

# Epistemic and Social Diversity as an Aspect of Evaluating Interdisciplinary Research

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Scientific disciplines have been primary units of epistemic and institutional differentiation in modern research systems, encompassing the specialization of scientists, disciplinary communication systems, discipline-oriented work organization, and discipline-aligned systems of quality control and rewards. In its contemporary outline, the institution of science fosters knowledge production within disciplinary boundaries while disincentivizing interdisciplinary research. Emphasizing organizational structures that accommodate interdisciplinary paradigms, we argue that evaluation systems able to assess research output transcending disciplinary boundaries are necessary to support inter- and transdisciplinary knowledge production. Transforming current evaluation systems requires a deeper understanding of scientific pluralism and a corresponding conception of epistemic diversity. Drawing primarily on arguments from decolonial theory and science and technology studies, we conceptualize epistemic and social diversity as intersecting dimensions in evaluating inter- and transdisciplinary research. Finally, with a particular focus on neuroscientific (inter-)disciplines, we reconsider how translating epistemic and social diversity into research evaluation practice can do justice to and potentially advance the plurality of inter- and transdisciplinarity.

**Keywords:** research evaluation, interdisciplinarity, epistemic diversity, decoloniality

## Introduction

The importance of diversity in inter- and transdisciplinary (ITD) research, both in terms of epistemic and social diversity, is increasingly recognized in

the scientific community. For example, consider the Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative, a major public-private research program by the National Institutes of Health (NIH) in the United States, established in 2013 to build a dynamic picture of brain function (BRAIN Working Group, 2014, p. 75). With neuroscience at its center, it is also rooted in several other disciplines, including genetics, physics, engineering, informatics, nanoscience, chemistry, and mathematics, to catalyze an interdisciplinary effort. In 2021, BRAIN introduced a training, inclusion, and equity program to foster a more inclusive biomedical research context for scientists with a social background underrepresented in biomedicine. Its reasoning for doing so was not only based in addressing systemic inequities, but also functional: Citing evidence that equity and inclusion improve the diversity of thought and creative problem-solving (Hofstra et al., 2020), it was argued that social diversity and inclusion “are not separate from, but instead are integral to, the pursuit of discovery and innovation” (Richardson et al., 2021, p. 3362).

While diversity, equity, and inclusion (DEI) initiatives have become an increasingly common feature of science policy, they are now under attack by reactionary political forces. In this climate, where authoritarian sentiments severely undermine the autonomy of science, there is a particular need for both a discussion of such policies and a reaffirmation of their importance.<sup>1</sup> Notwithstanding the limited results DEI has produced so far, we argue that its effectiveness in addressing systemic inequities depends on integrating what we call the double helix of epistemic and social diversity into science’s evaluation system. Research evaluation is a central quality control mechanism in science (Espeland, 2020), shaping both the epistemic and social dimensions across all levels of research practice—be it research systems, institutions, or individual researchers. Combined with the argumentation of the BRAIN Initiative, ITD evaluation depends on combining the assessment of the diversity of thought styles, thought collectives, and social backgrounds of the latter. Here, philosophical approaches to ITD that relate social epistemology with evaluation studies offer scholarly insight with potential practical significance.

This article contributes to this debate by reflecting on the role of epistemic and social diversity in ITD evaluation from a standpoint particularly rooted in decolonial perspectives (e.g., Khader, 2019; Maldonado-Torres, 2007; Anzaldúa, 1987). We suggest that including these perspectives in the philosophy of interdisciplinarity can enhance the production of emancipatory ideas on epistemic diversity in ITD practice and evaluation. Conceptually, epistemic diversity refers to different ways of knowing, understanding, and approaching knowledge production, which are embedded into contemporary power

<sup>1</sup> BRAIN’s DEI program was terminated in January 2025 after the second Trump administration issued an executive order eliminating all DEI policies across the federal government, including those of the NIH (Gewin, 2025).

structures. Social diversity refers to differences among individuals and groups within an organizational research setting with respect to their social identities, backgrounds, and experiences. Practically, epistemic and social diversity can be operationalized into distinct yet connected analytical dimensions of scientific pluralism in different contexts of research evaluation, emphasizing that both exist on a continuum, ranging from absence to high levels. Philosophically, we expect epistemic and social diversity to be a feature of scientific pluralism. Such scientific pluralism—itself a salient feature of ITD research—is not to be understood as a reflection of immaturity in science but as a necessary epistemic strategy to address the multifaceted nature of empirical and theoretical phenomena (Mitchell, 2002).

In what follows, we first review relevant literature on ITD from the philosophy of interdisciplinarity, science and technology studies (STS), evaluation studies, and decolonial theory to build our conceptual framework. Second, based on a small set of expert interviews and a brief review of two ITD neuroscience projects, we present a case study on the research evaluation of two interdisciplinary neuroscientific research initiatives. Herein, we explore how epistemic and social diversity are related to the perceived challenges and support factors that evaluation poses for ITD practice. Third, we discuss the implications of our case study in the context of the philosophy of interdisciplinarity, propose a decolonial conception of epistemic and social diversity to be integrated into ITD evaluations, and suggest potential changes in ITD evaluation practices. Our practical conclusion is straightforward: If scientific pluralism is a central quality criterion for ITD research, epistemic and social diversity—understood in an emancipatory sense and as mutually dependent dimensions of scientific pluralism—should be incorporated into ITD research evaluation frameworks. Finally, we consider the conceptual contribution of our study to the philosophy of interdisciplinarity.

## Literature Review

As a particular system of organizing and controlling scientific research as it is conducted primarily, but not exclusively, in public and private universities and research institutes, the academic system of science features continuous novelty production, high task uncertainty, and collective coordination of task outcomes through access to various forms of rewards, controlled primarily through the judgment of peers (Whitley, 1984, pp. 32–34). Although the institutionalization of scientific work remains structured by its differentiation into distinct epistemic communities and the formal organizations in which it is located, the relationships between and within scientific disciplines are changing, as evidenced by the multiple specializations within disciplines and the increasing exchanges between different disciplines (Larivière & Gingras, 2014, p. 197).

The transformation of contemporary science into a comprehensive performance panopticon has resulted, in part, from the emergence of extensive evaluation regimes at all levels of research governance. This shift has been driven by a complex interplay of external societal forces—such as political, administrative, and economic pressures—and internal dynamics within science in the normalization of evaluation practices (Engwall et al., 2022; Hammarfelt & Hallonsten, 2022; Münch, 2014).

From a pragmatist point of view, any research evaluation is a practical judgment like any other, that is, “a judgment of what to do, or what is to be done: a judgment respecting the future termination of an incomplete and in so far indeterminate situation” (Dewey, 1915, p. 514) of a particular type of subject matter, determining a value of what to give or not to give by future action. Current evaluation practices within the academic system, particularly peer review and evaluative bibliometrics, become most evident in system and institutional assessments, research funding and awards, scholarly publishing, and individual career paths. Research evaluation operates at all levels of research practice, creating a competitive environment that incentivizes research actors to focus on activities that are likely to produce traceable outputs, determines the allocation of reputational and material resources, and influences the priorities and direction of scientific research (Welpé et al., 2015; Gläser & Laudel, 2016; Gläser & Velarde, 2018).

Although the proportion of research that crosses disciplinary boundaries is increasing (van Noorden, 2015), the epistemic and social organization of research—including its evaluation—remains predominantly discipline-bound. Scientific disciplines are distinguished by specific paradigms, methodologies, and bodies of knowledge, while discipline-oriented research practices, communication patterns, and quality standards continue to structure them (Becher & Trowler, 2006; Stichweh, 1984; 2015). Interdisciplinary research, in turn, is “a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice” (National Academy of Sciences et al., 2005, p. 39). If interdisciplinarity seeks to integrate different disciplinary approaches to a research problem, transdisciplinarity, in addition, connects approaches within and beyond academic science to address a societally relevant problem field, which requires taking into account the diversity of life-world and scientific perceptions of the problem field (Hirsch Hadorn et al., 2008, p. 27; Holbrook, 2013, p. 1867; Ziman, 2000, pp. 209–210).

ITD research differs conceptually and practically in terms of its object, knowledge, method, and problem orientation (Schmidt, 2022, pp. 27–31), so that it becomes evident that its evaluation is considerably complex. Apart from identifying the disciplinary and transdisciplinary backgrounds of researchers

in a joint research effort, it is important to understand how they interact, approach the research problem, and interpret the shared epistemic challenge (Huutoniemi et al., 2010, p. 210). Therefore, while the heterogeneity of ITD requires several evaluation approaches, a key element is (or should be) epistemic and social factors in ITD collaboration (Klein, 2008, p. 119). The different levels of ITD evaluation—evaluating ITD research output, grant proposals, individual career progression, institutions, and systems—contribute to its institutional and conceptual complexity (McLeish & Strang, 2016, p. 2). Thus, implementing evaluations with clear, yet sensitive and flexible standards and criteria for peer review and evaluation metrics at all levels of ITD research is a necessary, if not sufficient, driver for a viable, yet-to-be-built ITD ecosystem.

Although science policy consistently promotes ITD, the disappointing outcomes of ITD evaluations are an obstacle to its implementation (Lyll et al., 2013, pp. 67–69). ITD grant proposals have consistently lower funding success (Bromham et al., 2016). Both at the individual level and collectively, interdisciplinary papers show significant lagged citation impact across different disciplines (Zhang et al., 2024). Further, empirical evidence reveals that interdisciplinary research depresses, on average, scholarly productivity—that is, fewer publications per researcher—but also increases scholarly visibility—that is, more citations per researcher (Leahey et al., 2017, pp. 118–120). Researchers also struggle to gain recognition for their ITD output in tenure reviews (Mäkinen et al., 2024). In addition, ITD researchers negatively perceive project-level evaluations and evaluations for hiring, promotion, and tenure (Vantard et al., 2023, p. 722). These findings suggest that current ITD evaluation patterns, though rather consistent in approach (Laurson et al., 2023), are insufficient in implementation and impact. In this regard, a systematic review of ITD evaluations reveals a neglect of evaluation principles that complicates efforts to make sense of the evaluated ITD (Laurson et al., 2022, pp. 338–339). It also recommends adaptable evaluation approaches and clear quality standards that fit the specific ITD context.

Although the philosophy of ITD can substantially support the conceptual alignment of evaluation criteria and dimensions—such as research quality, originality, impact, or integration—with the specific context of ITD research (Laurson et al., 2022, pp. 331–334), challenges arise at the intersection of epistemic and social diversity. A key rationale for ITD research is facilitating epistemic diversity to address complex problems that transcend disciplinary boundaries. There is also evidence that social diversity enhances scientific productivity and capability (Swartz et al., 2019, pp. 33–34). Both dimensions of diversity are linked to the social responsibility of science, emphasizing that research should neither cause nor reproduce epistemic and social inequalities (Koch, 2020, p. 675). To some extent, ITD evaluation practice already incorporates diversity considerations. While social diversity has become a standard criterion in research evaluation, epistemic diversity is also an important

criterion in ITD evaluation, but it remains inconsistently conceptualized and applied in practice (Laursen et al., 2022, p. 331).

For instance, Huutoniemi and Rafols (2017, pp. 500–507) describe breadth—alongside integration and transformation—as a central epistemic value in ITD, as it spans more than one discipline, field, or specialty and, therefore, requires an appropriate range of peer expertise and evaluation methods. In measuring ITD research, they operationalize breadth using a metric notion of diversity and coherence. Coherence measures the relationship between elements, while diversity captures the distribution of these elements—such as publications—across categories, like different disciplines, for a body of research (Stirling, 2007). To trace diversity (and coherence), quantitative ITD studies highlight two methodological approaches (Glänzel & Debackere, 2022, pp. 5555–5556). First, the cognitive approach analyzes information flows through citation analysis. Second, the organizational approach examines patterns of collaboration and co-authorship using researcher affiliation and subject classification. In other words, these approaches trace aspects of the epistemic and social organization of ITD research that are quantitatively measurable.

However, they fail to capture those aspects of the social dynamics of ITD collaboration that we have outlined above. From an actor-based perspective that conceptualizes the institution of science as a multidimensional constellation of individual, collective, and composite actors (Schimank & Stucke, 1994), epistemic and social relations intersect and mutually shape each other. Applying this understanding to the evaluation of ITD research, we propose that epistemic position refers to the standpoint or perspective of a particular actor, such as a researcher, a research group, a research institution, or a disciplinary and interdisciplinary community, in relation to objects of knowledge. In terms of Ludwick Fleck's (1979, pp. 38–51) concepts of thought style and thought collective, epistemic position primarily refers to the delineable features of the thought style an individual actor displays.

What we mean by epistemic position becomes more evident in the context of, and in comparison to, the thought style of the disciplinary or interdisciplinary thought collective that serves as the actor's reference group. A community's thought style encompasses its shared cognitive frameworks, methods, and conceptualizations in relation to a particular knowledge object. It includes aspects of the inquiry process such as the object's theoretical framing, empirical approach, research intuition, and problem formulation. An actor's epistemic position reflects their alignment with or divergence from these collectively established thought patterns. Consider, for instance, the contrasting approaches across the interdisciplinary fields of astronomy and planetary science to define a planet. For researchers who study celestial mechanics, a planet's motion, orbit, and interactions with local objects are essential aspects of its definition (Messeri, 2010, p. 190). For those who

primarily study the composition of celestial objects, atmospheric, tectonic, and material properties define a planet.

Our conception of epistemic position is inherently social and is related to what we term social position. Social position refers to an actor's place within intersecting social hierarchies, shaped by factors such as career position, class, race, gender, and age. It is particularly significant in ITD collaborations, where participants from diverse backgrounds bring varying social positions that influence access to resources, authority, and decision-making power. For instance, early-career researchers or individuals from underrepresented groups may encounter structural barriers that limit their contributions, even when their epistemic perspectives are valuable. Conversely, the epistemic position of a senior researcher may disproportionately shape a collaboration due to their hierarchical social authority, potentially constraining the diversity of perspectives considered. We assume a complex interplay between epistemic and social position. Both dimensions are integral to ITD research and require a flexible evaluation approach that does not rely solely on quantitative metrics.

As a conceptual metaphor, we use the double helix, where epistemic and social factors, like two intertwined strands of nucleotides, form a twisted ladder that shapes knowledge production, both in disciplinary and ITD research. Various scholarly approaches, including social epistemology (Fricker, 2007), standpoint theory (Longino, 1990), the sociology of knowledge (Mannheim, 1956), or feminist, postcolonial, and decolonial studies (Harding, 2011; Lugones, 2010), emphasize the importance of the relationship between the epistemic and the social and assert how epistemic-social biases (re-)produce systemic inequalities in science and society (Hofstra et al., 2021; Kozłowski et al., 2022). This pattern is also evident in ITD research. For example, neuroscience has historically relied on participants from specific populations that do not represent the global diversity of human experience (Falk et al., 2013).

For ITD evaluation not to reproduce such systemic inequities, we propose conceptualizing the double helix of social and epistemic diversity through the lens of social and epistemic justice. In this regard, we draw primarily on decolonial scholarship, which points to the monologic embedded in modern science due to its organization around a Western-centric, patriarchal reference point (Khader, 2019). Conversely, a decolonial perspective suggests that epistemic diversity requires decentering the reference point of knowledge production and recognizing the plurality of ways of knowing (Reiter, 2018). Framing ITD in terms of epistemic diversity goes beyond disciplinary diversity, as it allows for the inclusion of epistemological perspectives that differ from those of modern academic disciplines. While such scholarship reconstructs historical and contemporary inequalities in knowledge production and its validation, it is worth considering how such a perspective reflects on the challenges of evaluating ITD research.

In the biomedical sciences, the current power structure within and beyond academia perpetuates the co-production of knowledge, research institutions, and public health systems that are unable (and somewhat unwilling) to pay attention to, and therefore inadequately address, the needs of marginalized social groups (Kozłowski et al., 2022; Smedley et al., 2003). Again, the behavioral and brain sciences are an apt example, as they often generalize research findings based on samples drawn primarily from Western, educated, industrialized, rich, and democratic societies (Henrich et al., 2010). Assuming science (re-)produces external inequalities due to its systemic internal epistemic and social inequalities, we argue that addressing this in current research evaluation is necessary, given that the current evaluation regime is a substantial factor shaping scientific knowledge production. In the following section, we use a case study on neuroscience to illustrate the relationship between research evaluation and ITD knowledge production, and epistemic and social diversity as one aspect of this relationship.

## Case Study

Neurosciences are evolving, and ITD is at its core, adding and integrating various approaches to understanding the human brain (Sabbatini & Cardoso, 2002; Moore et al., 2018). However, ITD neuroscientific research faces evaluation challenges similar to those encountered by other ITD research (Sabbatini & Cardoso, 2002). A key issue is the emphasis on output-oriented quantitative evaluation patterns, particularly relevant in biomedical ITD research (Aubert Bonn et al., 2023). Despite ongoing political and societal demand for ITD proposals, scientists remain concerned about securing funding for their grant applications and gaining career recognition (Pellmar, 2000, p. 5). Moreover, the quality of peer review depends on assigning reviewers familiar with the research area. This presents a considerable challenge for ITD research in the neurosciences, as defining and identifying appropriate peer reviewers remains difficult (Morgan, 1988, cited in Pellmar, 2000, p. 48).

To achieve a deeper understanding of the relationship between ITD evaluations and research practice in neuroscience, we looked into two ITD research institutions based in Berlin, Germany.

- *The Berlin School of Mind and Brain (M&B)*, a graduate institution at Humboldt-Universität zu Berlin, Germany, offers graduate and doctoral training at the interface of the humanities and behavioral sciences with the neurosciences. Founded in 2006 and funded by the German federal and state governments through the Excellence Initiative (2006–2019) and the Excellence Strategy (2019–), the M&B aims to be an institutional integration node of university research, clinical research, and non-university research institutions in the greater Berlin area and beyond (Pauen & Winkelmann, 2019).

- *NeuroCure*—also located in Berlin, founded in 2008 and funded as a so-called *Cluster of Excellence* through the same funding schemes as M&B—is an interdisciplinary research network in neuroscience that investigates neurological and psychiatric disorders to understand disease mechanisms and develop new therapies. In addition, it promotes close cooperation between basic science and clinical research to translate findings from basic research to clinical application (NeuroCure, final report, 2019).

In a qualitative exploration, we approached M&B and NeuroCure in two steps. First, we interviewed two principal investigators and a science manager to gain field access and to gather insights from their individual perspectives on ITD evaluation in their respective neuroscience projects. Second, we conducted a thematic analysis of the most recent publicly available final reports from M&B and NeuroCure. By synthesizing the findings from both sources, we identified patterns of what our insider respondents perceived as challenges or supporting factors in ITD practice and evaluation, on the one hand, and what was reported externally, on the other. Throughout the analysis, we focused on considerations of epistemic and social diversity to identify respective understandings in ITD practice and evaluation.

### *First Challenge: Integration*

While our findings confirm that the complexity of neuroscientific research calls for ITD approaches, interviewees highlight that such projects are particularly hard to implement within current research evaluation frameworks. ITD aims to accelerate neuroscientific discoveries by fostering collaboration across diverse research fields. Researchers from various backgrounds are brought together in order to, for instance, speed up the translation of basic science into clinical applications (i1, interview, 2024).<sup>2</sup> However, interviewees point out that integrating disciplines is challenging, particularly because of the time required and the effort needed to bridge differences in field-specific language and concepts. New technologies, such as brain-computer interfaces for neurorehabilitation and theoretical simulations of neurophysiological experiments, also introduce the need for specialized expertise (Pauen & Winkelman, 2019, p. 12–13). These integration challenges often arise during ongoing projects, making resource estimation difficult at the proposal stage (i3, interview, 2024). In response, one interviewee notes that some funding bodies, such as the European Research Council, have adopted lump sum grants, which provide funding without requiring detailed cost breakdowns.

2 Pseudonyms are used throughout this paper to protect participant confidentiality. Codes were chosen randomly and do not refer to any personal information of the participants. Participants were given the opportunity to comment on issues of anonymity and quote accuracy prior to publication.

Moreover, collaborative ITD proposal writing highlights the epistemic dimension of the integration. An interviewee noted that the difficulty lies not so much in integrating theoretical frameworks and experimental practices, but rather in bringing together different epistemologies within and beyond the natural sciences to establish a common conceptual language for formulating and addressing research questions.

They spoke the same language but they didn't understand each other well because they were using different concepts and different terminologies. So that had to be put on some common grounds. And then the next problem was to define projects with a clear roadmap where there would be some output that benefits both sides. (i3, interview, 2024)

We assume that what is called language here is a broader epistemological approach of those involved, including certain understandings of concepts, terms, benefits, and interests that need to be negotiated. This is consistent with what the M&B report describes as factors that influenced the development of the grant proposal.

Many of the proposal writers involved were part of a younger generation of researchers and at the time of writing the proposal were only in their thirties. But they, like the more senior proposal writers, had been compelled or forced to study two or even three disciplines in the course of their scientific careers, in order to be able to take a well-founded approach to the relationship between brain and mind: e.g., psychologists and medical clinicians would complete a course of study in philosophy, while linguists took degrees in psychology. (Pauen & Winkermann, 2019, p.13)

Here, the aforementioned social and epistemic diversity is considered to be bridged by a common trajectory of interdisciplinary education. This seems to be a prerequisite for successful epistemic integration, as the focus is not on the level of theoretical knowledge at the moment of joint proposal writing, but on previous shared experience over time.

Another integration challenge lies in the structural level of disciplinary categorization required by funding schemes and publication procedures. Interviewees pointed out that ITD researchers must frequently align their work with specific disciplinary criteria, complicating application and review processes. While ITD approaches have gained attention in funding calls, many funding bodies still require project proposals to be classified under disciplinary sub-categories, marginalizing ITD initiatives.

[The German funders] agree with interdisciplinarity, within, for example, the natural science, so you can have a biologist and a doctor, and so on. But when it comes to really making a bigger arc into philosophy or social science, then they start to become a little bit more difficult, I would say. They say "why is that important to test your hypothesis?" So, they want it to be more focused in one direction of science, social science or natural science. (i3, interview, 2024)

The current publication system poses similar challenges, as top journals often lack suitable categories for ITD research. This mismatch forces researchers to adjust their manuscripts and terminology to align with field-specific expectations (i2, interview, 2024), risking a dilution of focus on integrating diverse epistemological perspectives. The following metaphor conceptualizes this struggle for epistemic adaptation.

It's a little bit like you've got these two fields. And these are two chairs you can sit on. And normally people come and they know this is my chair. . . . For the interdisciplinary one, the problem is that [there are two chairs and] the chairs are not neighboring, and we are in the middle. So, the danger is, although everyone says this is really interesting, there's nothing for you to sit on, and you essentially fall through. So, what we need is active measures like a bridge between, let's say, you take a piece of wood or something between the chairs so that you can also sit safely in the middle. (i2, interview, 2024)

As researchers point out how their ITD research risks falling through gaps within the evaluation system, they uncover a potential lack of integration on the evaluation level itself. The examples discussed in this section suggest that, particularly in funding and publishing, researchers frequently do not find supportive mechanisms to bridge disciplinary divides and are left to navigate these challenges through trial and error.

### *Second Challenge: Uncertainty*

The exploratory nature of most neuroscience ITD projects is seen as making them somewhat unpredictable and potentially prone to perceived wrong turns.

This interdisciplinary research and the necessary training for this research require a very individualized approach and appropriate support that is tailored to individual needs. Although research that is conducted on the borders of disciplines undoubtedly has a certain potential for wrong turns, at the same time it does establish at an unusually early stage the opportunity for doctoral candidates and their supervisors to consider individual skills and aptitudes and independently pursue their own research interests. (Pauen & Winkermann, 2019, p.25)

Although the report does not specify what is meant by wrong turns, we read it in terms of the challenge of providing an appropriate, controlled structure for graduate training and research while allowing sufficient freedom for more open research. This is related to the above-mentioned challenge of funding structures that do not provide sufficient flexibility to deal with the sometimes unforeseen outcomes of ITD projects.

Furthermore, there is a sense of uncertainty regarding funding conditions and whether they provide sufficient protected space and research flexibility for researchers to explore new approaches. This uncertainty is

especially noted in relation to transdisciplinarity. While collaboration with societal actors and patients is considered an important step for the future of neuroscientific research, researchers appear hesitant to implement transdisciplinary methods fully. This hesitation stems from uncertainty about the outcomes, such as producing transdisciplinary papers. Regarding their engagement with society, interviewees often highlight science communication initiatives, encouraged and supported by funders, that involve the general public in ongoing ITD research.

Another structural issue highlighted by the interviewees' reflections on uncertainty surrounding ITD is that it can give researchers an advantage in secure, tenured positions. At the same time, diverse participation and opportunities for early-career scholars remain limited. This can perpetuate inequalities, as researchers from socially and epistemically marginalized groups are disproportionately affected by career insecurities in academia. Disparities in this regard have long been examined by feminist scholars (e.g., Harding, 1991), and recent data reveal persistent racialized and gendered faculty structures, particularly in tenure-track positions (e.g., National Center for Education Statistics, 2020–2022; Kim & Cooc, 2020; Bell et al., 2021). Thus, if greater career insecurity prevents marginalized researchers from participating in and leading ITD projects, this not only limits social diversity but also constrains epistemic diversity—a challenge that likewise requires attention within evaluation structures. We elaborate on this observation in the following philosophical reflections.

### *Support Factors*

To address the challenges outlined above, M&B and NeuroCure have implemented measures to support the evolution of ITD practice and evaluation. Both institutions prioritize an interdisciplinary mindset, with training as the primary strategy. Training components engage researchers in regular exchanges with colleagues from diverse backgrounds (i1, interview, 2024). For instance, NeuroCure offers internal mentoring, matching junior and senior researchers to form interdisciplinary mentoring teams. In another format, working group members from different backgrounds are paired for projects to foster collaboration and prevent isolation. However, existing training formats do not yet directly address integration challenges, such as interdisciplinary communication or fostering an understanding of epistemic diversity.

The focus on ITD practice also extends to tailored recruitment. Particularly from a science management perspective, recruitment is key to promoting social diversity and ITD mindsets, stating that “generally the idea is to attract difference” (i1, interview, 2024). Complex recruitment and admission procedures are seen as supporting ITD practice, evolving beyond traditional methods. For example, open calls for applications seek to encourage researchers from diverse disciplines.

Who we try to recruit to Berlin is already an interdisciplinary operation, so to speak. So most of the time, our calls for applications are . . . quite open—not always, but they try to be in order to encourage excellent researchers from any kind of discipline. (i1, interview, 2024)

In terms of social diversity, calls typically include a statement of encouragement directed at marginalized groups and “encouraging international applications” (Pauen & Winkelmann, 2019, p. 32).

The M&B graduate school claims to support ITD through its hiring practices, and emphasizes that its complex admissions process indicates improvements in its approach to diversity.

The elaborate admissions procedure . . . is significant for the success of interdisciplinarity, highlighting as it does the indispensable willingness of doctoral candidates, supervisors and scientific management alike to deal with unusual structures and issues with a view to engaging in the unconventional work described above. Just as they are developed with a high degree of creativity and autonomy, the doctoral projects are supervised with an open mind and willingness to negotiate and they are welcomed in spite of the extra work and occasional problems that such a great diversity of topics and methods inevitably engenders. (Pauen & Winkelmann, 2019, p. 13)

This process is presented as a test of applicants’ ability to deal with unpredictability, with careful evaluation of candidates seen as key to implementing interdisciplinarity. While negotiation skills are identified as essential, the specifics of such negotiations or the challenges posed by diversity are not detailed. We think this framing suggests an unresolved attitude to the uncertainty discussed earlier and a lack of clear strategies for addressing epistemic and social diversity in ITD integration.

Interviewees from both M&B and NeuroCure observed that, in recent years, dedicated science management roles, such as equal opportunity and diversity officers, have become more prominent. These roles focus on recruitment and raising awareness of the importance of diversity in ITD research, for example through initiatives like journal clubs. The extent to which these activities, such as mandatory training programs, can be institutionalized is also seen as uncertain.

Our case study reveals that the evaluation system struggles to effectively accommodate new ITD approaches. Implementers often face uncertainty, pushing the limits of funding, publishing, and research practices through trial and error. Despite ongoing institutional support for M&B and NeuroCure—both of which have consistently secured funding and received positive evaluations—barriers persist, which are perceived as systemic. Current evaluation patterns tend to prioritize productivity and output metrics over research quality. For example, output-driven reporting is reinforced by statements such as: “The success of the Cluster is documented by numerous high-impact publications and a significant increase in collaborative research grants in Berlin” (NeuroCure, 2019, p. 9). As awareness of the complexity of ITD grows, it is

crucial to develop suitable metrics for evaluating the quality of ITD research and promoting epistemic diversity. One interviewee expressed concern that inappropriate metrics could disadvantage ITD research, particularly if criteria become overly rigid or restrict flexibility during the research process.

While social and epistemic diversity are acknowledged in ITD practice and evaluation, their conceptual understanding remains limited and inconsistent. To address this issue, we explore how the philosophy of interdisciplinarity can guide the evaluation of ITD.

## Philosophical Reflections for Research Practice

Assuming science (re-)produces external inequalities due to its internal epistemic and social inequalities, we argue that research evaluation should address this at a conceptual and practical level. The case of ITD in neuroscience research and its evaluation dynamics offers conceptual and practical insights for the evaluation of ITD research.

As the case study shows, various actors relevant to research practice and governance, particularly funders and publishers, seem to pay limited attention to epistemic and social diversity and their intersections. We suggest that this contributes to integration challenges, specifically integrating different epistemological inputs, negotiating common terminology, and considering the time and resource demands of these processes, and increases uncertainty in ITD implementation. Uncertainty, especially with regards to ITD-related career trajectories, may lead to socially marginalized groups being even further excluded, which in turn inhibits social and epistemic diversity. This is to some degree considered and countered by DEI measures being implemented into recruitment procedures at the ITD initiatives examined in our case study. However, what is framed in the case study as facilitators of diversity in ITD practice primarily refers to disciplinary diversity. Conceptions of social and epistemic diversity and how to address them for the purpose of fruitful integration are largely missing.

The case study prompts reflection on epistemic and social diversity and highlights a challenge for research evaluation. Introducing a philosophically grounded understanding of epistemic and social diversity into ITD evaluation could help align and sensitize evaluation practice with ITD research practice, which features multiple epistemologies and methodologies but struggles with their integration. It can, therefore, potentially improve the quality of ITD evaluation and, indirectly, the quality of ITD research. As already indicated in our literature review, we propose linking the philosophy of ITD with a decolonial perspective on knowledge production in order to reflect on epistemic and social diversity as elements in ITD evaluation practice. Decoloniality (Quijano, 2000; Maldonado-Torres, 2007) emphasizes that historically grown inequalities

and the resulting asymmetries permeate modern research systems. These inequalities have epistemic and social consequences, hierarchizing science's internal differentiation, organizations, and disciplines, as well as disciplinary and interdisciplinary paradigms. For example, the natural and life sciences trump the social sciences, and the social sciences trump the humanities, each in terms of specific research problems and epistemic and material valuation within and beyond academic science.

The current evaluation regime fails to account for research that combines and transcends disciplinary paradigms and fails to understand epistemic diversity beyond scientometric measures currently applied in evaluation practice. For metrics specific to ITD, such as breadth and integration (Huuttoniemi & Rafols, 2017), only map ITD traces within the confines of disciplinary maps that rely on manifest information flows and do not (attempt to) account for cognitive content and social relations.<sup>3</sup> While the complexity of interdisciplinary integration has received considerable attention (Klein, 2012; Laursen & O'Rourke, 2019), we argue that a decolonial perspective highlights the interplay between epistemic and social relations, along with the respective inequalities, which shape ITD research practice. In other words, decolonial theory connects epistemic and social positions within and between research constellations by showing how not only epistemic or social asymmetries matter but also, or especially, the interaction between both dimensions. Moreover, a decolonial perspective contributes to the critique of monodisciplinarity already present in ITD. It argues that overcoming the universality of monological research paradigms is a precondition for epistemic diversity and requires addressing both epistemic and social asymmetries, extending beyond mere disciplinary diversity (Lugones, 2020).

This involves challenging conventions, including the objectivity of scientific data (Grosfoguel, 2012), the perception of the universal validity of a specific set of scientific methods (Nagar et al., 2019), and the alleged self-regulation of disciplinary expertise on a cognitive level (Keestra, 2017). Such a process requires institutions and mechanisms sensitive to the correspondence between epistemic and social asymmetries. So far, evaluation practice in ITD does not adequately reflect the processual nature of epistemic diversity and its need for facilitation. The challenges of ITD implementation raised in our case study, emphasizing integration and dealing with uncertainty, underscore that integrating diverse epistemologies into a unified interdisciplinary research framework remains poorly understood.

In this respect, developing fitting assessment approaches and criteria built on current critiques on research evaluation and grounded in philosophical

3 This limitation is widely recognized in evaluation research and scientometrics, which emphasize the use of mixed methods approaches to capture the complexity of interdisciplinarity (Laursen et al., 2022, pp. 338–340).

perspectives on epistemic and social diversity may give evaluators considerable orientation in implementing more robust ITD evaluations that can capture the complexity of ITD research beyond measuring the discrete output variables. Organizationally, this entails incentivizing protected space and flexibility (Whitley, 2014, pp. 370–371) to negotiate epistemic diversity in ITD research. Moreover, evaluation could induce the active facilitation and implementation of epistemic diversity sensitive to the epistemic and social dimensions in a decolonial sense in all areas of research practice. Beyond the development of criteria, their implementation depends on (the availability of) adequate resources to train evaluators and researchers on epistemic and social diversity in general and on power-critical and positionality-sensitive aspects in particular.

Moreover, the evaluation of ITD research—particularly transdisciplinary studies involving and addressing actors from other societal domains—should include non-scientific stakeholders as evaluators, a practice already common in many cases. Such evaluation frameworks require a deeper understanding of the similarities and differences among the ways of knowing that intersect and, depending on the research aim, converge in ITD research—particularly when these epistemes emerge outside academia. For example, a social neuroscientist, a medical neuroscientist, and a patient representative may each have different understandings of concepts such as societal impact, which is supposed to be one of the most desirable features of ITD research. Here, the philosophy of ITD can also contribute to equipping evaluation practice with a conceptual repertoire that bridges the epistemic and social divide and enables stakeholders to understand, assess, and counter epistemic and social asymmetries.

The main elements of any evaluation are the evaluand, criteria, standards, evaluative reasoning, evaluative judgment, and the purpose of the evaluation (Laursen et al., 2022, p. 328). Evaluation criteria, standards, evaluative reasoning, and evaluative judgment should be consistent and appropriate to the evaluand and the purpose of the evaluation. Evaluative reasoning is the process of comparing the status or performance of an evaluand against established evaluative standards to determine its value or quality. Evaluative standards are tangible or intangible thresholds related to the criteria, that is, the specific features by which the evaluand is judged in the context of the respective evaluation. Epistemic and social diversity could be straightforward evaluation criteria with defined thresholds for which ITD should aim. For example, funders could demand work packages dedicated to integration which outline strategies of enhancing social and epistemic diversity appropriate to the respective research project. Many assessments of interdisciplinarity use epistemic diversity as a criterion in restricted and operationalizable forms for quantitative measurement and with different subcriteria, mainly consisting of variations of balance, variety, and disparity to assess the traceable

features of information flows of the respective evaluand (Laursen et al., 2022, pp. 331–333). Likewise, some dimensions of social diversity are also already criteria or subcriteria in many ITD evaluations, for example, the criteria of stakeholder engagement, collaboration, or integrative capacity.

On the one hand, the evidence from evaluation practice shows that epistemic and social diversity, like almost any criterion, are complex concepts with many components. Each component needs to be operationalized into observable, assessable dimensions. On the other hand, on a conceptual level, our understanding of epistemic and social position allows for a general paradigm for evaluating epistemic and social diversity in ITD. For example, a neuroscience project, such as those described in the case study, could be considered epistemically diverse in a transdisciplinary sense:

- if it uses theories, methods, approaches, and whatever else is useful for the particular research purpose from appropriate disciplinary and interdisciplinary perspectives within science,
- if it uses appropriate insight from different epistemic perspectives outside of science, for example, by engaging patients and other relevant stakeholders, and,
- if it organizes a symmetrical research process so that each epistemic element is solely judged by its epistemic merits with respect to the particular research purpose, with sensitivity to the social position of those who want to use and argue for it.

While such a paradigm can, should, and to some extent already is broken down into operationalizable criteria, we see three qualifiers, each of which is beyond the scope of this article and may deserve further attention in future research. First, we believe that epistemic and social diversity, at least in the conception we propose, is more than an identifiable set of evaluation criteria; it can serve as a guiding frame for evaluative reasoning in ITD evaluation. Second, like any evaluation criterion, the operational dimensions of epistemic and social diversity should be explicit, consistent, and sensitive to the subject and purpose of the evaluation. That means, among others, adjusting epistemic and social diversity to the different levels of research evaluations, including ITD research outputs, grant proposals, individual progressions, and institutional and system assessments. Third, in line with current advances in research evaluation, the assessment of epistemic and social diversity should rely on qualitative judgment—primarily peer review, but also methods that involve stakeholders beyond academia—while being supported by the appropriate use of quantitative measures.

In sum, broadening the inclusion of epistemic and social diversity—through a decolonial lens—as interconnected dimensions of ITD and its evaluation challenges traditional hegemonies in modern science. It also allows further reflection on the philosophy of interdisciplinarity.

## Practical Reflections for Philosophy of Interdisciplinarity

If epistemic and social diversity is particularly relevant to ITD research practice, and if research evaluation struggles with assessing the dimensions of this criterion, the practical relevance of a philosophy of ITD that aims to conceptualize this double helix-like interplay is evident. While a philosophically grounded conceptualization of epistemic and social diversity can have practical relevance beyond improving ITD evaluation, it also has epistemic and empirical potential for developing the philosophy of ITD. Here, we identify at least two practical considerations for the philosophy of interdisciplinarity. First, if epistemic and social diversity can be embedded into sound philosophical concepts grounded in a decolonial perspective, this may lead to a more robust and sensitive consideration of these criteria in ITD evaluation. If such improvements enhance ITD evaluation practices, they could also benefit the evaluation of interdisciplinary research in philosophy. The philosophy of interdisciplinarity is, after all, highly interdisciplinary itself—not just in name—and faces challenges similar to those faced by other ITD fields in evaluation.

The second practical reflection concerns research practice in the philosophy of interdisciplinarity. Suppose that a decolonial conception of epistemic and social diversity can contribute to improving the practice of ITD evaluation. In this case, such a conception should also apply to research practice in any ITD field. Therefore, the philosophy of interdisciplinarity should draw on theories, methods and approaches from both disciplinary and interdisciplinary perspectives within and beyond the academy. It should also ensure a symmetrical integration process in which each epistemic element is judged solely on its merits for the research purpose, and valued with sensitivity to the social position of those who advocate it. While we think that the philosophy of ITD already does this to a considerable extent, the level of self-reflexivity that the decolonial perspective invites may lead to fruitful debates within its research practice as well.

We have further proposed a decolonial conception of the double helix of epistemic and social diversity. The entanglement of colonial continuities in the modern scientific system is also evident in ITD research, among others, through the persistence of universality—that is, monological science—that contributes to hierarchizing epistemic statements in correspondence with the social position of its transmitter. Our case study suggests a lack of conceptualization and operationalization of epistemic and social diversity in organizing and evaluating ITD research in a general and decolonial sense. Although our findings are highly exploratory and more robust empirical insight is needed, we expect this lack of conceptualization and operationalization to represent a broader issue in current ITD research and evaluation practice. The philosophy of interdisciplinarity, precisely because of its interdisciplinary approach, is

well equipped to reflect on the shortcomings of these issues revealed by our study and to propose possible solutions for ITD practice and its evaluation.

Incorporating a decolonial conceptualization of the double helix of social and epistemic diversity into the analysis of ITD evaluation also contributes a genealogy of the explained inequalities in knowledge production and draws a connection to colonial history as constitutive of modern European epistemology (Maldonado-Torres, 2007). Thus, the notion of the double helix of epistemic and social diversity, framed in part through the perspectives of decoloniality, can be a substantial addition to the philosophy of ITD.

## Future Outlook

Reforming the academic evaluation system to meet the specific needs of ITD research will take time. As the demand for ITD research increases, so does the pressure on research institutions, funders, and publishers to implement appropriate evaluations. From a philosophy of science perspective, we have argued that it is crucial to ground such reform processes in thorough conceptualizations of what constitutes ITD research. Our conception of the double helix of epistemic and social diversity is only one attempt of many, but it is a critical aspect of doing so. To transcend disciplinary traditions in a modern scientific framework trapped in its claim to universality, the philosophy of interdisciplinarity can and needs to support the production of more emancipatory thought about the multiple facets of epistemic diversity and scientific pluralism, which can inform practice-oriented evaluation studies. Planning and incrementalism are also needed to gather conceptual insights and evidence of best practice in evaluating epistemic and social diversity in ITD research, ensuring the integration of diverse perspectives and practical considerations.

As we have argued, a philosophy of ITD grounded in decoloniality that addresses the connections between epistemic and social diversity can contribute to a more robust conceptual repertoire that displays the necessary sensitivity to epistemic and social inequalities. Especially in interdisciplinary collaboration with evaluation studies and other fields, both within and outside the academy, such a perspective can build a more substantial understanding of these theoretical concepts and help translate them into operationalizable dimensions for evaluation practice. Its conceptual expertise in translating different epistemologies plays a crucial role in implementing the link between epistemic and social diversity in ITD evaluations and as an actual part of such evaluations. Including this expertise could enhance both the philosophy of ITD and research evaluation, thereby advancing ITD research as well.

This means pursuing several avenues in future research. First, we need a more comprehensive conceptualization of epistemic and social diversity

in ITD that is primarily grounded in the philosophy of ITD while integrating theoretical and empirical insights from adjacent fields. We also propose a continued focus on decolonial scholarship because it places emancipatory thought, power-critical perspectives, and epistemic justice at the center of knowledge production. Fostering robust diversity will require ITD governance actors, evaluators, and researchers to engage with epistemic and social relations. Sensitivity to and the willingness to counteract historical and contemporary power dynamics in science is essential for fruitful integration processes within the arena of possibilities that ITD research represents for the future. Indeed, such epistemic and social sensitivity emerges as a necessity from our proposed conception of epistemic diversity in the decolonial perspective at the core of ITD. The academic evaluation system should not contribute to reproducing social and epistemic inequalities. Instead, it should employ sensitivity and open up spaces for intensive engagement with the multiple forms of epistemic and social diversity that ITD research can take on in practice. In pragmatic terms, the felicity of this requires a deeper alignment of ITD evaluation practice with the epistemic and social foundation of ITD research, especially with its diversity.<sup>4</sup>

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## References

- Anzaldúa, G. (1987). *Borderlands/La Frontera. The New Mestiza*. Aunt Lute Books.
- Aubert Bonn, N., & Bouter, L. (2023). Research assessments should recognize responsible research practices. Narrative review of a lively debate and promising developments. In E. Valdés & J.A. Lecaros (Eds.), *Handbook of bioethical decisions. Volume II* (pp. 441–472). Springer. [https://doi.org/10.1007/978-3-031-29455-6\\_27](https://doi.org/10.1007/978-3-031-29455-6_27)
- Becher, T., & Trowler, P. R. (2006). *Academic tribes and territories: Intellectual enquiry and the culture of disciplines* (2nd ed.). The Society for Research into Higher Education & Open University Press.
- Bell, M.P., Berry, D., Leopold, J., Nkomo, S. (2021). Making Black Lives Matter in academia: A Black feminist call for collective action against anti-blackness in the academy. *Gender, Work & Organization*, 28(51), 39–57. <https://doi.org/10.1111/gwao.12555>
- BRAIN Working Group. (2014). *BRAIN 2025: A scientific vision. Report to the advisory committee to the director, NIH*. National Institutes of Health. <https://braininitiative.nih.gov/vision/nih-brain-initiative-reports/brain-2025-scientific-vision>
- Bromham, L., Dinnage, R., & Hua, X. (2016). Interdisciplinary research has consistently lower funding success. *Nature*, 534(7609), 684–687. <https://doi.org/10.1038/nature18315>
- Dewey, J. (1915). The logic of judgments of practise. *The Journal of Philosophy, Psychology and Scientific Methods*, 12(19), 505–523. <https://doi.org/10.2307/2012995>
- Engwall, L., Edlund, P., & Wedlin, L. (2022). Who is to blame? Evaluations in academia spreading through relationships among multiple actor

- types. *Social Science Information*, 61(4), 439–456. <https://doi.org/10.1177/05390184221146476>
- Espeland, W. (2020). Formalized evaluation: The work that rankings do. In D. Stark (Ed.), *The performance complex: Competition and competitions in social life* (99–122). Oxford University Press.
- Falk, E. B., Hyde, L. W., Mitchell, C., Faul, J., Gonzalez, R., Heitzeg, M. M., Keating, D. P., Langa, K. M., Martz, M. E., Maslowsky, J., Morrison, F. J., Noll, D. C., Patrick, M. E., Pfeffer, F. T., Reuter-Lorenz, P. A., Thomason, M. E., Davis-Kean, P., Monk, C. S., & Schulenberg, J. (2013). What is a representative brain? Neuroscience meets population science. *PNAS*, 110(44), 17615–17622. <https://doi.org/10.1073/pnas.1310134110>
- Fleck, L. (1979). *Genesis and development of a scientific fact*. The University of Chicago Press.
- Fricker, M. (2007). *Epistemic injustice: Power and the ethics of knowing*. Oxford University Press.
- Gewin, V. (2025). Trump executive order puts STEM diversity efforts on hold. *Science*. Advance online publication. <https://doi.org/10.1126/science.zsoz644>
- Glänzel, W., & Debackere, K. (2022). Various aspects of interdisciplinarity in research and how to quantify and measure those. *Scientometrics*, 127(9), 5551–5569. <https://doi.org/10.1007/s11192-021-04133-4>
- Gläser, J., & Laudel, G. (2016). Governing science. *European Journal of Sociology*, 57(1), 117–168. <https://doi.org/10.1017/S0003975616000047>
- Gläser, J., & Velarde, K. S. (2018). Changing funding arrangements and the production of scientific knowledge: Introduction to the special issue. *Minerva*, 56(1), 1–10. <https://doi.org/10.1007/s11024-018-9344-6>
- Grosfoguel, R. (2012). Decolonizing western universalisms: Decolonial pluriversalism from aimé césaire to the zapatistas. *Transmodernity: Journal of Peripheral Cultural Production of the Luso-Hispanic World*, 1(3). <https://doi.org/10.5070/T413012884>
- Hammarfelt, B., & Hallonsten, O. (2022). Are evaluative bibliometrics neo-liberal? A historical and theoretical problematization. *Social Science Information*, 61(4), 414–438. <https://doi.org/10.1177/05390184231158195>
- Harding, S. (1991). *Whose science? Whose knowledge? Thinking from women's lives*. Cornell University Press.
- Harding, S. (2011). *The Postcolonial science and technology studies reader*. Duke University Press.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2–3), 61–83. <https://doi.org/10.1017/S0140525X0999152X>
- Hirsch Hadorn, G. H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Hoffmann-Riem, H., Joye, D., Pohl, C., Wiesmann, U., & Zemp, E. (2008). The emergence of transdisciplinarity as a form of research. In G. Hirsch Hadorn, H. Hoffmann-Riem, S. Biber-Klemm, W. Grossenbacher-Mansuy,

- D. Joye, C. Pohl, U. Wiesmann, & E. Zemp (Eds.), *Handbook of transdisciplinary research* (pp. 19–39). Springer. [https://doi.org/10.1007/978-1-4020-6699-3\\_2](https://doi.org/10.1007/978-1-4020-6699-3_2)
- Hofstra, B., Kulkarni, V. V., Munoz-Najar Galvez, S., He, B., Jurafsky, D., & McFarland, D. A. (2020). The diversity-innovation paradox in science. *PNAS*, 117(17), 9284–9291. <https://doi.org/10.1073/pnas.1915378117>
- Holbrook, J. B. (2013). What is interdisciplinary communication? Reflections on the very idea of disciplinary integration. *Synthese*, 190(11), 1865–1879. <https://doi.org/10.1007/s11229-012-0179-7>
- Holm, P., Goodsite, M. E., Cloetingh, S., Agnoletti, M., Moldan, B., Lang, D. J., Leemans, R., Moeller, J. O., Buendía, M. P., Pohl, W., Scholz, R. W., Sors, A., Vanheusden, B., Yusoff, K., & Zondervan, R. (2013). Collaboration between the natural, social and human sciences in Global Change Research. *Environmental Science & Policy*, 28, 25–35. <https://doi.org/10.1016/j.envsci.2012.11.010>
- Huutoniemi, K., Klein, J. T., Bruun, H., & Hukkinen, J. (2010). Analyzing interdisciplinarity: Typology and indicators. *Research Policy*, 39(1), 79–88. <https://doi.org/10.1016/j.respol.2009.09.011>
- Huutoniemi, K., & Rafols, I. (2017). Interdisciplinarity in research evaluation. In R. Frodeman (Ed.), *The Oxford handbook of interdisciplinarity* (2nd ed., pp. 498–512). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780198733522.013.40>
- Keestra, M. (2017). Metacognition and reflection by interdisciplinary experts: Insights from cognitive science and philosophy. *Issues in Interdisciplinary Studies*, 35, 121–169.
- Khader, S. (2019). *Decolonizing universalism: A transnational feminist ethic*. Oxford University Press.
- Kim, G. M. & Cooc, N. (2020). Asian Americans and Pacific Islanders in academe: Race and gender through the tenure pipeline from 1993–2017. *Race Ethnicity and Education*, 24(3), 338–356. <https://doi.org/10.1080/13613324.2020.1753675>
- Klein, J. T. (2008). Evaluation of interdisciplinary and transdisciplinary research: A literature review. *American Journal of Preventive Medicine*, 35(2 Suppl), 116–23. <https://doi.org/10.1016/j.amepre.2008.05.010>
- Klein, J. T. (2012). Research integration: A comparative knowledge base. In A. F. Repko, W. Newell, & R. Szostak (Eds.), *Case studies in interdisciplinary research* (pp. 283–298). Sage.
- Koch, S. (2020). Responsible research, inequality in science and epistemic injustice: An attempt to open up thinking about inclusiveness in the context of RI/RRI. *Journal of Responsible Innovation*, 7(3), 672–679. <https://doi.org/10.1080/23299460.2020.1780094>
- Kozlowski, D., Larivière, V., Sugimoto, C. R., & Monroe-White, T. (2022). Intersectional inequalities in science. *PNAS*, 119(2). <https://doi.org/10.1073/pnas.2113067119>

- Larivière, V., & Gingras, Y. (2014). Measuring interdisciplinarity. In B. Cronin & C. R. Sugimoto (Eds.), *Beyond bibliometrics: Harnessing multidimensional indicators of scholarly impact* (pp. 187–200). MIT Press. <https://doi.org/10.7551/mitpress/9445.003.0014>
- Laursen, B. & O'Rourke, M. (2019). Thinking with Klein about integration. *Issues in Interdisciplinary Studies*, 37(2), 33–61.
- Laursen, B. K., Motzer, N., & Anderson, K. J. (2022). Pathways for assessing interdisciplinarity: A systematic review. *Research Evaluation*, 31(3), 326–343. <https://doi.org/10.1093/reseval/rvaco13>
- Laursen, B. K., Motzer, N., & Anderson, K. J. (2023). Pathway profiles: Learning from five main approaches to assessing interdisciplinarity. *Research Evaluation*, 32(2), 213–227. <https://doi.org/10.1093/reseval/rvaco36>
- Leahey, E., Beckman, C. M., & Stanko, T. L. (2017). Prominent but less productive: The impact of interdisciplinarity on scientists' research. *Administrative Science Quarterly*, 62(1), 105–139. <https://doi.org/10.1177/0001839216665364>
- Lyall, C., Bruce, A., Marsden, W., & Meagher, L. (2013). The role of funding agencies in creating interdisciplinary knowledge. *Science and Public Policy*, 40(1), 62–71. <https://doi.org/10.1093/scipol/scs121>
- Longino, H. E. (1990). *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton University Press.
- Lugones, M. (2010). Toward a Decolonial Feminism. *Hypatia*, 25(4), 742–759. <https://doi.org/10.1111/j.1527-2001.2010.01137.x>
- Lugones, M. (2020). Gender and universality in colonial methodology. *Critical Philosophy of Race*, 8(1–2), 25–47. <https://doi.org/10.5325/critphilrace.8.1-2.0025>
- Mäkinen, E. I., Evans, E. D., & McFarland, D. A. (2024). Interdisciplinary research, tenure review, and guardians of the disciplinary order. *The Journal of Higher Education*, 1–28. <https://doi.org/10.1080/00221546.2024.2301912>
- Maldonado-Torres, N. (2007). On the coloniality of being: Contributions to the development of a concept. *Cultural Studies*, 21(2–3), 240–270. <https://doi.org/10.1080/09502380601162548>
- Mannheim, K. (1956). The problem of the intelligentsia: An inquiry into its past and present role. In B. S. Turner (Ed.), *Collected works: Vol. 7. Essays on the sociology of culture* (pp. 91–170). Routledge.
- Messeri, L. R. (2010). The problem with Pluto. *Social Studies of Science*, 40(2), 187–214. <https://doi.org/10.1177/0306312709347809>
- McLeish, T., & Strang, V. (2016). Evaluating interdisciplinary research: The elephant in the peer-reviewers' room. *Palgrave Communications*, 2(1). <https://doi.org/10.1057/palcomms.2016.55>
- Mitchell, Sandra D. (2002). Integrative Pluralism. *Biology & Philosophy*, 17(1), 55–70. <https://doi.org/10.1023/A:1012990030867>

- Moore, T., Chestek, C., Polley, D., Chen, A., Hippenmeyer, S., & Anikeeva, P. (2018). Visions for the future of neuroscience. *Neuron*, 98(3), 464–465. <https://doi.org/10.1016/j.neuron.2018.04.024>
- Morgan H. E. (1988). Open letter to NIH. Review of cross-disciplinary applications. *Physiologist*, 31(17), 18–21.
- Münch, R. (2014). *Academic capitalism: Universities in the global struggle for excellence*. Routledge.
- Nagar, R., Mazdoor Sangathan, K.S., & Theatre, P. (2019). *Hungry translations: Relearning the world through radical vulnerability*. University of Illinois Press.
- National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. (2005). *Facilitating interdisciplinary research*. National Academies Press. <https://doi.org/10.17226/11153>
- National Center for Education Statistics (2020–2022). Full-time faculty in degree-granting postsecondary institutions, by race/ethnicity, sex, and academic rank: Fall 2020, fall 2021, and fall 2022. [https://nces.ed.gov/programs/digest/d23/tables/dt23\\_315.20.asp](https://nces.ed.gov/programs/digest/d23/tables/dt23_315.20.asp)
- NeuroCure Cluster of Excellence (2019). *NeuroCure: Towards a better outcome of neurological disorders (DFG Project No. 39052203)*. <https://doi.org/10.2314/KXP:1698804903>
- Pauen, M., & Winkelmann, A. (2019). *Berlin School of Mind and Brain: Final report (DFG project no. 24184485)*. Humboldt-Universität zu Berlin. <https://dx.doi.org/10.2314/GBV:1697094120>
- Pellmar, T. C., & Eisenberg, L. (2000). *Bridging disciplines in the brain, behavioral, and clinical Sciences*. National Academies Press. <https://doi.org/10.17226/9942>
- Quijano, A. (2000). Coloniality of power and eurocentrism in Latin America. *International Sociology*, 15(2), 215–232. <https://doi.org/10.1177/0268580900015002005>
- Reiter, B. (2018). *Constructing the pluriverse: The geopolitics of knowledge*. Duke University Press. <https://doi.org/10.1515/9781478002017>
- Richardson, R. R., Crawford, D. C., Ngai, J., & Beckel-Mitchener, A. C. (2021). Advancing scientific excellence through inclusivity in the NIH BRAIN Initiative. *Neuron*, 109(21), 3361–3364. <https://doi.org/10.1016/j.neuron.2021.10.021>
- Sabbatini, R. M. E., & Cardoso, S. H. (2002). Interdisciplinarity in the neurosciences. *Interdisciplinary Science Reviews*, 27(4), 303–310. <https://doi.org/10.1179/030801802225003169>
- Schimank, U., & Stucke, A. (1994). Coping with trouble as a complex constellation of political and research actors: Introducing a theoretical perspective. In U. Schimank & A. Stucke (Eds.), *Coping with trouble: How science reacts to political disturbances of research conditions* (pp. 7–34). Campus.
- Schmidt, J. C. (2022). *Philosophy of interdisciplinarity*. Routledge. <https://doi.org/10.4324/9781315387109>

- Smedley, B. D., Stith, A. Y., & Nelson, A. R. (Eds.). (2003). *Unequal treatment: Confronting racial and ethnic disparities in health care*. <https://doi.org/10.17226/12875>
- Stichweh, R. (1984). *Zur Entstehung des modernen Systems wissenschaftlicher Disziplinen: Physik in Deutschland 1740–1890*. Suhrkamp.
- Stichweh, R. (2015). Scientific disciplines, History of. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., Vol. 21, pp. 287–290). Elsevier. <https://doi.org/10.1016/B978-0-08-097086-8.03048-8>
- Swartz, T. H., Palermo, A. G. S., Masur, S. K., & Aberg, J. A. (2019). The science and value of diversity: Closing the gaps in our understanding of inclusion and diversity. *Journal of Infectious Diseases*, 220(Suppl 2), S33–S41. <https://doi.org/10.1093/infdis/jiz174>
- Stirling, A. (2007). A general framework for analysing diversity in science, technology and society. *Journal of the Royal Society, Interface*, 4(15), 707–719. <https://doi.org/10.1098/rsif.2007.0213>
- van Noorden, R. (2015). Interdisciplinary research by the numbers. *Nature*, 525(7569), 306–307. <https://doi.org/10.1038/525306a>
- Vantard, M., Galland, C., & Knoop, M. (2023). Interdisciplinary research: Motivations and challenges for researcher careers. *Quantitative Science Studies*, 4(3), 711–727. [https://doi.org/10.1162/qss\\_a\\_00265](https://doi.org/10.1162/qss_a_00265)
- Welpe, I. M., Wollersheim, J., Ringelhan, S., & Osterloh, M. (Eds.). (2015). *Incentives and performance*. Springer. <https://doi.org/10.1007/978-3-319-09785-5>
- Whitley, R. (1984). *The intellectual and social organization of the sciences*. Clarendon Press.
- Whitley, R. (2014). How do institutional changes affect scientific innovations? The effects of shifts in authority relationships, protected space, and flexibility. In R. Whitley & J. Gläser (Eds.), *Organizational transformation and scientific change: The impact of institutional restructuring on universities and intellectual innovation* (pp. 367–406). Emerald Group Publishing Limited.
- Zhang, Y., Wang, Y., Du, H., & Havlin, S. (2024). Delayed citation impact of interdisciplinary research. *Journal of Informetrics*, 18(1), 101468. <https://doi.org/10.1016/j.joi.2023.101468>
- Ziman, J. (2000). *Real science: What is, and what it means*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511541391>