

## Profile

**Dr. Jan-Ulrich Kreft**

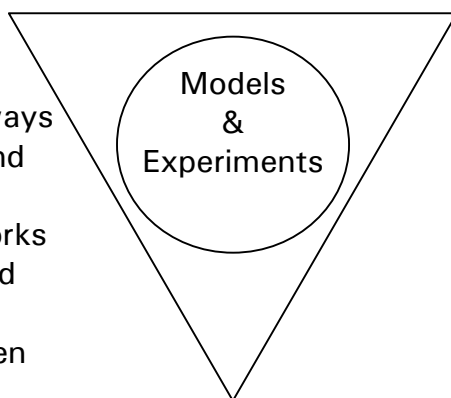
Theoretical Biology, University of Bonn



**Research interests** (with a focus on current not yet published work)

### Metabolism

- Metabolic networks
- Kinetic theory of optimal metabolic pathways
- Competition and evolution of metabolic networks
- Metabolism and social behaviour
- Scaling between metabolism and ecosystem processes



### Ecology & Evolution

- Cooperation and communication in complex habitats
- Division of labour
- Trade-offs and coexistence
- Individual-based modelling to understand complexity
- Importance of spatial structure
- Stress and population diversification

### Microbiology

- Biofilms and spatial dynamics
- Survival strategies
- Trade-offs in growth parameters
- Horizontal gene transfer
- Autoinducer signalling
- Twitching motility

**Key publications** ([please download abstracts and papers from my website](#))

**Kreft JU, Booth G, Wimpenny JWT (1998)**. BacSim, a simulator for individual-based modelling of bacterial colony growth. *Microbiology* **144**: 3275-3287 (IF 3.2)

**Kreft JU, Picioreanu C, Wimpenny JWT, van Loosdrecht MCM (2001)**. Individual-based modelling of biofilms. *Microbiology* **147**: 2897-2912 (IF 3.2)

Picioreanu C, **Kreft JU**, van Loosdrecht MCM (2004). Particle-based multidimensional multispecies biofilm model. *Applied Environmental Microbiology* **70**: 3024-3040 (IF 3.8).

**Kreft JU (2004)**. Biofilms promote altruism. *Microbiology* **150**: 2751-2760 (IF 3.2)

Costa E, Pérez J, **Kreft JU (2006)**. Why is metabolic labour divided in nitrification? *Trends in Microbiology* **14**: 213-219 (IF 6.6)

Hense BA, Kuttler C, Müller J, Rothballer M, Hartmann A, **Kreft JU (2007)**. Does efficiency sensing unify quorum and diffusion sensing? *Nature Reviews Microbiology*: to appear in March 2007 (IF 14)

## Curriculum Vitae

Name: Jan-Ulrich Kreft, PhD  
 Date of birth: February 1<sup>st</sup>, 1964  
 Nationality: German  
 Position: Wissenschaftlicher Assistent (~ Assistant Professor)  
 Address: Abteilung Theoretische Biologie  
 Institut für Zelluläre und Molekulare Botanik  
 Universität Bonn  
 Kirschallee 1, D-53115 Bonn, Germany  
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 Private address: Carl-Justi-Str. 30, D-53121 Bonn, Germany  
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 Private fax: +49 (228) 6197980

### Community service

01/1984 – 04/1985 German nature conservation society (Naturschutzbund Deutschland), Wetzlar  
 08/1985 Royal Society for the Protection of Birds, Kent, UK

### Education

10/1985 – 07/1987	Vordiplom-Biologie Studium (sehr gut – best mark) Topics covered included: physics, chemistry, biophysics, biomathematics, cell & molecular biology, botany, and zoology	University of Konstanz, Germany
10/1987 – 07/1990	Diplom-Biologie Studium (sehr gut – best mark) Topics covered included: microbiology, plant physiology, biochemistry, genetics, animal physiology, geology & soil science, and computer programming	University of Tübingen, Germany
10/1990 – 08/1991	Diplom thesis in Microbiology (sehr gut – best mark) “Demethylation and further anaerobic degradation of gallate methyl ethers by a homoacetogenic bacterium”	University of Tübingen, Germany Supervisor: Prof. Dr. B. Schink
09/1991 – 06/1995	PhD in Microbiology (summa cum laude – best mark). PhD thesis entitled “The methyl ether cleaving enzyme system of the anaerobic bacterium <i>Holophaga foetida</i> ”	University of Konstanz, Germany Supervisor: Prof. Dr. B. Schink

**Professional Experience**

08/1991 – 12/1991	Research Assistant	Institute of Microbiology, University of Tübingen, Germany
01/1992 – 05/1995	Research Associate	Microbial Ecology, Limnology and General Microbiology, University of Konstanz, Germany
06/1995 – 02/1997	Postdoctoral Research Associate	Microbial Ecology, Limnology and General Microbiology, University of Konstanz, Germany
03/1997 – 08/1998	Postdoctoral Research Associate, DFG fellowship	School of Pure and Applied Biology, Cardiff University, UK
09/1998 – 08/2001	Postdoctoral Research Associate, BBSRC grant	School of Pure and Applied Biology, Cardiff University, UK
04/1999 – 06/1999	Guest scientist in the lab of Prof. Mark M. C. van Loosdrecht	Environmental Biotechnology, TU Delft, NL
09/2001 – present	Wissenschaftlicher Assistent (~ Assistant Professor)	Theoretical Biology, University of Bonn, Germany

**Graduate & Postdoctoral Advisors**

Bernhard Schink, University of Konstanz (Diplom and PhD)

Julian W. T. Wimpenny, Cardiff University (Postdoc)

**Membership in Professional Societies**

Vereinigung für Allgemeine und Angewandte Mikrobiologie – since 1990

American Society for Microbiology – since 1994

Society for General Microbiology – since 1997

International Society for Microbial Ecology – since 1998

Society for Applied Microbiology – since 2002

European Society for Mathematical and Theoretical Biology – since 2004

**Reviewer of Manuscripts**

Archives of Microbiology

Biofilms

BMC Ecology

Biotechnology and Bioengineering

Ecological Modelling

Environmental Microbiology

The ISME Journal (the new journal of the International Society for Microbial Ecology)

Journal of Theoretical Biology

Journal of Theoretical Medicine  
Mathematical Medicine and Biology  
Mathematical Biosciences  
Microbiology  
Nonlinear Analysis  
Physica A  
Proceedings of the National Academy of Sciences of the USA  
Water Research

### **Reviewer of Grant Proposals**

Austrian Science Fund (FWF), Austria  
Natural Environment Research Council, UK  
Engineering and Physical Sciences Research Council, UK  
National Science Foundation, USA  
Dutch Ministry of Economic Affairs' Innovation Oriented Research Programme on Genomics, NL  
Netherlands Organisation for Scientific Research (Nederlandse Organisatie voor Wetenschappelijk Onderzoek, NWO), NL

### **Service to the Scientific Community**

Co-organizer of a series of minisymposia on biofilm modelling at the SIAM conference on the Life Sciences (2004, Portland, Oregon, USA)  
Organizer of a minisymposium on the evolution of cooperation at the European Conference on Mathematical and Theoretical Biology (2005, Dresden, Germany)  
Member of the "Faculty of 1000" online literature awareness service (in the "Environmental Microbiology" panel headed by Stahl and Molin), since 2003  
Member of the IWA task group on Biofilm Structure, since 2005

### **Administrative Responsibilities**

Serving on committees for the Institute of Cellular and Molecular Botany, the Collaborative Research Centre (SFB 611) on Singular Phenomena and Scaling in Mathematical Models, for selection of journal titles for the University Library, and for developing the new MSc curricula.

Organization of seminar series at the University of Bonn (inviting speakers, etc.)

### **Honors & Awards**

Vordiplom: "sehr gut" (best mark), 1987  
Diplom: "sehr gut" (best mark), 1991  
PhD: "summa cum laude" (best mark), 1995  
Deutsche Forschungsgemeinschaft (DFG): Postdoctoral fellowship, 1997

**Extramural Grant Support**

03/1997 – 08/1998	Deutsche Forschungsgemeinschaft (DFG), Germany	Postdoctoral fellowship	39,000 €
1998	Royal Society, UK	Travel grant for ISME8, Halifax, Canada	700 €
09/1998 – 08/2001	Biotechnology and Biological Sciences Research Council (BBSRC), UK	“The spatio-temporal organisation of microbial ecosystems: development and application of a hybrid computer model”, named researcher	195,000 €
01/2002 – 12/2004	Deutsche Forschungsgemeinschaft (DFG), Germany	Sonderforschungsbereich (SFB 611): “Singular phenomena and scaling in mathematical models”. Project B5: “Dynamical contact phenomena in biological systems”, named researcher	166,000 €
01/2005 – 12/2008	Deutsche Forschungsgemeinschaft (DFG), Germany	Sonderforschungsbereich (SFB 611): “Singular phenomena and scaling in mathematical models”. Project B5: “Dynamical contact phenomena in biological systems”, named researcher	270,000 €
10/2004 – 09/2005	Universitat Autònoma de Barcelona (UAB), Spain	Grups Emergents 2004 (EME2004-40): “One Step Nitrification”, Julio Pérez (PI), Jan-Ulrich Kreft (Co-PI)	6,000 €
<b>Recent Grant Applications</b>			
2006 – 2010	Forskningsrådet for Teknologi og Produktion (FTP – Danish Research Agency), Denmark	“Center for Microbial Community Analysis and Control (CeMiCAC): Analysis and Control of Horizontal Gene Transfer in Microbial Communities”, Barth F. Smets (PI), Hans-Jørgen Albrechtsen, Tim Tolker- Nielsen, Søren Sørensen, Niels Kroer, Jan-Ulrich Kreft (Co-PI's)	1,900,000 €
2007 – 2011	Helmholtz Initiative on Systems Biology, Helmholtz- Gemeinschaft, Germany	Network A, chapter 1 (Dynamic cellular processes in microbial pathogens), 13 projects, PI for project 9 (Individual- based modelling as the framework for integration of intra- and extracellular dynamics in a multiscale model)	421,000 €

## Supervision

Oliver Kappler (now at 3M, Munich, Germany)	Role of sulphide methylation in the metabolism of the homoacetogenic bacterium strain TMBS4	University of Tübingen, Germany	Diplom thesis in Biology 04/1994	05/1993 – 04/1994
Kathleen M Schleinitz	Quantification of the distribution of NADH dehydrogenase activity in sectioned <i>Escherichia coli</i> colonies	Cardiff University, UK	BSc Hons in Applied Biology	10/1998 – 05/1999
Katy Allen	Quantification of the distribution of NADH dehydrogenase activity throughout a colony of <i>Klebsiella pneumoniae</i>	Cardiff University, UK	BSc Hons in Applied Biology	10/1999 – 05/2000
Foy N Osborne	Quantification of the distribution of NADH dehydrogenase activity throughout colonies of <i>Klebsiella pneumoniae</i> using digital image processing	Cardiff University, UK	BSc Hons in Applied Biology	10/2000 – 05/2001
Antina Barger (now at Federal Institute for Drugs and Medical Devices, Germany)	Development of a mathematical model to predict the effect of antibiotics	University of Bonn, Germany	PhD thesis in Microbiology 01/2004	01/2002 – 09/2003
Amit Tyagi	Mathematical modelling of interaction forces between cells	University of Bonn, Germany	PhD thesis in Applied Mathematics (ongoing)	11/2003 – present
Andreas Dötsch	Mathematical modelling of growth and accumulation of compatible solutes in the halophilic eubacterium <i>Halomonas elongata</i>	University of Bonn, Germany	Diplom thesis in Biology 04/2005	08/2004 – 04/2005

Andreas Dötsch	Mathematical modelling of the evolution of diversity in <i>Pseudomonas aeruginosa</i>	University of Bonn and GBF, Germany	PhD thesis in Microbiology (ongoing)	11/2005 – present
Heidrun Budde	Confocal microscopy of twitching dynamics in <i>Pseudomonas aeruginosa</i> biofilms	University of Bonn, Germany	3 month project	02/2005 – 04/2005
Engràcia Costa	The metabolism of nitrification: a theoretical study including mathematical modelling of biofilm reactors	Autonomous University of Barcelona, Spain	Master thesis in Environmental Engineering	11/2004 – 06/2006
Stefan Stoffelen	Biofilm dynamics of twitching <i>Pseudomonas aeruginosa</i> : comparison of model and experiment by image analysis	University of Bonn, Germany	Diplom thesis in Biology (ongoing)	01/2006 – present
Laurent Lardon	Individual-based modelling of horizontal gene transfer in biofilms	University of Bonn and DTU, Lyngby	Postdoc	04/2006 – present

### Teaching Experience

1991 – 2001 (*Universities of Konstanz and Cardiff*)

Various lectures on microbial physiology and ecology.

Design and organization of practical courses on microbial physiology, ecology, and biochemistry, as well as instruction of students.

2001 – present (*University of Bonn*)

Four-week full-time courses for undergraduate and graduate Biology students on:

Mathematical modelling in microbiology

Mathematical modelling in ecology and evolution

Two-week full-time course for Master in Molecular Biotechnology students on:

Mathematical modelling of metabolic networks

These courses integrate lectures, literature seminars, pen and paper exercises and computer programming of simulation models.

Fully responsible for choosing and developing the content as well as teaching of these courses.

## Research Interests

Mathematical modelling of the *dynamics of interaction* of microbes with microbes, protists, plants, and animals: competition, interference, cooperation, predation, signalling, gene transfer, and evolution. Experimental determination of model parameters and experiments for comparison with model predictions. Understanding the metabolic basis of trade-offs and their ecological consequences. How simple microscopic mechanisms give rise to complex macroscopic dynamics. How models can be used to infer and predict the effect of spatial structure and the effect of interactions between species in diverse communities inhabiting complex systems, based on input data from well-mixed pure cultures. How models can help to solve real world problems.

### **Selected collaborations on the mathematical modelling of microbes (since starting to work on modelling in Cardiff in 1997)**

**Individual-based modelling.** Development of BacSim, a generic, individual-based model of bacterial growth in various, spatially structured environments: Ginger Booth, Yale Center for Biodiversity Conservation & Science, USA.

**Biofilm modelling.** Individual-based modelling of biofilms: Cristian Picioreanu, Mark CM van Loosdrecht, Kluyver Laboratory for Biotechnology, Delft University of Technology, The Netherlands.

**Food microbiology (eggs).** Individual-based modelling of the growth and spread of *Salmonella* in eggs: Koen Grijspeerdt, Agricultural Research Centre, Gent, Belgium.

**Food microbiology (lag and stationary phase).** Individual-based modelling of the lag and stationary phase of bacterial growth in foodstuffs: Jan F Van Impe, BioTeC - Bioprocess Technology and Control, Katholieke Universiteit Leuven, Belgium.

**Contact dynamics between bacterial cell surfaces.** Mathematical modelling of the dynamics of mechanical cell-cell contact interactions in biofilms: Gernot Schaller, Michael Meyer-Hermann, Theoretical Physics, Dresden University of Technology, Germany.

**One-step nitrification.** Kinetic theory of optimal pathway length and nitrification: Julio Pérez Cañestro, Dpt. d'Enginyeria Química, Universitat Autònoma de Barcelona, Spain.

**Anaerobic food chain.** Kinetic theory of optimal pathway length and the anaerobic food web: Ben Griffin, recently at University of Konstanz, Germany, now at University of Illinois at Urbana-Champaign, USA.

**Osmoregulation by compatible solutes.** Modelling the dynamics of compatible solute production and transport as response of *Halomonas elongata* to osmotic stress: Erwin A Galinski, Institute of Microbiology & Biotechnology, University of Bonn, Germany.

**Twitching motility.** Individual-based modelling of twitching motility of *Pseudomonas aeruginosa* and the effect on biofilm structure and comparison with experiments via image analysis: Cristian Picioreanu, Joao Xavier, Kluyver Laboratory for Biotechnology, Delft

University of Technology, The Netherlands; Janus Haagensen, Tim Tolker-Nielsen, Søren Molin, Danish Technical University, Denmark.

**Horizontal gene transfer in biofilms.** Individual-based modelling of horizontal gene transfer in spatially structured microbial communities using experimental data as input and for testing model predictions: Barth F Smets, Hans-Jørgen Albrechtsen, Tim Tolker-Nielsen, Danish Technical University; Niels Kroer, NERI, Roskilde; Søren Sørensen, University of Copenhagen, all Denmark.

**Evolution of diversity in biofilms.** Individual-based modelling of the evolution of diversity of *Pseudomonas aeruginosa* in CF patients: Susanne Häußler, Gesellschaft für Biotechnologische Forschung (GBF), Braunschweig, Germany.

**Quorum sensing robustness.** Problems of quorum sensing in complex communities and environments and a solution: Burkhard Hense, Institut für Biomathematik und Biometrie, GSF - Forschungszentrum für Umwelt und Gesundheit, München, Germany.

**Grazing of biofilms.** Individual-based modelling of the effect of grazing by various feeding types of protozoa on the structure and productivity of biofilms as a simple microbial food web: Markus Weitere, Anja Scherwaß, Hartmut Arndt, Allgemeine Ökologie und Limnologie, Universität zu Köln, Germany; Carsten Matz, Gesellschaft für Biotechnologische Forschung (GBF), Braunschweig, Germany.

## Overview of my key contributions to scientific progress to date

I have shown that theory can be good for you: evolutionary and kinetic theory can explain long known and fundamental problems of Microbial Ecology.

- ◆ **Elucidation of anaerobic degradation of methylated phenolics**
  - Elucidation of the catabolic pathway of a newly isolated bacterium
  - Development of new photometric enzyme assays to measure anoxic demethylation reactions, both for partial and overall reactions
  - Elucidation of the anoxic demethylation reaction: reaction carried out in two steps, corrinoid dependent, ATP-dependent reductive activation required
- ◆ **Introduced and established Individual-based Modelling in Microbial Ecology**
  - My Individual-based Models (IbM) of the growth of bacteria in colonies and biofilms were the first applications of the new approach of IbM in Microbial Ecology
  - Several colleagues have followed and switched to use IbM, often in collaboration with me, for example
    - Cristian Picioreanu and Joao Xavier (biofilms)
    - Jan Van Impe and co-workers (food microbiology)
    - Koen Grijspeerdt (food microbiology)
    - Barth F. Smets and Laurent Lardon (horizontal gene transfer)
- ◆ **Evolution of cooperative behaviour in brainless bacteria**
  - Economic resource use is a form of altruistic behaviour
  - Metabolism can have social consequences (tragedy of the commons)
  - Cooperation can consist in restraint from competition
  - Cooperation can promote biodiversity by counteracting competition
  - Spatial structure (growth in microcolonies (groups of clustered individuals) limited by diffusion of resources into the microcolony, formation of clonal microcolonies from single cells) is the condition for the evolution of economical resource use
- ◆ **Trade-offs exist between the three fundamental growth parameters of microorganisms (growth rate, growth yield, and substrate affinity)**
  - Chemostats (continuous inflow of nutrients and wash out of cells and nutrients) select for optimal growth rate and substrate affinity
  - Biofilms (spatially structured growth on surfaces characterized by substrate gradients) select for maximal growth yield (under some simplifying assumptions)
  - Trade-offs prevent the evolution of competitors that are superior in growth rate and yield and substrate affinity and are therefore key for biodiversity maintenance
- ◆ **Evolution of metabolic pathways and consequences for the structure of the food web**
  - Metabolic division of labour in nitrification can be explained by kinetic theory of optimal pathway length
  - Kinetic theory can explain the differences in the structure between the aerobic and anaerobic microbial food web
- ◆ **Clustering solves the problems of communication in complex systems such as soil**
  - Microcolonies avoid complexity and evolutionary problems of interference

## Bibliography

All original articles and reviews can be downloaded from my website  
[http://www.theobio.uni-bonn.de/people/jan\\_kreft/papers.html](http://www.theobio.uni-bonn.de/people/jan_kreft/papers.html)

### Refereed original articles

#### Anaerobic Degradation of Aromatic Compounds

1. **Kreft JU, Schink B (1993)**. Demethylation and degradation of phenylmethylethers by the sulfide-methylating homoacetogenic bacterium strain TMBS4. *Archives of Microbiology* **159**: 308-315 (IF 2.1)
2. **Kreft JU, Schink B (1994)**. O-Demethylation by the homoacetogenic anaerobe *Holophaga foetida* studied by a new photometric methylation assay using electrochemically produced cob(I)alamin. *European Journal of Biochemistry* **226**: 945-951 (IF 3.2)
3. Liesack W, Bak F, **Kreft JU**, Stackebrandt E (1994). *Holophaga foetida* gen. nov., sp. nov., a new, homoacetogenic bacterium degrading methoxylated aromatic compounds. *Archives of Microbiology* **162**: 85-90 (IF 2.1)
4. Kappler O, Janssen PH, **Kreft JU**, Schink B (1997). Effects of alternative methyl group acceptors on the growth energetics of the O-demethylating anaerobe *Holophaga foetida*. *Microbiology* **143**: 1105-1114 (IF 3.2)
5. **Kreft JU, Schink B (1997)**. Specificity of O-demethylation in extracts of the homoacetogenic *Holophaga foetida* and demethylation kinetics measured by a coupled photometric assay. *Archives of Microbiology* **167**: 363-368 (IF 2.1)

#### Mathematical Modelling in Microbial Ecology

6. **Kreft JU, Booth G, Wimpenny JWT (1998)**. BacSim, a simulator for individual-based modelling of bacterial colony growth. *Microbiology* **144**: 3275-3287 (IF 3.2)
7. **Kreft JU, Picioreanu C, Wimpenny JWT, van Loosdrecht MCM (2001)**. Individual-based modelling of biofilms. *Microbiology* **147**: 2897-2912 (IF 3.2)



[Link to Faculty of 1000 evaluation for this article](#)

8. **Kreft JU, Wimpenny JWT (2001)**. Effect of EPS on biofilm structure and function as revealed by an individual-based model of biofilm growth. *Water Science and Technology* **43(6)**: 135-141 (IF 0.88)



[Link to Faculty of 1000 evaluations for this article](#)

9. Picioreanu C, **Kreft JU**, van Loosdrecht MCM (2004). Particle-based multidimensional multispecies biofilm model. *Applied and Environmental Microbiology* **70**: 3024-3040 (IF 3.8)
10. **Kreft JU (2004)**. Biofilms promote altruism. *Microbiology* **150**: 2751-2760 (IF 3.2)

11. **Kreft JU, Bonhoeffer S (2005)**. The evolution of groups of cooperating bacteria and the growth rate versus yield trade-off. *Microbiology* **151**: 637-641 (IF 3.2)
12. Grijspeerdt K, **Kreft JU**, Messens W (2005). Individual-based modelling of growth and migration of *Salmonella enteritidis* in hen's eggs. *International Journal of Food Microbiology* **100**: 323-333 (IF 2.5)
13. Dens EJ, Bernaerts K, Standaert AR, **Kreft JU**, Van Impe JF (2005). Cell division theory and individual-based modeling of microbial lag. Part II. Modeling lag phenomena induced by temperature shifts. *International Journal of Food Microbiology* **101**: 319-332 (IF 2.5)
14. Costa E, Pérez J, **Kreft JU (2006)**. Why is metabolic labour divided in nitrification? *Trends in Microbiology* **14**: 213-219 (IF 6.6)



[Link to Faculty of 1000 evaluation for this article](#)

15. Hense BA, Kuttler C, Müller J, Rothballer M, Hartmann A, **Kreft JU (2007)**. Does efficiency sensing unify quorum and diffusion sensing? *Nature Reviews Microbiology*: to appear in March 2007 (IF 14)
16. Standaert AR, Bernaerts K, **Kreft JU**, Van Impe JF (2007). Parameter identification for individual based models: a case study from predictive food microbiology. submitted

#### Refereed reviews

17. van Loosdrecht MCM, Heijnen JJ, Eberl HJ, **Kreft JU**, Picioreanu C (2002). Mathematical modelling of biofilm structures. *Antonie van Leeuwenhoek* **81**: 245-256 (IF 1.5)
18. **Kreft JU (2004)**. Conflicts of interest in biofilms. *Biofilms* **1**: 265-276 (IF not yet)
19. Klausen M, Gjermansen M, **Kreft JU**, Tolker-Nielsen T (2006). Dynamics of development and dispersal in sessile microbial communities: examples from *Pseudomonas aeruginosa* and *Pseudomonas putida* model biofilms. *FEMS Microbiology Letters* **261**: 1-11 (IF 2.1)

#### Refereed contributions to conference proceedings

20. **Kreft JU**, Picioreanu C, Wimpenny JWT, van Loosdrecht MCM (1999). Individual-based modelling of biofilms: Why? In *Biofilms: the good, the bad, and the ugly (Contributions made at the 4th Meeting of the Biofilm Club, Gregynog Hall, Wales, September 18-20, 1999)*, pp. 257-262. Wimpenny JWT, Gilbert P, Walker JT, Brading MG, Bayston R (eds). Cardiff: BioLine
21. **Kreft JU**, Booth G, Wimpenny JWT (2000). Applications of individual-based modelling in microbial ecology. In *Microbial Biosystems: New Frontiers (Proceedings of the 8th International Symposium on Microbial Ecology, Halifax, Canada, August 9-14, 1998)*, pp. 917-923. Bell CR, Brylinsky M, Johnson-Green M (eds). Halifax, Canada: Atlantic Canada Society for Microbial Ecology

22. **Kreft JU, Wimpenny JWT (2001)**. Modelling biofilms with extracellular polymeric substances. In *Biofilm Community Interactions: Chance or necessity? (Contributions made at the 5th Meeting of the Biofilm Club, Gregynog Hall, Wales, September 13-15, 2001)*, pp. 191-199. Gilbert P, Allison DG, Brading MG, Verran J, Walker JT (eds). Cardiff: BioLine
23. **Kreft JU (2003)**. Cooperation and competition in biofilms: an evolutionary perspective. In *Biofilm Communities: Order from Chaos? (Contributions made at the 6th Meeting of the Biofilm Club, Gregynog Hall, Wales, September 3-5, 2003)*, pp. 371-380. McBain AJ, Allison DG, Brading MG, Rickard AH, Verran J, Walker JT (eds). Cardiff: BioLine
24. Standaert AR, Poschet F, Geeraerd AH, Uylbak FV, **Kreft JU**, Van Impe JF (2004). A novel class of predictive microbial growth models: implementation in an individual-based framework. In *Computer Applications in Biotechnology 2004 (Contributions made at the 9<sup>th</sup> International Symposium on Computer Applications in Biotechnology (CAB9), Nancy, France, March 28-31, 2004)*, pp. 183-188. Pons MN, Van Impe JF (eds). Amsterdam: Elsevier

### Theses

25. **Kreft JU (1991)**. "Demethylierung und weiterer anaerober Abbau von Gallussäure-Methyl-Ethern durch ein homoacetogenes Bakterium", Diplom thesis, Universität Tübingen
26. **Kreft JU (1995)**. "The methyl ether cleaving enzyme system of the anaerobic bacterium *Holophaga foetida*", Dissertation (PhD thesis) Universität Konstanz, Konstanz: Hartung-Gorre Verlag

### Manuscripts in preparation

Dötsch A, Severin J, Alt W, Galinski EA, **Kreft JU (2007)**. A mathematical model for growth and osmoregulation in halophilic bacteria.

Piciooreanu C, **Kreft JU**, Klausen M, Haagenen JAG, Tolker-Nielsen T, Molin S (2007). Microbial motility involvement in biofilm structure formation: a 3-d modelling study.

**Kreft JU**. What games microbes play in biofilms.

**Kreft JU**, Griffin BM. Anaerobic food chain and the evolution of optimal pathway length: when biodegradation by a community can be more efficient.

**Kreft JU**. Triangle of evolutionary trade-offs in basic growth characteristics.

Costa E, Pérez J, **Kreft JU**. Advantages of compartmentalization in nitrifying reactors explained by a simple model of the kinetics of nitrifiers.

Tyagi AK, **Kreft JU**, Alt W. Contact dynamics between cell surfaces modelled by weighted Voronoi neighbourhoods.

Stoffelen S, Kreft JU. Consistent image analysis of time series from confocal laser scanning microscopy of biofilms.

### Invitations to book chapters

Kreft JU (2007). Mathematical modeling of microbial ecology: spatial dynamics of interactions in biofilms and guts. In *Foodborne Microbes: Shaping the Host Ecosystem*. Jaykus LA, Wang HH, Schlesinger LS (eds). Washington, DC: ASM Press

Lardon L, Kreft JU, Smets BF (2007). Individual-based modeling of horizontal gene transfer in microbial communities. In *Horizontal Gene Flow*. Barkay T, Smets BF (eds). Washington, DC: ASM Press

### Meeting reports

Kreft JU (2006). Happy birthday ITB – and many happy returns! (Report from the meeting to celebrate the 10<sup>th</sup> anniversary of the Institute for Theoretical Biology at Humboldt University Berlin, held October 12-14, 2006.) In *European Communications in Mathematical and Theoretical Biology* 9, pp. 17-20. Alt W, Byrne H, Deutsch A, Preziosi L (eds).

### Public outreach (printed newspaper and magazine articles about my work)

1. "Altruismus hilft" – [Der Spiegel](#) 49 (29/11/2004), p. 166.
2. "Egos gegen Sparer" – scht, [General-Anzeiger Bonn](#) (11/01/2005), p. 13.
3. "Egoistische Bakterien sind chancenlos" – fl, [forsch](#) 1, 2005 (Bonn University News) (02/2005), p. 18-19.
4. "Modell für Biofilm gesucht" Jo Schilling, [BioWorld](#) 1, 2006 (Official organ of Swiss Biotech Association)
5. "Arbeitsteilung zahlt sich auch bei Bakterien aus" – sj, [General-Anzeiger Bonn](#) (13/06/2006), p. 13.
6. "Ineffizienz setzt sich durch!" – fl, [forsch](#) 3, 2006 (Bonn University News) (07/2006), p. 17.

### Oral contributions to international conferences

- 1995 International Symposium on Microbial Ecology (ISME7), Santos, Brazil
- 1998 SwarmFest '98, Santa Fe Institute, NM, USA
- International Symposium on Microbial Ecology (ISME8), Halifax, Canada
- 1999 British Biofilm Club (BBC4), Gregynog, UK
- 2000 IWA International Conference on Microbial Extracellular Polymeric Substances, Mülheim, Germany
- 2001 British Biofilm Club (BBC5), Gregynog, UK
- 2002 European Conference on Mathematical and Theoretical Biology (5th ESMTB), Milano, Italy
- 2003 ASM Conferences on Biofilms (Biofilms 2003), Victoria, Canada

- British Biofilm Club (BBC6), Gregynog, UK
- 2004 Biocomplexity VI, Bloomington, USA  
SIAM conference on the Life Sciences (SIAM 2004), Portland, Oregon, USA  
International Symposium on Microbial Ecology (ISME10), Cancun, Mexico
- 2005 European Conference on Mathematical and Theoretical Biology (6th ESMTB),  
Dresden, Germany
- 2006 Annual meeting of the German Society for General and Applied Microbiology, Jena,  
Germany  
Biofilms II, Leipzig, Germany

**Invited seminars**

- 1998 Institute for Food Research, Norwich, UK
- 1999 University of Oldenburg, Germany  
MPI for Microbial Ecology, Marburg, Germany
- 2000 Cardiff University, UK  
Institute of Biomathematics and Biometry, GSF, München, Germany  
Technical University of Braunschweig, Germany
- 2001 University of Exeter, UK  
University of Bonn, Germany
- 2002 Food Modelling Club, Leatherhead, UK
- 2003 Danish Technical University, Lyngby, Denmark  
MPI for Mathematics in the Sciences, Leipzig, Germany
- 2005 University of Konstanz, Germany  
ETH Zürich, Switzerland  
National Environmental Research Institute, Roskilde, Denmark  
University of Köln, Germany
- 2006 Umweltforschungszentrum Leipzig (UFZ), Germany  
Wessex Institute of Technology, UK  
University of Southampton, UK  
University of Osnabrück, Germany
- 2007 University of Birmingham, UK