



CHAIRMAN OF THE BREAKFAST CLUB
FRANCIS L. W. RATNIEKS

Originally from Berkshire, England, Francis Ratnieks was interested in science and insects from childhood. Since 1995, he has been at the Department of Animal and Plant Sciences, University of Sheffield, where he is currently Professor of Apiculture and head of the Laboratory of Apiculture and Social Insects. He teaches a wide range of courses to undergraduates. His research and that of his laboratory is focused in three main areas of social insect biology: 1) How conflicts among individuals within insect societies are resolved; 2) how the activities of the many individuals within insect societies are organised and co-ordinated; 3) practical questions in bee keeping, bee breeding, and social insect conservation. One thing that appeals to him about these research questions is that they have wider relevance, both to human society and to biology in general. He also likes the fact that he can pursue this research using many different approaches, ranging from field work in Brazil to solving equations, and that there seems to be both a never-ending series of intellectual challenges to overcome and interesting discoveries to make. In addition to teaching and research, he also enjoys the public communication of science, including giving talks to the public, schoolchildren, and beekeeper groups and writing popular articles. – Address: Laboratory of Apiculture and Social Insects, Department of Animal and Plant Sciences, University of Sheffield, Sheffield, S10 2TN, Great Britain. E-mail: Ratnieks@Sheffield.ac.uk
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On the first page of the Wiko website are some quotes from Wiko directors past and present, outlining and justifying the Wiko's role. Former director Peter Wapnewski writes: "The times are not such that a learned and creative mind can devote himself in

concentration and continuity to his research task at our institutions of higher education. And the times are not such that ‘the society’ – of whatever country and whatever culture – can afford to do without the harvest of the creative work of the learned mind.”

These are sentiments with which I agree, but which were nevertheless somewhat daunting for a new Fellow. It was easy to agree with the comment that institutions of higher education do not always make it easy for a scientist to “devote himself in concentration and continuity to his research task”. That was why I was keen to be a Wiko Fellow. But was I a sufficiently “learned and creative mind” to justify my place at the Wiko? Would the harvest of my research be such that my society could not afford to be without it? On arriving at the Wiko, it soon became clear that the way Fellows were encouraged to reach these lofty heights was simply by allowing them the freedom and time to do their own thing. With great efficiency and a friendly human touch, the Wiko staff provided a wonderfully supportive environment in everything from library facilities, food and accommodation, residence formalities, and computers to seminar and workshop co-ordination and so on. But no one was there telling you what to do.

With Wiko Fellows Tom Wenseleers and Kevin Foster, I was part of a group focused on *Conflict Resolution in Biological Systems*. The idea was to build from our collective experience of conflict resolution in social insects (all of us), multicellular slime moulds (Kevin) and intraorganismal conflict (Tom) towards a synthesis and ultimately a book on this topic. Things have worked out more or less as planned. We first cut our teeth by writing a review, for the *Annual Review of Entomology*, on “Conflict Resolution in Insect Societies”. This enabled us to grapple with some of the general issues within a manageable field. After much discussion, we have been able to extend these ideas to the wider world of biological conflicts and have started writing the first sections of the book.

One enormous benefit of being at the Wiko was the amount of time available to discuss ideas and think. Tom, Kevin and I very frequently talked about conflict resolution. Many of these sessions were over breakfasts, lunches, afternoon cups or tea, during walks in the nearby Grunewald forest, and in the cafe there. I do not know if all fields are the same, but doing evolutionary biology seems to require a vast amount of discussion in order to understand the underlying logic and connect it to reality. And there is no better way to understand things more clearly than to talk to a fellow evolutionary biologist and maybe to jot down a quick equation or diagram to illustrate one’s idea. After much bouncing of ideas back and forth, the mist usually clears. Back in my home institution, discussions with fellow academics are largely hurried and revolve mainly around administrative matters.

But at the Wiko there was time to talk about science. It turned out to be a good thing that Tom, Kevin and I knew each other well and had worked together before. In fact, Kevin had been my Ph.D. student and Tom my postdoc. Far from having exhausted all possibilities of collaboration, it meant that we were able to work together effectively. We were on the same wavelength, but not with the same ideas in our heads or the same expertise and problem-solving skills. (A certain division of labour arose. Tom, for example, burrowed into the literature in all areas of conflict resolution and requested a world record number of reprints from the Wiko library, which arrived, conveniently for us, in pdf form and with amazing swiftness.)

Wiko staff member Reinhart Meyer-Kalkus actively encouraged our breakfast conversations, often joining in. One day he referred to me as Chairman of the Breakfast Club, hence the title of this report. Also frequently present at breakfast was Wiko Fellow Bernard Wasserstein. From Bernard I learned a great deal of history and the importance of reading the obituary columns in the newspaper, “the only part of a daily paper of lasting value”. In return, I showed him how to identify oak trees and the rudiments of how to think like an evolutionary biologist. I think he meant it when he asked me to recommend a good book to get into the subject.

Over the course of the year it was clear that most of the interdisciplinary cross-pollination was taking place over meals, and to my mind exceeding the importance even of the weekly colloquia, in which each Fellow took his turn to enlighten the others, or sometimes not. Did any of this interdisciplinarity rub off on me? Quite to my surprise, I found myself, near the end of my stay at the Wiko, writing an article with a historical slant to it, on the special difficulty that insect workers presented to Charles Darwin in his theory of evolution by means of natural selection. (OK, it was still about social insects, but it was addressing some historical aspects of this.) Unlike real historians, who grapple with enormous amounts of material, I only needed to work with a single historical document, the first edition of the *Origin of Species*. This simplified things considerably, especially since it could be downloaded from the Internet.

I also received some advice on writing poetry from Lars Gustafsson, who assured my own immortality by writing a short poem about me. (I initially thought nothing of this, but some of the more literary Fellows assured me it was a great honour and that I was now a part of the canon of English literature, because Lars, who is from Sweden and normally writes in Swedish, had kindly written the poem in English.). Harvard physicist Eric Heller was also on hand when needed to define tricky scientific concepts originating in the phys-

ical sciences but relevant to biology, such as “phase transition” and “large”. Eric’s presence inspired me to write an essay on ants, the main theme of which was that ants are smarter than physicists. *Nature* magazine was kind enough to agree to publish it as a concept essay. (I am not expecting any serious flak from the physicists union, because I never suggested that biologists were smarter than physicists, although they are of course.)

On arriving at the Wiko, the main plan had been to focus on conflict resolution, as I had written in the proposal for the conflict resolution group. This plan turned out to be a good one. But I also had plan b. This was to read widely in new areas and to explore tangents. On looking at my scientific career, I realised that practically everything I had ever done that was any good had started off as a tangent or distraction from what I was supposed to be doing. The Wiko provided a good place to explore these tangents. Tom and Kevin were also enthusiastic followers of this methodology.

I am not sure exactly where scientific creativity comes from, but it is probably something to do with generating ideas and asking questions. I am very grateful to the Wiko for giving me an opportunity to spend 10 months doing this. Being a Fellow at the Wiko was a great opportunity not only to focus on a well-defined project, but also to spread out intellectually and to recharge my battery of ideas and, following the advice of the poet Robert Frost, to have time to take roads not taken under the circumstances of normal academic life.

Articles in refereed journals from the “Conflict Resolution” group

- D’Ettorre, P.*, E. Brunner, T. Wenseleers, and J. Heinze. 2004. “Knowing your enemies: seasonal dynamics of host-parasite recognition.” *Naturwissenschaften* 91: 594–597.
- D’Ettorre, P., A. Tofilski, J. Heinze, and F. L. W. Ratnieks. “Cue scrambling does not occur in *Pachycondyla inversa*.” *Naturwissenschaften*. Accepted.
- D’Ettorre, P., T. Wenseleers, J. Dawson, S. Hutchinson, T. Boswell, and F. L. W. Ratnieks. 2005. “Wax combs mediate nestmate recognition by guard honeybees.” *Animal Behaviour*. Accepted.
- Foster, K. R. 2005. “Hamiltonian medicine: why the social lives of pathogens matter.” *Science* 308: 1269–1270.

* Dr. Patrizia D’Ettorre (University of Regensburg, Germany) and Dr. Heikki Helanterä (University of Helsinki, Finland) were members of the Conflict Resolving group for short periods during visits as guests of the Wiko.

- Foster, K. R. "Sex, the single-cell bottleneck and the evolution of complex multicellular life." Submitted.
- Foster, K. R. and H. Grundmann. "The tragedies of antibiotic resistance." Submitted.
- Foster, K. R. and F. L. W. Ratnieks. 2005. "A new eusocial vertebrate?" *Trends in Ecology & Evolution* 20: 363–364.
- Foster, K. R. and T. Wenseleers. "A General model for the evolution of mutualisms." Submitted.
- Foster, K. R., T. Wenseleers, and F. L. W. Ratnieks. "Kin selection is the key to altruism." Submitted.
- Ratnieks, F. L. W. 2005. "Outwitted by ants." *Nature* 436: 465.
- Ratnieks, F. L. W., K. R. Foster, and T. Wenseleers. 2006. "Conflict resolution in insect societies." *Annual Review of Entomology*. Accepted.
- Ratnieks, F. L. W., K. R. Foster, and T. Wenseleers. "Darwin's 'special difficulty': the evolution of neuter insects and its relationship to current thinking." Submitted.
- Ratnieks, F. L. W., H. Helanterä*, and K. R. Foster. "Effect of facultative biasing of sex allocation on allelic diversity of underlying odour cues used in recognition." In preparation.
- Ratnieks, F. L. W. and T. Wenseleers. 2005. "Policing insect societies." *Science* 307: 54–56.
- Schoeters, E. and T. Wenseleers. 2005. "Onze sociale wespen" (Our social wasps). *Educatie Limburgs Landschap*, Heusden Zolder, 135 pp.
- Wenseleers, T. 2004. "The puzzle of cooperation." *Trends in Ecology & Evolution* 19: 409–410.
- Wenseleers T., N. S. Badcock, K. Erven, Á. Tofilski, F. S. Nascimento, A. G. Hart, T. A. Burke, M. E. Archer, and F. L. W. Ratnieks. 2005. "A test of worker policing theory in an advanced eusocial wasp, *Vespula rufa*." *Evolution* 59: 1306–1314.
- Wenseleers, T., A. G. Hart, F. L. W. Ratnieks and J. J. G. Quezada-Euan. 2004. "Queen execution and caste conflict in the stingless bee *Melipona beecheii*." *Ethology* 110: 725–736.
- Wenseleers T. and F. L. W. Ratnieks. "Comparative analysis supports relatedness theory for worker policing in eusocial Hymenoptera." Submitted.
- Wenseleers T. and F. L. W. Ratnieks. "Effective sanctions deter worker reproduction in wasp societies." Submitted.
- Wenseleers, T. and F. L. W. Ratnieks. 2004. "Tragedy of the commons in *Melipona* bees." *Proceedings of the Royal Society of London Series B – Biological Sciences* 271: S310–S312.

- Wenseleers T., F. L. W. Ratnieks, M. F. Ribeiro, D. A. Alves, and V.-L. Imperatriz-Fonseca. 2005. "Working-class royalty: bees beat the caste system." *Proceedings of the Royal Society – Biology Letters* 1: 125–128.
- Wenseleers T., A. Tofilski, F. S. Nascimento, K. Erven, and F. L. W. Ratnieks. "Infighting among workers helps queen in an advanced eusocial wasp." Submitted.
- Wenseleers T., A. Tofilski, and F. L. W. Ratnieks. "From egg-laying competition to worker policing: a proposed evolutionary scenario." Submitted.
- Wenseleers T., A. Tofilski, and F. L. W. Ratnieks. 2005. "Queen and worker policing in the tree wasp *Dolichovespula sylvestris*." *Behavioral Ecology & Sociobiology* 58: 80–86.