Book Reviews

Space, Technology, and Society: From Puff-Puff to Whoosh

This delightful spin-off from the moondoggle is a wonderful illustration of the principle that excuses are always more important than reasons, and that even the flimsiest of excuses can produce results which the best of reasons cannot supply. The excuse for this volume, **The Railroad and the Space Program: An Exploration in Historical Analogy** (M.I.T. Press, Cambridge, Mass., 1965. 245 pp., $7.50), edited by Bruce Mazlish, was an invitation from the National Aeronautics and Space Administration to the American Academy of Arts and Sciences to make a study of the effects of space activity on our society. As these effects are still largely in the future, the first impulse of the study turned towards the past, and this volume, as its subtitle indicates, is an attempt to use historical analogy to uncover certain patterns in social systems which might be repeated in the present and future. There is a brilliant, if somewhat long-winded, defense of this procedure by the editor, which constitutes the first essay in the volume; then there is a series of seven essays by different authors on various aspects of the impact of the railway on the United States in the 19th century. Each essay concludes with some remarks on the application of the principles discovered to the space program, which remind me, I am afraid irresistibly, of the libations to Marxism-Leninism which usually accompany quite sensible Russian works. The essays themselves, however, are of uniformly high quality, well written, instructive, and provocative, and any one of them can stand on its own feet without reference to the ostensible excuse for the book. However, the excuses, that is, the references to the space program, are also quite entertaining, are certainly not expected to be definitive, and form, as it were, a pleasantly decorative icing on the good cake of scholarship.

In the first of the seven essays, Thomas P. Hughes discusses the railroad as a technological frontier, and makes the railroad almost look like a mere transitional stage between the canal and the subway. However, the impact of the railroad engineer and of the railroad on the development of engineering schools is duly noted, and although the contribution of the railroad to overall technological development is probably more modest than popular imagination perceives, it is nevertheless noticeable.

The next two essays, by Robert W. Fogel and Paul H. Cootner, are on the economic aspects of the railroad. Both essays summarize larger works, and they represent a rather fundamental reevaluation of the impact of the railroad on American development, which represents almost an anti-railroad school of thought. Fogel, in a remarkable statistical tour de force, has made a rough calculation of the total impact of the railroad on American development in quantitative terms, and finds it surprisingly small. We could, apparently, have gotten along without it, with canals and roads. A possible weakness of this analysis is that it is concentrated very heavily on the transport of goods, somewhat to the neglect of the impact on passenger transportation. Nevertheless, the main points are made cogently, and I must confess that my own image of American history was substantially revised as a result.

In the next essay, Alfred D. Chandler, Jr., and Stephen Salsbury discuss the impact of the railroads on business administration and organization. It is at this point, perhaps, that the impact was greatest. Railroads, the first of the big businesses, developed an interesting variety of styles in organization, and their experience undoubtedly carried over later into the organization of the great corporations. The struggle between centralization and decentralization on the railroads foreshadows similar struggles in General Electric, the Soviet Union, and other large economic organizations.

The next essay, by Thomas C. Cochran, studies the social impact. This is somewhat more of a "think piece" and less based on original research than the others, perhaps because the research has simply not been done. Within the limitations of its material, however, it is a charming and insightful essay. The next essay, on the political impact, by Robert L. Brandfon, is a case study of the fight between the State of Mississippi and the Illinois Central. This again is delightfully written and recounts a very entertaining episode in American history. The last essay, by Leo Marx, on the impact of the railroad on American imagination, is the briefest but in many ways the most stimulating. Here again it represents, in a sense, a summary of a much larger work, and the central theme of "the machine in the garden" is vivid and illuminating.

The opening paragraph of the book betrays the origins of the space program in our fear of "the vengeance of history," which is risked, according to Representative George P. Miller, by "whosoever says going to the moon and Mars is a waste of money." The same vengeance is also risked by those who say it is not a waste of money, and it could well be that the space program is a prize example of how history exacts vengeance by being misread. If the impact of a volume of this kind is to give us a few second thoughts about historical parallels, the spin-off will be well spun.

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Palynology

Palynologists have waited a long time for the publication of this text volume, **Pollen and Spore Morphology. Plant Taxonomy—Gymnospermae, Bryophyta**, vol. 3 (Almquist and Wiksell, Stockholm, 1965. 216 pp.), by Gunnar Erdtman. It is a companion volume to the illustrations (vol. 2) which were published in 1957. Volume 3 is divided into three parts, of which the first provides a very brief account, arranged by families, of megaspore membranes of the Gymnospermae. The next part, alphabetically arranged, *Abies* to *Zamia*, consists of the descriptions of some 64 genera and an uncounted number of species. The third part is devoted to the descriptions of 245 genera and representative species of Bryophyta. This compilation makes available, for the first time in one place, the generic descriptions of