

The Microscope: Mediations of the Sub-visible World

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Isobel Armstrong's essay, "The Microscope: Mediations of the Sub-visible World," to be found in the collection *Transactions and Encounters: Science and Culture in the Nineteenth Century*, addresses how the use of the microscope became a contested issue in Victorian Britain, especially before the publication of Darwin's *On the Origin of Species* (1859). It shows how microscopy, an embodiment of technological mediation (or mediating device), was related to the idea of the sub-visible world in the field of natural science. Armstrong is largely concerned with the controversies over the use of the visual device after the microscope became a popular instrument of measurement. The mediation of the microscope transformed users' perceptual abilities, which, in turn, enabled them to observe the minute beings hidden in the natural world. Like the telescope or the lighthouse, the microscope was a serious, utilitarian, philosophical instrument for mimicking the transformation of vision in the nineteenth century. Microscopy was not just about the calibration of an optical instrument or the reticule measurement of specimens with different sizes for examining phenomena experimentally. It was also about the philosophical idea of using an optical device for popular amusement. In such a case, the knowledge revolution was intertwined with science, technology, and philosophy, which gave rise to the transformation of microscopic vision at various scales of measurement.

Armstrong's essay begins with a description of Thomas Henry Huxley's purchase of an expensive microscope as the key instrument for his nature study in 1846. The microscope at the time was a visual device for the well-to-do. Later, the demand for the commercial manufacture of optical instruments led to a

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growing middle-class market. The middle classes had the leisure needed to learn about and appreciate the wonders of the microscopic world. The public began to explore a new world of extremely small objects on the Devon coast in England when a craze for sea-side microscopy occurred. Seaside visitors explored, collected and displayed marine specimens. They also published accounts of their visits. George Henry Lewes's "Sea-side Studies," for example, was published in *Blackwood's Edinburgh Magazine* in 1856. Philip Gosse's *Evenings at the Microscope* was published by the Society for Promoting Christian Knowledge in 1859. These publications about the miniscule wonders of the microscopic world exemplify the rise in the popularity of seaside microscopy, which also facilitated the visual experience of minute specimens at the time. Lewes, Gosse, John Ruskin, and "Glasses" (a short story by Henry James) provide a series of case studies for Armstrong to discuss how the pursuit of the miniscule generated rival epistemologies of the microscope and became questionable in microscopic and anti-microscopic discourse.

It is worth noting that Armstrong links the microscopic experience with the thesaurus of transparency to describe Lewes's and Gosse's microscopic observation of specimens that are not transparent to the naked eye. Glassy apparatuses, transparent glass containers, and the slides that trap specimens were the sources of sensual pleasure for microbiologists of the Victorian era. Rather than a pleasure for the eye, the optical transparency in microscopic observation was problematic to seventeenth-century microscopists, as revealed in Robert Hooke's *Micrographia* (1665). In other words, the mediation of the microscope could be repressed. It was something that troubled Margaret Cavendish, Duchess of Newcastle and one of the most prolific female authors and philosophers of the seventeenth century. Cavendish recognized the discrepancy between the microscope's virtual image and its object (the consequence of the atopic image). She thought the enlarged image of an object under the microscope could be deceptive and therefore visually ambiguous. Magnification in this sense could distort the image of a specimen.

In contrast, the nineteenth-century microscopic gaze seemed to want to see through creation, as represented, for example, by Gosse's observation of *Polyzoa's* cells. The stress on transparency through the microscopic vision points to the indistinguishable and interchangeable relationships between observer, specimen, and optical instrument. The clarity afforded by the microscope allows the Victorians to think about the interaction between optical illusions and image formation. The visual image of the sub-visible world could be mediated through the process of pictorial representation.

Armstrong mentions two ways of capturing images in a microscope in the nineteenth century: micrometer and photomicrography. Micrometer, a device used for measuring very small things, came into general use by the 1850s, while photomicrography, a technique of taking photographs through a microscope, became increasingly used in the 1870s. These measuring techniques remind Armstrong of George Eliot's knowledge of optical technology, which is made explicit in the novelist's commentary on Charles Kingsley's 1855 historical novel *Westward Ho!*.

Concerning nineteenth-century discourses of the microscope, Armstrong's argument is at odds with Jonathan Crary's assertion in *Techniques of the Observer* (1990). Armstrong states that the question about whether seeing could function as a prosthetic agent points to the dualism between observation and measurement, between observer and specimen, and between mind and body. Armstrong recognizes Crary's achievement in giving a new shape to the history of the nineteenth-century gaze. But she criticizes Crary's borrowing of Foucault's use of Panopticon for his grand theory to discuss technologies of vision. Armstrong's critique of Crary's monologic discourse of optics raises awareness of the mechanization of sight or the prosthesis for vision as a crucial issue in the nineteenth century.

For her discussion of epistemologies of the microscope, Armstrong uses Philip Gosse as the first case to explain how scientific studies carry the divine meaning through the mediation of the microscope. Gosse employs his biblical language to describe the microscopic world as the work of an invisible God. For the naturalist, the sub-visible world is a divine text that embodies the truthfulness of God's revelation: theology is behind science. The microscope has an important effect on Gosse's teleological framework for understanding the natural world and his visual perception of organism in relation to minute details. Gosse's quest for accuracy and detail is reminiscent of the sense of sound in *Middlemarch* and Browning's 1864 poem, "Mr. Sludge, 'the Medium,'" a parody of Gosse's teleology.

Compared with Gosse, Lewes had fewer scientific credentials within the culture of rockpool hunting. In his study of marine specimens, Lewes was devoted to the discovery of a typical form. His study of the nervous system and its connection with sensibility allowed him to discover the so-called Molluscan vision. In Lewes's thinking, the eye is not just an organ of sight. It is also a tactile organ for mediating sensation. The process of image formation is a combination of tactile sensations with sensations of light.

Armstrong, then, moves on to John Ruskin for his attack on the microscope as well as his preference for looking at the natural world with an innocent eye.

Ruskin reveals his hatred of the mediation of the microscope and shows his disapproval of a scientist's dependence on prosthetic optical instruments because it blurs the distinction between the eyes and the microscope. Ruskin's hatred of all mechanical instruments indicates the conflicting views of the ways of seeing and the ways of knowing at the time, particularly in relation to the horror of urban spectacles (featured by the bombardment of visual media and scientific vision competing for the consumer's gaze). In his account, the microscope's authority is a false objectivity as the eye is technologized. Different from Gosse's preoccupation with God's eye, Ruskin reinforces the significance of the human eye.

Gosse's association of microscopic life with the struggle for mastery and Lewes's understanding of the truth of morphology both contain the social implications of Darwinism, a theory of evolution based on Malthus's analysis of population growth. For both Gosse and Lewes, the sub-visible world can be seen through, and therefore the microscope reveals the primal form of life itself. However, Darwin was not concerned about the meaning of seeing or the philosophical problems of the microscope. Instead, he was interested in how the simplest forms of life would lead to an understanding of species evolution. Darwin took delight in the microscope, which he saw as a source of new information and as a means by which to celebrate the nature of creation. Darwin's evolutionary idea, especially his idea of sexuality, helps bridge the gap between the pre-Origin microscope controversy and Henry James's "Glasses" (1896), a tale about the mechanization of sight with the aid of eye-glasses and the problematization of seeing. James's story invites a symbolic reading of eye-glasses within the prevalent ideology of female sexuality: the artist-narrator's scrutiny of Flora Saunt's beauty is similar to a scientist's observation of a flower specimen. Surely, this is a typical example of the "Darwinian" struggle for a bourgeois Victorian woman like Flora.

Armstrong's essay, in general, demonstrates how the lens, a mediating tool to transform the eye into an external optical instrument, became a dominant element of a scopic culture within the context of the nineteenth-century epistemology. The Victorian microscope helped crystalize the enchantment of mysteries of the sub-visible world and generated Victorian Britons' senses of scale. Such an optical instrument epitomizes the performative nature of specific observational practices. It is indicative of a posthumanist notion of performativity in measuring with apparatuses like a microscope within the framework of onto-epistem-ology. The physical presence of apparatuses calls further attention to Karan Barad's agential realism, a term that she has used in *Meeting the Universe Way* (2007) for conceptualizing and measuring the act of human observation

with observing instruments. Understandings of the mutual entanglement between measurement and value have also been influenced by Barad's *Meeting the Universe Way*, which emphasizes the role of the nonhuman in facilitating modern conceptions of the "measuring device" and the "measured object." In the light of microscopy, we can conclude with Barad's remarks thus:

Measurements . . . are causal intra-actions, physical processes. What we usually call a "measurement" is a correlation or entanglement between component parts of a phenomenon, between the "measured object" and the "measuring device," where the measuring device is taken to be macroscopic so that we can read the patterns of marks that the measured object leaves on it. (337)

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