SCHOLARSHIP
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How does being at Wiko alter one's work? You cannot know. A scientist would say that you would need to replicate yourself, randomly assign each of those replicates to different life experiences, and then compare the outcomes. Milan Kundera emphasized that same unknowableness in his *Unbearable Lightness of Being*.

But we like to imagine that we understand how experiences change us. The managers of modern academia demand a continuous stream of defense briefs. So here is my story.

In science, new data force the action. Even Einstein's great triumph of pure thought derived from the mounting pressure of the seemingly incompatible observations and puzzles of the prior decades.

In modern biology, the tide of new data and the activity required to generate it have become almost overwhelming. To get off the wave, just far enough to feel its force but to have achieved the independence to control, to adjust, and to think – it's not so easy. Put another way, how does one achieve the quiet that scholarship demands, without entirely losing the wave?

Before I came to Wiko, I had thought, perhaps pridefully, that I had caught the proper angle. Then, at Wiko, suddenly far from the turbulence, the reality of true quiet surprised me. The daily life at Wiko is not really quiet – another meal incessantly looming, another challenging discussion across the disciplines – across to those disciplines that one normally cannot imagine as anything but a source of bodies to fill interdepartmental committees. But Wiko's local currents and their turbulent noise are not the same as from one's own discipline. One can recalibrate the approach.

From the Fellows, some new styles of scholarship to consider. I study their moves. What determines the rhythm of their discipline? The changes in direction? How much do people get caught up in the force or go their own way? I quiz the Fellows. I watch how they describe their ride in relation to the currents they feel in their own subjects and in their own curiosities. I often do not understand. But the challenge pushes me to measure my own alternatives.

From the Wiko itself, a subtler force. They say to me: We trust you. Completely. Work on whatever you think is best. Follow any diversion that you think promising, wherever it leads. You know best. Trust yourself. Don't be afraid. We support you absolutely.

Faced with that challenge, I could for the first time see more clearly my own internal calculations. I had tried hard to challenge myself, to find my own limits to my work. But I had lived in the current of modern academic biology. There, if you are off the wave even briefly, you face the pressure to get back on immediately or to be left behind forever.

These thoughts about scholarship caused me to reorient. But the quiet to reconsider did not mean stillness. The need to keep moving remained. Where did I actually go?

At the start of the year, feeling the freedom, my ambition runs wild. The title of my planned book becomes *The Common Patterns of Nature*. I try this out on my Wiko colleagues in my Tuesday Colloquium. They stare at me. It sounds pretty. Is it sweet talk, or is he really on to something? At first, I wonder as much as they do. But there is a year ahead, and only one way to find out. Have the library deliver a pile of books and get started.

At the end of this essay, I present an abstract of my project. That abstract gives a sense of my topic and its scope.

One of my goals is to write in a way that can be read by biologists, economists, physicists, and others. The diversity of Wiko Fellows allowed me to test some of my ideas about composition and book design. I particularly benefited from many conversations with Hisa Kuriyama, who has deep insight into the history of science and the ways in which modes of visualization and communication influence the spread of ideas. After many failed experiments, I arrived at a book design that combines a conceptual structure, parallel graphical narrative, and physical layout that defines my task and should survive through the final product.

I started to fill in the chapters. The technical challenges of solving open problems and of communicating across disciplines inevitably arose. More books from the library. A diversion, during which I tried to attain a reasonable graduate student level of proficiency in theoretical physics. That required studying some classics in the calculus of variations and differential geometry. Suddenly, a profound connection to the theory of natural selection, my own greatest expertise and a subject on which I have worked for 35 years. The melting of conceptual boundaries and the seeing of things as a more coherent whole, the hedonic pleasure that has shaped my life. Still there, better than ever. Feels very good.

My prior hesitation to start this project came from knowing that I would have to work harder than ever, training myself to see in these different ways. I doubt that I would have had the courage to begin without the subtle Wiko whispering: we believe in you, believe in yourself. Find your limits, which perhaps requires going beyond them. I started. Now, I am committed and will not stop. What are five or ten years, when measured in Wiko scholarly time?

The Common Patterns of Nature

Science is about explaining the patterns of nature. For example, trees come in different shapes and sizes. Those shapes and sizes form a pattern. A biologist tries to explain the pattern of trees.

When explaining pattern, we must separate constraint from process. First, we remove those aspects of pattern that we do not try to explain. For example, trees are made from certain kinds of basic materials. Those materials set constraints on the patterns of trees.

Second, within those basic constraints, we try to understand the processes that lead from the range of possible patterns to the actual observable patterns.

Much of the constraint on pattern arises from randomness itself. That may seem like a contradiction, because pattern seems to be the opposite of randomness. Yet, when we combine many random processes, very strict patterns arise. For example, if we measure the height of the first adult to walk by, that particular height is highly unpredictable – it is highly random. But if we measure the heights of the first 1000 adults who walk by, the aggregate pattern of variability among those 1000 individuals will follow a very strict and predictable pattern.

Observable patterns create puzzles in which we must separate randomness from process. For example, the risk of getting cancer changes with age. Some of the pattern that relates risk to age comes from the constraints set by the way that randomness influences cancer. Other aspects of cancer risk arise from particular biological processes, such as the number of different ways that our bodies normally protect us from disease. To understand the biological processes, we must learn to parse pattern into random components and biological components. Parsing requires a deep understanding of the various ways in which randomness creates pattern.

Randomness creates pattern by information obtained through measurement. The information that we obtain through measurement changes with magnitude. For example, a 30 cm ruler provides useful information about distances within my office, but provides little information about the relative distances of Venus and Mars. That change in information with magnitude shapes the observable patterns created by randomness.