

# DR. ALEX BEST

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## RESEARCH

I am a mathematical biologist working in the field of theoretical evolutionary ecology. My research focuses on assessing the ecological and evolutionary dynamics of infectious disease systems to understand, for example, the evolution of host resistance to disease and how parasites evolve to counter these resistance mechanisms. I work closely with disease biologists to develop mathematical and computational tools to answer a range of real biological questions. My principle interests are, (i) coevolutionary host-parasite dynamics; (ii) spatially explicit models of infectious disease, and; (iii) adaptive dynamics theory (an extension of evolutionary game theory). My research has been published in high impact, interdisciplinary, peer-reviewed journals, such as PNAS and The American Naturalist.

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## POSTS

2010 - **NERC Postdoctoral Research Associate**  
'The impact of spatial structure on the ecology and evolution of host defence'  
Animal & Plant Sciences, University of Sheffield

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## EDUCATION

2006 - 2010 **PhD – 'The Evolution and Coevolution of Host Defence'**  
University of Sheffield  
*Supervisors:*  
Prof. Mike Boots (Animal & Plant Sciences, University of Sheffield)  
Dr. Andy White (Mathematical Sciences, Heriot-Watt University)

2005 - 2006 **MRes Mathematics in the Living Environment (Distinction)**  
University of York  
*Research Placement:*  
UFZ Centre for Environment Research, Leipzig, Germany

2002 - 2005 **BSc Mathematics and Philosophy (First Class)**  
University of Durham

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## EXPERIENCE

Research	Mathematical Modelling Evolutionary and ecological dynamics Adaptive dynamics Dynamical systems/stability analysis Pair approximation/moment closure Computer Modelling Programming in C/C++ Software: Maple, Matlab, LaTeX, AUTO, XPP
Teaching	Undergraduate Mathematics Tutorials Maple computer labs (Autumn 2010) PhD Supervision Informal support of maths and biology PhD students

## CURRENT PROJECTS

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### **The coevolution of hosts and parasites with specific interactions**

Developing models where epidemiological parameters depend on the prevalent host and parasite types.

*Collaborators:*

Dr. Andy White (Heriot-Watt University)

Dr. Eva Kisdi (University of Helsinki)

Prof. Mike Boots (University of Sheffield)

### **Processes leading to the evolution of host-parasite diversity**

Combining community dynamics and adaptive dynamics to understand branching and coexistence in host-parasite systems.

*Collaborators:*

Prof. Roger Bowers (University of Liverpool)

Dr. Andy White (Heriot-Watt University)

Prof. Mike Boots (University of Sheffield)

### **The impact of spatial structure on the coevolution of hosts and parasites**

Determining the coevolutionary dynamics of a spatially structured host-parasite system using a pair approximation.

*Collaborators:*

Dr. Steve Webb (Strathclyde University)

Prof. Janis Antonovics (University of Virginia)

Prof. Mike Boots (University of Sheffield)

### **The evolution of immunopathology**

Determining the evolutionary dynamics of parasites in response to host immunopathology.

*Collaborators:*

Dr. Grainne Long (University of Sheffield)

Prof. Mike Boots (University of Sheffield)

## PUBLICATIONS

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In Review

**Best A.,** Webb, S., White, A. and Boots, M. (*In Review*)

The evolution of resistance in a spatially-structured host population.

*Proceedings of the Royal Society B: Biological Sciences*

(*Journal Impact Factor: 4.857*)

**Best A.,** Webb, S., Antonovics, J. and Boots, M. (*In Review*)

The implications of local frequency- and density-dependent transmission to infectious disease dynamics and host extinctions.

*Theoretical Ecology*

(*Journal Impact Factor: 1.409*)

Vale, P., **Best, A.,** Wilson, A., Boots, M. and Little, T. (*In Review*)

Epidemiological, evolutionary and coevolutionary implications of context-dependent parasitism.

*The American Naturalist*

(*Journal Impact Factor: 4.796*)

2010

**Best, A.,** White, A., Kisdi, E., Antonovics, J., Brockhurst, M. and Boots, M. (2010)

The evolution of host-parasite range.

*The American Naturalist*, 176:63-71.

(*Journal Impact Factor: 4.796*)

**Best, A.,** White, A. and Boots, M (2010).

Resistance is futile but tolerance can explain why parasites don't always castrate their hosts.

*Evolution*, 64:348-357.

(*Journal Impact Factor: 5.429*)

- 2009 **Best, A.**, White, A. and Boots, M (2009).  
The implications of coevolutionary dynamics to host-parasite interactions.  
*The American Naturalist*, 173:779-791.  
(*Journal Impact Factor*: 4.796, *Times Cited*: 6)
- Boots, M., **Best, A.**, Miller, M. and White, A. (2009).  
The role of ecological feedbacks in the evolution of host defence: what does theory tell us?  
*Philosophical Transactions of the Royal Society*, 364:27-36.  
(*Journal Impact Factor*: 5.1, *Times Cited*: 2)
- 2008 **Best A.**, White, A. and Boots, M. (2008).  
The maintenance of host variation in tolerance to pathogens and parasites.  
*Proceedings of the National Academy of Sciences*, 105:20786-20791.  
(*Journal Impact Factor*: 9.432, *Times Cited*: 3)
- 2007 Travis, J., Münkemüller, T., Burton, O., **Best, A.**, Dytham, C. and Johst, K. (2007).  
Deleterious Mutations Can Surf to High Densities on the Wave Front of an Expanding Population.  
*Molecular Biology and Evolution*, 24:2334-2343.  
(*Journal Impact Factor*: 9.872, *Times Cited*: 17)
- Best, A.**, Johst, K., Münkemüller, T. and Travis, J. (2007).  
Which species will successfully track climate change? The influence of intraspecific competition and density dependent dispersal on range shifting dynamics.  
*Oikos*, 116:1531-1539.  
(*Journal Impact Factor*: 3.147, *Times Cited*: 12)

#### INVITED TALKS

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- 2010 Krebs Institute Symposium  
University of Sheffield, UK  
**Talk:** *The evolution of host-pathogen diversity.*
- 2009 Biomathematics Seminar Series  
University of Helsinki, Finland  
**Talk:** *Trade-offs and the evolution of hosts and parasites.*

#### CONFERENCES, TALKS & COURSES

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- 2010 Computational and Mathematical Population Dynamics  
Bordeaux, France  
**Talk:** *The evolution of host resistance with local interactions.*
- Coevolution: Models and Microbial Model Systems  
Liverpool, UK
- 2009 European Society for Evolutionary Biology  
Turin, Italy  
**Poster:** *Living with the consequences: when can variation in host tolerance to parasitism be maintained?*
- Mathematical Models in Ecology and Evolution  
Bristol, UK  
**Talk:** *The maintenance of variation in host tolerance: a critical function analysis.*
- Biological Sciences Poster Day  
University of Sheffield, UK  
**Poster:** *Living with the consequences: when can variation in host tolerance to parasitism be maintained?*

Animal & Plant Sciences Graduate Seminar Series  
University of Sheffield, UK

**Talk:** *Living with the consequences: the maintenance of variation in host tolerance.*

2008

Helsinki Summer School on Mathematical Ecology and Evolution  
Turku, Finland

European Conference on Mathematical and Theoretical Biology Edinburgh,  
UK

**Talk:** *The implications of coevolutionary dynamics to host-parasite interactions.*

2007

Mathematical Models in Ecology and Evolution  
Brighton, UK

Animal & Plant Sciences Graduate Seminar Series  
University of Sheffield, UK

**Talk:** *Resistance is Futile: Modelling the Evolution of Hosts and Parasites.*