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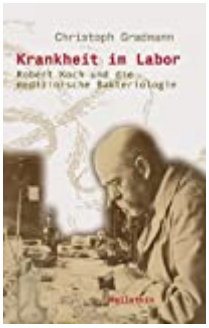

Christoph Gradmann. *Krankheit im Labor: Robert Koch und die medizinische Bakteriologie.* Göttingen: Wallstein Verlag, 2005. 376 pp. EUR 38.00 (paper), ISBN 978-3-89244-922-5.

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The Patient Vanishes

Christoph Gradmann's volume is a valuable contribution to the history of bacteriology, to our understanding of Robert Koch's scientific work, and ultimately to our understanding of the culture and society of Imperial Germany in general. The book is not a conventional biography, but rather a disciplinary history that uses Koch's career as a lens through which to view the emergence of bacteriology as the most prestigious and heroic of medical disciplines in imperial Germany. Organizationally the book is somewhat of a hybrid, with the major chapters organized around thematic elements that are then arranged roughly in chronological order, although they do overlap one another considerably. After a brief biographical introduction, the first substantive chapter explores the early history of medical bacteriology and laboratory practice. Although Gradmann handles the topic deftly, this section will probably be challenging for the non-specialist, though the reader's patience is rewarded at the end of the chapter by the author's clear explanation of the development of pure cultures, staining and other technologies that would stamp not only Koch's laboratory practice but his thinking throughout his career. Chapter 3 covers Koch's tuberculosis research from a laboratory perspective and the following chapter traces the troubled interaction between this laboratory program and clinical medicine. The book concludes with coverage of Koch's most significant medical expeditions, researching cholera in Egypt and India in the early 1880s and sleeping sickness in German East Africa in the early 1900s.

The book is a revision of Gradmann's 2002 *Habilitationschrift* and represents nearly a decade's worth of research and scholarship on the topic. Gradmann draws heavily upon the secondary literature, but the strength of the book comes from its exhaustive survey of archival sources. In particular, Gradmann made use of numerous short notes Koch kept for himself to document his laboratory work, which allows the author to make an extraordinarily detailed reconstruction of Koch's research. In addition, Gradmann's association with Berlin's Max-Planck-Institut fÃ¼r Wissenschaftsgeschichte is a major asset; its emphasis on the importance of the material culture of science as well as the significance of metaphor in scientific writing pervade the book, lending depth to the analysis. In some respects, the book is a compila-

tion rather than an original work, as the author has already presented much of the material in a number of articles and book chapters. While this previous publishing diminishes the book's novelty, the advantage is that Gradmann's ideas have clearly benefited from circulation within the scholarly community and the analysis is thoughtful and nuanced throughout. Overall, the volume is a very mature piece of scholarship. Since the book presents a critical interpretation of Koch's work to counter previous heroic narratives of his life, such maturity prevents the book from degenerating into a polemic. Gradmann recognizes and documents Koch's lasting contributions to the discipline as well as his numerous errors and misunderstandings. The result is a fuller, rather than a diminished, interpretation of Koch's work than has previously been presented.

Chapters 3 and 4, which focus on Koch's tuberculosis research, are the heart of the book, and it is here that Gradmann makes his most significant and lasting scholarly contributions. Koch's identification of the causal agent for tuberculosis is rightly seen as one of his greatest achievements, but previous treatments have tended to treat this episode as the culmination of Koch's work on this organism. Gradmann convincingly shows that the opposite is true. Identification of the tuberculosis bacillus was in fact the beginning of a research program that was to preoccupy Koch for much of the following thirty years. Since tuberculosis was among the most significant infectious diseases in late-nineteenth-century Europe, Koch desperately hoped to develop a cure, but was hampered by his own inability to understand the disease fully (pp. 106-110). Koch's understanding of disease can best be described as a very strong form of bacterial reductionism. He believed that healthy organisms were free of bacteria and that disease was exclusively the product of the invading microorganism. The host organism played no role; in Koch's thinking it was little more than a growth medium like that used to grow pure cultures in the lab (122-134). He had become so successful at bringing disease into the laboratory, via his work on pure cultures of bacteria, that he conflated his laboratory constructions with the much more complex process of disease itself (pp. 169-170). The result, Gradmann shows, was that in Koch's experimental investigations on tuberculosis, the patient simply vanished (p. 171).

This style of thinking led directly to one of the greatest failures of Koch's scientific career, tuberculin. Announced to great acclaim in 1890, tuberculin was a preparation that Koch claimed could cure tuberculosis. It was to be Koch's great scientific triumph, except that it soon became clear that the compound did not work. Worse, the preparation aggravated the disease in many patients, resulting in numerous deaths. Koch was unwilling to provide a detailed analysis of the compound or data from his animal trials, angering many physicians who had embraced tuberculin out of respect for Koch himself (pp. 214-216). While some researchers have been so bold as to accuse Koch of fraud, Gradmann is more cautious. He shows that Koch indeed had numerous personal, professional and financial reasons to hope for the compound to succeed, but Gradmann's reconstruction of the research program demonstrates that Koch's own honest, yet mistaken, assumptions about bacterial disease were more to blame than his pursuit of his interests. For example, Koch was so convinced that patients were irrelevant to the study of the disease that he had not carried out human trials to evaluate the compound (pp. 189-90). This confluence of factors, Gradmann suggests, led Koch to a process of self-deception regarding the efficacy of tuberculin in which he simply saw what he hoped to see and ignored evidence to the contrary (pp. 150-159). The paradox here, of course, is that the same research program that was an enormous success in identifying the causal agent for tuberculosis was unable to deal with the disease itself. Thus the failure of tuberculin was not an aberration in Koch's career, as is usually argued, but instead was very much consistent with it.

The broadest significance of the volume, and the reason for its appeal to readers of H-German, is its exploration of the seemingly effortless way that understandings of disease and pathogens, cultivated in the laboratory setting, then migrated steadily outward, manifesting themselves in such areas as human experimentation and colonial exploitation. Gradmann demonstrates that such unpleasant phenomena as these were not perversions of medical science, but rather were consistent with the foundations of modern microbiology. In chapter 2 Gradmann shows that that the need to reproduce disease symptoms reliably and consistently in experimental animals led to the breeding of pure lines of animals; they literally became standardized pieces of laboratory equipment. Koch himself wrote in 1878: "There is no better culture medium for pathogenic bacteria than the body of an animal," indicating that for him the mice, guinea pigs and monkeys that his lab used were little more than living Petri dishes (cited on p. 97). Later, when this program was applied to human disease, Koch's failure with tuberculin demonstrated that laboratory research needed to be linked to clinical practice, introducing human beings into the experimental process. Gradmann suggests that this

step blurred the boundary between experimentation and therapy, opening up a direct pathway from animal experimentation to human experimentation (pp. 227, 250-251).

The final chapter, which analyzes Koch's research expeditions, demonstrates that these events were very much part of the agenda of colonial domination. In fact, colonies offered researchers numerous prospects for the investigation of epidemic diseases not ordinarily found in Europe (pp. 271-273). In return, knowledge produced by researchers was expected to ease the financial burden on colonial administrators. Medicine and colonization became resources for one another (p. 267). This progression, from mechanization of life in the laboratory, to humans as experimental objects, to complicity with projects of social control and domination, was by no means pre-ordained. Nevertheless, Gradmann's careful and empirically grounded analysis shows that it was not entirely accidental, either. The implication here is that the complicity of medicine with the worst moral transgressions of German history is deeply rooted. For this reason, this volume will reward those interested in European and German history as well as those interested in the history of medicine.