

# Philosophy *of* and *as* Interdisciplinarity

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## Introduction to a special issue in *Synthese*

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“Interdisciplinarity” is now a buzzword for more than 40 years since Erich Jantsch coined the term for a broader audience, together with “transdisciplinarity” (Jantsch 1970; see also Apostel et al. 1972). The exact meaning of these and related terms seems to be still in flux. However, as Britt Holbrook explains in the first contribution to this special issue, we can observe a convergence in the literature according to which we could distinguish three notions. Following Holbrook’s report about more or less accepted terminology—which he himself criticizes in his contribution—we restrict, for the purposes of this special issue, “multidisciplinarity” to a *juxtaposition* of two or more academic disciplines focused on a single problem; “interdisciplinarity” to the *integration* of one or more academic disciplines; and “transdisciplinarity”—although this usage is more contested—to “the integration of one or more academic disciplines with extra-academic perspectives on a common (and usually a real-world, as opposed to a merely academic) problem.”<sup>1</sup>

It is obvious that these terminological distinctions alone and the concepts used in these definitions, such as “discipline,” “problem,” “juxtaposition,” “integration,” and “real-world problem” *versus* “academic problem,” call for clarification and philosophical reflection. These are called for even more so as the increased usage of these terms indicates a substantial shift both in the modes of scientific knowledge production (Gibbons et al. 1994) and in the critique of what has been dubbed the “knowledge society.”<sup>2</sup> Whereas multi-, inter-, and transdisciplinarity have been intensively studied over the past decades by social scientists,

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<sup>1</sup> For an alternative usage of “transdisciplinarity” see NRC (2003) and the classical text by Jantsch (1970).

Holbrook’s and our understanding of transdisciplinarity is documented also in Hirsch Hadorn et al. (2008).

<sup>2</sup> All these movements are visible in concepts such as “mode-2-science” (Gibbons et al. 1994), “post-normal science” (Funtowicz/Ravetz 1993), “post-paradigmatic science and societally oriented finalization” (Böhme et al. 1983), “postacademic science” (Ziman 2000), “technoscience” (Hottos 1984; Haraway 2003; Nordmann 2008; Schmidt 2011b), “problem-oriented research” (Chubin et al. 1986; de Bie 1970; Schmidt 2011a), “socio-ecological research” (Becker 2002), “post disciplinarity” (Norton 2005) or “triple helix” research and innovation (Etzkowitz/Leydesdorff 1997).

particularly in the area of “Science and Technology Studies” (STS; cf. Rossini and Porter 1979; Klein 1990; Klein 1996; Gibbons et al. 1994), it is surprising that philosophers, so far, have stayed on the sidelines for most of the time. The most significant exception might be *The Oxford Handbook of Interdisciplinarity*, edited by R. Frodeman, J.T. Klein, & C. Mitcham, 2010, which is itself an interdisciplinary project, not solely a philosophical one. Further exceptions can be found in the works by J. Mittelstraß (1987), G. Ropohl (2005), M. Carrier (2001), G. Hirsch Hadorn et al. (2008), J.C. Schmidt (2007; 2011a) and M. Jungert et al. (2010).<sup>3</sup> In general, philosophers have remained reluctant to address “interdisciplinarity.”

The goal of this special issue on “philosophy *of* and *as* interdisciplinarity” is to change that situation. The six contributions collected here present genuine philosophical perspectives on the phenomenon and notion of interdisciplinarity (and transdisciplinarity). Crucial for these perspectives is the distinction between philosophy “of” and “as” interdisciplinarity. This distinction reflects the thesis that interdisciplinarity can mean two different things in the field of philosophy. On the one hand, it can be a new subject area just as science is the subject of “philosophy of science” and biology the subject of a “philosophy of biology,” and so on. On the other hand, interdisciplinarity can be perceived as a more fundamental challenge to philosophy itself; that is, as a challenge to the self-understanding and self-conceptualization of philosophy as an academic discipline, including its forms of institutionalization with funding procedures, academic careers, course programs, and teaching methods. Philosophy “as” interdisciplinarity starts from questioning the academic status of philosophy as a discipline with its well-known specializations, methodological approaches, and interests and attempts to envision new forms of philosophical practice, institutionalization, and products whose common denominator is embedding philosophy in inter- and transdisciplinary collaborations. Philosophy “as” interdisciplinarity calls for intensive and explicit philosophical engagement with “the world out there”; an engagement, as Robert Frodeman emphasizes in his contribution, that questions and overcomes the boundaries that have constituted philosophy as a discipline

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<sup>3</sup> Further examples for philosophical references to the notion of interdisciplinarity include Peter Galison’s discussion of computer simulations as “interdisciplinary trading zones” (Galison 1996); Nancy Nersessian’s reference to mental models and model-based reasoning as a tool in interdisciplinary collaboration across the laboratory, e.g. in “interdisciplinary engineering” (Nersessian/Patton 2009); Star and Griesemer’s concept of “boundary objects” that they conceive as “interdisciplinary objects” (Star/Griesemer 1989); Stephen S. Kline’s (1995) “conceptual foundation of multidisciplinary thinking”; Alfred Nordmann’s focus on the dissolution of boundaries between natural sciences and engineering so that they converge towards “interdisciplinary oriented technosciences” (Nordmann 2005); Karen Kastenhofer and Jan C. Schmidt’s (2011) characterization of a two-fold convergence of disciplinary perspectives in recent synthetic biology towards an “interdisciplinary melting pot”; and Michael Decker’s (2001) discussion of technology assessment as “an inherent interdisciplinary approach.” Of course, this is an open list of philosophic engagement in the discourse on “interdisciplinarity.” Depending on how this notion is defined, and depending on the question of which phenomena should count as implicitly related to “interdisciplinarity,” much more could be listed here.

in the 20th century. According to this understanding of the relevance of “interdisciplinarity,” philosophers should leave their office from time to time and enter “the field” in order to integrate their work with scientists, engineers, and policy makers (cf. Frodeman et al. 2010).

Whereas the first three contributions of this volume focus on questions that a philosophy “of” interdisciplinarity encounters, the second group of three develops ideas for an evolving philosophy “as” interdisciplinarity. We introduce the first group with Britt Holbrook’s paper on “What is interdisciplinary communication? Reflections on the very idea of disciplinary integration.” Starting from the definitions mentioned above, Holbrook reflects critically on the notion of “integration” which is crucial, according to these definitions, both for “interdisciplinarity” and for “transdisciplinarity.” Against a majority view that takes “integration” as the core characteristic of inter- and transdisciplinarity, Holbrook argues that there are two philosophical traditions whose reflections on the possibilities and limits of integration and mutual understanding should be taken into account to develop more nuanced positions: What he dubs the “Kuhn-MacIntyre” and the “Bataille-Lyotard” models of interdisciplinarity contest the majority view of integration which Holbrook discusses under the heading of the “Habermas-Klein” model. All three models provide very different answers to the question of how mutual understanding could be possible across the boundaries of “incommensurable” or conflicting background assumptions. And they provide three types of answers to the question what interdisciplinarity could mean: (1) integration and consensus (Habermas-Klein), (2) recognizing incommensurability (Kuhn-MacIntyre), and (3) being ready to invent a new language when “attempts at communication fail” (Bataille-Lyotard).

In contrast to Holbrook who uses resources provided by the recent history of philosophy to develop a better understanding and critique of the central notion of “integration,” Hanne Andersen and Susann Wagenknecht refer to research in social epistemology in their analysis of “Epistemic dependence in interdisciplinary groups.” As with other articles in this special issue, their contribution not only provides insights to the philosophical dimensions of interdisciplinarity, but also—*vice versa*—insights that enrich the debates from which they are derived. Andersen and Wagenknecht show, for example, that even though there are extensive discussions in social epistemology about how conflicting knowledge within one subject area can be aggregated, how to justify “testimony-based beliefs” from other fields, and what “intentional states” of groups might be, there is much to be gained when these approaches “work together to form an integrated analysis of collaborations between scientists with complementary knowledge.”

The focus on interdisciplinary knowledge creation allows the authors to develop a better understanding of the “detailed process through which scientists with different areas of ex-

expertise connect and integrate their knowledge to arrive at a joint view across disciplinary boundaries” (Andersen and Wagenknecht, in this volume). Interdisciplinary work takes place in fields in which knowledge—in particular: complementary and conflicting models, concepts, paradigms, and knowledge fragments—is distributed among experts, and each expert’s “knowledge” is knowledge that depends on someone else’s knowledge (“epistemic dependence”). So the fundamental question is, as Hardwig wonders, who is “the knowing subject of interdisciplinary teamwork in the end?” Is it the group as a whole or any individual? Andersen and Wagenknecht argue that this question can only be answered based on a detailed analysis of the kind of collaboration in each case. Considering a combination of empirical research and a philosophical reflection that takes into account the varying degrees to which mental models are shared, they distinguish four types of interdisciplinary collaboration: (1.) “integration by leader” where the group leader alone possesses the expertise necessary to integrate contributions by others; (2.) “common group learning,” a process that starts from interlocking intentions and leads, ideally, to the sharing of mental models and concepts; (3.) “negotiation among experts,” where the fact that there is little overlap in the areas of expertise does not lead to integration or shared mental models, but only to an “interrelated analysis;” and, finally, (4.) “joint integration” in which group members collaborate with “interlocking intentions, meshing subplans and mutual responsiveness” throughout the cooperation, based on “substantial interactional expertise” of all group members in the fields of their collaborators. This way, Andersen and Wagenknecht arrive at a clarification of what “cognitive integration”—a central notion in the discourse on interdisciplinarity—can mean.

The third contribution that we group in those papers that focus primarily on philosophy “of” interdisciplinarity should be read as bridging from the first to the second group. Steve Fuller, while distinguishing—in the style of talking *about* interdisciplinarity—“normal” and “deviant interdisciplinarity,” engages at the same time in a programmatic vision regarding two possible roles philosophy can play “as” an interdisciplinary activity. In his article “Deviant interdisciplinarity as philosophical practice: Prolegomena to deep intellectual history,” he describes “normal interdisciplinarity” as a form of collaboration in which philosophy plays primarily an “auxiliary role,” the role of an “underlaborer,” for example through conceptual analysis, “in the understanding that the disciplines themselves are the main epistemic players.” In “deviant interdisciplinarity,” by contrast, philosophy may itself be “the site for the production of interdisciplinary knowledge.” Here, philosophy transcends the knowledge that the disciplines provide and works actively on an encompassing and integrative understanding of reality—what Fuller calls “second-order understanding of reality.” Fuller advocates the latter type of philosophy. Tracking the idea of “deviant interdisciplinarity” from the medieval

university to German Idealism and natural philosophy, then to modern biology, Fuller presents an ongoing tradition of paradigmatic deviant interdisciplinarians from John Duns Scotus and William of Ockham, to Hegel, Fechner, Jean-Baptiste Lamarck, Ludwig Bertalanffy, and others. Fuller argues against an understanding of interdisciplinarity as “teamwork” according to which disciplinary boundaries remain basically intact, and for deviant interdisciplinarity as a project that assumes that the differences in disciplinary expertise themselves pose the main obstacle.

While Fuller envisions “deviant interdisciplinarity” as a philosophical practice that attempts to break out of any subservient collaboration with other disciplines in order to assess again the possibilities of a synthetic worldview, Robert Frodeman aims at a new practice of philosophy that is *integrated* in inter- and transdisciplinary collaboration, and thus introduces our second group of contributions. It was Frodeman (2010) who developed originally the idea of a “philosophy as interdisciplinarity” in his concept of “field philosophy.” He encourages philosophers to go into the interdisciplinary “field” to address real-world problems, working together with scientists of other disciplines, practitioners, policy makers, and others. Leaving the academic ivory-tower behind, Frodeman’s field philosopher acts in “real life.”<sup>4</sup> The field philosopher is not conceived merely as a “public intellectual,” but as an “active *participant* in ongoing debates on policy problems.” Frodeman’s philosopher is working “on the project level with scientists, engineers, policy makers, public agencies, and community groups.” Additionally, field philosophers engage also in science, technology and innovation politics, in environmental, global change, and energy politics, in technology assessment, and in other public arenas.<sup>5</sup> In “Philosophy Dedisciplined,” Frodeman criticizes the historical development of academic philosophy in the United States and elsewhere across the 20th century; a development that he characterizes as nothing but an “aberration compared to the main tradition of two thousand years of Western philosophy.” For Frodeman, the real problems the world is struggling with call “for changes in the institutional expressions of philosophy. The institutional status of philosophy—e.g., its functioning as a *discipline*—was the great blind spot of twentieth (and now twenty-first) century philosophy.” Frodeman tries to show—based also on a survey of the status of academic philosophy in the United States—that only a “dedisciplined philosophy” can avoid being crushed by tightening budgets. He advocates that academic philosophy should perform a critical reflection on its overall irrelevance for societal problems.

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<sup>4</sup> His programmatic vision comes close to what Gibbons et al. (1994) discuss as a “new mode of knowledge production.” Frodeman envisions this new mode as a radical change in academic philosophy.

<sup>5</sup> See also the goals and activities of the “Public Philosophy Network” in which Frodeman plays a central role (<http://publicphilosophynetwork.ning.com/>).

This should be an opportunity to reflect on its relationship with society and on the question how this relationship is influenced by its institutional reality.

The second paper in this group of contributions demonstrates how the idea of philosophy “as” interdisciplinarity can be realized in a very concrete case. In their article “Philosophical Intervention and Cross-Disciplinary Science: The Story of the Toolbox Project,” Michael O’Rourke and Stephen J. Crowley report and reflect on the development of a philosophical “tool” that has been designed to facilitate and improve cross-disciplinary communication and collaboration. The so-called “Toolbox,” which includes a workshop and a questionnaire, stimulates reflection on epistemological assumptions that might differ from discipline to discipline. O’Rourke and Crowley show with examples from the many workshops they performed that cross-disciplinary communication is often hindered by differences in background assumptions, methodological assumptions, and discipline-specific meanings of concepts that are usually taken for granted. If these differences remain unidentified and not explicitly reflected upon, the success of cross-disciplinary collaboration is threatened. The Toolbox approach “intervenes” exactly at this point. Small-group discussions about answers to a questionnaire that participants have provided first individually can lead to epistemic changes that improve group communication. In O’Rourke and Crowley’s contribution, philosophy “as” interdisciplinarity is realized in form of “philosophical interventions” into the cognitive processes that make interdisciplinarity possible.

At the same time the Toolbox research project realizes philosophy “of” interdisciplinarity based on a critical function of the Toolbox. As O’Rourke and Crowley show, using the Toolbox to facilitate communication in its “outreach mode” reveals critical implications for the philosophical background theories based on which the Toolbox has been developed in the first place. Analyzing these implications—for example with regard to recent debates on “reasonable disagreement”—and using them for a refinement of the philosophical terminology used in the Toolbox questionnaire is another important dimension of the Toolbox project.

In our final contribution to what philosophy “as” interdisciplinarity can mean, Nancy Tuana develops a strong argument for the need of the humanities, and in particular of philosophy, in interdisciplinary projects. Using the funding practice of the “National Science Foundation” (NSF) in the United States as a case study, Tuana argues in “Embedding Philosophers in the Practices of Science: Bringing Humanities to the Sciences” that all the laudable efforts of NSF to promote interdisciplinarity are counterbalanced by an insufficient appreciation of the substantial role philosophy and the humanities can play. A more robust practice of interdisciplinarity, a practice that develops “deeper and wider interdisciplinary research in the

sciences,” would include what she calls “coupled ethical-epistemological research.” Such research would, for instance, ask how the various attempts to frame scientific uncertainty and to develop an adequate conceptualization of risk influence scientific decision making when it comes to developing climate models. Tuana discusses the example of recent ice sheet models that, based on scientific consensus about the limitations of these models, were deliberately not used for the recent Intergovernmental Panel on Climate Change’s projections of sea level rise. “A coupled ethical-epistemic analysis,” Tuana writes, “would render transparent the epistemic decisions regarding reliability and robustness of this data, examine the question of an adequate decision process (including questions regarding “adequate for whom and for what”) for determining whether and what data is sufficiently robust to include in models and how best to do so, and provide resources for better understanding the implications of not including this data into integrated assessment models.”

Reflecting on a series of interdisciplinary projects in which she has engaged over the years as the director of the Rock Ethics Institute at Penn State, Tuana argues that interdisciplinarity in the sciences is often hampered by a failure to acknowledge that often scientific models and methods represent certain value decisions. “These can be both ethically significant, as well as have consequences for what is (and is not) known.” Rendering “these values transparent and examining their coupled ethical-epistemic significance” can lead to “*better science* both in the traditional science of advancing knowledge by building on and adding to our current knowledge as well as in the broader sense of *science for the good of ... society*.”

This special issue results from activities of PIN-net, the Philosophy of/as Interdisciplinarity network (<http://pin-net.gatech.edu/>). The PIN-net organizers—Jan C. Schmidt, Michael Hoffmann, Robert Frodeman, and Britt Holbrook—arranged a first workshop in 2009 which has since then been transformed into a series of annual, international conferences (see also Hoffmann & Schmidt, 2011). With this special issue, we hope to facilitate and foster philosophical engagement with inter- and transdisciplinarity—both theoretically and practically, that is both in the sense of *philosophy of interdisciplinarity* and *philosophy as interdisciplinarity*. We should use the richness of the philosophical tradition and resulting expertise to improve the human condition. Philosophy itself can gain by not only reflecting on the world but engaging with it.

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