2 *Practices and materialities*

Professor Balthazar is a figure that many Swedes remember from 1970s' children's television. In every episode, the cartoon professor dealt with all the problems he encountered by going to his chamber, wrinkling his brow and pacing about, to then – after a eureka – have the hurly-burlytron machine blend a concoction that magically solves the problem. Of course, this is not how scientific knowledge formation works. Scientists do need to think sometimes, but scientific work definitely requires the world outside their chambers. Information must be gathered, processed and analysed, instruments and other apparatus must be built, calibrated and then used, and numerous other actors must play their part. Knowledge formation thus has practical and material conditions that enable, and sometimes prevent and limit, its activities.

In recent decades, research in the history of science has talked of a "material turn". Naturally, a turn presupposes something that is turned away from, and in this case it refers to an older tradition focused on scientific theories, ideas and texts. It has become increasingly clear that research must also examine science's material conditions – objects, instruments and, by extension, the practices surrounding them – to understand the processes involved in knowledge formation. How, and with which tools, did a chemist perform the analysis that produced an element, and what could this say about the formation and establishment of knowledge? What did it mean to look into a 19th-century refractor with an astronomer's trained eye, and how can this help us understand what was known, or not known, about the heavens' nebulae, for example? One consequence of this turn towards the material, towards the tangible, is that historians of science are forced to broaden their methodological repertoire. Another consequence is that boundaries with other fields, such as the history of technology, of art or of emotion, become less defined.

In the following essays, we meet a few examples from the practice of scientific knowledge formation. We start in cold conditions – on Svalbard,

in the Arctic, and high in the Himalayas – to see how data is gathered in the field. As we will see, observations are not only made using advanced equipment. Paper, pen and a good eye can be quite enough. As well as a kite, a balloon or a camel. There is also an essay about the Abisko Scientific Research Station, which has been a material requirement for both environmental and polar research thanks to its resources and its location north of the Arctic circle.

This is followed by a few essays inspired by the world of astronomy. In popular culture, the astronomer may be the type of scientist who most often has Balthazarian features – alone in a tower, gazing out across the heavens, on the hunt for comets or whatever might be out there. But the observational astronomer would not be able to study heavenly bodies without the help of cartographers and their star atlases, without the help of instrument makers and the telescopes they build or, when the amount of data is too great, without the help of assistants and calculating machines that perform all the thousands of calculations the analyses require.

The section concludes with two essays that deal with analyses, the work that is done to transform data into something meaningful and comprehensible. Here, the examples are of different types. First, we meet the supervisor of the Academy of Sciences' natural history cabinet, Anders Sparrman, who wrestled with the issue of how all the collected specimens should be ordered and categorised, among other things. From Sparrman's 18th century we then take a brisk stride through time to the late 20th century, and the visual technology that has been used to reveal the ecosystem of the Baltic Sea.

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