

Margaret C. Morrison

Models as Instruments



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It is certainly a truism of academic life that scholarly work always takes at least twice as long to complete as one expects. I began my year at the Wissenschaftskolleg attempting to complete a book manuscript that I assumed would be finished the previous autumn. As I became acquainted with the other Fellows I realised that very few of us were actually working on the projects we intended to undertake while we were in Berlin — everyone seemed to be clearing up the "loose ends" that needed to be sorted out before new research could begin. But the day finally arrived; by mid-November I put my manuscript in the mail and began thinking about the work that lay ahead. I came to the Wissenschaftskolleg with a colleague from the London School of Economics, Mary Morgan — an economic historian, with whom I had been working for a few years. We were and continue to be co-directors of a project based at the LSE to investigate similarities and differences in models and modelling techniques in physics and economics. However, it wasn't until we were able to spend a concentrated period of time away from other academic duties that we finally felt that the ideas and thoughts we had been

discussing for the past two years finally took on some structure. The environment at the Wissenschaftskolleg made that possible. Although we had many productive discussions together and with other colleagues about how modelling works in their fields, I came away at Xmas feeling that I hadn't really accomplished much, more specifically I hadn't written anything new. To my mind, finishing the book didn't really count since it should have been completed long before I arrived! But, and perhaps more importantly, I didn't see how I was going to accomplish even half of what I'd set out to do at the Kolleg. German classes and homework, lunches, colloquia and discussion groups seemed to take up the better or at least most productive part of the day; not to mention the occasional venture out of the Grunewald to see some of Berlin. Not only did I feel discouraged about the state of my work but I had become one of those Fellows we were warned about at the beginning of the year — those who gain ten pounds. I had been there for only three months but had already achieved that goal.

I returned to Berlin in January having made some New Year's resolutions. I would stop taking German classes, eat fewer lunches and attend only the colloquia that were conducted in a language I understood. This was in part prompted by my selfish desire to write but also by the fact that I promised to give lectures at three conferences in the Spring, all of which were on research I had not yet begun. I stuck to my plan and by March I felt extremely pleased with what I had accomplished. A couple of articles had been written and I felt as though I was making real progress.

The only thing to feel guilty about now was that I had been living in a wonderful city for six months and barely knew how to get around. I had been to no museums or galleries, saw only one opera and my acquaintance with the architectural aspects of Berlin owed much to riding the 100 bus. But this was a shame I could live with. After all, I could always come back to Berlin as a tourist; I could never come back to the Wissenschaftskolleg as a Fellow, and for me a large part of being a Fellow was having the kind of opportunity the Kolleg provides — the chance to pursue one's work without the encumbrances of teaching and administration. That experience was something to make the most of, so I tried to make every minute count and spent most of my waking hours working. I did indulge myself in one museum trip — I was struck by photographs of the Nofretete bust and so decided to visit the *Ägyptisches Museum*. It was truly wonderful, as was my other excursion to the Berlin *Philharmonie*.

By the time I was ready to leave Berlin in July, I had accomplished roughly half of the new work I expected to do, which, in academic

terms, is quite satisfying. I was able to write some articles developing various themes I consider important for understanding how models are constructed and how they function in the physical sciences. More specifically, in these papers I tried to show how models differ from theories by discussing the various ways in which they play an "active" role in scientific investigation. I claim that one shouldn't think of models as hypotheses about how the physical world is constructed but rather as "instruments" that allow us to intervene in the world. This intervention comes by way of the model's role in developing technologies, functioning as a measuring device and, in economics, as the basis for policy decisions. Perhaps the most important philosophical question about modelling is: If models provide highly idealised or abstract accounts that do not accurately describe real physical systems, then how can they provide knowledge of material objects in the world? Thinking of models as instruments supplies an answer to that question by showing the connection between abstract models and concrete problems and their solutions. For example, an abstract model in geometrical optics that says nothing about the real nature of light nevertheless allows us to construct a variety of different kinds of lenses. Models also function as the basis for producing simulations of particular kinds of behaviour. Astrophysicists use simulations for investigating the structure and evolution of galaxies, something that is not amenable to direct study. Such a simulation produces a kind of experimental context that would have been impossible without a model. By investigating the role models play in these and other contexts, one begins to see that the focus of a good deal of scientific study can be located in models. Consequently, understanding their construction and function is an important philosophical task. During the Spring and Summer I was able to present some of this work at conferences in Amsterdam, at the Technical University in Berlin, in Edinburgh and of course, at the *Dienstags-Kolloquium*.

But the feeling of fulfilment that resulted from this work came at a price; namely, not taking advantage of the best opportunity I'll likely ever have to learn German, and never feeling like I really "lived" in Berlin. I think all the Fellows came away from the Kolleg wishing we had had more time, both to work and to enjoy our lives there, but each of us left enriched in different ways by our experiences as Fellows. As I sit writing this at my desk in Toronto it occurs to me that it is exactly one year ago today that I first arrived at the Kolleg. I find myself wondering who lives in "my" apartment, and thinking back to the first lunch in the garden and how wildly inaccurate my first impressions of some of my colleagues were. But mostly I find myself thinking about some of the wonderful friendships I was fortunate enough to make over the year.

The way those friendships formed and evolved could only have happened in the environment provided by the Kolleg; for that and the chance to do my work I am eternally grateful!