Living Handbook of Science Communication and Science Studies

Scientific Disciplines

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ABSTRACT **Despite a tendency to proclaim new paths to interdisciplinary and transdisciplinary knowledge production—both in academia and in science policy—scientific disciplines still constitute the core of academic identities, research practices, and organizational structures. This article provides an overview of the origins and dimensions of scientific disciplines, and highlights dimensions of disciplinarity relevant to science studies and science communication.**

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Relevance

Every aspiring undergraduate student accessing a university website for the first time will soon have to familiarize themselves with the intricate categorizations of faculties and disciplines structuring research and teaching in academic contexts. A similar dilemma is faced by the editor of the local news outlet looking for scientific expertise for a piece on the medieval history of their hometown: Do they call the Professor Emeritus for Central European Medieval History or rather the postdoctoral expert on German Studies with a special regional focus? And what about the research funder responsible for granting huge sums of tax money to promising research projects from fields they know nothing whatever about? They will also have to navigate their way around the jungle of scientific disciplines to identify and consult the individuals who can assess the quality of research in their field and evaluate the grant proposals.

These examples show that scientific disciplines remain central points of reference and orientation when dealing with the social system of science. Not only do disciplines serve as heuristics for the internal and external evaluation of science, they also shape the institutional structures organizing the complex endeavor of modern science. In turn, publishing practices, habitus, language, and style emerging in disciplinary communities reinforce research identities and the "boundary-work" (Gieryn 1983) that distinguish-

es them from other disciplines and non-scientific actors. Regardless of declarations of a "new production of knowledge" (Gibbons et al. 1994) and frequent normative as well as epistemically motivated calls for "more interdisciplinarity," disciplines continue to structure scientific thinking, teaching, researching, and institution building.

History

Scientific disciplines are a product of recent centuries. The way science is pursued in Western countries today is the result of major structural changes within the public sphere following the Renaissance in these countries. Notwithstanding the growing global hegemony of Western scientific institutions and paradigms, alternative conceptions and research cultures obviously do exist, but cannot be addressed here due to space constraints. This brief account of the history of scientific disciplinarity within the parameters of the *Living Handbook* format is thus limited to selected literature from Europe and the United States.

The foundations of philosophy, astronomy, and medicine in the Mediterranean region date back to Ancient Egypt and Mesopotamia (Clagett 1989). Classical antiquity later saw Greek and Islamic scholars elaborate sophisticated assumptions about our planet and our solar system, the human body and mind—many of which were only rediscovered during the Renaissance some hundreds of years later. With the end of absolute Christian hegemony towards the end of the Middle Ages, scientific thinking still had to come to terms with the dominant powers. Hosting scholars at court became a sometimes useful and sometimes quirky hobby of the aristocracy. Eventually, the system of science patronage shaping the role of science at the courts of the Old Europe's rich principalities disappeared with the emergence of a bourgeois public sphere. Scientific research was no longer an eccentricity of the rich but became a visible pillar of the modern state: publicly financed, structured, and held accountable (Weingart 2005, 12–19). Ancient "meta"-disciplines such as philosophy and mathematics lost something of their elevated status and were embedded in the emerging polarized system of disciplines in either the sciences or the humanities (Dilthey 1883). It was only in the late 19th century that industrialization and modernization turned academic attention to "society" as an independent object of research quite different from the natural and cultural worlds. Sociology and the social sciences were born and successfully fought their way into the halls of institutionalized academia, spawning a convoluted network of more or less independent and "orthodox" disciplines along the way (Lepenies 1988, 7).

From a system-theoretical perspective, the ongoing trend towards a small-scale disintegration of science into more and more specialized disciplines is a reaction to the increasingly complex structures through which modern life is organized (Stichweh 1979). In order for society to continue functioning amid these growing

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complexities of modernity, science as a truth-seeking system needs to mirror the process of general differentiation. In this context, disciplines coordinate academic reproduction, educate academic trainees and establish employment markets. Beyond that, disciplines anchor academic identities and are key to "legitimating our necessarily partial knowledge" (Abbott 2001, 130).

Disciplinary funding structures

Anyone researching the social and economic conditions of the scientific process will have to deal with the consequences of disciplinary funding structures and the ways in which they set research priorities, thereby changing the direction and focus of scientific research altogether.

A glimpse at the funding structures of the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) illustrates the very practical consequences of the historical, institutional, and social shifts described above (dfg.de): As the leading funding institution for research in Germany, the DFG groups the German research landscape into four superordinate categories: social sciences and humanities, life sciences, natural sciences, and engineering sciences—with a total of over 200 associated subject areas. In some instances, each of these could arguably be divided into dozens of sub-disciplines. The "literary studies" group, for example, includes specific perspectives on classic and recent German literature as well as European and American literature. The focus on all other possible regional and cultural literary landscapes is subsumed under "general and comparative literary studies" and "cultural studies." Various sub-disciplines that have probably already developed institutional structures immediately spring to mind, such as the dynamic block of postcolonial studies.

These structures may sometimes force grant applications into a grid of scientific topics and methodological orthodoxies with limited flexibility, overseen by reviewers possibly gatekeeping "their" discipline. In addition, the funding budgets for the different fields can indirectly become subject to political agenda-setting. Moreover, imposed disciplinary clusters, which do not reflect the dynamic relations between disciplinary cultures, can lead to reviewers being forced to evaluate research from outside of their formal areas of expertise.

Disciplinarity and interdisciplinarity in theory and practice

At the same time, it remains highly disputed at which exact point a certain specialization within a research field turns into a disciplinary formation. As is usually the case with science, there is no consensus on this question although some common reference points can be identified, as illustrated by Stichweh (1979, 83):

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- a shared communication network among academics researching the disciplinary field
- a shared corpus of knowledge and pertinent literature which can be and is commonly referenced without further explanation
- a set of typical research questions
- commonly accepted methods and established ways of framing and addressing problems
- formal and informal structures shaping the academic socialization and career of (new) members of the disciplinary community

If these criteria are applied, for example, to science communication studies, which contribute some core perspectives to this article, a number of observations can be made: First, science communication is researched and taught across universities all over the world. Second, such researchers have formed a specialized section within the German Communication Association (Deutsche Gesellschaft für Publizistik- und Kommunikationswissenschaft, DGPuK). Internationally, since 1989, the PCST Network (Network for the Public Communication of Science and Technology) has been organizing conferences and connecting researchers and practitioners in the field across the globe. Third, there are widely accepted national as well as international journals deemed relevant to the discipline (dgpuk.de). Fourth, the aims and scope of these journals concur regarding their research interests and methodological specifications. In conclusion, without being able to pinpoint an exact "disciplinary threshold," it can be argued that science communication research exhibits several defining features of disciplinarity (Rauchfleisch and Schäfer 2018, 48).

Similar reference points are echoed in the way scientists themselves describe their research cultures and communities (Sugimoto and Weingart 2015). For example, bibliographical analyses of multi-disciplinary research literature have shown that many researchers consider a certain degree of institutionalization—in the form of specialized journals (see ❇ Scholarly Journals), communication networks as well as shared paradigms, canonical publications and methodologies—to be a prerequisite for discipline formation. In summary, it can be noted that scientific disciplinarity seems to gain shape with reference to three main aspects: shared communication, language, and tropes; shared epistemological beliefs and methods deemed appropriate (see ❇ Epistemic Cultures); institutional manifestations of the discipline.

However, in science policy papers and funding guidelines (see ❇ Funding Bodies; ❇ Funding Formats), today's main concern seems to be less with defining and more with overcoming disciplinarity. Very much in the spirit of the proverbial "university with departments" contrasting a "world with problems," inter- and transdisciplinarity (Bogner et al. 2010) are increasingly promoted in the world of science funding. At the same time, their central concepts are interpreted very differently, again depending on the

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dominant associations within disciplines. In practice, interdisciplinarity in the field often turns out to be much more complex and costly than expected.

Disciplines in science communication and science journalism

The fact that, at present, the paradigm of interdisciplinarity is still essentially contested and that scientific research continues to revolve around faculties, methodologies, and specialized journals, also has far-reaching consequences for the theory and practice of science communication. Scientific fields and disciplines differ with regard to their financial resources, publication cultures, and media activities (Summ and Volpers 2016, 779). All of these aspects shape their public visibility. Observers have pointed to the specific challenge of communicating the social sciences and humanities (Cassidy 2021, 203), which, as they frequently touch on everyday matters, are characterized by their extended "loci of legitimate interpretation" (Lewis et al. 2023, 659): Since to a certain extent all of us are observers and interpreters of the social in our daily lives, the research methods of the social sciences often seem less "scientific" than laboratory work or physical and chemical experiments. In addition, their results are not only published in typical research papers but also in monographs and anthologies, posing a challenge for journalistic practice and the attention economy.

Consequently, on the journalistic side of the science communication arena (see ❇ Science Journalism), "science" sections in news outlets mostly restrict themselves to covering scientific research results and breakthroughs, such as the development of the latest high-performance battery cell, while the social sciences and humanities are treated either as cultural topics or their expertise is embedded in general news contexts (Summ and Volpers 2016, 783). Often working qualitatively and interpretatively, their disciplines also lack the news value generated by quantifiability (Luhmann 2000, 28).

There are several other factors, varying from discipline to discipline, which set the scene for individual communication efforts under differing disciplinary circumstances. Clinical research, for example, receives wide public attention not only because it corresponds to one of the key criteria of news value theory, affectedness (all of us are going to get sick and old, eventually), but also simply because the applied nature of its research makes it more accessible to general audiences. Moreover, the journal article as the dominant format of publication in medicine as well as in most life and natural sciences is more in line with the journalistic news beat as the main operating principle of most daily media. Accordingly, these disciplines attract attention more easily in the fast-paced business of daily news media. Books (see ❇ Monograph), in contrast, which are still common in many disciplines of the social sciences and humanities (Deutsche Forschungsgemeinschaft 2022, 10), are harder to compress into standalone research results and are more time-consuming for journalists and other non-scientists to read, grasp, and evaluate.

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Conclusion

Disciplines as the main ordering structures of academia are practical reality. National and international research communities are formed around faculties, associations and their regularly published proceedings, flagship journals, shared methodologies, and a canon of literature and concepts. Public and private funders advocate interdisciplinarity but nevertheless need specific disciplinary expertise within their organizational and evaluative structures. Disciplinary self-conceptions are re-negotiated continuously. That is why disciplines are hard to grasp, but impossible to ignore. Does the disciplinary status quo bring about knowledge of the highest quality imaginable? Strong advocates of interdisciplinarity would doubt that. But regardless of the normative aspects of the disciplinary reality, academia and society will have to deal with it for the foreseeable future. Science studies and science communication are destined to take on a crucial role in observing, explicating, and communicating this reality accordingly.

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Further reading

Further reading is a section where each author makes recommendations for interesting publications that widen the scope of the respective topic or are particularly valuable for deeper research.

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