

of literacy. Knowledge without correct political discipline was seen — accurately no doubt — to be dangerous to the bourgeois order.

Gardner's book is an invaluable contribution to the literature of working-class education and it speaks directly to anyone interested in the methodology of historical inquiry as well.

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THOMAS P. HUGHES — *Networks of Power: Electrification in Western Society, 1880-1930*. Baltimore: Johns Hopkins University Press, 1983. pp. xi, 474.

This lucid and wide-ranging study of electrification cannot be recommended too highly for historians of technology in general and of electric power systems in particular. Thomas P. Hughes describes and analyzes the changing configuration of electrical generation, transmission, distribution and consumption from the small central station systems of the 1880s to the large regional power networks of the 1920s. His approach is both comparative and theoretical. On the one hand, Hughes examines the evolution of electrical supply in the United States, Britain and Germany (only passing reference is made to Canada). On the other hand, he rests his analysis of particular individuals, inventions and institutions on the assumption that the history of all large-scale technology is a history of "systems".

According to Hughes, electric power systems evolved through five phases: invention and development; technology transfer, during which site-specific technologies were adapted to different environments; system growth, involving not only increases in size but correction of technical imbalances that obstructed fulfillment of "system goals"; the achievement of "substantial momentum" and the emergence of various organizations and political arrangements that formed what Hughes calls "the system's culture"; and a last phase when, in response to problems of large-scale planning and funding, system control came into the hands of financiers, consulting engineers and, in some cases, government agency entrepreneurs. This model enables Hughes to order a vast array of technical detail while incorporating non-technical elements into his story of systems development. It suggests a universal pattern of evolution while allowing for the isolation of those characteristics which defined a system's distinctive "style". Hughes argues that, as an explanatory device, the model is at once peculiarly appropriate to the systems outlook of electrical men such as Thomas Edison and generally applicable to the history of other modern technological systems. He suggests, indeed, that the study of technology in light of his model is revealing of the systematizing nature of modern societies.

This book, then, is ambitious in scope and purpose. While close attention is devoted to specific problems, such as the contribution of Lucien Gaulard and his English partner, John D. Gibbs, to transformer development in the 1880s, or the metamorphosis of the American firm of Stone and Webster from a partnership of consulting engineers into a large utility holding company in the 1920s, these are always discussed in the context of broader issues. In the case of Gaulard and Gibbs, their work is related to the general significance of transmission and distribution in electrical supply systems, to the phenomenon of simultaneity in the invention process and to the problem of technical imbalances in systems growth. In the case of Stone and Webster, their transformation is related to early twentieth-century structural trends in the electrical industry and to the regionalization of power systems that occurred after the World War I.

In addition to constructing a model of system formation and growth, Hughes offers certain concepts for understanding the internal dynamic of technological change, notably the military met-

aphor of “reverse salients”, which he uses to describe technical imbalances in the third phase of the model. Inventors and engineers viewed technology as a goal-seeking system and were therefore concerned, like military strategists, to identify components that hampered the system as a whole. These were then defined as “critical problems” and corrected. When such corrections failed to harmonize with existing components, new systems were called forth, a process illustrated by the resolution of the conflict between direct current and alternating current systems.

The order and coherence that distinguish this study are achieved at some cost. In adopting the systems approach of his leading individual and institutional characters, Hughes substantially accepts as his own framework their basic assumptions of technological rationality. The result is an engineer’s analysis of electrification from the inside out, and the social dimensions of the process, despite the book’s sub-title, receive comparatively little consideration. Still Hughes is not unaware of the Whiggish tendencies of his model. He insists that technology is man-made, that it is not neutral and that the capitalist entrepreneurship of Edison, Emil Rathenau, Samuel Insull and Charles Merz was integral to their system building. And if systems have an internal drive and a universal character, Hughes also argues that they are influenced and differentiated by culture, geography and historical contingencies. Certainly, readers with any awareness of Adam Beck and Robert Bourassa will acknowledge the force of his contention that technological systems acquire a conservative momentum.

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VERNON L. LIDTKE — *The Alternative Culture: Socialist Labor in Imperial Germany*. Oxford: Oxford University Press, 1985. pp. x, 299.

This volume represents a rather unique attempt by Professor Lidtke to see German Social Democracy prior to 1914 from a radically different perspective. Instead of explaining this movement from the point of view of the Social Democratic Party or the leaders of the powerful pre-war trade unions, he has literally gone into the popular working-class associations of the time to determine more closely the feelings and ideas of Germany’s emerging laboring class. Making use of analytical techniques that have become common to social history over the past 20 years, Lidtke progressively examines working-class clubs, the festivals they held, the songs they sang, the poetry and drama that they listened to and the lectures and courses they attended. This prolonged look at working-class life from the bottom up is a major contribution to German historiography. Dr. Lidtke is at the very same time an extraordinary writer. There is real power in the clarity and simplicity of his writing style. His meanings are never in doubt. But this strength turns against itself as the volume progresses, primarily because Lidtke’s crystal-clear interpretations unfortunately, on occasion, carry him beyond the evidence he has himself accumulated.

The media by which the workers themselves, in the words of the author, created their own “social [and] cultural milieu” were the voluntary associations, or *Vereine*, of this era. They steadily sprang into existence before the anti-Socialist laws of 1878 and especially after those laws were struck down as of 1890. The two oldest and, as it turned out, the largest groups here were the singing and gymnastic clubs. Other voluntary organizations encouraged such physical activities as swimming, boxing and rowing as well as the exploration of nature. Because Lidtke is not strong when it comes to numbers, it is difficult to tell from his narrative just what percentage of the German working class belonged to these voluntary associations. According to the contemporary German historian, Michael Schneider, the free trade unions had enrolled by 1913 slightly more than two million members, of whom Lidtke says some 186,958 were organized into gymnastic societies. But the actual number of those involved in singing and other societies is never definitely stated. As a result, it is impossible