Book Reviews / Comptes rendus

Myers, Natasha, *Rendering Life Molecular: Models, Modelers, and Excitable Matter*, Durham, NC: Duke University Press, 2015, 328 pages.

Reviewer: Jacquelyne Luce
Mount Holyoke College

Natasha Myers's *Rendering Life Molecular: Models, Modelers, and Excitable Matter* is at once a detailed account of the everyday practices of protein modellers in academic research labs and classrooms and an innovative exploration of the normative framings of biological object visualisation and the scientific pedagogies within which protein modellers learn and work. In the opening pages, anthropologist and science studies scholar Natasha Myers contextualises protein modelling, and structural biology in general, within the broader context of the life sciences and, in particular, the emphasis on genetics throughout the 1980s and 1990s. She writes that in the current post-genomic era, "life scientists can be seen turning from matters of code to matters of substance – that is, from spelling out linear gene sequences to inquiring after the multidimensional materiality of the protein molecules that give body to cells" (10).

The book draws on ethnographic fieldwork carried out in the United States between the years 2003 and 2008, during which Myers interviewed structural biologists and biological engineers at various stages in their careers; undertook observations in labs, classrooms and scientific meetings; and did archival and public sphere research. Protein crystallography, a practice aimed at providing "visual access to the unseen dimensions of cellular life" (36), is central to both the sites of fieldwork and Myers's theoretical positioning. Myers writes: "There is no material or optical contiguity between the diffraction pattern generated by a protein crystal and the three-dimensional model that rotates on a modeler's computer screen. The resulting model is in this sense a fabrication" (19). This disconnect – the indirect access and diffracted modalities of visualisation and modelling potential – is key to her analysis of the affective and kinesthetic practices of the science of protein modelling. *Rendering Life Molecular* makes several key interventions within the disciplinary and interdisciplinary fields comprising science studies. I focus here specifically on the book's contribution to work around vision and visualisation, pedagogies, and animation.

There is a long history of the study of visual renderings of science and "scientific objects" in the public sphere, both figuratively and literally. *Rendering Life Molecular* is instead more clearly situated as kin to the genre of laboratory studies and focuses primarily on the worlds and practices of visualisation through modelling within the sites of academic research laboratories, science classrooms and scientific conferences. Myers emphasises the history and everydayness of scientific and pedagogical practices, in which "seeing" and "representing" is undertaken within a framework of collaborative, and also competitive, research relations. Protein models are understood to facilitate knowledge about function and potential. Publication in a reputable scientific journal and submission to the Protein Data Bank, an online repository of protein structures, are considered to be key steps in the making of scientists within this field. In an era of emphasis on the translational potential of scientific knowledge, rendering a model of a particular protein could be a critical career springboard. In her analyses, Myers attends closely to the interface of vision and visualisation in processes of modelling. She notes that crystallographers were among the first life scientists to make use of computers; yet, among those with whom she conducted her research, she found that the available computer graphics and the intangibility of that which is depicted on the screen posed strong limitations to practices of (thinking and knowing through) modelling. These limitations were often compensated for/surpassed through what Myers identifies as kinesthetic and affective sensibilities acquired/learned through interactions with mentors and peers in the field. Her engagements with *The Inner Life of the Cell*, a computer animation developed as a pedagogical tool and posted online in 2007, the now annual "Dance Your PhD" contest launched in 2008, in which graduate students and recent graduates interpret and communicate the results of their science-related dissertations through dance, and *Naturally Obsessed*, a 2009 documentary about the experiences of graduate students in a protein modelling laboratory, offer contrasting analyses of representations of the field that might be generated for, or come to assume, a more "public life."

As protein modellers render the structure of proteins "visible" through various practices, Myers renders visible the tacit means by which these researchers come to know "their" molecules and to embody practices of protein modelling. She looks at the forms of visualisation that the students and more senior researchers achieve through interactions in classrooms and labs, articulating the ways in which the doing of modelling via the use of found material (from branches to paper clips)

or matter at hand (the scientist's and perhaps also another person's body) is integral to processes of knowing. Body work, or kinesthetic knowledge production, is prevalent within both laboratory and lecture sites. Attending to the intuitive and tacit body experiments that are part of the "rhythm of communication among practitioners" (218), Myers illustrates the ways protein modellers transgress the limitations of scale, scaling up (or amplifying) molecular vision through bodily contortions. Yet, while seemingly integral to understanding, this body work is also subject to containment. Myers discusses in depth the tensions associated with bodily practices and statements perceived as anthropomorphisms, linking these to concerns about the ways a scientist's use of their body is read (as sexualisation, indulgence in leisure or unprofessional), as well as concerns about being associated with more Lamarckian, or non-normative, views of evolutionary progress.

Throughout the book, but most explicitly in Part 3, Myers challenges dominant mechanistic renderings of structural biology, which are produced both within and outside of the field. She returns throughout the book to a scene from her fieldwork recounted in the introduction, in which Edward, a postdoctoral researcher frustrated with what a computer program is delivering, demonstrates to Myers the animated nature of proteins. Myers writes, "Where the model on screen remained static, he relayed the qualities of his breathing molecule by wrapping his hands around an invisible, pulsing sphere" (3). His gestures seemingly counter the "mechanistic approach" to protein function that would be expected. Myers explores the ways the molecular machines of today, or mechanistic reasoning, is differently entangled with discourses of liveliness. The tensions surrounding the potential animation of molecular models draws attention to the historical and political contexts that give rise to distinctions between organisms and machines and related notions of objectivity and manipulability. Myers writes that "in spite of efforts to clamp down on the figure of the machine, modelers produce renderings of molecules that are undeniably *lively*" (199). Which epistemological possibilities emerge when borders between concepts such as *machinic* and *lively* are revealed as malleable? In my reading, drawing on critical thinkers in feminist science studies, Myers argues that this helps us to imagine and reimagine the relationalities of matter and of knowledge, both of which are politically significant.

Through its enactments of the affective and kinesthetic practices of protein modellers, *Rendering Life Molecular* asks readers to explore a field that has not yet "come of age" within science studies and general public knowledge, perhaps especially with regard to understandings of its potential social relevance (see Holmes et al. 2016). Although I am comfortable learning about sciences and technologies that are unfamiliar to me, I found myself struggling with sections on protein modelling. Perhaps ironically, I was frustrated at my inability to grasp (in a tactile way) the practices of modelling and molecular vision that Myers writes about. I turned to the "Protein Primer" in the appendix; I stared at the colourful pictures in the book; I watched *Naturally Obsessed*, the documentary that Myers both analyses and uses to exemplify and conjure particular imagery; I found myself rotating images of protein models on the Protein Data Bank; and, repeatedly, I gravitated to Parts 2 and 3 of the book, where analyses of modellers' kinesthetic practices, scientific truth formations, and intra-action are compelling but also much more familiar in terms of the theoretical frames within which they are situated. What types of knowledge do readers expect and/or require in order to work within and across the fields of the histories of science and technology, science and feminist science studies, laboratory studies, and translational research? I imagine that some, or many, readers will find various parts of this book much more accessible than others. Yet, reading the parts of the book, which may contain familiar and unfamiliar content and/or approaches, in relation to each other is what highlights the book's offering to readers across disciplinary and interdisciplinary fields about the challenges of thinking through the policing of pedagogical practices, the tactility of vision, and the animation of mechanism. Perhaps one experiment would be to read/assign *Rendering Life Molecular* in collaborative transdisciplinary reading groups and classes, with access to, as Banu Subramaniam suggests, "labs of our own" (Bauchspies and Puig de la Bellacasa 2009, 8) to facilitate experimentation with protein modelling and protein folding in sync with discussions about the aesthetic and kinesthetic processes we might find ourselves engaging in to convey our emerging knowledge.

References

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Holmes, Christina, Siobhan M. Carlson, Fiona McDonald, Mavis Jones, and Janice Graham. 2016. "Exploring the Post-Genomic World: Differing Explanatory and Manipulatory Functions of Post-Genomic Sciences." *New Genetics & Society* 35(1): 49–68. http://dx.doi.org/10.1080/14636778.2015.1133280.

Jain, S. Lochlann, *Malignant: How Cancer Becomes Us*, Berkeley: University of California Press, 2013, 304 pages.

Reviewer: Michelle Wyndham-West
School of Health Policy and Management, York University

S. Lochlann Jain's ethnography/memoir *Malignant: How Cancer Becomes Us* is organised in a linear fashion, which gives the initial impression that the book follows an expected illness trajectory: diagnosis, treatment, recovery and the concomitant biographical interruption (Bury 1982). However, the book's contents are not linear, nor do they hinge on an individual narrative. Instead, the author deploys her own breast cancer experiences as an opening through which to explore knowledge production surrounding the cancer complex. As such, Jain traces "lines of knowledge" (155) relating to cancer causation, screening and treatment. Primary emphasis is placed on how uncertainty in these knowledge bases results in misdiagnoses and ineffective and unnecessary treatments. Jain states that "when nobody knows how to proceed (and nobody wants to admit that), certain kinds of knowledge claims come to seem most logical and therefore guide thought and action" (155).