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## The comparative and the experimental revisited

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**Bruno J. Strasser: *Collecting Experiments, Making Big Data Biology* (The University of Chicago Press, 2019). 404 pages. Illustrations, notes and index. Prize: \$45.**

At a first glance, the history of the contemporary life sciences appears as punctuated by the rise of the experimental method and a later comeback of natural historical approaches. This was the initial hypothesis of Bruno Strasser when, in 2005, he started the investigations that are now published in this book. Strasser had noted the importance of molecular sequence repositories in current biomedical research and argued that they represented a return of the practices of data collection and comparison, which had been vital for natural historians in the past and which had allegedly been replaced by the rise of experimentation in the late nineteenth century. Yet the crucial contribution of Strasser's monograph is showing that rather than being dichotomous categories that can replace each other, natural history and experimentation have always been together: life scientists have hybridised them in different ways throughout the course of the twentieth century.

This finding led Strasser to embark on a big picture history of the hybridisations. Throughout the six chapters of the book, he shows different spaces in which comparative practices and ways of reasoning were combined with the pursuit of experiments. He also addresses the obstacles and tensions that those combinations faced, especially with regard to communities holding different value systems in the attribution of credit and sharing of data. Strasser derives the analytical categories of comparing and experimenting from John Pickstone's seminal portrayal of the history of science as the result of changing interactions between different ways of knowing and working. The negotiation of conflicting value systems is drawn from the work of Robert Kohler and his proposal of moral economies as a framework to interpret the dynamics between different communities in the history of biology and genetics. Another source of inspiration of the book is Lynn Nyhart's critical approach to the emergence of modern biology and her observation that life scientists combined natural history with experimentation rather than replacing one for the other.

The first two chapters of the book address instances of interaction between the comparative and the experimental. One of these instances are the stock collections that geneticists and other life scientists compiled to experiment with mice, corn, flies or other so-called model organisms. In the mid-to-late twentieth century, these collections transitioned from being shared by laboratory researchers to being held at stock centres whose regime of funding and administration found inspiration in that of the museum. A similar hybridisation of the practices of the museum and the laboratory occurred around the collections that experimental taxonomists and molecular evolutionists gathered since the early 1900s. They ranged from blood sera to protein and DNA data, and enabled them to derive new knowledge from systematic comparisons. All these collections, compiled and classified at different levels – whole organisms, physiological substances and molecular data – suggest to Strasser that the rise of experimental biology "led not to the exclusion of natural history, but to its transformation" (p.109). The practices of natural historians enabled life scientists to introduce a comparative dimension into their experimental laboratory work. This led to the production of new knowledge, but also to tensions, mainly between natural history's concern with diversity and the drive of experimental biologists towards standardised model organisms.

Chapters three to six deepen Strasser's investigation of the collections of molecular data. He addresses the databases of protein and nucleic acid sequences that emerged from the 1960s onwards and the contemporary development of repositories of protein structures determined through x-ray crystallography. A main narrative thread through these chapters is the negotiation that these data banks required between the communities compiling the entries and those

determining the molecular sequences or protein structures. With the rise of molecular data, these communities gradually diverged and showed discrepancies in their moral economies regarding intellectual property and credit attribution. These discrepancies, which derived from the different cultures of natural history and experimental biology, underpinned the competition between two groups in the United States for the contract to develop the first centralised DNA sequence database at the National Institutes of Health. Margaret Dayhoff, based in the National Biomedical Research Foundation, had more experience in developing this type of repositories, but her drive to collect the sequences prior to their publication clashed with the will of the sequencer biologists to protect their discoveries. Walter Goad at the Los Alamos Laboratory devised a system that relied on the journal editors, who would make the submission of the sequences to the database a requirement for the acceptance of the manuscripts. This system ensured that the sequences would be available through open access, while protecting the priority of the biologists who had determined them. It was crucial for the award of the grant to Goad and the emergence of a new category of professionals, the bioinformaticians, that administered the flow of unpublished sequences from the journals to GenBank and the other databases in Europe and Japan.

Building on this, Strasser queries the novelty of the current dependency of biomedical research on data. If big and open data in biology constituted a revolution, it was “a very conservative one” (p.267) since it required harmonising the reward systems in a way in which freely sharing laboratory evidence – DNA sequences or any other potential database entry – served the interests of the community of experimental biologists. Universal access to these data repositories has made comparison a routine practice that is naturally hybridised with experimentation in today’s biomedical laboratories. Yet according to Strasser, the history of divergences and negotiations behind this hybridisation shows that it was “the product of a deep epistemic, social and political transformation” throughout the twentieth century (p.271).

Strasser’s monograph is a welcome addition to attempts by historians of uncovering the long-term trajectory of today’s biomedical practice. As Michel Morange has recently done with *The Black Box of Biology* (Harvard, 2020) and Hans-Jörg Rheinberger and Staffan Müller-Wille did with *A Cultural History of Heredity* (Chicago, 2012), Strasser shows historical processes that have fundamentally transformed biology and its connection to medicine. These processes sometimes operated gradually and sometimes more rapidly, but their proper analysis invariably requires an insight into the past. Strasser’s approach to collection and experimentation as historically intertwined categories is an invaluable tool for achieving such an insight.

His concept of hybridisation, however, sometimes conceals the direction in which the intertwinements operated and the consequent power dynamics. During and after the sequencing of the human genome, some medical geneticists regretted having been recast as ‘users’ who would experiment with the resulting reference sequence rather than being involved in the collection of the data. This feeling of exclusion reflects actors whose voice was left aside in the process of hybridisation of genomics research. Conversely, the genome centres that determined the sequence gained unprecedented influence by positioning themselves as the collectors in that hybrid culture.

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