



THE IMPORTANCE OF  
INTERDISCIPLINARY MEANDERING  
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After being departmental chair for five years, I looked forward to using my time at the Wiko to reevaluate my priorities and my approach to science and to set my path for the remaining years of my career. I particularly looked forward to focusing my research and reducing the number of topics on which I was working. Instead, I actually expanded the range of topics that I am pursuing in the natural sciences, particularly renewing my interest in the evolution of cooperation and group selection, an area that had at one time been my specialty. The experience at the Wiko that changed me the most, however, was

the continual engagement with people from fields to which I would normally not be exposed. And not only being exposed to these areas, but interacting with experts in these fields in a consistent, intense way. I was able to ask them questions, rethink the answers, and then (often) return to them with the same questions (perhaps sometimes annoyingly) over the months at the Wiko. In my report I will first describe the natural science questions I pursued, but then end my report with a description of the interdisciplinary meanderings I enjoyed so much.

## I. Natural Science at the Wiko

### 1. Focus Group on “Origin and Evolution of Exaggerated Traits”

Jerry Wilkinson was the leader for this focus group. Jerry has been working on genomics of sexually selected characters in stalk-eyed flies, and I in guppies; we were joined by two temporary Fellows, Judith Mank and Seth Barribeau. As part of this focus group, I learned a huge amount from reading and discussing papers on sex-limited gene expression, sex chromosomes, dosage compensation, and how genes are apportioned between sex chromosomes and autosomes. Both Jerry and I were interested in factors in the genomes that might explain why one species develops strong exaggerated characters due to sexual selection (bright colors, long tails, big antlers), while other species do not develop these exaggerated characters. By the end of the year, we refined these questions to “how is variation maintained in characters under strong sexual selection?” This led to extensive reading in genomic factors, especially the effect of transposable elements on genetic variation and adaptation.

Our focus group organized a two-day workshop on “Mind the Gap: Genomics of Sexual Selection”. What could have been a pretty standard conference took on a Wiko flair. Jerry Wilkinson and I represented a traditional approach to sexual selection research, part of which has been attempting to find the genes underlying sexual selection phenotypes for several decades. Planning for the conference made us realize at least two things. One, the field has really failed to find these genes, and perhaps the field has never clearly defined why finding these genes is important. And second, there was a generational gap in our field. Younger scientists, who grew up taking a genomics approach, tended to study the genomic basis and evolution of sexual dimorphism and the evolution of sex chromosomes versus autosomes and tried to work from the genomic level to the specific genes. It seems that the “gap” that we had to “mind” was the disconnect between

those trying to apply genomic approaches to the more traditional questions, without much progress, and those applying genomic approaches to descriptive studies, often without clear hypotheses rooted in evolutionary theory. As with many of the questions dealt with at the Wiko, the jury is still out, and we are still struggling to produce a review manuscript from this workshop that captures a consensus of these ideas.

## 2. Tuesday Colloquium on “Hubris in the Post-Genomics Era” and my “secret project”

My Tuesday Colloquium examined some systemic problems inherent in the technology of the human genomics enterprise and how this enterprise can be “oversold” to basically everyone. Preparing for my colloquium helped me focus on what my exact criticisms are of the human genome project and how I can communicate these to an audience that is not expert on genetics and genomics. This also related to my “secret project”, the project that many of us bring to the Wiko, but that is not revealed in our proposal. Mine was to develop a way to deal with the massive genomics data sets that are being produced in antibody repertoire analysis, important in vaccine development and basic immunology. While at the Wiko, our team at the IRMACS Centre at SFU received a contract to build a prototype of such a system, which would link these massive data sets in an integrated, queryable system across multiple biomedical research institutions. We also began organizing workshops to bring the community together to set protocols for assessing the quality of these data, sharing these data, and overcoming the confidentiality and consent issues involved in sharing these data. This will be a major undertaking and will involve working not only with genomicists, immunologists, and bioinformaticians, but also experts in the legal, ethics, and business fields. My interactions and increased knowledge of the goals and interests of humanists and sociologists that I met at the Wiko will greatly help in this endeavor.

## 3. Project on variation in guppy sex chromosomes with Fellow Judith Mank

One of the joys of being at the Wiko is the potential for forming fortuitous connections, and I did this with Fellow Judith Mank. Guppy sex chromosomes are fascinating because the genes for attractive male characters, such as male coloration and courtship, are linked to the sex chromosomes, and the sex chromosomes seem to evolve very quickly. It has been a dream of mine for many decades to study these chromosomes, and the collaboration with Judith, an expert in the genomics of sex chromosomes, will make this possible.

#### 4. Historical and sociological perspective on the evolution of cooperation

During my year at the Wiko I was very lucky to be exposed to the Focus Group on Cancer Evolution. I learned that this topic, and the topic of Evolutionary Medicine, has broadened and matured over the past decade, and I learned a lot about how this field can apply evolutionary principles to medical questions in new and productive ways. In addition, working with members of this group rekindled my interest in cooperation theory, but in a way that expanded the question beyond biology. And this was the first of my “interdisciplinary meanderings” during my time at the Wiko.

This topic developed mostly by talking to Athena Aktipis of the Cancer Evolution Focus Group, who studies cooperation and how cancer breaks the rules of cooperation that keep a multi-cellular organism functioning. Based on our long-term interests in the evolution of cooperation and altruistic behavior, we began exploring a question in evolutionary biology that seems never to be resolved: how could altruism evolve? I.e., why would an organism be selected to reduce its immediate fitness to increase the reproduction and survivorship of other individuals? Proposed answers to this question include the ideas of kin selection, group selection, selfish genes, inclusive fitness, etc. For many years, amongst these ideas, the theory of “group selection” has been strongly vilified by many evolutionary biologists, and endless numbers of papers have pitted group selection versus kin selection, proposing one or the other as the explanation for the evolution of cooperation and altruism. However, these arguments don’t make sense, and the never-ending vitriol that accompanies them is particularly unjustified, because most serious examinations of these concepts in the last decade or two have concluded that the approaches of group and kin selection and inclusive fitness can all be seen as variants of the same approach to solving the same problem. Yet, despite this seeming resolution of the problem, the arguments continue. Talking to other Fellows at the Wiko made us realize that there is probably a more “sociological” and “historical” explanation why the arguments persist and that an interdisciplinary approach, bringing in philosophers of science, historians, sociologists, and beyond, might be a good way to elucidate and even eliminate this conflict. Hence, we formed a core interdisciplinary group at the Wiko to explore this, and we hope to organize a Fellows’ forum next year to deal with this question.

In summary, during my time at the Wiko I expanded rather than narrowed my range of topics and interests in natural science. The great thing about the environment of the Wiko is that this happened so organically and easily that I didn’t even notice it had

happened until writing this report! What I was fully conscious of as I left Berlin was how excited I was about getting these projects done.

## II. Inter-, Multi-, and Trans-Disciplinary Meanderings

The part of the Wiko experience that I will always cherish the most was the chance to interact with people so highly trained in areas of which I had been so ignorant: the law, humanities, sociology, musicology, history, and many other areas. My interdisciplinary meanderings at the Wiko involved three main, repeating themes.

### 1. Questions and approaches common to natural sciences and “un-natural” sciences

One of my earliest memories of meeting people at the Wiko is of Maria-Pia Di Bella, who along with her partner Baber Johansen spent much of the year at the Wiko, sitting down at lunch and declaring that she was a social anthropologist, but she was “not a scientist”. Her declaration fascinated me and prompted me to question many of the historians, philosophers, and sociologists as to how they conducted their business. Were they trying to come up with general principles that could then be applied to other situations and to make predictions? Did they formulate hypotheses? As I write this it seems like a somewhat sophomoric question, but I feel it led to many interesting and revealing conversations. Although often they said they weren’t testing hypotheses, Yuri Slezkine summed up his research for me as showing that “revolutions always destroy themselves from within”. Sounds like a hypothesis/general principle to me, but I guess there is no resolution to that debate.

### 2. How some humanists view natural scientists, and what we can do about it

Before coming to the Wiko I had read and thought about the “two cultures” and understood that often natural scientists and academics from the other side of campus have to struggle to understand each other, and when that attempt at understanding goes awry, there can be some unfortunate outcomes. But my experiences at the Wiko really made me understand how deep the rift can be between the two groups and how hard one has to work to try to bridge that gap.

One interesting part of the process at the Wiko was that you had the time and close quarters to develop real, deep relationships with some of your Fellows, but then sometimes you could then have fundamental intellectual and philosophical differences with

these people, simply based on field-specific assumptions and languages and goals. It is important to point out that most often the interdisciplinary conversations worked great, and, when these differences became apparent, they were worked through with respect and even love. It pointed out to me that if natural scientists choose to reach out to a diverse audience, then we must very carefully start with common principles and explain what and why we do what we do. It is widely acknowledged that to be shown how other people see you is a great gift, and that seems to be as true in academia as it is in normal life.

### 3. Do academics believe that their work will make a better tomorrow?

Maybe it is easier for, say, a biomedical scientist, or human geneticist, to believe that their work is making the world a better place than it is for a musicologist. But I suspected that most of the Fellows at the Wiko, who had worked hard to excel in their discipline, were partly motivated by improving the fate of the world. We could all argue whether a given field helped or in fact screwed things up, but my suspicion was that that had to be part of the motivation in most of us. Again, who knows? But I had fun asking that question to many of the Fellows: if they weren't changing the world for a better place, why did they get up in the morning and work so hard? Perhaps my most fun was trying to get Klaus Ospald to admit that he worked so hard at his music to improve peoples' lives.

Upon reflection, all of this activity and intensity for me was, at heart, a process of me asking myself these questions: What does it mean to formulate and test a hypothesis, especially within the confines of natural science and especially biological evolution? How can we better communicate to non-scientists what we do, and why does it matter that we make this attempt? Finally, why do I get up in the morning, and how can I encourage students to quit worrying about their first job and, rather, put all their energies into working toward a better world? Put down in print this way, this seems like pretty heavy stuff, but grappling with these questions was the exhilarating part of my Wiko experience. And for this experience, I owe a deep debt of gratitude to my fellow Fellows, my wife Jamie and daughter Fran, and, not least, the wonderful staff of the Wiko, who not only do such a superb job of running the institute, but also help create its special ambience.