

Leaping over disciplinary shadows

Research increasingly crosses disciplinary boundaries and draws in outside stakeholders. **Karl-Heinz Erb, Veronika Gaube and Marina Fischer-Kowalski** report from two decades of experience in inter- and transdisciplinary research at the Institute of Social Ecology in Vienna, Austria. They advise on how to succeed in three not-so-easy steps.

Global environmental change confronts us with multifaceted problems. Getting good solutions to these challenges requires bridging the boundaries of scientific disciplines, in order to produce effective, useful information for policymakers and practitioners, as well as for stakeholders. Traditions of interdisciplinary work have emerged over the past few decades in many research contexts, such as under the umbrella of the Global Land Project, and can provide foundations and inspirations for new ways of working together.

We discuss here three preconditions for successful interdisciplinary and transdisciplinary research, gathered from our experiences at the Institute of Social Ecology in Vienna, Austria. Such programmes need to establish a joint focus on real-world problems; integrate not only the “flow” of the research process, but also the “stock”, i.e. the scientific capital that research institutions have accumulated; and be able to draw upon changed reward systems.

A few definitions

In our work, we distinguish between interdisciplinary and transdisciplinary research. Interdisciplinary research draws on both the concepts and

methods of various disciplines. Reaching across these boundaries is particularly challenging if disciplines have a long history of separation or follow different epistemological approaches. Such is the case for the disciplines on both sides of the “Great Divide” (Goldman and Schurman 2000, Snow 1959): natural sciences on the one hand, and social sciences and humanities on the other.

Transdisciplinary research not only bridges scientific traditions, but also draws in stakeholders from beyond the scientific realm: the actors who try to implement solutions politically and practically (Dressel *et al.* 2014).

Looking together

The key to successful interdisciplinary and transdisciplinary research is a joint focus on real-world problems and their solutions (Frodeman *et al.* 2010, Repko 2008). This kind of applied research contrasts with the analytical and insular traditions of scientific disciplines and communities (Gibbons *et al.* 1994).

Scientific specialisation was a huge achievement. Since the times of Humboldt, narrowed expertise and topical focus has been the silver bullet for scientific progress. But specialisation comes at a considerable cost – the cost of insularity – which

interdisciplinary research attempts to overcome.

The barriers that specialisation has built up between fields are particularly obvious along the demarcation line between the two scientific “realms”: the social and natural sciences. Each regards the other as simplistic, versus its own sphere, which is complex; this shared view of the other is a kind of remarkable agreement between these two worlds.

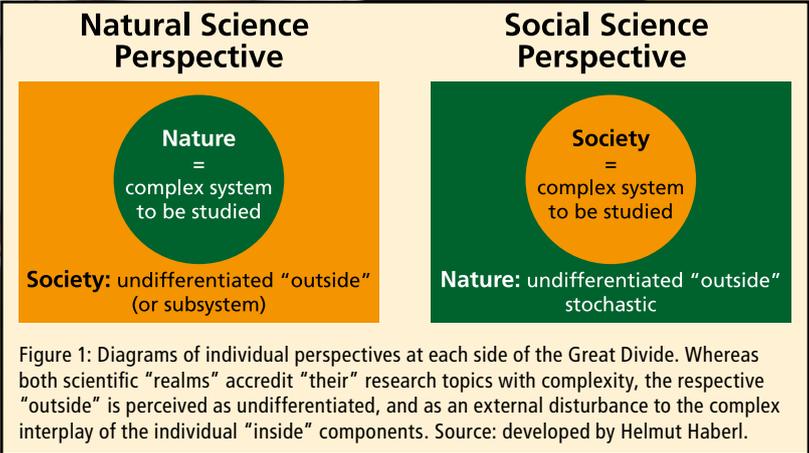
Each realm has also become rigid and sees itself in its own ways (see Figure 1). Sociological research, for example, restricts itself to the study of “social facts”, following the seminal notion laid out by Émile Durkheim in 1895. Analogously, ecological research continues to predominantly focus on pristine, untouched parcels of nature even today, when those unspoiled patches are hard to find.

Today, many scientific problems, in particular those relating to global environmental change, cannot be adequately addressed by isolated specialised disciplines; each lacks the breadth necessary to capture the full range of real-world problems. Solutions require interdisciplinary teams.

Researchers in interdisciplinary teams find themselves in a hybrid role: within the team, they represent their disciplinary expertise, informing the science and

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Interdisciplinary teamwork fosters reflections on the limits and confines of one's own discipline and is a prerequisite to approaching new scientific frontiers. Researchers from the Institute of Social Ecology meet to discuss strategies (pictured here).



contributing to the success of a project. When interacting with other scientific communities, however, researchers have to represent interdisciplinary research questions and orientations.

Researchers working across the natural and social sciences are often asked, "What does socioeconomics tell us?" or "What do the natural sciences say?" These questions do not mean scientists have to be universal representatives of the entire social and natural science disciplines, but rather must serve as bridges between them. This double role is a challenge, of course, but it also allows individuals to gain expertise and to reflect on the limits and confines of their own disciplines, including its scientific jargon. Such open-minded thinking is a prerequisite to approaching new scientific frontiers.

A particularly powerful way to create strong connections between different disciplines while getting focused on real-world problems is to get a partner from the outside. Such an external partner can serve three functions, sometimes all at once: to "supply" the problem, benefit from proposed solutions, and be a motivating force. For example, a local air pollution board might seek preventative measures for problems triggered by intensifying land use in rural areas, which could be controlled with agricultural subsidies. The more critical, independent and yet closely involved such a partner is, the better the chances for interdisciplinarity; for transdisciplinarity, such a partner is indispensable.

The Global Land Project (GLP) explicitly addresses this orientation of research as one of its central approaches in exploring the role of human decision-making and actions regarding the terrestrial environment and the services ecosystems provide to society (GLP 2005). Research

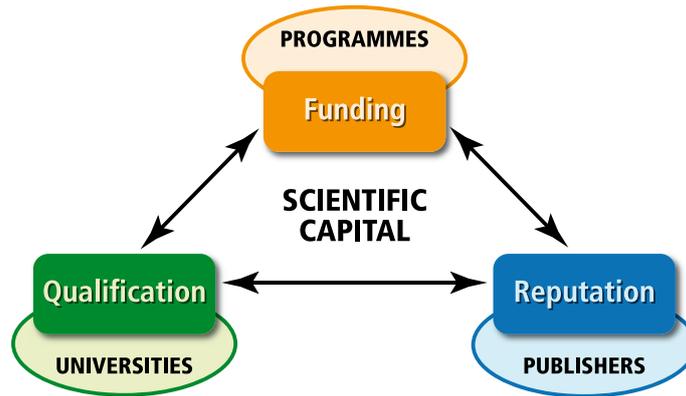


Figure 2: Funding, reputation and qualification are all provided by different institutions but have co-evolved over time, allowing research institutions to accumulate scientific capital.

projects endorsed under the GLP umbrella regularly involve non-academic experts and stakeholders in designing and evaluating policy strategies, for example, of sustainable land-use intensification, forest protection under climate change mitigation schemes such as REDD+ (an extension of the UN programme, Reducing Emissions from Deforestation and forest Degradation in developing countries, or REDD) or biodiversity conservation.

Scientific "capital"

The scientific system, including rewards and funding, evolved and adapted alongside the distinct scientific disciplines. In this process, research teams accumulate scientific capital that consists of databases, models and social networks, to address research questions. This capital accumulation typically involves huge long-term investments of time and money, and determines the research teams' potential to act in the future.

In the existing scientific landscape, such scientific capital is usually segregated by disciplines, or even more narrowly by institutionalised "micro-disciplines" (i.e. specific approaches shared by teams or research institutions). Sharing, changing or turning this capital to new schemes can be very costly and risky. Capital is usually hard to access for outsiders: for example, databases may lack

metadata, models can be poorly documented, or social networks and connections may be informal. Thus, in terms of working time and social and financial investments, accumulated scientific capital constrains a research institution to its previous path, in order to keep doing research efficiently.

In our view, this so-called path dependency of scientific capital is the reason why "naïve" pleas for interdisciplinary cooperation made over the past few decades have not worked. If funders or framework programmes demand a quick jump to 'applications' of research results, then institutions fall into their existing routines of capital utilisation. This fallback position is not due to a lack of willingness to cooperate or work with experts from other disciplines, or even practitioners, but is inherently based on the internal logic of how institutions and their economics operate.

In order to overcome this logic, over the past few decades, the Institute of Social Ecology has shared and integrated scientific capital between its research teams, creating joint databases and expert networks across social, economic, ecological and technological realms. With the help of historical methods, these databases could be gradually extended for long time periods, according to conceptual system boundaries and consistent classifications that were repeatedly and thoroughly discussed. This process had to be piecemeal, based more on internal goodwill than on reliable funding to support the work.

Changing the reward system

Requests from funding programmes and agencies for interdisciplinary work will not suffice. The integration of scientific capital across institutional settings requires fundamental changes in scientific rewards. Three distinct but interdependent actors

An external partner can serve three functions, sometimes all at once.

shape reward systems (Figure 2): funding agencies and research programmes, universities, and scientific publishers.

Funding agencies and research programmes provide financial assets, stringent reviews with well-defined quality criteria, and scholarly reputations. Universities also provide financial assets (though increasingly less over the past decades), in particular in the form of tenure, and offer defined routes of qualification (in the form of doctoral degrees, postdoctoral research positions, etc.), and so contribute to the build-up of reputation. Publishing houses organise other scholars in peer-review processes and so contribute to the formation of discipline-organised scientific communities (as do funding agencies' review committees). Successful publication, in particular in high-impact or high-profile journals, builds reputations for individuals, but also for research teams and institutions.

These three components of reward systems influence each other and lead to positive feedbacks (publication success leads to funding success leads to reputation leads to tenure) that reinforce the tendency of disciplines to be inwardly focused. Publications, as central currency for this interaction, have immense impact on the success rates for funding and other qualifications.

The successful implementation of inter- and transdisciplinary research requires the relaxation of the tight disciplinary bonds between universities, funders and publishers. Universities as well as funders can start to support cooperation between institutes, by adjusting quality-assurance systems such as peer review to the challenges of interdisciplinary research. Publishers as well as funding agencies need to recruit staffs of experts that are experienced in interdisciplinary research. On top of this, additional quality criteria

beyond high-profile publications have to be defined. For example, successful stakeholder cooperation and knowledge transfer, which in our experience only rarely yields a high publication output, should be taken explicitly into account. Looking at the international research landscape, one might say that such changes are under way, but in a fashion that is still too disjointed.

Getting it together

Inter- and transdisciplinary research requires overcoming scientific disciplines' constructs and creating novel ways of organising the accumulation of scientific capital. Such change will only happen if supported by shifts in reward systems; that transformation will be challenging, as it means working against longstanding structures of scientific research. If a few preconditions are fulfilled, however, interdisciplinary research as well as co-design and production with non-academic experts can prosper. A credible provider of an outside perspective (for example, stakeholders) is extremely helpful for shifting the focus to innovative questions and research procedures.

For this to happen, an attitude of mutual respect between different members of interdisciplinary teams is fundamental. This approach includes renouncing scientific jargon, perhaps at the expense of communication efficiency, but with the advantage of openness to novel perspectives and insights. Most essential, though, is changing reward systems and establishing reliable partnerships, in particular between research and funding institutions. ■

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LUISE) and is a member of the Scientific Steering Committee of the Global Land Project.

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FURTHER READING:

The Matisse Project, 2009 (www.matisse-project.net)

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