Memory Practices in the Sciences. Geoffrey C. Bowker. Cambridge, MA: MIT Press, 2006. 312 p. ISBN 0-262-02589-2. $34.95.

Geoffrey C. Bowker's latest book, *Memory Practices in the Sciences*, continues his intellectual project set forth in his previous works such as *Sorting Things Out: Classification and Its Consequences* (with Susan Leigh Star, 2000) and *Science on the Run: Information Management and Industrial Science at Schumberger, 1920-1940* (1994). Specifically, he investigates the way that science structures history as the mediation of time and information through analysis of three "memory epochs" from the nineteenth century through to the present day.

Bowker first discusses the changing nature of geology in the nineteenth century as impacted by Charles Lyell's magnum opus, *Principles of Geology* (1830-1833). Lyell redeveloped geology radically through his statement that sets of geological forces were identical through time rather than there being isolated, abrupt changes. Since our knowledge of geology is limited to the most recent geological events, this prevented the geologist from studying the origin of the earth, as no traces of it were accessible for study. Bowker links Lyell's theses to the changing nature of time and memory as a result of the Industrial Revolution in three main areas, which all can be considered forms of a "second nature": the quantification of time into discrete, exchangeable units (time as currency); the regularization of time qua metaphor of mechanization (time as order); and the standardization of time necessary for globalization (time as coordinate). Bowker also asserts that Lyell's geology was a reaction to a rapid information explosion and served as a classification system for it, replacing the singularity of geological events with the systematization of a limited set of events.

Bowker's second area of analysis is cybernetics, which developed first in the United States following the Second World War. The overarching principle of cybernetics is the existence of an idealized set of machine forms, which allows for the description of any type of machine behavior. Cyberneticists viewed a wide variety of systems such as guided missiles, economies, and animal and human behavior as machines that responded to input to produce feedback. This universality of cybernetics was matched by its emphasis on collaboration of researchers across various disciplines with the ultimate goal of subsuming all of them into a metascience of cybernetics. This in turn required the development of a common language that could address the functional similarities of mind and machine. Bowker implies that cybernetics thus attempted to eradicate the differences in time scale across disciplines, replacing it with a "time with agency" that characterized past scientific developments and anticipated others through continuous adaptation. His conclusion is that these ideological aspects of cybernetics eliminate the need for history of science since it would inadequately capture the entirety of the constantly evolving system and inhibit the system from responding to feedback properly. In essence, memory must be destroyed to allow the subsumation of all disciplines and systems into cybernetics.

The remaining three chapters are dedicated to investigating the emerging science of biodiversity and its memory practices. Bowker's overwhelming emphasis on this topic is explained by the nebulosity of biodiversity as a field. In opposition to cybernetics, biodiversity seeks to classify all entities within the "web of life" yet preserves the interactions between them across spatiotemporal axes in an idealized unified database. However, researchers across disciplines, geographical area, and taxonomic specialty must interact for mutual benefit, but also protect their individual interests, which are often economic. Differing classification systems that have varying degrees of incompatibility and the inability of individual systems to classify everything efficiently further complicates the state of biodiversity. Accordingly, there is no monolithic database that has successfully flattened the landscape of biodiversity information while meeting the needs of all researchers. Bowker concludes by noting two competing modalities to deal with the explosion of biodiversity data: a modality of implosion, where all categories of organism are given a particular

economic value, and a modality of particularity, wherein as many individual species as possible are identified, generating a complete list. Furthermore, as in the cases of geology and cybernetics, time mediates these modalities through background stasis (the boundary of culture) and foreground change (the boundary of nature).

The final premise is that between all three epochs the burden of investigation is placed upon the present, through Lyell's geology to the most recent developments in biodiversity. Ultimately, all three disciplines synchronize first with second nature and matter with metaphor successfully to varying degrees. Bowker's analysis throughout the book is lucid and remarkably easy to follow despite the complicated interconnections within cybernetics and biodiversity that comprise its majority. Furthermore, one can recognize the implications of his investigation onto a variety of other disciplines. In all, Bowker has elegantly drawn from a wide variety of literature and has created a common thread between multiple disciplines without attempting to subsume them.

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