Maria M. Sojka: *A Heated Debate: Meta-theoretical Studies on Current Climate Research and Public Understanding of Science*. Bielefeld: Transcript Verlag, 2023, 228pp., €45.00 (Hardcover), ISBN: 978-3-8376-6580-2

Hernán Bobadilla1

1Department of Mathematics, Politecnico di Milano, La Nave, Via Edoardo Bonardi 9, 20133, Milan, Italy. [hernanfelipe.bobadilla@polimi.it](mailto:hernanfelipe.bobadilla@polimi.it); <https://orcid.org/0000-0003-0003-9952>

Why should the public trust climate scientists? After all, as Maria M. Sojka (2023) reminds us, public debates often end up depicting climate experts as individuals who “do not seem to know anything anyway because they all seem to change their opinion all the time or because there seems to be no consensus even about critical, basic questions—or even worst that experts are all ‘in cahoots’ in order to supress ‘common folk’” (190). Sojka’s book seeks to illuminate this issue, which stands as one of the most pressing problems of our time. In my view, the author succeeds in producing a timely and valuable textbook, offering a concise synthesis of up-to-date discussions on the topic from both philosophical and sociological perspectives. Though the book has shortcomings, it is important to first consider its argumentative strengths.

Sojka’s overarching argument is well-structured, clearly articulated, and thoroughly researched. At its core, the argument begins by asserting that the public holds idealized views of how science operates or ought to operate. Falling short of these ideals, climate scientists become vulnerable to criticism, often from lobbyists and interest groups. This, in turn, fosters climate scepticism or even denialism, which diminishes the impact of climate research. To some extent, scientists themselves are responsible for perpetuating these unrealistic expectations. What is needed is to overcome these distorting ideals and develop an alternative strategy that warrants public trust in climate researchers.

Consequently, the book has two specific objectives. The first one is to examine three ideals of science and argue for their inadequacy. These ideals are: (i) science should be value-free and produce objective facts; (ii) scientific theories and models should be easily proven or refuted by unequivocal observable or experimental data; and (iii) science should be predictive, providing clear and certain yes-or-no answers. The second objective is to propose an alternative approach to these ideals that justifies trust in climate scientists. This approach articulates an account of scientific expertise based on the notion of “tacit knowledge.” In this view, expertise is understood as experience in specialist fields, which is, in principle, assessable by the public.

The first ideal, widely held by the public, asserts that good science, including climate science, is value-free. According to this view, if climate scientists are influenced by values, they are not practicing good science. As Sojka points out, climate research involves numerous value-laden decisions, particularly in addressing the gaps left by epistemic and methodological underdetermination. As a result, climate scientists are vulnerable to public criticism. Philosophers of science have explored this issue and proposed distinctions to demarcate which values can legitimately influence scientific decisions (e.g., the epistemic/non-epistemic values distinction or the cognitive/social values distinction). However, as Sojka rightly observes, most of these demarcations are difficult to maintain, with fuzzy boundaries and values on one side often influencing those on the other. Furthermore, it is not always clear that excluding values from one side of the distinction is desirable. Thus, Sojka contends that climate science is irreducibly value-laden, though this does not mean it is systematically biased. The very complexity of climate models and related practices, distributed across large networks of collaborators, together with the diversity of practitioners around the globe, safeguard scientific outputs from undue influence by individual scientists.

The second ideal Sojka critiques is the notion that climatic observations provide definite evidence to either confirm or refute climate models and the claims derived from them. However, the complexity of climate science practices makes a sharp separation between its empirical and theoretical aspects untenable: Models and data are fully interdependent. As Sojka puts it, models are data-laden and data are model-filtered. This interdependence is poorly understood by the public. Climate sceptics and deniers frequently use isolated observations to criticize the outputs of scientific models, but both data and models carry inherent uncertainties. Therefore, one cannot dismiss a model based on data alone, and vice versa. This does not mean that models cannot be evaluated in terms of their fitness with observational data, but such evaluations must take into account the various uncertainties of data and models. In addition, these evaluations should also consider the specific purposes of the models in question. Here, the principle of adequacy-for-purpose is key. For instance, a model may accurately represent certain aspects of past climate (i.e., be adequate for that purpose) and fail to predict those aspects with equal accuracy in the future (i.e., be inadequate for this different purpose). Thus, model fit to observational data is just one factor among many that must be considered in evaluating models.

The third ideal assumes that science is primarily a predictive enterprise, expected to provide clear and certain answers to questions. However, this notion is far removed from the actual practices of climate science, where uncertainties are numerous and difficult to minimize. In other words, there is a clear mismatch between how scientists work and what the public expects. While scientists operate with concepts such as “degrees of certainty” and “evidential support,” public discourse often frames issues in binary, yes-or-no terms. Worse still, climate sceptics and deniers frequently exploit this mismatch as a tactic to discredit scientific research or reduce its impact. Yet, the fact that climate science contends with numerous irreducible uncertainties does not imply that climate scientists cannot make meaningful statements about the climate system or anthropogenic climate change. Many critical questions can be addressed through careful reasoning. In particular, Sojka explores how robustness analyses can help reduce uncertainties in climate modelling. A crucial insight is that robustness analyses should not only focus on assembling diverse sets of models but draw from a variety of sources of evidence, including instrumental records, paleoclimate data, and physical understanding.

Given the limitations of the three aforementioned ideals of science, Sojka proposes an alternative approach to warranting trust in climate scientists. The author introduces a notion of “expertise” rooted in specialized experience within a particular field of research. Such experience, Sojka explains, manifests in critical moments of climate research as a “feeling” that experts develop for recognizing appropriate decisions, making some scientific practices akin to a craft or an art. This leads to intuitive judgements, honed through rigorous training and a comprehensive understanding of the history of successful practices in a particular field. Thus, central to this notion of expertise is the role of “tacit knowledge,” the implicit understanding and related skills that experts acquire through practice that cannot be conveyed explicitly.

Sojka discusses two forms of tacit knowledge that are distinctive of scientific expertise, namely “contributory” expertise and “interactional” expertise. Contributory expertise requires intense training and practice. This is achieved through an immersion in the field and cannot be attained by merely reading the relevant literature or similar pathways. As a result, specialists can contribute to the field and advance its internal goals. Interactional expertise is proficiency in the language of a speciality, but not necessarily the practices. This, however, still requires close engagement with the relevant community. It is expressed in the expertise that, for example, sociologists have of their target study groups. It is also expressed by the ability of principal investigators in managing large and multidisciplinary projects, or the ability of engaging in specialized peer review processes. In science, contributory and interactional expertise go hand in hand, as science (especially climate science) is an intensely social endeavour. As a result, a focus on tacit knowledge as a marker of expertise leads to a focus on the various institutions and social contexts where such knowledge is cultivated and acquired. Sojka argues that public trust in climate science experts should rest upon the social structures and institutions that ensure the proper acquisition and dissemination of tacit knowledge.

As Sojka comments, it is often uncomfortable to acknowledge that tacit knowledge is an essential part of scientific practice, as it contradicts public expectations of science as a fully explicit and transparent enterprise. Yet, reliance on tacit knowledge can actually be seen as a strength. We trust experts precisely because acquiring tacit knowledge is costly in terms of time and effort, requiring years of immersion in a particular field. Scientific experts have already invested the necessary resources to develop this expertise, which grants them a nuanced and mostly implicit understanding that non-experts lack. Having said this, Sojka adds two important caveats. First, explicit knowledge remains crucial, even if it is not the sole basis for expertise. While tacit knowledge plays a key role, scientific fields are also grounded in formal, codified knowledge that can be shared and communicated. Second, tacit knowledge does not, by itself, define a scientific field. Rather, a field is constituted by a collection of methods, practices, and conventions. Tacit knowledge serves to facilitate access to and mastery of these elements, allowing experts to navigate and apply them effectively.

Sojka’s proposal—that expertise be understood as experience—is a compelling strategy for the public to recognize who qualifies as an expert. This approach is more nuanced than simply relying on credentials or track records, as it allows for unconventional experiences to be acknowledged. It also emphasises the importance of practice and the institutional settings where the apprenticeship of expertise unfolds (e.g., universities). Still, using experience as a proxy for expertise is not a fail-proof method. To make this approach more efficient, Sojka suggests shifting the focus from trying to identify actual experts to recognizing only apparent experts. In this sense, experience is a necessary, though not sufficient, criterion for trusting scientists. Beyond identifying non-experts, Sojka contends that the public should not be expected to evaluate the quality of the research conducted by climate experts, as this goes well beyond the capacities of the public. Rather, institutional arrangements and peer judgements should play this role, ensuring that rigorous standards are maintained.

In many ways, Sojka’s book can be seen as a critique of traditional philosophical approaches to the concepts of reliability and trustworthiness in science, proposing a turn towards a sociological understanding of expertise. As Sojka emphasizes in her concluding remarks, the philosophical focus on the reliability of scientific outputs, such as data and models, is misguided for at least three key reasons. First, philosophers are not equipped to assess the reliability of scientific outputs in climate research, as this requires the expertise that only climate scientists possess. Second, even if philosophers were in a position to assess the scientific outputs of climate experts, aiming for reliability misses the mark. A more appropriate target would be adequacy-for-purpose, which reflects whether scientific models or data are suitable for addressing a variety of concerns. Third, Sojka contends that the discussion on trustworthiness should centre on the social structures and practices that foster expertise, rather than on particular scientific outputs.

As mentioned above, Sojka demonstrates great skill in synthesizing existing research, presenting a well-structured and clearly articulated argument, examined and supported by a range of perspectives from both the philosophy and sociology of science. However, in my view, the argument ultimately lacks originality, settling for a combination of positions already well-established in the literature. In other words, while the book thoughtfully navigates various positions—distancing itself from some while embracing others—it doesn’t push beyond them. This is not necessarily a flaw, but it is worth noting: The book functions primarily as a literature review structured around the three ideals of science and an alternative to overcome them. For those new to the field, Sojka’s book may serve as a considerably valuable resource, offering a solid introduction to ongoing debates on these topics. However, for those already familiar with the subject matter and literature, the book is unlikely to provide many new insights.

Most importantly, I find room for criticism in Sojka’s adopted positions. In my view, her project can be interpreted as replacing three inadequate ideals of science with another ideal, one that is similarly flawed. This alternative ideal can be stated as follows: A public understanding of climate science, grounded in the recognition of contributory and interactional expertise as experience in a specialist field should foster trust in climate experts (or at least prevent misplaced trust in non-experts). To clarify my unease with this position, it is important to note that, in some ways, it is even more extreme than traditional deficit models of public understanding of science. Some of these models assume that the public must learn about science in order to be more receptive and trust its conclusions. In contrast, Sojka argues that the public is not expected to grasp the inner workings of climate science due to the field’s complexity and the intricacy of its practices. Instead, she suggests that only experts, by virtue of their training and accumulated tacit knowledge, can successfully navigate the complexity, epistemic opacity, and analytical impenetrability inherent in the field. Public trust in science, therefore, depends on recognizing this expertise.

This leads to a problematic outcome: public understanding of climate science is effectively reduced to public recognition of climate expertise, leaving no room for genuine public critical engagement with climate science. Essentially, the public is told that the complexity of climate science is beyond their reach and that they should simply trust the experts based on their specialized experience. This approach risks fostering a sense of disengagement which, at its worst, could lead to even greater skepticism or denialism concerning anthropogenic climate change. While tacit knowledge is undoubtedly a crucial aspect of expertise, presenting it as entirely inaccessible or unintelligible to outsiders runs the risk of alienating the public from the very experts they are being asked to trust. It also leaves little room for transparency and accountability, which are essential for building trust in any field.

Sojka’s (2023) position is clearly articulated in the following passage: “The analysis of tacit knowledge in science […] has also shown that it cannot be the job of the public to pass judgement on the quality of the specific work done by scientists; the experience and knowledge to do so lie with the scientists themselves and it would be presumptuous to assume that a layperson could, on the spur of the moment, acquire the knowledge that scientists need many years to amass in order to evaluate a scientific argument” (192). I believe Sojka is right in conceiving of expertise as a genuine, hard-won epistemic phenomenon, one that takes years to build and is essential for successfully conducting specialized tasks. However, if this is the case, two critical issues remain unresolved, one of which is discussed in the book—though not fully to my satisfaction—and another that is practically overlooked.

The first issue is that it remains unclear how the public can recognize expertise, especially when expertise is conceived as experience grounded in tacit knowledge. Sojka suggests that the public can identify genuine experts by examining their careers, specifically how much time and effort they have dedicated to specific research within reputable institutions. This approach, according to Sojka, helps distinguish genuine experts from scientists who may have only a superficial understanding of the subject, lacking the specialist training that leads to the acquisition of tacit knowledge. In some cases, such non-experts can still leverage their academic credentials to pose as experts and steer public debates in specific directions. These “merchants of doubt” often act as lobbyists for particular interest groups. For most of the book, this is the foil upon which Sojka crafts her alternative ideal of scientific expertise as experience.

Unfortunately, Sojka’s account for recognizing expertise is unsatisfactory. She suggests that the public can identify expertise by assessing how much a scientist has been trained in particular research field within an expertise-building hub. Her intention is to demystify tacit knowledge by shifting the focus to the institutions that provide the proper training to acquire it. However, the mystery is not removed, only relocated. Her strategy leads to a circular explanation in which expertise is assigned to those who have undergone proper training in expertise-giving contexts and institutions. This begs the question: What makes an institution or social arrangement an expertise-building hub? Sojka does not provide clear criteria for identifying expertise-building institutions. Instead, she resorts to broad categories, such as “universities” and “laboratories,” leaving the specific markers of expertise-building institutions implicit and unexamined. This vagueness risks perpetuating the same problem she seeks to overcome, namely the difficulty for the public to discern where true expertise is cultivated and by whom. Without explicit criteria, the task of recognizing expertise becomes just as opaque as identifying tacit knowledge itself, ultimately reinforcing the reliance on institutional prestige rather than on a more nuanced understanding of the training and knowledge involved in scientific expertise.

This brings me to the second issue I want to address—one that is virtually overlooked in Sojka’s book—namely, why scientific expertise warrants trust. As Sojka frames it, the public’s main challenge is to identify the right experts; once these experts are correctly identified, trust should naturally follow. The implicit assumption is that scientific experts are the bearers of the best knowledge available, and if we want our decisions and actions to be well-informed, we should defer to them. This assumption is problematic because it presumes that professional, academic, Western science is the sole authoritative epistemic system. It overlooks the existence of alternative knowledge systems, each with distinct institutions, social arrangements, and criteria for attributing expertise. This issue becomes particularly relevant in discussions about climate adaptation, where local, traditional, and indigenous knowledge systems play a crucial role. My concern is that the public may rely on different ways of producing knowledge that can conflict with the professional, scientific consensus. In such cases, the matter is not that the public will pass gratuitous judgement on the quality of scientific research, but rather that there is a genuine confrontation of approaches to knowledge production.

This is, admittedly, a relativist thesis, which may not sit well with more traditional audiences. However, I believe it is crucial to bring these issues to the forefront, especially given the significant uncertainties of climate change, the variety of stakes that the public holds, the multiple knowledge systems worldwide (each with its own conventions and criteria for expertise), and the countless injustices—particularly epistemic ones—that people face in terms of participation in climate governance. Sojka herself claims that a strength of her approach to expertise is its openness to unconventional experiences contributing to trustworthy expertise. It is therefore unfortunate that her discussion remains largely focused on the traditional institutions and social arrangements of professional, academic, Western science. To be clear, I am not advocating for a full-blown relativism in which anything goes. Rather, I see space for meaningful dialogue, discussion, and negotiation between representatives of different epistemic systems. Unfortunately, this possibility is not adequately explored in Sojka’s book, where scientific knowledge appears to take precedence.

In conclusion, it seems to me that using the “merchants of doubt” as a counterpoint in Sojka’s discussion of trust in science sets a low bar. The more challenging case arises when non-professional scientists are, in fact, experts according to the criteria of their respective epistemic communities. These individuals often possess extensive knowledge—both explicit and tacit—gained through experience, apprenticeship, and deep interactions with their surroundings. When such expert knowledge is dismissed or overshadowed in favour of more Western and professional scientific outlooks, the issue of trust in science becomes significantly more complex. To put it bluntly, one cannot discuss trust in science without addressing issues of epistemic injustice within science and beyond. Transdisciplinary and participatory efforts are crucial not only for tackling the political aspects of climate change but also for addressing its epistemic dimensions, as different communities may possess expert ways of understanding their surroundings and the changes occurring within them. Still, this gap in Sojka’s book does not diminish its value as a document that synthesises a complex field of research and clearly articulates crucial ideas for the debate.

*Acknowledgements*

The author discloses receipt of the following funds: European Union’s Horizon Europe Framework Programme, HORIZON-MSCA-2022-PF, Project 101105236 (UN3): “Understanding Under Uncertainty”.