

Current position

Senior Lecturer in Computational Biology, School of Biosciences & Institute of Microbiology and Infection & Centre for Computational Biology, University of Birmingham, UK

Previous positions

07/1995 – 02/1997	Postdoc in the lab of Prof. Dr. Bernhard Schink , Microbial Ecology, University of Konstanz, D
03/1997 – 08/1998	Postdoc (DFG research fellowship) in the lab of Prof. Dr. Julian W. T. Wimpenny , Microbial Ecology, Cardiff University, UK
09/1998 – 08/2001	Postdoc in the lab of Prof. Dr. Julian W. T. Wimpenny , Microbial Ecology, Cardiff University, UK
04/1999 – 06/1999	Guest scientist in the lab of Prof. Dr. Mark M. C. van Loosdrecht , Environmental Biotechnology, TU Delft, NL
09/2001 – 08/2007	Wissenschaftlicher Assistent of Prof. Dr. Wolfgang Alt , Theoretical Biology, University of Bonn, D
09/2007 – 07/2018	Lecturer in Computational Biology, University of Birmingham , UK

Education

04/1985 – 06/1985	Microbiology, Guest term, University of Surrey , Guildford, UK
10/1985 – 08/1987	Biology, Vordiplom, University of Konstanz (sehr gut), D
10/1987 – 08/1990	Biology, Diplom, University of Tübingen (sehr gut), D
10/1990 – 08/1991	Diplom thesis in Microbiology with Prof. Dr. Bernhard Schink , University of Tübingen (sehr gut), D
09/1991 – 06/1995	PhD in Microbiology with Prof. Dr. Bernhard Schink , University of Konstanz (summa cum laude), D

Expertise

Dr Kreft is a microbiologist by training and has turned mathematical modeller, pioneering individual-based modelling of microorganisms to understand how interactions between microorganisms lead to emergent population dynamics and structures, e.g. in biofilms.

His mathematical modelling expertise (since 1997) covers: (1) individual-based modelling (e.g. nitrifying biofilms, EPS, twitching motility in *Pseudomonas aeruginosa*, aggregate formation, colonies on plant leaves, competition, cooperation, cell-cell communication, aging in unicellular organisms, plasmid transfer and dynamics, gut microbiota); (2) ordinary differential equation modelling (e.g. chemostats and related reactors such as sludge tanks and activated sludge reactors, predator prey dynamics of the bacterial predator *Bdellovibrio bacteriovorus*, osmoregulation in halophilic bacteria); (3) game theory; (4) Bayesian model selection and inference; (5) software development for individual-based modelling (BacSim, iDynoMiCS 1 & 2, eGUT).

His experimental expertise (since 1991) covers: (1) physiology and biochemistry of anaerobic bacteria; (2) microscopy of biofilms in flow cells, (3) microfluidic chemostats; (4) silver nanoparticles; (5) experimental evolution of *Pseudomonas putida* in the presence of silver and nanosilver; (6) *Bdellovibrio bacteriovorus* predator prey dynamics in chemostats; (7) fermentation in lab-scale reactors; (8) AMR dynamics in mesocosms; (9) genetic engineering of resistance plasmids and measuring plasmid transfer.

Several recent modelling and experimental research projects focus on AMR, including the effect of host range on transfer and dynamics of resistance plasmids, maintenance and selection of resistance plasmids in activated sludge, Bayesian model selection and inference for the transmission of ARB and ARG in the urban water cycle, mini slurry tank experiments to investigate co-selection for resistance genes, microfluidic chemostats to measure the effect of antibiotics on single cells.

Relevant recent and current research grants

02/2012 – 07/2012	WT ISSF Translational Award, Co-I	“Developing a second generation pCURE plasmid to eliminate antibiotic resistance from enteric bacteria”	£28,908
01/2013 – 12/2015	NC3Rs project grant, PI	“eGUT: a Tool for Predictive Computer Simulation of the Gut Microbiota and Host Interactions”	£332,746
06/2016 – 02/2020	NERC AMR in the Real World project grant, Co-I	“EVAL-FARMS: Evaluating the Threat of Antimicrobial Resistance in Agricultural Manures and Slurries”	£1,495,892
03/2017 – 02/2020	JPI-AMR Joint Transnational Call, Co-I	“Dynamics of Antimicrobial Resistance in the Urban Water Cycle in Europe (DARWIN)”	€1,717,636
06/2017 – 05/2018	British Council UK-Israel SYNERGY Symposium grant, Co-I	“One Health: antimicrobial resistance from mechanisms to interdisciplinary solutions symposium”	£8,500
11/2017 – 10/2022	BBSRC/Innovate UK, Coordinator for Birmingham partner	“National Biofilms Innovation Centre (NBIC) – consortium with 4 lead and 14 partner institutions”	£12.5M
09/2018 – 08/2021	NC3Rs PhD Studentship, PI	“Developing and validating a computational model of the gut microbiota-mucosa interactions to replace and reduce animal experiments”	£90,000
02/2018 – 01/2021	Institute for Global Innovation (IGI) Development Theme, Co-I	“Confronting Antimicrobial Resistance (CARE)”	Internal funding: £60,000

Evidence of esteem, prizes and honorary positions

- Editorial Board, FEMS Microbiology Letters
- Guest associate editor, Frontiers in Microbiology
- Member of Faculty of 1000, Environmental Microbiology section, 2003-2014
- Erwin Schrödinger-Prize 2007 (€50,000 awarded jointly with Burkhard A. Hense, Christina Kuttler, Johannes Müller, Michael Rothballer, Anton Hartmann by the Helmholtz Association & Stifterverband für die Deutsche Wissenschaft)
- Visiting Fellow, Isaac Newton Institute, Cambridge (Aug-Dec 2014)
- Fellow of the Institute for Global Innovation, University of Birmingham

Impact

Dr Kreft’s main scientific contributions to date are the (1) elucidation of the mechanism of an oxygen-independent, B12-dependent ether cleaving enzyme system; (2) establishing individual-based modelling in microbial ecology; (3) discovering a simple, metabolic form of altruism in biofilms; (4) demonstrating that so-called quorum sensing is affected by clustering of cells more than cell density; (5) showing that damage repair is better than damage segregation during cell division; (6) predicting the existence of complete ammonia oxidation in biofilms.

Dr Kreft is currently the coordinator for the University of Birmingham’s partnership in the National Biofilms Innovation Centre. Related to AMR, he gave a talk at a public AMR event organized by the 7 Learned Society Partnership on AMR, was invited to a Defra workshop to set up an antimicrobial resistance surveillance programme, has co-organized a UK-Israel symposium and workshop on “One Health: antimicrobial resistance from mechanisms to interdisciplinary solutions” with Laura Piddock in 2018 and is leading the AMR transmission and evolution stream of the Institute of Global Innovation’s “Confronting Antimicrobial Resistance (CARE)” theme.

Relevant collaborations

Dr Kreft is currently collaborating with Profs Wellington (co-supervisor of PhD student), Stekel (NERC EVAL-FARMS grant and co-supervisor of PhD student) and Keevil (members of NBIC).