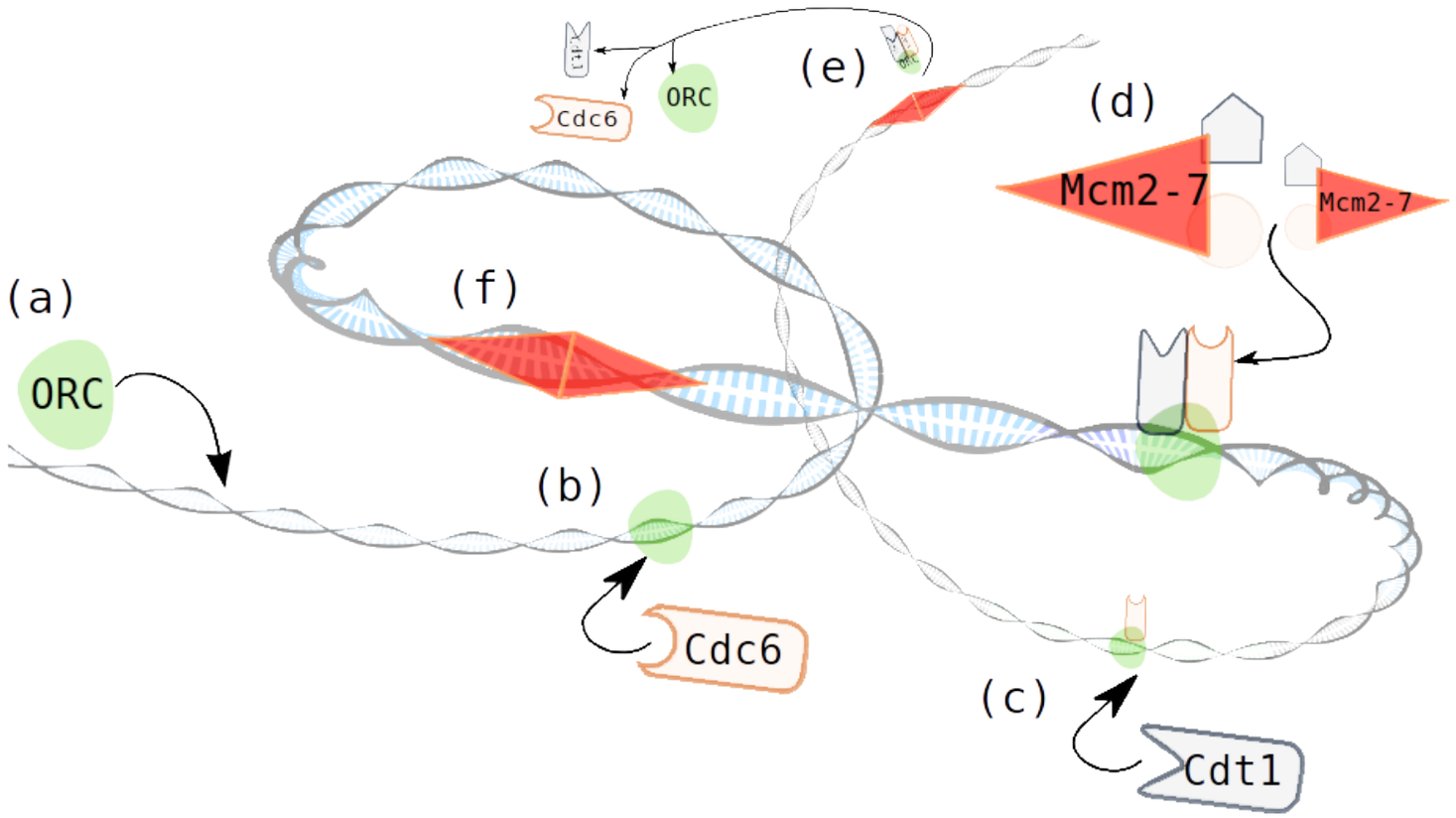
Alessandro de Moura

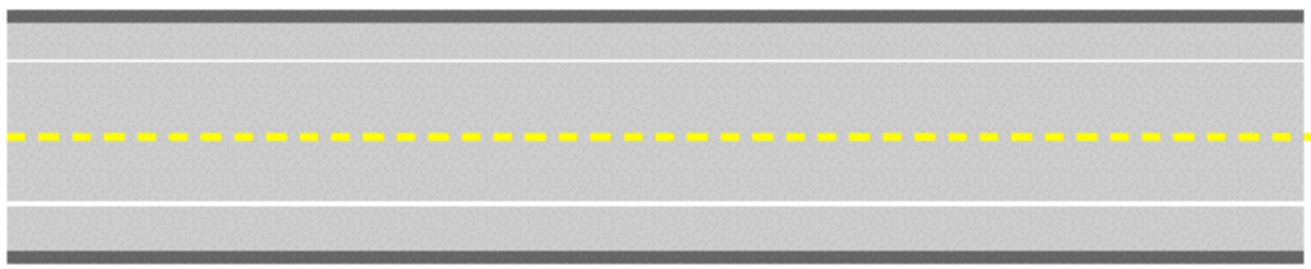
UNIVERSITY OF ABERDEEN

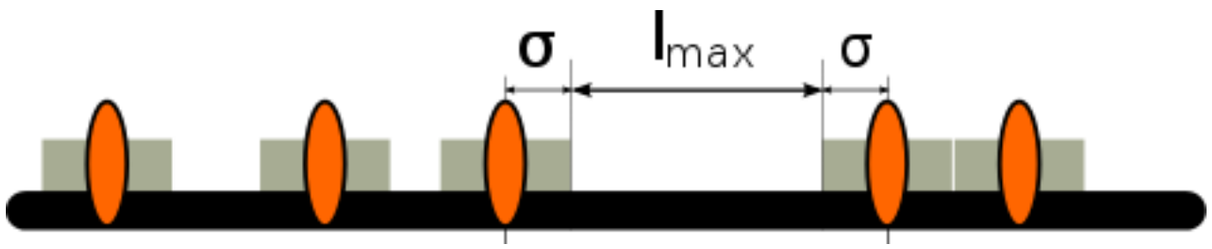
The random completion problem – a car-parking problem

P. Gillespie*, J. Karschau*, J. Kisielewska, J.J. Blow and A.P.S. de Moura, *in preparation*.
*equal contribution.

Modelling of the process of protein binding to DNA in a analogy to cars parking along a street.





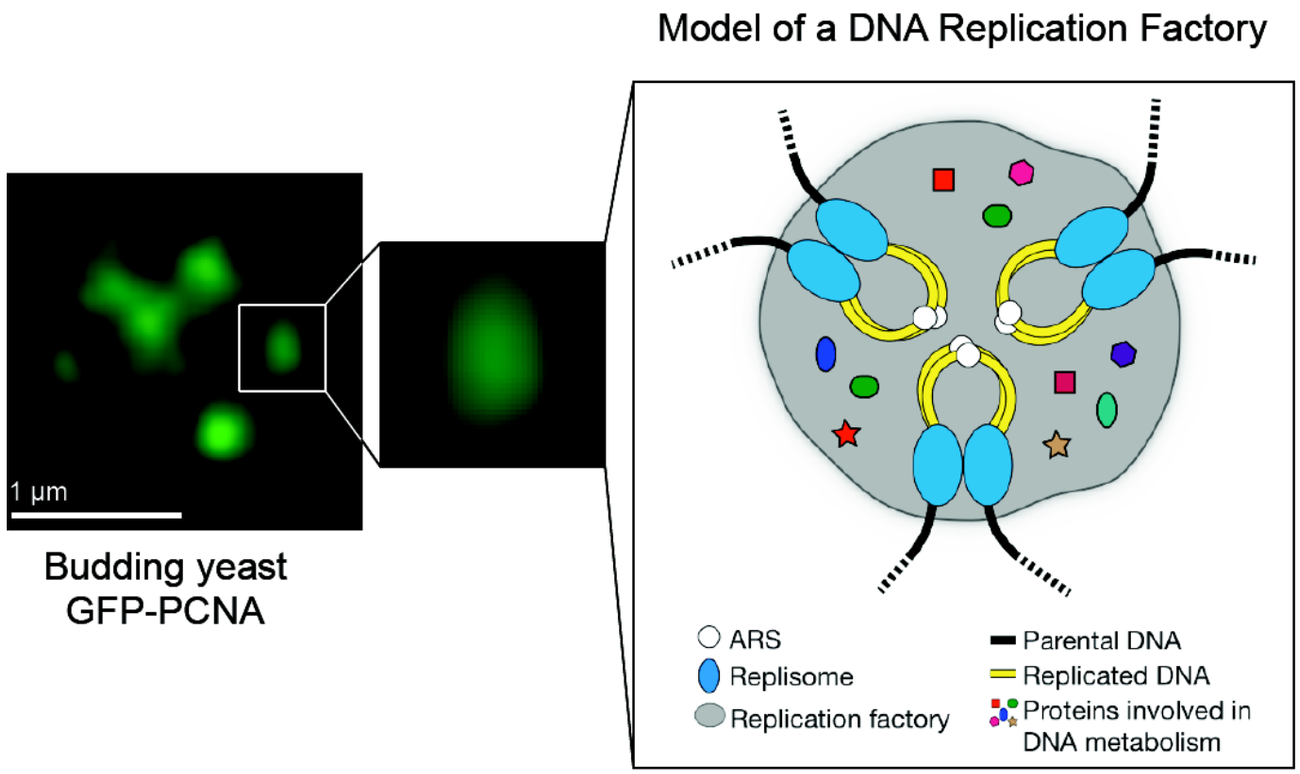


Alessandro de Moura
Julian J. Blow
Peter Gillespie

Replication Factories

Spatial Organisation of DNA Replication within the yeast nucleus

N. Saner, J. Karschau, T. Natsume, M. Gierlinski, R. Retkute, M. Hawkins, C. Nieduszynski, J.J. Blow, A.P.S. de Moura, T. Tanaka,
Stochastic Association of neighboring replicons creates replication factories in budding yeast. Journal of Cell Biology 7(202):1001-12. 2013



Adapted from Frouin, I *et al*. 2003
Falaschi, A. 2000
Kitamura, E *et al*. 2006

Sites at which DNA replication takes place

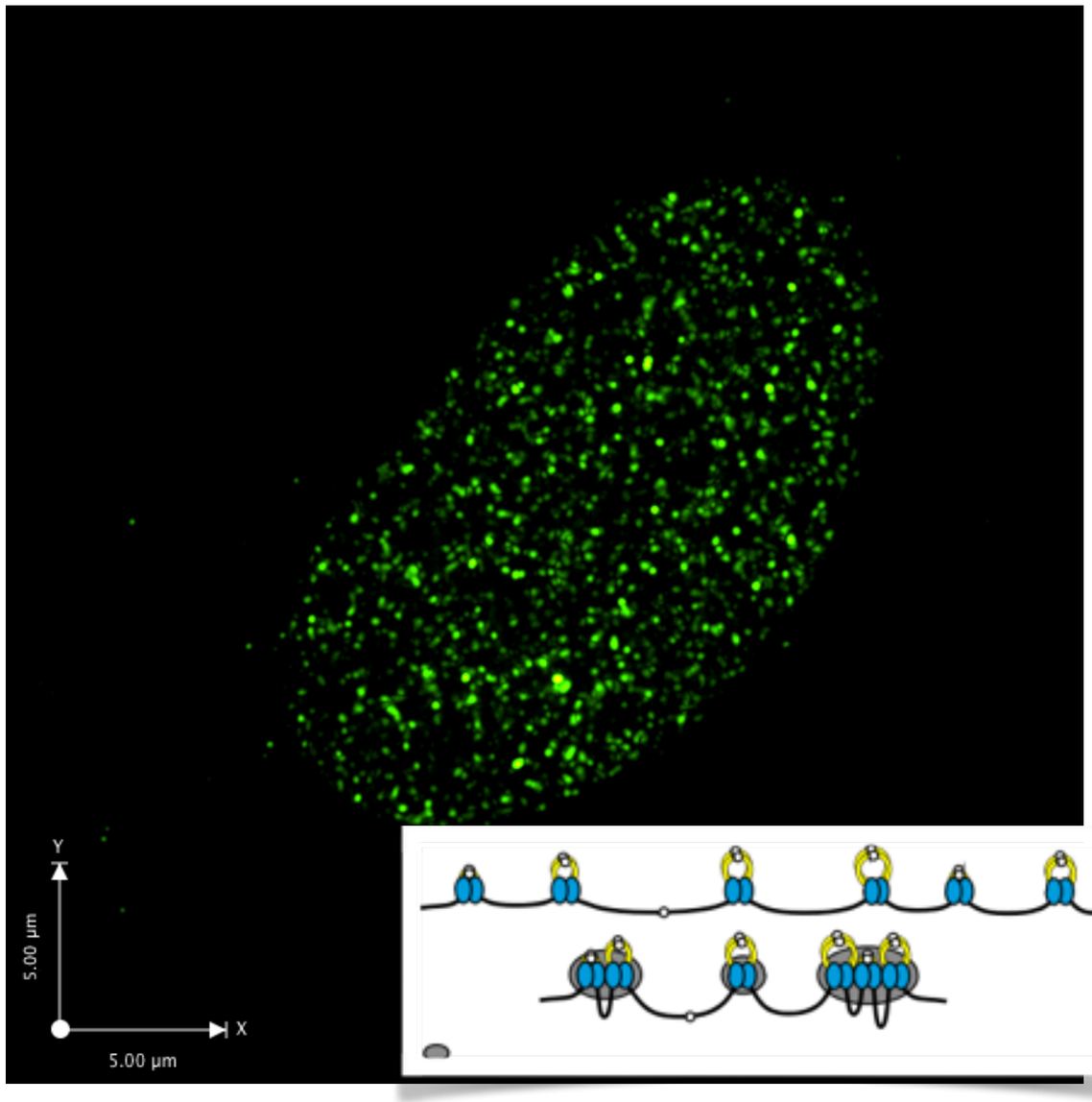
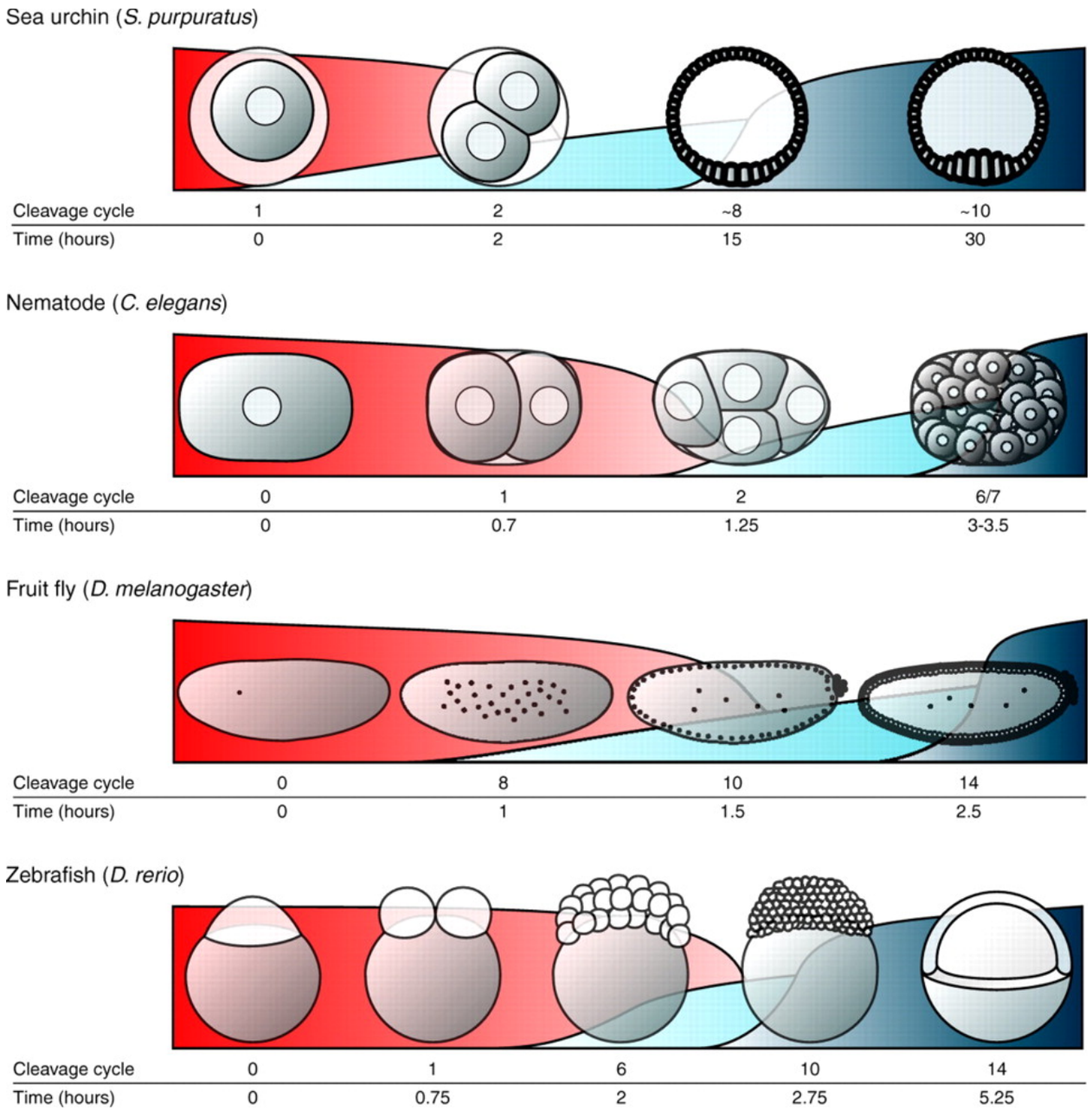


Photo: Debbie McIntosh, J.J.B. lab

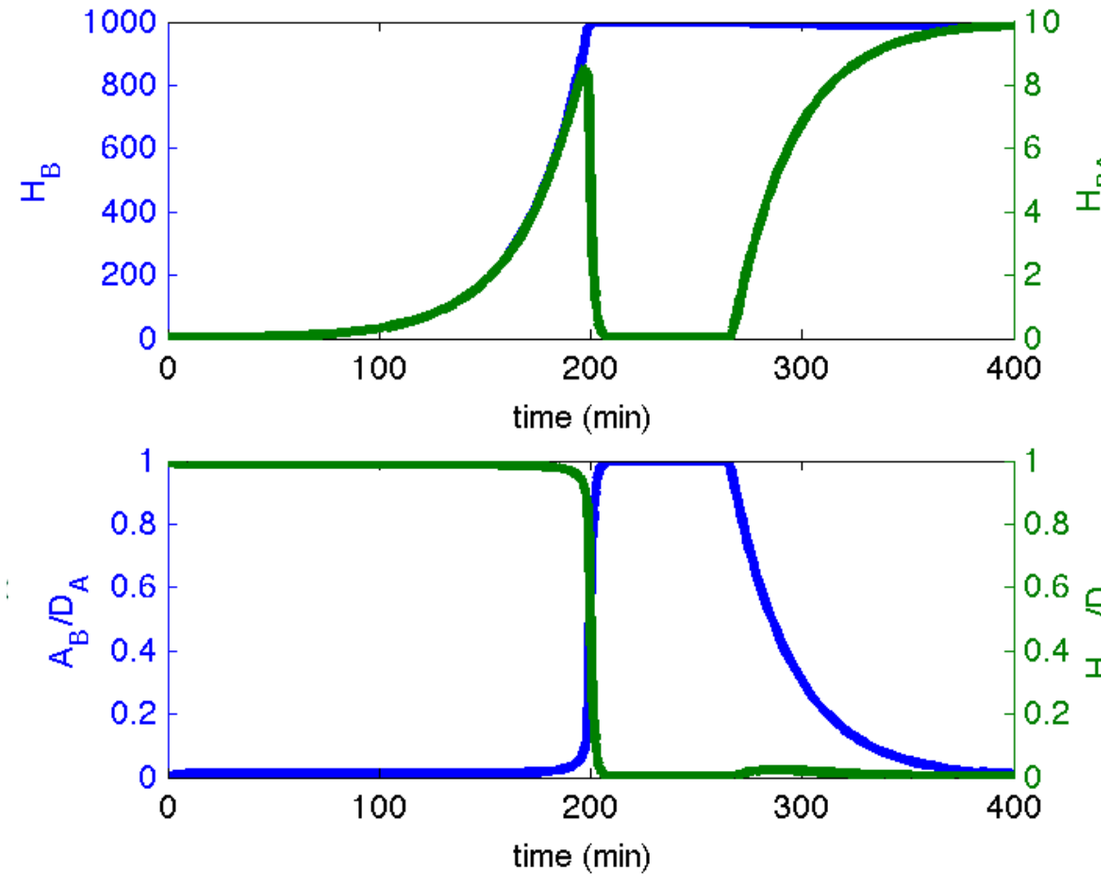
Replication factories are compartment-like structure
However there is no physical boundary that keeps replication forks together.

UNIVERSITY OF DUNDEE
Tomoyuki Tanaka
Julian J. Blow
Nazan Saner
UNIVERSITY OF ABERDEEN
Alessandro de Moura
Conrad Nieduszynski

Genome activation in early embryos



Tadros and Lipshitz, 2009



Modelling of competition for DNA binding sites

More general: What sets the time point of genome activation in activator repressor model?

CBG Max Planck Institute of Molecular Cell Biology and Genetics

Shai Joseph

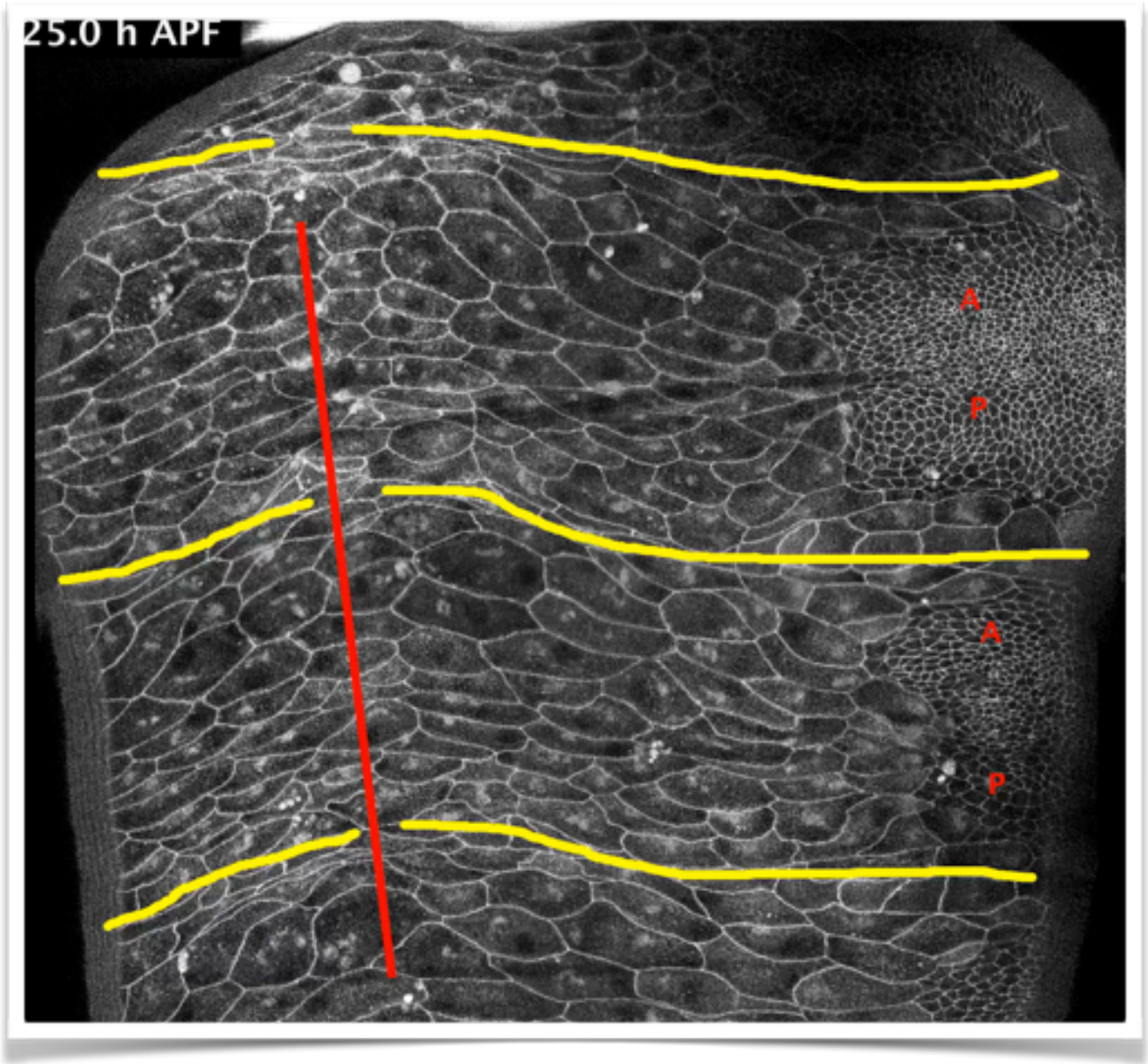
Nadine Vastenhouw

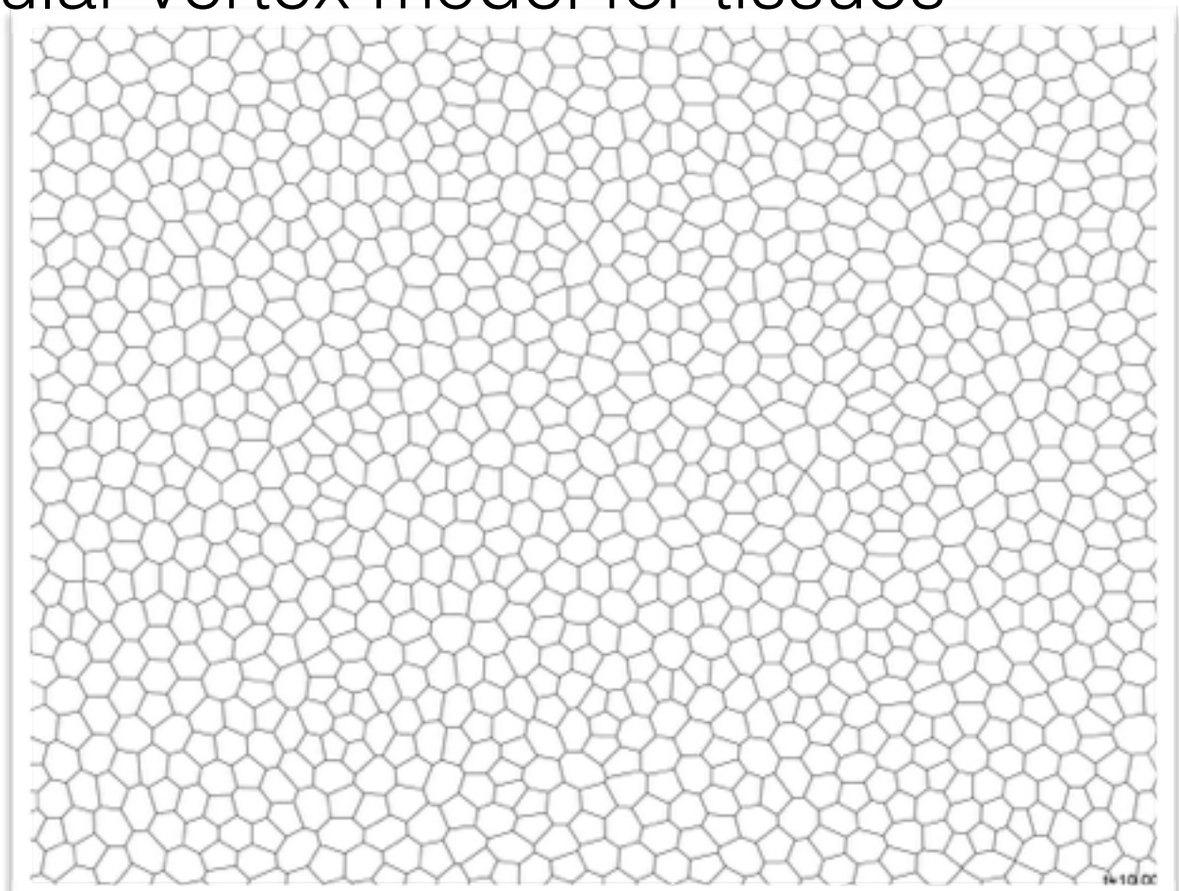
MPI-PKS | Collective Dynamics of Cells

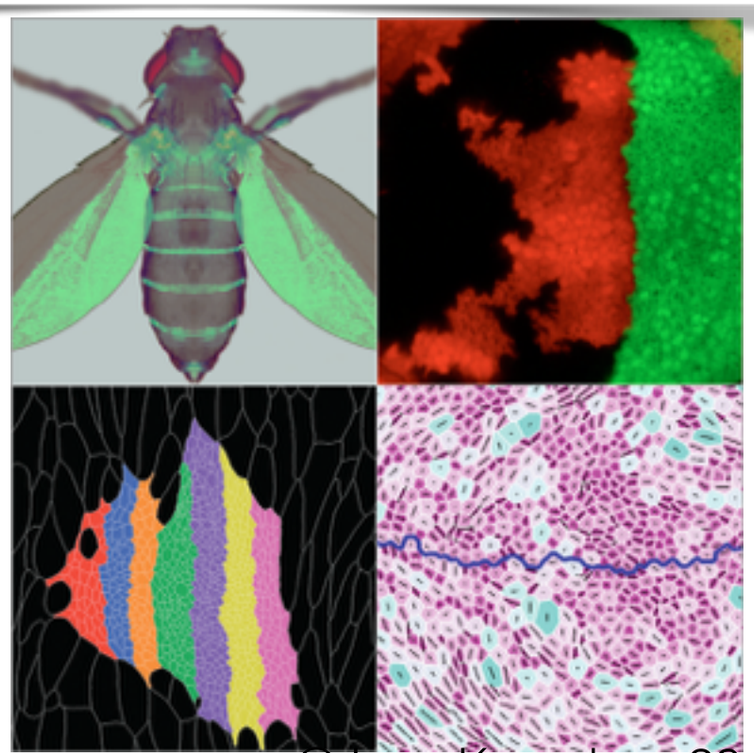
Vasily Zaburdaev

Tissue formation and cellular mechanics

Modelling of cell mechanics using a cellular-vertex model for tissues







top left, bottom right figures:
courtesy of C. Dahmann group TUD

TECHNISCHE UNIVERSITÄT DRESDEN

Frank Jülicher
Christian Dahmann
Marcus Michel

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Advancing Molecular Bioscience

EPS

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