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Essay review*

The disunities of representation

Lorraine Daston and Peter Galison, *Objectivity*. New York: Zone Books, 2007. Pp. 501. ISBN 978-1-890951-78-8. £25.95 (hardback).

Here is a wonderfully rich and wide-ranging book, with a wealth of insights and beautiful pictures. It spans from early modern botany to nanotechnology, and from the intricacies of illustrative techniques to subtleties of epistemology. Some of the arguments will be familiar to those who have followed Lorraine Daston and Peter Galison's project on atlases, but much has been added, not just about the reconfigurations of 'subjective' and 'objective' in the decades around 1800, but also about structural objectivity, and about recent techniques of creating images which might be called synthetic.

The plot begins with the pre-1800 ideal of 'truth to nature', centred on the problem of representing plant species. Did one picture a particular plant, including any 'imperfections', or depict the typical plant of the species? Truth to nature is said to have been practised by sages, such as Goethe, who used intuition to select or synthesize the ideal, the universal of the species. Such was truth before the 'mechanical objectivity' which is then explored as one historically specific form of veracity and scientific morality, created in the early nineteenth century, especially through the deployment of machines – although, as the authors recognize, the dilemmas of species depiction continue to the present, not least for botanical illustration.

Objectivity, unlike sage idealizations, was about representing the world 'as it truly is', with all its asymmetries and imperfections. The model for this objectivity was often photography – imagined as a mechanical process whereby a piece of nature rendered itself permanently and clearly visible, whatever its original size or temporality. Photographs bypassed the observer's expectations, suppositions or bodily imperfections, but to make a faithful recorder of oneself involved great discipline – a virtue much stressed by Victorian scientists.

That this form of quasi-mechanical representation could be called 'objectivity' followed from radical shifts in terminology around 1800. In medieval philosophy, 'objective' had meant 'as object of the mind', as opposed to the essence of the subject. But after Kant, and in various ways, the objective became, as Coleridge put it, nature 'in its passive and material sense', whereas 'the sum of all that is subjective we may

* I am most grateful to the generous authors, the *BJHS* reviews editor, and my Manchester colleagues for discussions of the book and of this review.

comprehend in the name of the self or intelligence'. From the early nineteenth century, the old and new knowledge disciplines then being put together as 'science' were chiefly about this objective world. They were often explicitly concerned with 'accuracy' but it is not entirely clear how commonly 'objectivity' as such was emphasized before about 1870, when photography became easier to use.

But the revised objective/subjective distinction offered a new challenge both to and about the observers: if mechanical aids could guarantee objectivity in studying physical objects, could one also attain objectivity when studying the mind, or at least sensations? A new analysis of sensation, seeded by Goethe and pursued by Purkinje and other German physiologists in their laboratories, could converge with objectivity about the self in the 'personal equations' of scientists who saw themselves as recording systems and corrected for their idiosyncrasies. But perhaps there was another way to escape the individuality and cultural dependence of sensation and interpretation? Perhaps there were indisputable structures underlying the world and our experiences? Here the book departs from its concern with atlases to discuss the structural objectivity pursued by Frege, Carnap and others, and currently of interest to some philosophers of science.

Then we return to atlases, with Galison and Daston claiming that after around 1920 devotion to mechanical objectivity gave way to a stress on 'trained judgement', as when medical professionals insisted that 'objective' records did not speak for themselves. Radiographs, for example, now seemed to require interpretation by experts who recognized families of resemblance in ways that were impossible to mechanize.

The last substantive chapter shifts from representation to 'presentation', to the construction of images which are not to be judged against nature. Examples of the thoroughly synthetic include fractal patterns, but one might also note the intriguing issues which surround current representations of the very large or very small, of galaxies or cell organelles, where the colour and other parameters of images can be adjusted at will, and – to borrow the theme of another Galison book – it is not at all clear how image-making ends. The arguments of the whole book are then reviewed, including a table which contrasts 'truth to nature', 'mechanical objectivity' and 'trained judgement'.

That the first and third of these categories contrast well with the second seems clear, but how well truth to nature and trained judgement contrast with each other may be open to question. The distinction drawn here seems to rest heavily on the decline of essentialist views of taxonomy, but how the complex histories of taxonomic theory were related to representation, or indeed to ordinary taxonomic practices, remains unclear, even for plants. Many long-standing issues of botanical or anatomical representation certainly persisted through to the present, and some of the same issues seem to have recurred from the nineteenth century for machine traces or photographs and so on, in as much as they were used for identification. If that is so, it would problematize the relations of all three modes.

The authors sometimes reply that the older modes persisted – which seems true but insufficient, for we are not discussing mere 'survivals'. We need to see how older modes related to newer modes, and were changed by the interactions. Though the ordering of the book is largely chronological, the relations discussed often seem as much synchronic as diachronic, as much structural as sequential.

For example, if we are trying to separate enlightenment truth to nature from later trained judgement, the appeal to Goethe and his 'types' seems little help. His association with the new analytical discipline of morphology surely points to a deeper understanding of plant form which runs forward into the nineteenth century and should not be conflated with long-standing commonplaces of botanical illustration. The more that nineteenth-century botanists followed de Candolle, especially, and grounded their taxonomies in comparative anatomy, the more they were sure that their categories were true to nature. Their revised taxonomies depended on newly 'structured' knowledge, on new 'object relations', as it were – though the ability to recognize plants and animals in the field remained more a matter of trained pattern recognition than dissection.

For the distinction between trained judgement and mechanical objectivity, however, we may need to stress social relations. For example, medical men interested in new diagnostic technologies often emphasized mechanical objectivity when debating with less technical colleagues, but when differentiating themselves from subordinate (often female) technicians, they usually stressed the intangibles of expertise.

Such points suggest the possibility of a complementary reading of the book's materials, stressing continuities at various levels of knowing, but including changes in the configurations of 'scientific work' – both social and cognitive. We can begin our alternative exploration with the persistent problems of representing and arranging objects from their surfaces – what might be called natural history in its most extended (Baconian) sense. We can then turn to the different, but also persistent, questions which, especially from the late 1700s, attended the analysis of objects, or the presentation of images constructed from analytical data.

At least as a working hypothesis, one might claim that from the later seventeenth century, wherever there were kinds to be described, grouped and identified, there were questions about typicality, individuality, boundaries and hierarchies. Many recurrent issues about classification in general – including 'system' versus 'method' (and 'family resemblances') – were discussed for eighteenth-century plant natural history and related to general theories of knowledge. The same issues continued to arise in medicine or meteorology, in studies of landforms or handwriting, or later for 'medical traces' or photographed paths in cloud chambers.

Within this 'extended natural history', representations differed in part according to the intended functions of the particular compilations. Atlases of plants or anatomy often stood alone as 'paper museums' – quite different from field guides for identification, or handbooks to guide dissection. Some collections – for example, photographs of particle paths or snowflakes – were selected from records of transient phenomena, where there could be no comparison with the 'real thing'. Theoretical positions might also be important. Thus, for example, if some later authors chose to depict the variety within a plant species, or the varieties of snowflakes, that might reflect a concern with variation, as much as any general epistemological shift.

All these mini-genres of atlases doubtless had their own temporalities, which were related in part to shifting theoretical positions, but it is not clear that they reduce to a common sequence around objectivity, or that they can be analysed without close attention to the social relations of the makers and users of images. For example, if a new

stress on trained judgement seems to have been general in the sciences of the early twentieth century, it may be partly because many disciplines were then being institutionalized in parallel – with new cadres of under-labourers, and the 'differentiation' effects noted above. Roles and virtues which had been exercised by single 'selves' were now distributed.

At this level of 'extended natural history', modes of representation were also related to aesthetics, and not least to the complex of 'realisms'. These included the intense concentration on particularities (including temporal and spatial specificity) which is found in some varieties of natural history, and in seventeenth-century genre-paintings or still lifes, or in William Hunter's 'enlightenment' illustrations of obstetrics, or Charles Bell's early nineteenth-century drawings of dissected corpses. To judge from the considerable secondary literature on anatomical and botanical illustration, 'objectivity' seems to have been a minor issue, except around photography – which was rarely used in these established genres, even at the end of the nineteenth century.

Indeed, photography might be seen as extending pre-existent concerns with realism and with collecting, rather than as a radically new 'mechanical vision'. It extended the eighteenth-century fashion for 'albums' in as much as buildings, for example, were more easily 'collected' and compared as photographs than as drawings. As an attempt to 'short-circuit' or to control drawing, photography joined the older *cameras* or such eighteenth-century novelties as printing direct from dried plant specimens. True, the utility of such 'mechanical' techniques was always debatable – but so too was scientific photography, as Jennifer Tucker's recent book nicely demonstrates.[1]

For more 'scientific' purposes, photography did not replace drawing; rather it proved critically important where drawing was not possible – when it was used to extend the visible. And here we enter yet another long, transdisciplinary story – the problems of extending 'natural history' to include phenomena which were too small or large, or too fast or slow, for the naked eye. Though the key atlases in this book include photographs of rapid events such as 'splashes', there is little discussion of historical distinctions between the (normally) visible and invisible – even though the long history of 'scopes' might have helped us judge the specificities of the nineteenth-century answers to these questions.

Nor, in spite of the inclusion of contour maps of solar magnetic fields or ECG traces, is there much exploration of how such representations seem to go beyond depiction in being 'made up' from measurements (or of representation in mathematical sciences such as positional astronomy). These last questions are important because they depend on the articulation of 'layers' of understanding, or ways of knowing, notably the relations of 'extended natural history' and the various kinds of analysis – to which we can now turn.

On the one hand, ECG recordings and the like were objects for classification and identification. Doctors took pride in recognizing graphic patterns and their significance, as they did for peculiar symptoms. In that respect, ECG traces may be regarded as extensions of natural history, like most such scientific traces. But on the other hand,

1 J. Tucker, *Nature Exposed: Photography as Eyewitness in Victorian Science*, Baltimore, 2005.

graphical traces are not, in the usual sense, images of the heart's action, any more than glomerular filtration rates are images of kidneys. They are measures represented graphically over time – potential means of physiological analysis (which aspect may affect their social placing). Sometimes you can make pictures from such measurements, sometimes not, but we may need to include both cases if we want a full view of the relations between analysis and representation.

Here it is worth recalling Joel Snyder's discussion, a decade ago, of Etienne Marey's famous films of human motion. Understood by Galison in terms of mechanical objectivity, for Snyder the images were not renderings of the visible, they were primarily aspects of measurement – part of a mechanical analysis of motion which also used measures of pressure.[2] That both these views are helpful can be shown by reflecting further on the complementarities of depictions and analyses. Some objects can best be recognized by their analytical traces, rather than their surfaces, and some traces can be made into images, as in the case of early medical ultrasound, where constructed images of body parts proved more popular than the graphical traces originally on offer. And if, in some cases, reconstructions from analyses can be directly compared with depictions of the original objects, then the two can be cross-checked, in ways which resemble longer-standing practices in mathematical sciences such as planetary astronomy. With which suggestion, we can now return briefly to Goethe.

The founder of morphology may not serve to mark off sagacity from trained judgement, but he can help us locate in time the rush of distinctions between natural-historical classifications and various forms of deeper analysis. Perhaps 'objectivity' became an issue in the early nineteenth century partly because analysis was then becoming hegemonic – no longer just in terms of mathematical reductions, but through substantive elements specific to new disciplines, such as unit crystals, chemical elements, bodily tissues, geological strata or phrenological faculties.

This hypothesis seems worth noting because it may suggest new reasons for exactitude, both in depiction and in measurement, thereby linking objectivity with 'accuracy' and increasing our historiographical resources for explaining why the several decades around 1800 proved so transformative.[3] If surfaces were to be a check on the adequacy of analytical models, and vice versa, then accuracy mattered at both levels, and they needed to be independent. Objectivity in representation was in part a way of withstanding the specific temptations of reductive simplification; moral power would allow analytical accounts to be tested against independent data. Methods

2 J. Snyder, 'Visualisation and visibility', in *Picturing Science, Producing Art* (ed. C. A. Jones and P. Galison), London, 1998, 379–97.

3 For more on this approach to the period, and more generally on 'levels' of knowledge, see J. V. Pickstone, *Ways of Knowing: A New History of Science, Technology and Medicine* (Manchester, 2000 and Chicago, 2001); and *idem*, 'Working knowledges before and after c. 1800: practices and disciplines in the history of science, technology and medicine', *Isis* (2007), **27**, 489–516. I would note here that this approach can also be linked to the Kantian shift explored by Daston and Galison, and to their discussions of structural objectivity and synthetic representations.

and epistemologies had changed, in part, because the projects of the sciences had changed.[4]

In all too little space, I have tried to show that the histories of pictures, atlases, methodologies and epistemologies need not be explored in terms of 'science' as a single evolving Quinean network, albeit with 'survivals'. They might also be examined in a more explicitly pluralist and cumulative frame – for definable, long-running genres of material and social practices, for 'ways of knowing' working at different levels, interacting in subtle ways, and being reconfigured over time. But, of course, that systematic search for plurality and productive interactions must extend also to historiography. Whatever your own narrative or analytical predilections, here is a colossal book with which to stimulate, feed and test your hypotheses and methods. That one can argue with the book is a measure of its quality.

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4 The links between mathematical sciences and microscopy are beautifully developed in J. Schickore, *The Microscope and the Eye: A History of Reflections, 1740–1870*, Chicago, 2007. One may also note that checking analytical accounts against accurate measures became a recognized method of discovering 'residuals' in both chemistry and physics. 'Virtue' could bring novel rewards.