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## Interdisciplinarity Beyond the Buzzword

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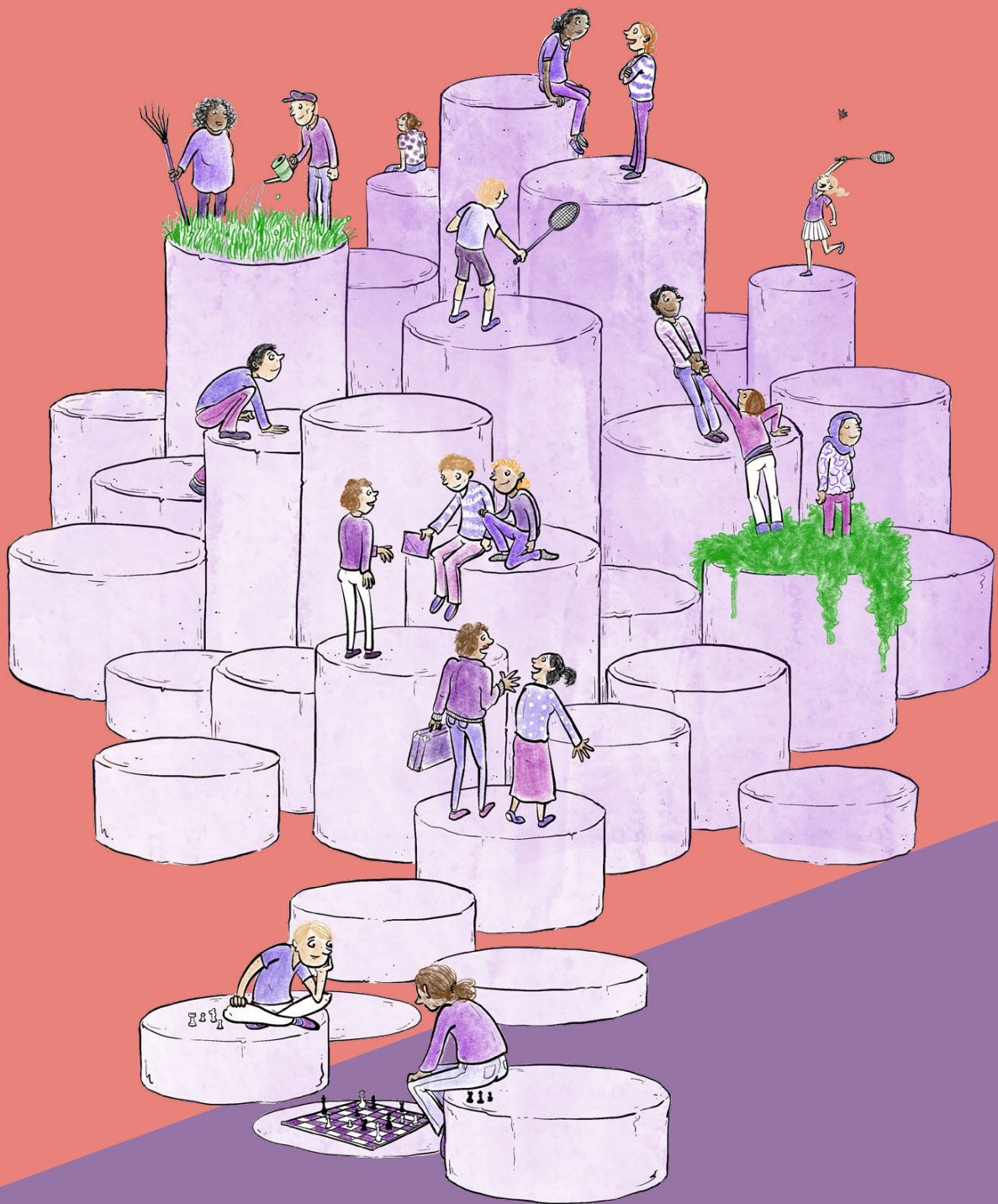
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# AYA

Amsterdam Young Academy



# Interdisciplinarity Beyond the Buzzword

A Guide to Academic Work Across Disciplines

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## 1. Prologue

Interdisciplinarity is easily formulated as an ambition, yet it is less easily put into practice. Nevertheless, as a working methodology and research framework, it is an amazing adventure for all those involved, as is shown in *Interdisciplinarity Beyond the Buzzword: A Guide to Academic Work Across Disciplines*.

This publication by the Amsterdam Young Academy (AYA) offers insight into the attitudes and practices of more than 20 intensely interdisciplinary researchers from the University of Amsterdam, the Vrije Universiteit Amsterdam, Amsterdam University Medical Centers and beyond. These scholars and practitioners were interviewed on their collaborations with colleagues in other fields. From the assembled conversations new and deepened understandings of interdisciplinary practices emerge. The collected insights, and the interviewees' reflections on them, offer a stimulating ground for newcomers, as well as a comforting mirror for all of us who conduct and enjoy this kind of research for quite a while already.

In this elegant and modest exploration, the Amsterdam Young Academy identifies current potential as well as obstacles, offering practical tips and tricks to deal with the latter. The book charts the personal attitudes and professional interactions that facilitate interdisciplinary work. Numerous aspects of the topic are discussed: The courage needed for being curious beyond one's own discipline, and for engaging with the unknown; the importance of cultivating a communal sense of direction based on discussions about shared values; of trying out different disciplinary lenses without immediately overseeing their added value for the bigger picture; the significance of creating interlacing and multilingual interactions in a team; and of developing new methodologies and boundary structures that are relatable for all, while not compromising on fundamental principles of validation and falsification.

Many of these aspects come together in the interwoven social and ecological challenges currently faced by cities. These problems require the engagement of a new generation of researchers who dare to expand and accelerate interdisciplinary collaborations. Also, these urban challenges – as they are addressed in what is now labeled “City Science” – necessitate inter- and transdisciplinary approaches at all stages of the research process: when setting the research agenda and formulating the questions, when designing the research and developing its methodologies, and during the processes of validation and publication.

In this guide, the Amsterdam Young Academy also spotlights the dilemmas faced by young researchers with interdisciplinary ambitions. While most real-world problems require an interdisciplinary approach, this type of research is still harder to get financed, validated, and published. Let this guide inspire readers to double down on their efforts to put interdisciplinary research center stage in our academic and scientific futures.

Caroline Nevejan

March 2022

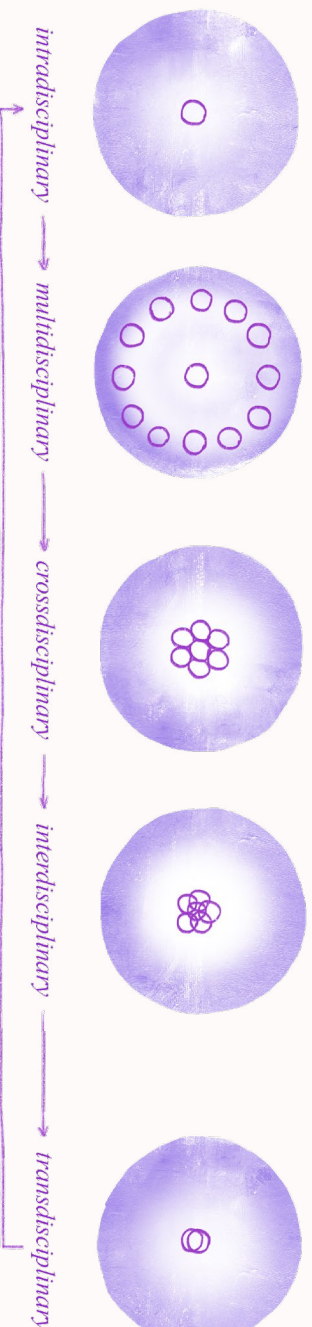
## 2. Introduction

Interdisciplinarity has recently been lavished with considerable hype in academia. A large proportion of calls for funding, new shiny projects and educational endeavours mention the concept. In Amsterdam, many research and education initiatives – academic and non-academic alike – seem to incorporate interdisciplinarity in some way. But what is interdisciplinarity? What is it good for? And how can a researcher best conduct interdisciplinary research? Very little hands-on guidance is currently available, particularly for those who are just starting out with interdisciplinary research or teaching.

The Amsterdam Young Academy (AYA), founded by the Vrije Universiteit Amsterdam, the University of Amsterdam and the Amsterdam University Medical Centers, is an independent platform where researchers from different disciplines meet to develop views on research and science policy. Within AYA's Interdisciplinarity Working Group, we aim to advance interdisciplinary research and teaching in Amsterdam, to provide a community particularly for early career interdisciplinary research and to learn from one another. In many of our discussions we noted the lack of guidance and of the sharing of best practices within the different interdisciplinary communities across Amsterdam's academic institutions.

### Forms of disciplinarity

In this guide we use 'interdisciplinary' loosely: the term is meant to indicate approaches to research and education that are distinguishable from monodisciplinary approaches (also known as intra-disciplinary approaches). However, scholars have defined more than just two opposing forms of disciplinarity (see Figure 1). Here are some definitions (Stember, 1991; Jensenius, 2012):



Through our interdisciplinarity lunch events, we learned that many researchers want to team up with colleagues working in other fields but often do not know where to start. Obviously, discipline-specific information is widely available for each institute and department. But cross-domain and cross-institute initiatives and opportunities are difficult to discover via Google without knowing what exactly to enter in the search box. Moreover, every interdisciplinary collaboration is different, so it is impossible to create a canonical guide to interdisciplinarity.

However, academics working interdisciplinarily can share similar attitudes and interests, and they do stumble upon similar organizational and infrastructural hiccups. That is why we interviewed nearly 20 people with various backgrounds, roles and experiences on the topic of interdisciplinarity. You will find the biographies of these players in the interdisciplinarity field listed in the concluding section of this guide. Discussing our various insights, we discovered common threads in our interviewees' interdisciplinary practices. We grouped these threads into our five main themes here: goal, person, community, education, and system. By sharing the diverse insights of these interviewees as well as our own, we hope to inspire those interested in (beginning) interdisciplinary research and teaching.

1. Intradisciplinary: within disciplinary work.
2. Crossdisciplinary: viewing one discipline from the perspective of another.
3. Multidisciplinary: a collaboration in which each discipline provides a different perspective.
4. Interdisciplinary: integrating contributions from different disciplines.
5. Transdisciplinary: creating a unity of intellectual frameworks beyond the disciplinary perspectives. Other scholars reserve the term transdisciplinary for when stakeholders from outside academia are involved (Cummings et al., 2013).

Despite the specific definitions, cross-, multi-, inter-, and trans-disciplinarity are often used interchangeably.

# 3. Goal

## When is interdisciplinarity necessary or of added value?

'Interdisciplinarity' has become a ubiquitous academic buzzword or, as one of our interviewees put it, a rarely scrutinized 'hooray term'. Research institutes proudly advertise their 'interdisciplinary orientation'; grant applications routinely mention the 'cross-disciplinary' scope of the proposed research. Given this often unquestioned enthusiasm, one should ask a set of basic questions: Why is interdisciplinarity research to be welcomed? Which research objects or problems require an interdisciplinary approach? Which of these might best be addressed via the in-depth expertise of one discipline? However, as disciplines are hardly ever a single unified 'thing', these questions may themselves be oversimplifying the current situation at universities and research institutes.

### Real-world 'interdisciplinary crises'

Let us note that the increasing diversity *within* disciplines, as well as the fuzzier borderlines *between* them, does not automatically result in truly interdisciplinary (or transdisciplinary) work. Some of our interviewees distinguished two modes of interdisciplinarity. Physicist and Journal editor [Dario Corradini](#), for instance, identified 'two kinds of interdisciplinary research. One is the type of research that stays mainly within its core discipline, but takes inspiration from another. An example would be biology-inspired physics, where one innovates in the methods of physics, or finds new results in physics, by taking inspiration from a problem in biology. The second kind is more complicated to achieve. This concerns research that really makes an impact on both (or more) disciplines involved. In the example given above, this would mean that by using newly developed methods, theories or experiments from physics, the biologist also becomes able to understand their problem better or in a wholly different way. This type of fusion really brings together the best of both fields and creates something new. Corradini made a strong case for the latter approach, arguing that the most significantly groundbreaking outcomes are typically realized through the mutual exchange and input offered by researchers from disparate traditions. Thus we arrive at a first answer to the 'why' question: cooperation across disparate disciplines spurs academic innovation.

These considerations introduce a second perspective on the 'why' question. Our interviewees kept reminding us that the challenges of our era cannot be addressed through the expertise of one research field alone. They necessitate work across disciplines. As [Caroline Nevejan](#) cogently put it, 'real-world problems are always interdisciplinary'. [Peter Sloot](#),

in a similar vein, invoked climate change as an obvious example of a multifaceted problem that cannot be relegated to (let alone 'solved' by) a single discipline. [Annoesjka Nienhuis](#) and [Eise Veldman](#) added insights regarding the practical dimensions of such collaborative work, emphasizing that energy transition requires intensive cooperation, not only amongst researchers but also with commercial and governmental parties. What's more, in their work for the Energy Lab Zuidooit (an initiative of the City of Amsterdam and the Amsterdam Institute for Advanced Metropolitan Solutions), technical solutions have to be constantly assessed in light of their social, legal, and economic implications.

Our interviewees were aware that scientific and social responses to such comprehensive crises hardly ever come down to a simple assemblage of different disciplinary 'pieces of the puzzle' designed to create a 'complete picture'. [Hanneke Hulst](#) emphasized the importance of integrating perspectives in ways that create new understandings of 'what we're looking at'. Her sentiments were echoed by [Philipp Tuertscher](#), who explained that at the integration of knowledge forms an essential part of the work: 'Knowledge integration is not just adding ... different data and aggregating [them]. [It] is a synthesis where you have two different ideas that somehow are incommensurate and you are integrating those ideas into a solution that's essentially more than the sum of its parts.'

### Curiosity, humility and self-reflection

Alongside the pressing need to understand and respond to current crises, many researchers underlined the intrinsic value of intra- or interdisciplinary diversity in research projects and institutions. On a fundamental level, the confrontation with other paradigms of knowledge spurs curiosity and inspires humility about the limitations of one's own expertise. Cross-disciplinary encounters introduce new types of questions and tend to provoke self-reflection on our disciplines' habits and histories. Thus, interdisciplinary encounters can be valuable even when not (yet) oriented towards a predetermined problem or a coordinated goal. These encounters take place (or should take place) within a research climate that keeps recalibrating our understanding of the reality we're looking at, the questions it raises and the scientific responses it elicits.

Unfortunately, the institutional organization of research means that there is hardly ever such a climate. [Peter Sloot](#) reminded us that the organization of academic funding, teaching and evaluation are still predominantly monodisciplinary, which creates feedback loops that further cement the boundaries between different paradigms of knowledge. This disso-

nance – between the disciplinary organization of universities and the multidisciplinary nature of real-world situations – lies at the heart of the 'why' question. The current status quo makes working across traditional borders exceedingly tough, even though it is urgently necessary.

In the introduction we asked what interdisciplinarity is and what it is good for. Now we need to delve deeper into these questions, and raise further issues: What happens, or what *should* happen, when different disciplines meet? As [Annemarie Mol](#) and [Anita Hardon](#) observe, interdisciplinarity is often imagined as an unproblematic process whereby various researchers each add a 'piece of the puzzle', creating an ever more complete picture of reality ([Mol & Hardon, 2020](#)).

Yet, contrary to what the puzzle metaphor suggests, researchers working in different disciplinary paradigms 'handle reality in different ways'. They rely on different techniques, address different concerns, and variously define the given object of inquiry. Their insights can hardly ever be smoothly aligned and pieced together. Some researchers are working on a jigsaw puzzle, so to speak, while others are solving a Rubik's cube. They disagree about which 'game' they are playing, which picture they're composing, and which rules apply.

Recent engagements with COVID-19 illustrate the sort of clashes and miscommunications that can occur. Mol and Hardon remind us that 'even when, say, virologists, clinicians, physicists, epidemiologists, immunologists, economists and sociologists all use the term "COVID-19", what they actually grapple with is not the same entity'. For Mol and Hardon this situation is problematic only if we cling to the idea that science is a singular 'thing'. Instead, we should accept that interdisciplinarity is not a framework for 'adding' information but rather involves the negotiating of perspectives, goals and interventions. This sort of orientation requires modesty, curiosity and an openness to scientific diversity:

*'Different research styles all deserve to be accorded space to continue along their own paths, without having to submit either to the object definitions or the criteria for good research of any other discipline. It means that diversity deserves to be fostered in academic ecosystems just as much as it does in biological ecosystems. It means that the virtues of inquisitiveness, tenaciousness and modesty should be advocated simultaneously.'*



# 4. Person

## Is there an ‘interdisciplinary attitude’?

Few interviewees regarded interdisciplinarity as a goal in itself, and most of them had not deliberately sought out an interdisciplinary career. As [Fernando Santos](#) told us: ‘[I] ended] up seeing myself as interdisciplinary, but without realizing it. Just across my career, it happened, like I was not designing my profile to be interdisciplinary, but I ended up enjoying this kind of research.’ [Claartje Rasterhoff](#) also stumbled upon interdisciplinary themes more or less accidentally: ‘The topic in question just caught my interest and I started researching it. Only in a second instance did I realize that I was doing multidisciplinary or interdisciplinary research in the field of Digital Humanities, where researchers with various skills and knowledge met. I was never intentionally interdisciplinary.’

### **The nature of an interdisciplinary attitude**

What constitutes an interdisciplinary attitude, whether ascribed to someone or adopted on one’s own? According to [Hanneke Hulst](#), interdisciplinary scholars aim to alter or overcome existing disciplinary boundaries rather than to combine the knowledge of experts from different backgrounds. ‘The way I see it, multidisciplinarity is the collaboration of experts. When a radiologist writes a piece on the MRI scans in a manuscript on neural correlates of cognition, I do not consider that interdisciplinarity. [...] I believe that interdisciplinarity is about processing and recombining the information from different disciplines. [...] It is about the synthesis of insights with different disciplinary origins into a new whole.’

*‘Interdisciplinary research [...] raises awareness of how little you know beyond the safety of your own field. It is almost an existential experience, to discover the limits of your own knowledge when talking with experts, real experts, from a different field. [...] You have to open up to them.’*

Scholars mention remarkably similar factors when they are asked how a culture for interdisciplinary collaboration might thrive. Inquisitiveness, the ability to listen and a tolerance for deep uncertainty are recurrent themes. According to [Fernando Santos](#) and [Caroline Nevejan](#), interdisciplinary scholars ‘have to be comfortable being uncomfortable.’



Jan Willem Duyvendak emphasizes modesty as an essential virtue for interdisciplinary research, as it allows conversations to flourish with scholars whose arguments are grounded in different worldviews and/or based on unfamiliar premises: 'Interdisciplinary research [...] raises awareness of how little you know beyond the safety of your own field. It is almost an existential experience, to discover the limits of your own knowledge when talking with experts, real experts, from a different field. [...] You have to open up to them.'

Hanneke Hulst illustrates an interdisciplinary attitude via an image of two trees filled with birds and various birds flying between them. 'The birds in the trees symbolize the disciplinary experts, for instance within neurology, radiology and anatomy. They are the hyper-experts and have an incredibly deep knowledge of their respective topics – more than I will ever know. However, they do not bridge disciplines. This is where the interdisciplinary researchers, the birds flying between the trees, come into play.' Natali Helberger agrees: 'My added value [in interdisciplinary collaborations] is that I know about the law and that I can translate concepts from the law into other disciplines, but also back into the legal analysis.' The essential capacity to move between (or fly to and from) various perspectives and interests was even more pronounced for Annesjka Nienhuis and Else Veldman in their work with various researchers and stakeholders. Nienhuis concisely summed up the necessary characteristics of bridge-builders like herself: 'You need curiosity, a broad range of interests, and the ability to listen.' Yet she and Veldman added that such an attitude was not itself sufficient. Transdisciplinary work, they underlined, also requires the persistent cultivation of an environment enabling cross-fertilization and committed collaboration. Trust and understanding need to be built up over time. Collective applications for funding, shared work spaces (for a part of the week) and informal gatherings are all indispensable parts of that process.

### **Ask, don't explain**

According to Duyvendak, cross-disciplinary collaborations, especially when they are interdisciplinary, are irreconcilable with the propensity to 'explain the world to others. [...] You have to open up, you have to be curious'. To do so requires didactic skills and an awareness of the often unmentioned premises of one's own discipline. Claatje Rasterhoff describes how she often aims to work 'on the fringes' of related but different fields, where researchers may differ in methods but share a similar puzzlelement regarding a given topic: 'What defines

my experience as a researcher is that I am always inclined to discover a new field "sideways", so to speak, operating from the boundaries. In what I observe in our daily life and in society, I am always interested in the fringes, where things work differently or simply go astray. I am intrigued by such topics, as they make me think "let's see what happens there, which processes I can identify". I think the same goes for my attitude towards methods in academic research: I am always looking for the fringes, the hard-to-grasp areas where I can signal the tensions that spur my curiosity.'

# 5. Community

## How do interdisciplinary communities and collaborations succeed?

*Simply gathering researchers from different fields does not guarantee that concepts and ideas will be adequately translated.*

Community and collaboration are major aspects of interdisciplinary work. In an interdisciplinary team, the composition of its members' disciplinary backgrounds determines both the types of question that can and will be addressed in a particular collaboration as well as the methodology used to answer such questions. It is important here to take into account that one's interdisciplinary identity may be just as important as one's disciplinary background in the creation of successful interdisciplinary teams. Simply gathering researchers from different fields does not guarantee that concepts and ideas will be adequately translated. Instead, identity and the personality characteristics relevant to interdisciplinarity (detailed in the previous section) may be more likely indications of interdisciplinary success. The present section underlines the importance of selecting team members based on their willingness to be vulnerable regarding (the limits of) their knowledge; their genuine interest in other fields can hardly be underestimated.

### **Finding shared unknowns**

For interdisciplinary collaborations to properly emerge, there must be opportunities to delineate a potentially important question. Very few interdisciplinary projects begin with methodological assumptions or preconception; ideas and questions are more often shared informally during an initial stage, then elaborated upon and developed. Peter Sloot recalls a lunch that sparked a new interdisciplinary collaboration:

<sup>1</sup>Let me give you an example of a success story. We held a lunch event with psychologists sitting next to economists, and mathematicians sitting next to ecologists. This initially led to some pretty weird communication. But then, the psychologist says that the big problem we have in psychology is trying to understand and measure the onset of depression. We know when it's there, we know when it's not there, but how do we measure and quantify that transition? At that moment the physicist jumps up. Of course, when we physicists think about transitions, we think about first- and second-order transitions, we think about phase diagrams. The ecologist then said that he had seen these transitions when studying lakes in the Netherlands, and that he had published a paper on such tipping points. Long story short, three days later we came up with a model to describe the signals that serve as an indicator for

depression, where depression is actually a tipping point in the state of individuals. The resulting paper has been published in *Science*.’

Jan Willem Duyvendak concurs with this notion that asking questions, and having the opportunity to do so, are essential for interdisciplinary work. Communicative openness is indispensable: ‘Historically, at abbeys and institutes like the Netherlands Institute for Advanced Study (NIAS), people came and withdrew themselves. They went into their own rooms to write their own books or articles, and there was not much emphasis on the intellectual community. Now we have greater ambition: We think that people’s own research gets better when making use of an outside view, drawn from a different discipline. Of course, this requires something in the way people present their research: It must be accessible to a wide audience of educated people. Then people can identify related questions within their own disciplines. My role is to think with others about what to bring out in your presentation, so that you receive meaningful responses from those who really have a different background but can nonetheless contribute something that will improve your research. Sometimes all it takes is for them to realize the sort of wider audience they might be presenting and writing for. They can remove jargon but keep what can readily be followed by researchers from other disciplines.’

There are many additional ideas and a large body of scientific literature concerning how to further stimulate successful interdisciplinary collaboration. Accounts of personal experiences from our interviewees illustrate how important it is, from the outset, to make explicit the disciplinary gaps in knowledge – not only to foster new interdisciplinary ideas but also to facilitate a thorough discussion of the potential hurdles threatening the collaboration. A good starting point could be the posing of a not-so-obvious question. Peter Sloot observes: ‘We don’t really ask people to tell what they know, because if I want to know what you know I can just read your papers or your thesis. I’m interested in what you do not know. The best advice I can give if you want to kick-start interdisciplinary discussions is just for someone to say what he doesn’t know.’ Wim Huisman mentioned that enforcing strict definitions of what can and cannot be labelled interdisciplinary research is not a good idea: ‘When you uphold certain definitions . . . You inhibit the development of interdisciplinary research. I find it difficult to pinpoint the exact outlines of interdisciplinary research, but if you want to pinpoint everything precisely you are losing something – namely the development of new research lines.’

*‘Some form of reflection about presuppositions towards the object of study should be mandatory in any interdisciplinary proposal or project. Moreover, this process of reflection is iterative, with questions, methods and/or the study object itself being tweaked in every cycle.’*

Machiel Keestra notes that as an interdisciplinary collaboration ramps up there should be ongoing attention directed towards defining the research and the salient research questions: ‘Some form of reflection about presuppositions towards the object of study should be mandatory in any interdisciplinary proposal or project. Moreover, this process of reflection is iterative, with questions, methods and/or the study object itself being tweaked in every cycle.’

### **Sustaining a shared passion**

Equally important to the development of collaborations is the presence of, and the commitment to, an overarching goal. Interdisciplinary research usually takes a greater amount of time than other sorts of research, and is more difficult to use in the service of personal advancement. Thus, one should ensure that everyone is on the same page regarding the project. Sufficient time and effort to make the collaboration work are indispensable. Bob Pierik has experienced firsthand how such a shared goal helps keep a community together: ‘What can hinder interdisciplinary collaboration is the fragmenting of your shared goal in practice. In our project, a shared methodology bridges our different research interests. That’s what makes it useful and interesting to keep talking to one another.’ Natali Helberger adds: ‘I think one factor that has definitely contributed to the success of [our interdisciplinary project] was a hypermotivated team. You need to love what you’re doing. Otherwise don’t do it, because it’s quite an adventure. It asks a lot of you. It’s a journey, and it’s risky. So you need to have people who are not risk-averse. It’s much safer, after all, to remain within the definitions of your own discipline. So you need a motivated team that is eager to take risks. You need a topic that speaks to all the disciplines, a unifying concept or theme or research question that speaks to what makes these people tick.’

However, having common goals or problems may not be the only prerequisites for successful collaboration, and seemingly trivial matters may prove to make or break interdisciplinary collaboration. A shared space to meet in person was something particularly mentioned as a crucial element of informal interaction as well as the integration of knowledge from different disciplines. Peter Sloot comments: 'I think there are four things that we really need: (1) a common problem [...], (2) a common language to start with [...], (3) a common place to meet [...], and (4) shared funding.' Natali Helberger described how she and her colleagues benefited from being mindful of the importance of physical proximity: 'Physical location helped a lot, the fact that we could meet. We would alternate locations every week, so that we could meet people, sit in a room together and drink coffee. I think that's a really important factor helping us to grow the team and to move forward.'

It may well be that to keep motivation high and to actually exchange ideas usefully, successful collaborations across disciplines need to be hands-on endeavours. As Bob Pierik describes his project: 'A crucial part of its beginning phase was developing some kind of method to start doing what we wanted to do. The collaboration worked because there really was some kind of practical problem that we all had to solve together.' Natali Helberger relates something similar: 'What also helped a lot is that we had joint data collection, a couple of longitudinal surveys which brought us together and forced us to really work together.'

### Interpersonal processes

Interpersonal processes often receive little specific attention, likely because they are so case-specific. However, our interviewees do underline that further insights and inspiration may emerge by taking a look at how people interact and determining whether they trust one another. Philipp Tuertscher shares what he experienced while investigating collaborations at CERN (the European Organization for Nuclear Research): 'One of the leading scientists in the Atlas collaboration at CERN told me in the beginning that if you want to understand our science you need to understand our collaboration, but if you don't understand the science you won't understand the collaboration. So you need to have an appreciation of the technical intricacies, but you also need to be very sensitive to the sociological processes going on.'

Fernando Santos stresses that interpersonal trust is necessary for interdisciplinary work: 'For interdisciplinarity you really have to trust your peers, because you are working in teams and the problems are usually

hard. Then you have to have a flexible mindset and need to understand your colleagues and their research partners because each person's questions are different. So this is really a skill you have to develop.'

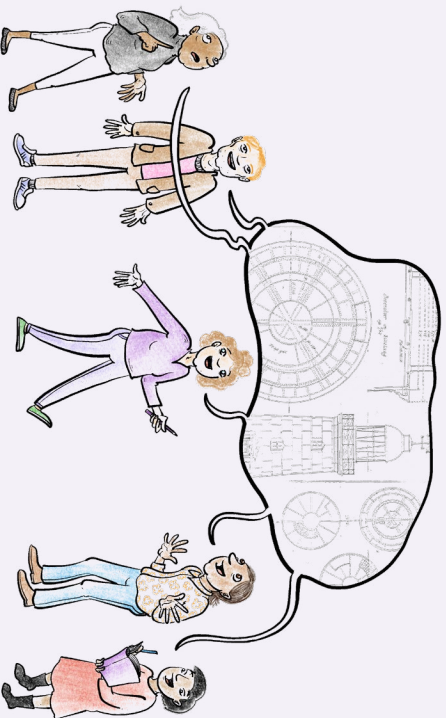
As indicated in section 3, modesty and the ability to listen to others are significant characteristics of (optimal) interdisciplinary researchers. However, group dynamics may often favour more extroverted members inclined to assume dominant roles. Attending to sufficient temperamental diversity in this regard, and ensuring that less vocal members not be ignored, is therefore important. Claartje Rasterhoff reflects: 'Something that I feel has gotten in my way a bit is that you may get snowed under compared to more monodisciplinary collaborators: if you are inclined to take on the role of a connector or facilitator, it may be more difficult to develop towards leadership positions within collaborations.'

*Perhaps it would be better for some students to become fluent in a specific domain before they embark on interdisciplinary research.*

Wim Huisman mentions that as a PhD candidate, an interdisciplinary approach is not necessarily the easiest choice. According to him, it depends on the subject and the attitude of the candidate. Nonetheless it is important that such candidates realize that doing interdisciplinary research is fun and challenging but that the stakes are potentially high. Perhaps it would be better for some students to become fluent in a specific domain before they embark on interdisciplinary research.

The situation that many interdisciplinary PhD candidates find themselves in is worth mentioning explicitly. Usually supervised by scholars having different backgrounds, employing different epistemological frameworks and pursuing duties according to fundamentally different schedules, these PhD candidates must find a way largely on their own to learn from various sources while still writing a coherent dissertation. In doing so, Charisma Helakaya finds it essential to initiate discussions on both the content and process of her research: 'Whenever I notice a divergence in ideas between my supervisors, I actively engage them and invite them to think with me on what this divergence means for our work. The fact that they are always responsive when I do so really strengthens my feeling of ownership of the dissertation. And it is important to make ideas visible. Write them down, literally. Language is important. A concept can have different meanings across disciplines.'

In terms of the nature of successful interdisciplinary collaboration more related to content, our interviews provide numerous insights. Philipp Tuertscher emphasizes the importance of 'interlaced knowledge' (Tuertscher et al., 2014), 'the pockets of shared knowledge interwoven within and across subsystem communities' - in other words, decentralized knowledge that overlaps between different disciplinary groups, forming an interwoven web.



In practice, creating interlaced knowledge means that people from a particular discipline also develop a certain amount of knowledge and expertise in the other discipline(s) involved and become hubs of knowledge within the network of collaborators. Using the interdisciplinary collaboration at CERN as an example, Tuertscher further explains the importance of interlaced knowledge, which in his case 'made the whole enterprise much more robust, because the collaborators had a lot of backup solutions that they could fall back on when one of the solutions turned out to be infeasible. Also, when a person from this large collaboration, which had very permeable boundaries, suddenly exited the collaboration and newcomers came in, there were still some redundant, overlapping manifestations of expertise from the people who remained. That made this collaboration very robust.'

'Interestingly, interlaced knowledge encompasses not only an understanding of what others do. The knowledge of what, how and why is also very important. You need to understand not just what others in another discipline are doing but also the assumptions underlying their frameworks, their motivations, why they do things in a certain way. That allows you to understand what you need to change or what you need to tell them if you want to engage in collaboration with them.'

## Feeling lost

Notably, those of us working in mainly monodisciplinary departments and teams may find it difficult to find a community. During our AYA interdisciplinary lunches we noticed that many members of our own community have experienced a feeling of 'not belonging' and being lonely. For example, if everyone in a monodisciplinary department goes to the same talks and conferences, and you as an interdisciplinary researcher also go to other types of events, you (1) often don't have your immediate colleagues around you (this is of course also beneficial for meeting new people), (2) miss out on the shared experiences that your colleagues are having and (3) still don't feel at home with the likely monodisciplinary researchers you meet at the field-specific event. Looking for like-minded people may indeed be difficult, but we hope that the interdisciplinary group within AYA could be a starting point for those new to interdisciplinarity.

# 6. Education

## How and why should we train students and researchers in interdisciplinary ways?

Interdisciplinary work is not only about research: It now enjoys an increasingly prominent role in education and teaching. Integrating interdisciplinary aspects into teaching – or even offering a fully interdisciplinary programme – has the potential to bring several benefits to students. It also brings with it a set of challenges.



### **Advantages: Opening up future minds**

The interviews mostly highlighted two aspects when considering the advantages of interdisciplinarity within an educational setting: The qualities of an interdisciplinary scholar as a lecturer, and the skills that students acquire by approaching topics in an interdisciplinary manner.

On the one hand, some interviewees, when reflecting on the role of interdisciplinary scholars in a classroom, highlighted their broader view and the ability to consider multiple perspectives as a potential advantage. As summarized by Ermando Santos: 'I would say it is better for a student to have an interdisciplinary scholar [...]. Because it is wider. And also to attract students. If you teach fifty people, they have different brains, they think differently. So if you only come with one line of thought, you may address one percent of the class, but if you have different perspectives, if you have more interdisciplinarity, then you get more people. Maybe that's a good strategy, because the quality of your teaching will increase if the teaching staff is more interdisciplinary.'

This view is also shared by Claartje Rasterhoff: 'I think that the nice thing about playing with these perspectives is that you can foster diversity in how people think and work, as well as in education. You actually learn a broad language and acquire a toolkit through which you also can be more flexible and free in how you collaborate and speak with others and, in an educational setting, in how you can help students.'

On the other hand, interdisciplinarity also offers direct benefits for students. For example, interdisciplinary education teaches not only various synergies across disciplines but also how to apply concepts from one discipline to another. The ability to make this sort of translation is a skill that students will carry with them for life. For example, when reflecting on history approached from an interdisciplinary perspective, Bob Plerik observed that 'what I find interesting about history is that you can secretly absorb all kinds of other disciplines, if you just historicize them a bit. Using different disciplines is really something that I learned in interdisciplinary training and that I'm applying now as a historian. I think this is something that we can teach students more actively.' In this process, students also learn how to cooperate with others – across boundaries. As suggested by Natali Helberger: 'I think that it is important that you learn whom to ask, to learn what interdisciplinary perspectives can teach you and why it can be enriching, and then how to ask the right questions to the experts from the other disciplines. I think this is an important thing to teach.'

Learning and cooperating across boundaries help students to have a broad view but also create the possibility that they will become experts in particular topics. As summarized by Hanneke Hulst: 'I think that in interdisciplinarity one has to have a kind of broad view, but also want to take that extra step to properly own it.' She offers an example: 'If you look at Alzheimer's, what do you see on the MRI? What do you see under the microscope? What kind of behaviour do you see in those people? And how should you combine these observations to advance your insights about the disease? So I do hope students learn that you can't just comprehend Alzheimer's by reading a book. You really have to fully understand it if you want to be able to make connections in a clinical neuroscience setting.'

### Challenges: Struggling with fragmentation

The integration of interdisciplinarity within education does not come, however, without its challenges or at least certain considerations – on the part of students and lecturers alike.

One of the main challenges involves the navigation of an interdisciplinary programme while being aware of disciplinary boundaries, as can be seen on different levels of education. In a bachelor's programme, for example, it may take some time for students to realize the differences in the disciplines that their programme is integrating. Bob Plerik recalls: 'It was only when I started writing a thesis that I became more aware of that. And I still have the feeling that I only really got a grip on this when I actually started my more traditional master's here at the University of Amsterdam.'

In a doctoral programme, this type of challenge comes more to the fore, especially because PhD candidates also need to consider their future career in academia. For example, Plerik indicated that 'I'm constantly terrified that someone will suddenly go through my dissertation with a red pen and say, "Hey, what happened here is not up to standards." That it has no disciplinary basis whatsoever. This is not entirely true, of course, but that [feeling of] danger, that voice is always there.' Conversely, the specialization that is often required of PhD candidates may also create barriers later on vis-à-vis their ability to move to interdisciplinary research. As Fernando Santos summarized the situation: 'The system now is working so that the PhD candidate has to be so narrow so that this person would be the best person in that specific topic, but the person would not be able to move around in other fields. Now in the early years when this is happening, it's not a big problem. But when those young scholars become professors, they will not be able to have broad views on their field. And then people who do have this broad view on their field die. So the science could be a bit fragmented.'

Lecturers interested in integrating interdisciplinarity into their teaching – or setting up interdisciplinary programmes – also face challenges. First and foremost one should consider that researchers often become 'interdisciplinary' as a consequence of their own interests and respective career paths, which may be difficult to translate into a teaching programme. As summarized by Hanneke Hulst: 'It's not something you can learn from a book. It's something that's almost like a lifestyle. A way of working, which I have taught myself through the environment I am in and within which I have grown. I've been doing this job for 13 years now, but I would like to have people who can do this right away, from their training onwards.'

I think there might be something that needs to be done within training as well. To teach people to look beyond their own disciplines, their own box. Why should you do that? Because I think that enriches your image of the phenomenon you are studying.'

In this sense, it is often important to start with a question in mind, and let students figure out how to operate in an interdisciplinary manner via a learning-by-doing approach. As suggested by Hanneke Hulst: 'If you are talking about education, I think there are many opportunities there for including interdisciplinary research. I don't think you should start with the students and explain that we are training them to take a certain direction. You have to teach them that you can also hold a broad view, even though you are specializing in one dimension. In that case you actually get people possessed of a certain attitude which makes it easier to follow an interdisciplinary route. I also think you learn this mainly by doing, that is, you have to actually teach people via practical experience. By walking with researchers who work on interdisciplinary issues you can simply experience real things, and all that knowledge based in those different perspectives ultimately offers a better picture of reality, of the phenomenon you are trying to study.'

### Best practices

Interviewees provided different tips or ideas about how to teach in an interdisciplinary manner. In some instances, combining scholars from different traditions was seen as an opportunity. As per Peter van der Slide: 'We have teachers from Science [in our programme and] we have teachers from Science Business and Innovation in it. Most of the time they form a tandem. They are a combination of lecturer, coach, that type of thing. What most teachers in innovation projects do is work with companies. They [the students] do an assignment for a company and that leads to more, or less, interdisciplinarity. You can bring in the science, but if you don't tell them what to do with it, you forget the business side of it, it is of no value to them.' A similar experience was shared by Natali Helberg: 'So the way I'm approaching things is asking teachers from other disciplines to join me and to teach a particular topic, in order to show students what these other disciplines are and how they approach themes and what they teach us about our way of looking at the law. And I think that is super fruitful.'

Being clear with students about this combination – and acknowledging that in practice these combinations actually exist – is also important. As indicated by Peter van der Slide: 'I can tell you how Science Business and Innovation is organized because it combines the different disciplines and in a way it goes beyond a Science discipline. What I ask from my students is that they have a sound background in the discipline of science. We have both the science topics and the business innovation topics. What we wanted to do is to see both worlds. In real life they complement each other.'

***'This artificial boundary between them starts in secondary school. You are either in the "gamma sciences," "alpha sciences" or you are in the "beta sciences," which is a completely artificial division.'***

er, but in teaching, most of the time they do not, because you choose one or the other. This artificial boundary between them starts in secondary school. You are either in the "gamma sciences," "alpha sciences" or you are in the "beta sciences," which is a completely artificial division, but that is how our education system is organized. It is quite hard to bring these domains back together again. This is difficult for the students. [...] From the outset, we look for students who are interested in both spheres. We sell interdisciplinarity from the beginning.'

The necessity of balancing the programme's needs must also be considered. As Natali Helberg notes: 'If you teach law, you should consider that on the one hand, you need to educate a new generation of lawyers who are able to work as judges, lawyers and in administration. So you need to teach them the solid basics of law, but you also need to teach them what they can learn from other disciplines, and then offer, for those truly interested, the possibility of engaging in greater depth with other disciplines.'

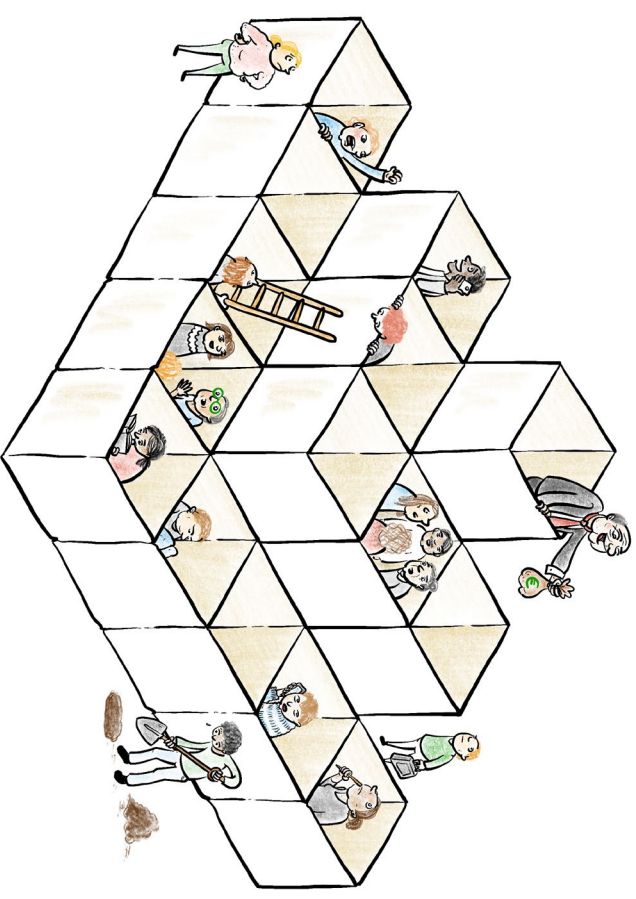
This balancing act can also be a factor in doctoral education, for example in a PhD project. As per Taco de Vries: 'We have always made sure that you never put one person on the behavioural part and one person on the molecular part. But you have two people who do both. The first you have to train a little more in one discipline, and the other must have a little more training in the other field. But they have both experienced both aspects during the PhD.'

1. These terms are used in the Dutch and Flemish context to distinguish between three clusters of academic disciplines. 'Gamma' includes all disciplines focusing on society, behaviour and psychology; 'Beta' is the term for the exact sciences; 'Alpha sciences' refers to the humanities.



# 7. System

## What is the influence of funding, publishing and promotion?



All academics are embedded within an academic landscape: The system, that is, or place of learning that encompasses the procurement of funding as well as publishing and evaluation. The academic landscape affects whether scholars' interdisciplinary approach hinders or advances their careers. Unfortunately, most of our interviewees expressed concerns that the current academic landscape prompts most researchers to shy away from interdisciplinary research. Peter Sloot summarizes the overarching problem:

*'Teaching, funding, and evaluation are all monodisciplinary, while our big problems are interdisciplinary. I think that's the biggest problem we have to solve.'*

### **Sense of belonging**

In general, researchers have been trained in a single discipline and then have remained within their own discrete field. Dario Corradini reflects: 'A problem regarding the genuine facilitation of interdisciplinary research starts in the educational process itself: Classes are given within a particular field or discipline. Even now, with interdisciplinary research

becoming more and more important, there is relatively little cross-fertilization between disciplines at universities. Thus begins the culture in which you “belong” to a particular field from the get-go. As you mature in your field, there is the problem of the departmental structure that we find in most universities: You need to be embedded within a traditional monodisciplinary department and should therefore publish in that discipline and build a track record in it. All these issues impact to some extent the publishing culture of researchers and, as a consequence, how journal editors handle submissions.’

## Shared resources

To facilitate interdisciplinary collaborations, researchers, explains Philipp Tuertscher, need to have objects and resources in common: ‘A shared jargon, space, devices or methods. This is what is called ‘boundary infrastructure’: ‘My colleagues who studied how organizations can overcome these boundaries found two types of shared objects: shared technical infrastructure and shared students.’ Regarding infrastructure: ‘So you have, for example, new types of microscopes that are useful for scientists working in chemistry, and then they team up with people from nano-science centers. Of course, they need those people in order to understand how these instruments work. You also maximize the utilization of these instruments if a lot of outside parties come to these nano-centers as hosts and use such instruments. So this is how the instrument itself, in its availability, provokes collaboration.’

Apart from a shared physical resource such as a tool or apparatus, shared resources can also include, for example, entities such as data cohorts. AVA member Elsjé van Bergen works at the Netherlands Twin Register at VU Amsterdam. The Netherlands Twin Register has data concerning more than 120,000 twins and their family members. The register includes behavioural and DNA data (Ligthart et al., 2019). Such a shared data resource stimulates collaboration amongst academics from a wide range of fields, such as (epi)genetics, psychology, educational sciences, movement sciences, epidemiology and statistics.

## Shared students

Regarding shared or jointly supervised students, Tuertscher says that ‘they’re the catalysts, they’re vital’. He contrasts students with mid- and late-career academics: ‘It is very difficult for us to escape our own rhythms in our own communities.’

*‘It is very difficult for us to escape our own rhythms in our own communities.’*

It is much easier for students to engage in this role and become facilitators to bridge these disciplinary boundaries. [...] Students very often forge connections because they acknowledge there could be a supervisor from a second discipline that they can leverage. So for a student it is a win-win situation, because the student gets different types of feedback and can develop a new line of research. Such a student can build a career based on a foundation that would, of course, also be possible for a professor, for a faculty member, but that person typically has much higher opportunity cost involved and much more at stake if it weren’t to work out.’ Tuertscher here introduces the term ‘path dependency’ for mid- and late-career academics: ‘Once you have created your profile, it’s not so easy for you to deviate from it. You would be diluting your profile: you are well known and established in your domain. You are more productive and efficient working in your domain because you understand it very well.’ According to Tuertscher, the collaboration between junior researchers who connect fields and senior monodisciplinary researchers who see the big picture enhances the changes of big discoveries. Tuertscher remarks that ‘you need to organize for serendipity?’

## Funding

Regarding funding for interdisciplinary work, Taco de Vries sees many hurdles standing in the way of interdisciplinary applications. First, the applicant: ‘People tend to follow the regular paths within their own domain, rather than go off the beaten track.’ Second, the reviewers: ‘Reviewers are selected based on their expertise, which is usually monodisciplinary.’ So it is very difficult to get a balanced assessment of an interdisciplinary proposal. Finally, the panel members of the grant scheme inevitably find it very challenging to handle interdisciplinary proposals. The proposals typically fall outside their domain of expertise, and with just three review reports in hand – potentially differing widely in perspective and in their assessments – panel members have little guidance. To get back to the applicants, they are trained in a certain discipline. And then another discipline is added, because that is important for the formulation of the question. But in principle they are, of course, not as well trained. So they are somewhat more dependent on collaboration with people with expertise in other areas. Which is good in itself, but with a personal grant, the question for the panel is always: Can someone pull it off on their own?’

## Publishing

Research that is interdisciplinary can also cause clashes at the publishing stage. Wim Huisman comments that 'the paradigms are different and so are the mores – this is how we do things here. For example, rules about how many authors go on a paper. In law it's only the PhD candidate, whereas in the natural sciences it's everyone who has even slightly participated in the lab where the data comes from. And then you have an article with ten authors. And the placement of the author tells the insider what that author's particular contribution is to the paper. A lawyer would find that very strange, and not even ethical. Then you indeed have two cultural differences between two disciplines that you can argue about if you put those people together around a PhD candidate.' Huisman goes on to say that 'you will be judged on the number of publications within a certain area. And then you shouldn't take any risks. In publication culture you see a brake on interdisciplinarity, while in the research funding system you see that there is an incentive for interdisciplinarity. But when it comes to that publication culture, that is precisely what people want to break through these days.'

## Recognition and rewards

Recognition and rewards are closely tied with publishing your work and getting funded for new work. Taco de Vries on getting grants and tenure: 'A department mainly looks at whether someone obtains grants. That is an important guideline. So that means that if the funding agency has a financing instrument that is favourable to monodisciplinary people, you simply build up those kinds of people in your department. Because everyone is trying to align and mold themselves to the hoops of the funding agencies.'

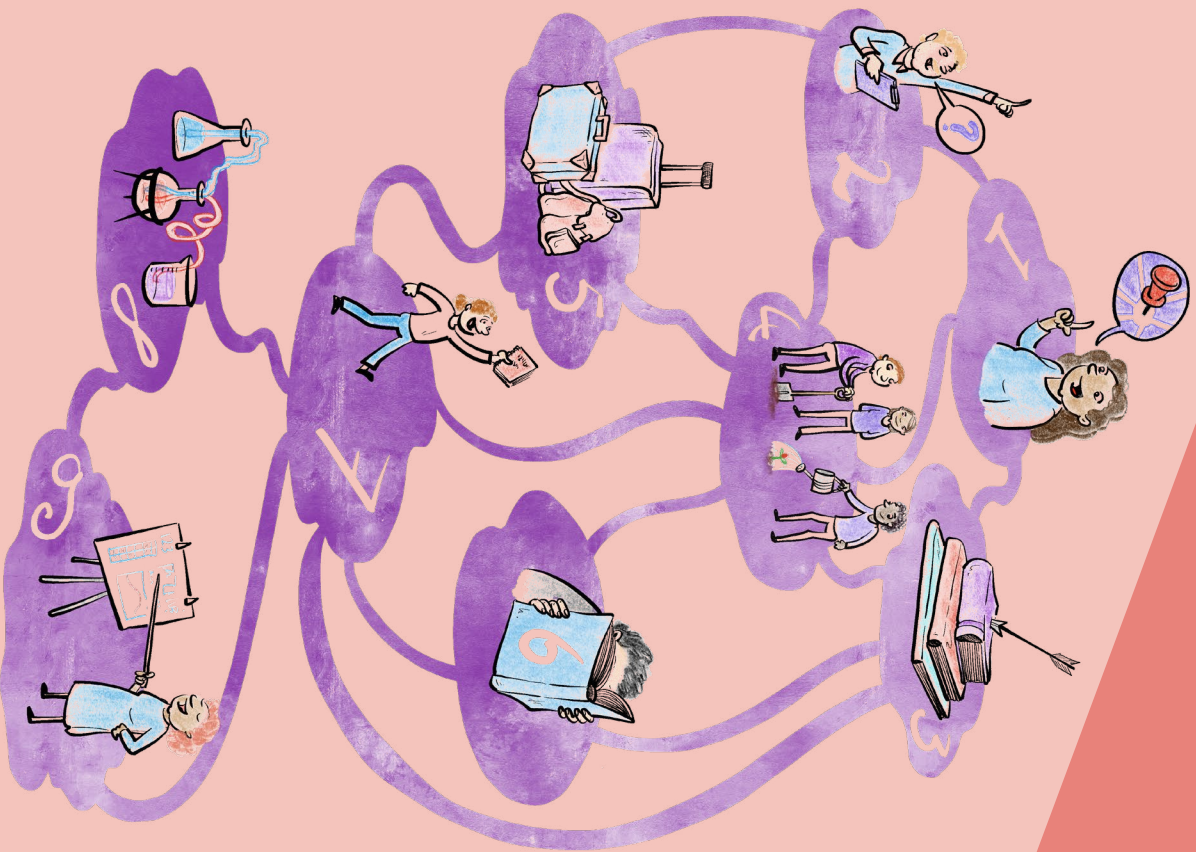
Guy Geltner notes that panel members for the awarding of grants and members of hiring committees look at people's Google Scholar and H-index, which is quicker than reading a long CV. 'But they look at all these metrics that are in fact machine-generated. The impact factors of journals in one field are meaningless in another field. So they outsource their quality control to Google Scholar or to PubMed or to whatever index they're looking at.' The incomparability of these metrics across (sub)fields can cause issues to arise; what we consider 'excellent science' is especially problematic across disciplines.

In sum, although the situation is slowly changing, the current academic landscape is still made by, and for, monodisciplinary researchers.

Deviating from the status quo seems to remain challenging due to a diminished sense of belonging and because of greater difficulties in getting funded and published and being awarded tenure.

*... the current academic landscape is still made by, and for, monodisciplinary researchers.*

# 8. Tips & Tricks



There's nothing more useful than a listicle to end this interdisciplinarity guide. We have condensed the top 10 tips and tricks from our many interviews:

1. Convey your interdisciplinary message well by explaining and perhaps even repeating explanations. Always merge the general and the particular: what are the specifics of your work, and how does it generalize? This may help readers from various fields latch on to the work.
2. In a meeting, especially with academics outside your field, don't shy away from signaling that you do not know a particular term or that you cannot follow their reasoning.
3. Identify target journals to publish in beforehand to figure out what assumptions need to be spelled out for which audiences.
4. Actively find and surround yourself with mentors from different fields, and find a community or smaller network of people interested in similar topics at the crossroads of disciplines. Help this community grow.
5. Attend conferences on different specializations.
6. Teach a course that falls outside your own specialization.
7. Particularly for students: proactively ask your supervisors for meetings, for input, etc., instead of assuming that the initiative will come from them.
8. Particularly for PhD advisors to students working on an interdisciplinary project: agree on the sequence of who gives feedback first and who builds on that feedback, and how.
9. Particularly for students: have courage and feel that it is safe to act as an 'educator' for those advisors on the team who are not experts.
10. When it comes to writing interdisciplinary grants, Els den Os offered a selection of useful tips. She pointed out that grant applications for interdisciplinary projects are particularly troublesome in the individual grant schemes, such as NWO's Veni/Vidi/Vici, and to a lesser extent in the individual grant programmes of the European Commission. In these cases, your project could receive conflicting review reports (due to the reviewers' different disciplinary backgrounds), which is often considered unfavorably by evaluation committees. So:
  - Take the wind out of critics' sails! Position your project explicitly as tapping into more than one discipline. This will help you rebuff potential criticism from reviewers when they argue that the approach or methodology deviates from disciplinary standards.

- Argue for the necessity of an interdisciplinary approach; show how the central problem in your project can only be solved by working in and between different research traditions.
- Concretely indicate how proposed research will realize the interdisciplinary promise of the project. For instance, if you (as the principal investigator) lack the necessary background for one of the project's components, recruit an experienced researcher (e.g., a Postdoc instead of a PhD candidate) to tackle that portion of the project.
- Explain your concepts. Don't presume that they are understood in the same way within other disciplines. Assuming that others have the same background knowledge as you do is called 'the curse of knowledge.'
- Be strategic about the keywords you choose for the project when submitting your proposal. In doing so, you will increase the chances that your project will be assessed by suitable reviewers. Check which publications and researchers pop up when you enter your keywords in Google (Scholar).

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# 10. Biographies

## Annoesjka Nienhuis

is a program manager Innovation & Sustainability at the municipality of Amsterdam for the build environment. She leads a program that accelerates the social energy and climate adaptation transition in Amsterdam Southeast. She does this by working together with residents, researchers, businesses, housing corporations, local mosques, etc. They work together on turning existing apartment buildings into “nui-op-de-meter” (NOM) buildings, designing local heat and electricity networks, stimulating local initiatives of residents to sustain their neighbourhoods, experimenting with doughnut economics in projects, developing 3D visualisations and more. Before joining the municipality, Annoesjka has worked as a process manager and advisor for TNO and for several innovation programs in the build environment in The Netherlands such as the UN International Year of Planet Earth, Energiesprong and De Bouwcampus. In these programs she always worked interdisciplinary.

## Bob Pierik

is a PhD candidate at the UvA specializing in the history of gender and urban space in early modern Amsterdam (1600-1800). He studied Liberal Arts and Sciences at Leiden University College, campus The Hague, and finished a master's programme in History at the UvA. Bob is interested in interdisciplinary approaches to early modern urban history, including digital humanities and geographical mapping. His PhD research is part of the interdisciplinary research project 'The Freedom of the Streets'.

## Caroline Nevejan

is a researcher and designer who has been involved with the emerging network society and digital culture since the 1980's. She is a professor by special appointment and holds the chair Designing Urban Experience with the Amsterdam School for Social Science Research at the UvA. She is also the Chief Science Officer of the city of Amsterdam, and orchestrates research between the city of Amsterdam and the different scientific, academic and artistic universities in the city. With a small team she makes sure that civil servants and researchers can find each other via openresearch.amsterdam and invent new and different ways of working together. Interdisciplinarity lies at the heart of Caroline's endeavours across her varied roles.

## Charisma Hehakaya

is a PhD candidate at University Medical Center Utrecht. She works on the health economic evaluation of MRI-guided radiotherapy for prostate cancer. Her very multidisciplinary background is in Clinical Epidemiology with Health Economic Modelling, Business Administration in Strategy & Organization, and Science, Business & Innovation in Life & Health. Public engagement of science is important to her, and she is involved in research on how to involve patient representatives and citizens in prostate cancer care in the Netherlands. Charisma is an active member of Young Science in Transition: a group of Early Career Academics working on various projects (#openscience, #recognitionrewards, #teamscience). She is the founder of the First Generation Fund to support first-generation students in Utrecht.

## Clartje Rasterhoff

is an Assistant Professor of Cultural Policy and Management at Maastricht University, interested in the relationship linking culture, economy and cities. She obtained her PhD in History from Utrecht University, and worked subsequently at the Media Studies and History department of the UvA. She also worked as project leader of the Culture Monitor at the Boekmansstichting, combining classical questions in the humanities with innovative digital research methods.

## Dario Corradini

is an Associate Editor at Physical Review X, a fully open access physics journal that places a high value on innovation, quality, and long-term impact of the science it publishes. He handles a large proportion of the interdisciplinary manuscripts that the journal receives. Dario's background includes a PhD on computational physics from the University Roma Tre in Italy. He worked on theoretical statistical physics of complex liquids and ionic materials, as well as biological and environmental physics at Boston University in the USA, and at University Pierre and Marie Curie (CNRS) and Ecole Normale supérieure in Paris, France.

## Els den Os

is a grant advisor and a member of the grant support team of Innovation Exchange Amsterdam (IXA). She supports (young) researchers at the Faculties of Law and Humanities, assisting them in writing grant applications for various national and European funding organizations. Prior to her work for the UvA, Els den Os obtained valuable experience in various collaborative international research projects, both as a researcher and project manager. In 2001 she was appointed Officer for

European Affairs for three Max Planck Institutes. In 2005 she started working at the Radboud University, first as a project manager of an EU Future and Emerging Technologies (FET) project, later as the head of the research office of the Faculty of Arts. She started her work for the grant support team of IXA at the UvA in 2016.

### **Else Veldman**

is a programme lead of the Energy Lab at Amsterdam Zuidoost, an initiative of the City of Amsterdam and the Amsterdam Institute for Advanced Metropolitan Solutions (AMS). She connects concrete urban energy challenges of Amsterdam Zuidoost to research and scientific expertise from various knowledge institutes. In particular, she closely cooperates with the Urban Energy Institute of Delft University of Technology. Through such collaborations Veldman contributes to the large-scale application of innovative energy solutions in Amsterdam's metropolitan environments. Before joining AMS, Else has worked as a researcher and innovation manager in the energy sector for over 10 years.

### **Fernando Santos**

has incorporated more and more disciplines into his research over the years. He was trained in statistical mechanics and applied topology at the Federal University of Pernambuco in Brazil, and spent a year at the Wolfson Center for Mathematical Biology in Oxford. In 2019, he further widened his research focus and started applying topological data analysis to neuroscientific questions. He currently works as a postdoctoral researcher at Amsterdam UMC and holds an Institute for Advanced Study (IAS) fellowship. Fernando aims to combine topological data analysis and information theory to understand high-order interactions in the brain and assess their relevance for cognition.

### **Guy Geltner**

is a Professor of History at Monash University, Australia and Full Professor in Medieval History at the UvA. His research interests include the socio-cultural history of public health, punishment and mining in mediaeval cities. As an advocate of open-access publishing, Geltner helped found Scholarlyhub, a platform for free access to scholarly communication, and BodoarXiv, an open repository for scholars in mediaeval studies. Geltner is currently working on the ERC Consolidator-programme 'Premodern healthscaping', a five-year interdisciplinary project on how mediaeval urban residents in Italy and the Low Countries thought about and pursued population-level health.

### **Hanneke Hulst**

is a Professor of Neuropsychology of Health and Disease at Leiden University. She was trained in health sciences, neuroscience and philosophy. Her research aims to understand and treat cognitive problems, particularly in people with multiple sclerosis. She is a member of De Jonge Akademie, where she is particularly involved in the discussion on recognition and rewards and improving the academic landscape for future generations. Hanneke is also the director of Brein in Beeld, a foundation that brings (neuro)science to the general public through, for instance, movie screenings and school activities.

### **Jan Willem Duyvendak**

is a Distinguished Research Professor of Sociology at the UvA. His research interests include urban sociology and the sociology of 'belonging'. Duyvendak studied sociology and philosophy at the University of Groningen, the UvA and the Ecole des Hautes Études et Sciences Sociales in Paris. He was director of the Verwey-Jonker Institute, a research center for social issues, from 1999 to 2003. Since 2018, Duyvendak is rector of the Netherlands Institute for Advanced Study (NIAS).

### **Machiel Keestra**

is an Assistant Professor with tenure at the Institute for Interdisciplinary Studies (IIS) at the UvA. He teaches in the Beta-Gamma (Natural & Social Sciences) Bachelor programme, Interdisciplinary Honours programme, Brain and Cognitive Sciences Master programme, and other interdisciplinary courses. His research interests include the history of philosophy and hermeneutics, the philosophy of action, and very relevantly the philosophy of interdisciplinarity. He is also the Diversity Officer of the Faculty of Science. As such he offers solicited and unsolicited policy advice to the department's community, shares expertise and brings together engaged department members in the Diversity Sounding Board. He was the president of the International Association for Interdisciplinary Studies ([www.interdisciplinarystudies.org](http://www.interdisciplinarystudies.org)) and is a founding board member of the global Inter- and Transdisciplinary Alliance ([www.itd-alliance.org/](http://www.itd-alliance.org/)).

### **Natali Helberger**

is an University Professor in Law and Digital Technology, with a special emphasis on Artificial Intelligence, at the UvA. She studies the legal, ethical and public policy related challenges associated with using algorithms and AI in media, political campaigning, commerce and the healthcare sector, and the implications this has for users and society.

She is one of the leaders of the Research Priority Area Human (e) AI, an interdisciplinary initiative across all UVA faculties. She is also founder and Principal Investigator of 'Information and Communication in the Data Society' (ICDS), an interdisciplinary research initiative into the way AI and algorithms affect the role, impact and regulation of data-driven communication and information platforms.

### **Peter Sloot**

is a Professor of Complex Adaptive Systems at the UVA. With a background in physics and chemistry, he tries to understand how natural and man-made systems process information. His work covers a wide range of topics, including virology, people's movements at dance events and a systems view on contemporary chronic health issues like obesity. He is also the founder and formerly the first scientific director of the Institute for Advanced Study (IAS). Its mission is to advance novel cutting-edge interdisciplinary research that addresses complex scientific and societal challenges.

### **Peter van der Sijde**

is a Professor of Organization, Entrepreneurship and Technology in the Faculties of Science and the Faculty of Social Science at VU Amsterdam. His research is in the area of entrepreneurship, university-industry interaction and knowledge valorization. He held senior research positions at the Dutch Institute for Knowledge Intensive Entrepreneurship (Nikos) at the University of Twente (Enschede, NL), Uister Business School and Saxion University for Applied Sciences (Enschede, NL). Peter van der Sijde is also the Educational director of the master's programme "Science Business and Innovation" at VU Amsterdam.

### **Philipp Tuertscher**

is an Associate Professor of Technology and Innovation at VU Amsterdam. He obtained his PhD at the University of St Gallen in Switzerland with a dissertation on large-scale scientific collaborations that received funding from the US National Science Foundation. He was also a visiting scholar at the Pennsylvania State University's Smeal School of Business. Philipp now explores organizational mechanisms and social practices for collaborative innovation in a variety of settings. Besides studying large-scale scientific collaborations at CERN, Philipp has been studying innovation processes in collaborative communities such as Linux and Wikipedia.

### **Taco de Vries**

is a Professor of Behavioral and Translational Neurosciences at Amsterdam UMC and VU Amsterdam. Drawing on his background in biology and neuroscience, his research spans basic neuroscientific work on impulse control and addiction in animals as well as innovative clinical interventions aimed at helping nicotine addicts to quit smoking (hopefully forever). His educational work includes teaching an interdisciplinary course on addiction at Amsterdam University College. Moreover, he reviewed interdisciplinary Veni and Vidi proposals as a member of the cross-domain committee of the Dutch Organization for Scientific Research (NWO) for several years.

### **Wim Huisman**

is a Professor and chair of Criminology at VU Amsterdam. Since 2009, he has been the director of the VU bachelor and master programmes of criminology. Huisman is co-editor in chief of the journal *Crime, Law & Social Change*, an interdisciplinary journal that covers crime and deviance at the global, national, regional and local level, worldwide. The journal publishes multi-disciplinary criminological research focusing on gender, age, racial and ethnic equality issues. His responsibilities include accepting submitted manuscripts for review, selecting reviewers, deciding upon acceptance of reviewed papers and organizing special issues on selected themes. He is co-chair of the Division of White-Collar and Corporate Crime of the American Society of Criminology and he is a member of the board of the European working group on Organizational Crime (EUROC) of the European Society of Criminology. The research focus of Wim Huisman is on the field of white-collar crime, corporate crime and organized crime.



# Biographies of the Editorial Board members

All are members of the Amsterdam Young Academy

## **Anastasia V. Sergeeva**

is an Associate Professor at the KIN Center for Digital Innovation at the School of Business and Economics, VU Amsterdam. She holds a PhD in Management from the Graduate School of Management of St Petersburg State University. Her research interests include technology-mediated organizational change, the transformation of professional work and the emergence of new forms of organizing due to digital technologies. She has studied these topics across diverse occupational contexts, following the introduction of such emerging technologies as surgical robotics, predictive policing and algorithmic hiring.

## **Antske Fokkens**

is a Professor of Computational Linguistics at VU Amsterdam. She currently holds a University Research Chair on Computational Linguistic Methods. The fundamental question behind her research is how language works and how it can be modeled computationally. In her work, she looks at what questions rise when language technology is used in research in other disciplines. Since she joined the VU Amsterdam in 2012, this interdisciplinary focus has enabled her to learn from, among others, historians, communication scientists, experts in law, psychologists and computer scientists.

## **Boris Noordenbos**

is an Associate Professor of Literary & Cultural Analysis at the UvA, and is affiliated with the Amsterdam School for Cultural Analysis (ASCA). His publications revolve around the multifaceted question of how (popular) culture imagines and confronts 'the past'. His focus is primarily on the countries of the former socialist world, Russia in particular. Boris is the author of *Post-Soviet Literature and the Search for a Russian Identity* (Palgrave Macmillan, 2016) and is the co-editor of the volume *Post-Soviet Nostalgia: Confronting the Empire's Legacies* (Routledge, 2019). He also is the Principal Investigator in the ERC-funded research project *Conspiratorial Memory: Cultures of Suspicion in Post-Socialist Europe* (2021-2026).

## **Bram Mellink**

is an Assistant Professor of Dutch history at the UvA. His current research focuses on the history of early neoliberalism in the Netherlands (1945-1975). Earlier, he analysed the hidden group formations behind the Dutch 'individualized society'. Bram has mostly worked in interdisciplinary research groups, particularly involving crossovers between history and the social sciences, such as political science and sociology.

## **Elsje van Bergen**

is an Associate Professor in Biological Psychology and at the Netherlands Twin Register at VU Amsterdam. She was trained in human movement sciences (VU Amsterdam and University of Aberdeen), obtained her PhD in educational sciences (UvA), did her postdoc in psychology (Oxford) and now works in behavioural genetics. She studies the causes and consequences of individual differences in learning. She integrates theories and methods from psychology, education and genetics to study how genetic and environmental influences on learning (dis)abilities work together in complex ways.

## **Linda Douw**

is an Associate Professor at the Department of Anatomy and Neurosciences of Amsterdam UMC. She leads the Multiscale Network Neuroscience research section, which aims to use network theory, a branch of mathematics and physics, to better understand the brain. She is particularly interested in cognitive dysfunction in diseases such as primary brain tumors, multiple sclerosis and neurodegeneration. Her team consists of physicists, medical doctors, neuroscientists and neuropsychologists, and she is fascinated by interdisciplinary collaboration (and how to optimize it).

## **Miriam Wijkman**

is an Assistant Professor in Criminology at the department of Criminal Law and Criminology at the Faculty of Law at VU Amsterdam. She was trained in Law (VU Amsterdam) and Child Psychology (VU Amsterdam) and obtained her PhD in Criminology (VU Amsterdam) with a study on female sexual offenders, studying offender typologies, criminal careers and co-offending patterns. Her research focuses on sexual offending, gender and crime, human trafficking and organized crime.

## **Theo Araujo**

is an Associate Professor of Communication in the Digital Society at the Department of Communication Science at the UvA, and researcher at the Amsterdam School of Communication Research. His research focuses on the increasing adoption of artificial intelligence and related technologies within our communication environment, and on computational social science including the development of large-scale data collection and analysis methods for communication research.



The Amsterdam Young Academy (AYA) is an independent group of top young academics from different disciplines from the University of Amsterdam, VU Amsterdam and Amsterdam University Medical Centers. AYA advises on science policy, stimulates science outreach, and promotes interdisciplinary research.

### **Colophon**

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