John Bender and Michael Marrinan, *The Culture of Diagram* (Stanford, Cal.: Stanford University Press, 2010). 296 pp. $60.00 U.S. (cl). ISBN-10: 0804745048.

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The Culture of Diagram is about a way of thinking we take for granted, one that relies on the interaction of an individual with a range of text and graphic media to actively make knowledge. A major foundation for Bender and Marrinan is the work of Lorrain Daston and Peter Galison, whose 2007 book *Objectivity* deals with the historic development of pedagogical books or "atlases" used in the empirical sciences (astronomy, anatomy, botany, geology, zoology) to train the eyes of specialists to see what is important for their disciplines. Daston and Galison define the atlas as a systematic compilation of "working objects", graphic representations of the range of things encompassed by a discipline. The overriding purpose of such representations is of course not aesthetic but dependant on what is deemed important to understand about the phenomenon being represented at the time the atlas was compiled.

Daston and Galison posit the development of three successive approaches to the representation of physical phenomena since the eighteenth century, each a response to new regimes of representation (e.g., photography) or the emergence of new "codes of epistemic virtue" that define ways of seeing in the sciences. What Bender and Marrinan seek to understand is how "working objects" or diagrams – non-aesthetic representations of things – became part of a process of knowledge-making embedded in many contemporary disciplines. Whereas Daston and Galison posit a rupture in the nineteenth century based on the invention of the concept of scientific objectivity or "blind-seeing" that attempts to erase the presence of the observer, Bender and Marrinan suggest that "the culture of diagram" is an approach to knowledge-making which transcends the Foucaultian divide between the classical and modern ages, linking our contemporary moment back to the mid-eighteenth century.

The Culture of Diagram opens with a description of computer-aided robotic technology currently used in eye surgery (chapter one). The point the authors wish to stress is that the computer-generated diagram is the thing being manipulated by the surgeon and guides the process of decision-making in the course of the operation, not the eye itself. The surgeon operates at several removes from the thing being sliced open, since she neither wields the knife nor looks directly at the organ being cut. How did we become accustomed to so disjointed a view reality or, more precisely, how did an approach to knowledge-making emerge in Western culture that allows for a continual, iterative process of analysis in real-time? How did the receiver of data become a participant in the making of knowledge and what consequences does such an active role for the observer have on the way that information is represented? The relevance of these questions is underscored by our comfort with all kinds of virtual reality environments, perhaps the most banal example being the increasing reliance on the use of GPS technology for navigating to the nearest grocery store.

The diagram is not a thing that stands on its own like a painting or which illustrates a concept in a linear sequence of steps like a cartoon-strip. Nor is a diagram a mere decorative appendage to text. The diagram is a graphic image used in conjunction with text to describe a thing or a process (GPS street view + computer-generated voice instructions + old-fashioned street signs). It does not aim to create

an illusionistic sense of verisimilitude and is thus in some respects deliberately reductive. It is a "working object" incomplete in itself, a vital component of an array of data used to describe a phenomenon. The diagram serves a didactic function and is part of an open-ended, non-linear process of knowledge-making, the outcomes of which are dependant more on the process of reading and interpretation than on some predetermined trajectory. The diagram in conjunction with text empowers the reader to make her own narrative about the reality these representations seek to describe.

The qualities of knowledge-making fundamental to Bender and Marrinan's definition of "the culture of diagram" sit well with the nature of late eighteenth-century literary production described by Northrup Frye in "Towards Defining an Age of Sensibility" (1956). For Frye, the distinctive feature of pre-romantic literature was an emphasis on process. Bender and Marrinan situate the origins of the culture of diagram in the same cultural moment, using Diderot and d'Alembert's *Encyclopédie* (1751-1772) as a demonstration of how image-text juxtapositions were used in the eighteenth century as part of an open-ended process of knowledge-making. Diderot's definition of the word "Encyclopédie" – a manifesto and instruction manual for readers – stressed that the alphabetic ordering of the volumes imposed no strict limitations on how to approach the material contained therein, encouraging readers to pursue their interests unhindered by the will of the editors. The system of "renvois" or cross-references embedded in individual articles allowed the reader to flit about the *Encyclopédie* like a bee in a field of clover, creating knowledge from unexpected juxtapositions. Diderot imagined the *Encyclopédie* to be like a well-ordered garden of carefully planted trees, a two-dimensional grid of *allées* down which the reader could amble gathering discrete nuggets of information.

An examination of the illustrations of the *Encyclopédie* reveals a disquieting heterogeneity even within individual plates (chapter two). The central role of diagrams in constructing knowledge was one of the principal innovations of the *Encyclopédie*, since illustrations were largely absent from the *Cyclopedia* of Ephraim Chambers (1728) that served as the inspiration for Diderot and d'Alembert's project. The emphasis of the *Encyclopédie* on the "arts et métiers" – what would now be labeled applied sciences and technology – necessitated a complex approach to the description of processes little familiar to most readers. As Bender and Marrinan observe, many of the plates combine different kinds of illustration such as views, plans, and details of apparatus that do not present an exhaustive or even complete description of a process. The reader is provided with multiple points of view rather than a window-like glimpse into the workshops and ateliers of the ancien régime. In this approach to description, Bender and Marrinan see an assault on the unitary vision of representation embodied in the Renaissance system of one-point linear perspective, a kind of fragmentation that shifts control away from the author and empowers the reader to reconstruct reality according to their own mental powers and interests. The "bossy" narrative is replaced in the *Encyclopédie* by something more open-ended, much as Svetlana Alpers and Michael Baxandall saw Giovanni Battista Tiepolo throwing out the "bossy" conventions of one-point perspective as he attempted in his gigantic frescoes to address a modern viewer who is "active physically, restless optically, [and] un-passionately curious." [*Tiepolo and the Pictorial Intelligence* (New Haven and London: Yale University Press, 1994), p. 166.]

The fragmented régime of graphic representation revealed by the plates of the *Encyclopédie* was reinforced in the entry on "Description" (1754), which juxtaposed the ideas of four authors addressing description in the natural sciences, mathematics, rhetoric, and aesthetics (chapter three). Bender and Marrinan's analysis of the concept of "Description" and its ramifications in Diderot's writings on theater, Jean-François Marmontel's aesthetics, and Jacques-Louis David's paintings (chapter four) are the central contributions of *The Culture of Diagram* to understanding how the observing subject was reconfigured in enlightenment thought. The fact that the entry on "Description" was written by four individuals underscores the fragmentation of knowledge-making the *Encyclopédie* attempted to embrace. As Bender and Marrinan note: "The text does not produce a coherent explanation in the guise of a theory of language, vision, or the perceiving body. Rather, it establishes a cluster of foundational platforms from which the task of describing was launched in several directions at once" (p. 73). Thus

Louis-Jean-Marie Daubenton (Buffon's close collaborator at the Jardin du Roi) provides a definition of description in natural history, a method aimed at establishing a hierarchy of details permitting the reader to understand resemblances and differences among things that permit grouping and comparison. Daubenton's definition of description maps closely onto Bender and Marrinan's concept of diagram as a form of representation that thwarts unity, inasmuch as it takes into account the need to adapt graphic representations of natural phenomena to the scale of the thing represented and acknowledged a need to embrace a multiplicity of points of view.

The tensions in knowledge-making that undergird the *Encyclopédie* and enlightenment epistemology as a whole are revealed in the two approaches to description in the *belles lettres* as presented by Edmé-François Mallet and Louis de Jaucourt. While the former concentrates on description as a means to invoke ideas of things, the later focuses on the imaginative pleasures and "secret emotions" that arise from the mental act of comparison. Applying the principles of the culture of diagram to aesthetics, Diderot's writings on theater provide a bridge from the book to the stage. His notion of "drame" as a genre located between comedy and tragedy mixed classical genres while transgressing their boundaries by emphasizing the crucial importance of gesture, expression, and pantomime in fleshing out narrative. At the moment French theater underwent a radical transformation whereby audience and stage were definitively separated and new techniques of lighting and composition were introduced to heighten verisimilitude, Diderot theorized a new understanding of drama based on a conception of the spectator who completes the playwright's work by assembling meaning from both visual and auditory stimuli. Diderot's conception of drama thus functioned like the *Encyclopédie*, as a machine in which individual experience built toward collective understanding.

In an attempt to restore the unifying ideal of classical aesthetics that speaks the same language and teaches the same lessons to all observers, Marmontel in his entries on theater and literature for the *Supplément* to the *Encyclopédie* (1776-1780) and *Encyclopédie Méthodique* faced off against Jaucourt's valorization of interiority which threatened to shatter any common message that could be derived from works of art. Addressing the dangers of fragmentation inherent in Diderot's theory of drama in an effort to safeguard theater as a vehicle for the expression of timeless and unambiguous values, Marmontel is positioned as an astute and sophisticated contributor to enlightenment debates about aesthetics and epistemology. Building on Diderot, Marmontel acknowledged the functioning of individual subjectivity and agreed that a sense of beauty emerged from the correlation of multiple points of view. This concept of knowledge-making, which provides the individual subject with latitude to exercise her mental powers rather than being a passive receptor of immutable truths, moves from an aesthetic paradigm built around a right-or-wrong dichotomy to one in which various interpretations of a work might emerge as complementary. Marmontel's response to Diderot thus embraced the culture of diagram rather than rejecting it out of hand, relying on emotion to serve as the binding-agent guaranteeing that all spectators react to theatrical representations as one.

Operating within the same patronage circles as Marmontel (the orbit of the Comte d'Angiviller, director of the royal arts administration) the painter Jacques-Louis David was no doubt familiar with the epistemic debates and theories of the observer outlined above. In the emergent culture of diagram, disquieting disjunctions within David's early history paintings thus acquire capital significance. The awkward perspective and stage-like composition of *Belisarius Begging for Alms* (1781) – a subject related to Marmontel's novel *Bélisaire* of (1767) – serves to heighten the observer's awareness of her own physical and subjective response to visual stimuli. Tensions remarked by contemporaries within David's construction of the *Oath of the Horatii* (1784) undermine the unitary ideals of Renaissance painting, revealing an aggregate approach to composition that seems more a collage of "working objects." For Bender and Marrinan, David's accomplishment was to graft "the descriptive and expressive potential of the diagram" onto history painting (p. 93).

Though *The Culture of Diagram* attempts to cover a period of some 250 years, the authors' fascination with a number of facets of the French Enlightenment makes their analysis one especially pertinent to eighteenth-century specialists. The possibility that knowledge of the world could be constructed through sequences of tableaux and the conception of the observer as one who moves in space and interprets sensory experience through the mental act of juxtaposing and correlating impressions can equally be found in contemporary British discourse on landscape design and French architectural theory. In the final sixty pages of *The Culture of Diagram*, the authors shift their analysis from the diagram as graphic image to a wide-ranging survey of the application of probability to an array of sciences in the nineteenth and early twentieth centuries (chapter five). The main point is to underscore the progressive replacement of direct observation of phenomena with mathematics, shifting the original site of knowledge away from direct sense perception. Mathematics and probability provided science with tools not merely for describing phenomena but for identifying the existence of phenomena that could not be perceived by any other means. The trajectory traced by Bender and Marrinan is one in which our awareness of the universe is augmented by increasingly refined instrumentation and mathematical analysis, which stand between the observing subject and exterior phenomena. The "culture of diagram" stands for a model of knowing in which the observer produces understanding by correlating information presented in any number of different forms and generated by a range of techniques that extend beyond the limited range of sense perception.

The Culture of Diagram illuminates the *Encyclopédie* in several ways, both by drawing attention to its impact on various strands of enlightenment discourse and by highlighting how the description of phenomena was subsequently transformed by mathematics and probability in the nineteenth century. The abrupt shift from enlightenment discourses on description, aesthetics, theater, and art to nineteenth-century science and mathematics tends to emphasize rather than minimize the disparities between those periods. From the observer of pictures and plays theorized in the waning days of ancien régime society, Bender and Marrinan move to consider the work of professional scientists – Gaspard Monge, Pierre-Simon Laplace, Carl Friedrich Gauss, Adolphe Quetelet, Hermann von Helmholtz, James Clerk Maxwell, Ludwig Boltzmann, Niels Bohr – whose ideas about observation and the limits of human perception reshaped whole disciplines and undermined any lingering belief that we could ever step outside ourselves and gain a stable, complete, and "objective" view of the world or of any natural phenomenon. In a very general way, *The Culture of Diagram* suggests that Diderot and d'Alembert had already theorized such an understanding when they began to construct the *Encyclopédie* and its ideal observing subject.

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