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Arleen Marcia Tuchman. *Science, Medicine and the State in Germany: The Case of Baden, 1815-1871.* New York and Oxford: Oxford University Press, 1993. viii + 200 pp. $39.95 (cloth), ISBN 978-0-19-508047-6.

Reviewed by Terrie M. Romano (Queen's University)

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Science, Medicine and the State in Germany: The Case of Baden, 1815-1871 is a study of the institutionalization of the experimental sciences, and particularly experimental physiology (thus the emphasis on medicine in the title), centered on the University of Heidelberg. Scholars have long sought to explain the emergence of scientific research institutes in nineteenth-century Germany, in part since such establishments quickly became the models that envious colleagues in Europe and America attempted to emulate. By focusing on the state of Baden, Arleen Tuchman first provides a useful corrective to what she aptly calls "the Prussianization of German history" (p. 7). She demonstrates that Baden (and other German states) did not merely follow Prussia's example: the government of Baden was strongly supportive of the experimental sciences by the 1850s, an era when Prussia was indifferent, if not actively hostile to the sciences. Tuchman has also integrated into her narrative sufficient information about the other German states to make possible broader claims.

In contrast to earlier works that have stressed the ideology of *Wissenschaft* and institutional factors as the explanation for the early establishment of research in German universities, Tuchman emphasizes the context of German industrialization. Government officials reacted to the discontents of the era by forming new educational institutions to teach the *Realwissenschaften* that they believed citizens would need in the new industrialized German state. Eventually this ethos was applied to universities. As Tuchman puts it: "My argument is that training in the exact method of the experimental sciences received institutional support in the German university system...because it had come to signify the kind of 'cultural education' (*geistige Bildung*) desired by a society trying to deal with the problems of a changing and growing economy" (p. 7).

Support for education and research was of course not the only option available to a government that found itself in uncertain times (as we know all too well!). Tuchman attributes Baden's early support for the experimental sciences to its long tradition of "political constitutionalism and liberalism" (p. 7). Thus the state government, after a brief period of reaction to the Revolution of 1848, returned in the 1850s "to its liberal program, preferring education over repressive measures for carrying out its social and economic plans" (p. 92). Tuchman argues that in Baden and other German states, support for science education was usually linked with political liberalism. For example, she describes how for some medical reformers the scientific method was to be a "tool for the democratization of medicine" (83) that would allow less gifted "scientific physicians to join the medical elite..." (p. 66).

Despite her emphasis on the wider political context, Tuchman does not dismiss the importance of institutional factors in the establishment of science in Germany during this era. One of the strengths of the book is her analysis of the expansion of science education at all levels in Baden. She also outlines the internal politics of the many incremental steps – like the collection of instruments, the altering of courses to include laboratory instruction, and the establishment of chairs – that were carried out at the University of Heidelberg in the decades before the construction of the university's first research institute in 1854 – Robert Bunsen's famous chemical laboratory. Tuchman concludes that the decision to erect research institutes, rather than marking the beginning of government commitment to the experimental sciences, "marked the creation of an institutional home for a methodological approach to the study of nature that had long been in use" (p. 76).

Tuchman also grapples with the "changing definitions of *Wissenschaft*" (p. 49). In order for the experimental sciences to be established in universities, the natural sciences had to become an acceptable part of the human-

ist education. She describes how by the late 1830s, this change was occurring. Scientific knowledge and practical knowledge were being "divorced from their association with utilitarian ends" and "more closely aligned with a *wissenschaftlichen* education" (p. 49). The result was that the "image of *Wissenschaft* as pure research was beginning to disappear" (p. 49). This change was not embraced openly by professors who were eager to emphasize the differences between the universities and the technical schools. Tuchman contends that by 1871, however, it was no longer tenable to claim that universities had scientific goals totally separate from the practical goals of the polytechnical schools.

Since Tuchman's conclusions are based on solid archival research, and since she has thoroughly incorporated earlier work, the book is difficult to criticize. A minor criticism is that because the material is organized thematically and chronologically, the narrative is sometimes difficult to follow. But overall in *Science, Medicine, and the State in Germany*, Tuchman ably demonstrates how a detailed study of one German state can be the basis for a wider discussion. Finally, her mastery of the archival sources and the secondary literature makes the book both useful as an introduction to the history of German science for students, and engrossing for specialists.

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