

Janet Vertesi, *Seeing Like a Rover. How Robots, Teams and Images Craft Knowledge of Mars* (Chicago and London: The University of Chicago Press 2015), 304 pp.

Do you know what Mars looks like? Chances are that pictures of a reddish, rocky surface are emerging in front of your inner eye right now. How is it possible that you can have an image in your mind if you have not set foot on the planet yourself and are unable to discern its detailed features on the firmament? To a significant extent, we owe our ideas on the Red Planet to two robotic vehicles: the NASA Mars Exploration Rovers (MER) Spirit and Opportunity. Scientists and engineers of a number of NASA related universities and research centres have been operating the twin vehicles, steering the data collection and analysing the acquired material. Janet Vertesi, sociologist of science and technology at Princeton University, has been present as an ethnographer on the mission for about 2 years. Her observations grant insight into the processes and negotiations that go into making sense of the visual material of Mars.

As her study's theoretical skeleton serve the notions of *seeing as*, *drawing as* and *seeing like*, Vertesi shows how transforming images

of Mars crafts knowledge, shapes future perceptions and produces a curious coalescence between humans and instruments. *Drawing as* serves as the inscription of any particular interpretation onto an image. Scientists on the MER mission use image processing programs to make sense of their observations. Certain ambivalences are removed from a picture while other aspects are highlighted through applicable filters. As a result, a phenomenon is no longer *seen as* this or *as* that, but simply *seen* in one unambiguous way. *Seeing like*, finally, refers to the embodied experience rover scientists and engineers undergo as they perceive Mars through the twin vehicles. Programming Spirit's and Opportunity's every move, scientists and engineers begin to adapt their modes of thought to the abilities and vulnerabilities of the instruments.

In telling her tale, Vertesi takes the reader directly into the field with her. Thick descriptions of scenes in the laboratory, at planning meetings or in the classroom are integral to reproducing her experiences on site. In this, the author conveys the importance of visualization in her subjects' activities. Coloured pictures, maps of the rovers' traverse routes as well as drawings and graphs that researchers on the MER mission relate to accompany each chapter.

The author's declared decision to 'follow my actors and the scope of my laboratory field site in my analysis, concordant with my embedded perspective' (p. 292) provides a legitimate rationale for the organization of her material. The book retraces the journey that images undertake throughout the mission. First, the reader learns about the planning process that precedes the recording of any image. Next, she gains insight into the calibration and annotation activities that prepare the images for analysis and shape future problem framings. Vertesi then elaborates on the flat hierarchy in the research group and the continuous efforts to fulfill the interests of all scientists and engineers involved. The collective orientation of the research group is fostered by a type of technomorphism the subjects experience. The researchers' identification with the vehicles' vista entails a set of shared narratives and gestures that binds the team together. The

self-imposed social order also limits the scope of image manipulation and interpretation. Rather than transforming visualizations at will, scientists discipline themselves according to conventions such as replication to maintain credibility. Finally, the last chapter situates the MER mission in the broader context of NASA's funding schemes and political negotiations on the project's continuation. Public outreach is playing a central role here to maintain mission support.

Certainly, the narrative structure makes for an engaging read and enables the author to disentangle topics that in reality are intertwined. It must be noted, however, that the onion-like composition obscures some of the author's analytical findings. Reading *Seeing Like a Rover* turns out to be a discovery mission itself, with more than one inconspicuous gemstone lying on the way. The fact that scientists and engineers refer to the rovers as 'female', for instance, which points to dynamics of gender in sociotechnical environments. Further, a trade-off between scientific and political considerations can be observed in the MER team members' strategies to fight for the project's survival. Also, the unusually high public participation in the field of space exploration evokes the broader challenges and opportunities of citizen science. A more clear-cut presentation of these thought-provoking aspects in the introduction or conclusion of the work might have emphasized the broad relevance of the contextual study. More than 30 pages of footnotes hold a great deal more truly intriguing observations and should not be overlooked.

*Seeing Like a Rover* holds precious insights appreciable by a wide range of audiences. Sociologists, historians and philosophers of science and technology are invited to resume discussions closely related to Vertesi's contribution. Examples include Karin Knorr-Cetina's laboratory studies, Peter Galison's work on image-producing instruments in the physical sciences and Don Ihde's writings on embodiment relations between humans and instruments. Further, ethnographic researchers can find inspiration and admiration for Vertesi's skilled, disciplined and transparent methodological approach. Interested laypersons have the chance

to get acquainted with the intellectual quest and the practical challenges of planetary science in the minutest detail. Last but not least, planetary scientists themselves will benefit from the reflective view on their pursuits.

Vertesi's central claim, fortunately, is by now well-established in the social sciences, and hopefully in the plethora of natural sciences that are also part of space exploration. Doing science always is a social undertaking. *Seeing Like a Rover*, though, extends this insight to an as of yet underexplored site of knowledge production. Space exploration has rarely been subjected to sociological inquiry. Persistence and zeal are required to gain access to this sociotechnical field that is guarded by solid institutional boundaries. For the diligent exploration of unknown terrain as well as a captivating and educational read, the author merits full credit.

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