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Preface

An Introduction to Interdisciplinary Research is a handbook on interdisciplinarity and its background, and a manual on conducting interdisciplinary research for undergraduates and beyond. Although several books have been written about interdisciplinary research, providing rich theoretical descriptions of and hands-on approaches to the topic, this handbook is a more condensed resource focusing on students in the social and natural sciences. The most relevant comparison can be drawn with Allen Repko's seminal *Interdisciplinary Research: Process and Theory*, 2nd ed. (2012). Repko's book served as an important source of inspiration and information for us. Having used Repko's book for several years in our interdisciplinary research seminars, we felt the need for another book that would differ in several respects from Repko's valuable book. As a result, our book mainly focuses on European students, whereas Repko's book seems to be primarily addressing undergraduate students from institutions in the US and Canada. This is why our book primarily contains examples of research carried out in Europe. Furthermore, we focus on students with majors in the social and natural sciences and less on those who major in the humanities or liberal arts and sciences. We have also included a thorough description of complexity, which we and others consider to be a main driving force behind interdisciplinarity. However, the most significant difference to Repko's manual concerns size. We explicitly aimed to produce a more condensed book that is practical, to the point, and clear.

The book is divided into three parts. The first part – *The Handbook* – gives a brief overview of interdisciplinarity and provides fundamental information about the origins of interdisciplinary research, what it entails, when it can be applied, and why it should be applied. The second part of the book – *The Manual* – focuses on the step-by-step process and sets out instructions on how to undertake interdisciplinary research. The third part contains a model example of an interdisciplinary project and the career stories of some interdisciplinary scholars.
Many questions surround interdisciplinary research. How does it differ from disciplinary research? What does it demand from the interdisciplinary researcher? What potential does it have that disciplinary research does not offer? It is important to note that interdisciplinary research builds on disciplinary research. When dealing with complex problems, a merely disciplinary approach will not suffice. Such problems necessitate an interdisciplinary approach when scientifically and socially robust answers are sought.

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The interdisciplinary research process is not an easy journey. In fact, it is a challenge for undergraduate students and experienced senior researchers alike. The aim of this book is to make the process more accessible. We provide many examples of interdisciplinary research projects, obstacles that researchers encounter during their academic journey, and the solutions they came up with. Moreover, we interviewed researchers who are experienced in applying an interdisciplinary approach, and we share their expert insights.

It would have been impossible to write this book without the contributions of the experts, lecturers, students and other individuals affiliated with the IIS at the UvA. We hope that you enjoy it, that you will learn a lot while reading it, and that you put the insights obtained into practice. We also welcome your feedback, so if you come across mistakes, or have suggestions to improve it, please get in touch with us via L.degreef@uva.nl.

Chapter guides

The first part of the handbook begins with a short introduction to the main topic of the book (chapter 1). Next we give an explanation of what science actually is; in other words, we will dive into the philosophy of science (chapter 2), after which we define what an academic discipline is, and provide a description of the historical development of the current disciplinary structure of the academic system (chapter 3). We then describe how this division into disciplines evolved (also in chapter 3), and thereafter we move on to define multidisciplinarity, transdisciplinarity, and interdisciplinarity (chapter 4). This is followed by an overview of the most relevant drivers of interdisciplinary research, which, in our view, share one characteristic: complexity (chapter 5). Part 1 concludes with a feature that is unique to interdisciplinary research: the integration of disciplinary insights at different levels (chapter 6). This is where interdisciplinary research differs from multidisciplinary research.

After reading part 1, you should have acquired enough knowledge to start your own interdisciplinary research project. Part 2 will guide you through this process by means of a model for interdisciplinary research introduced in chapter 7. It points out where monodisciplinary and interdisciplinary research approaches differ, and gives a step-by-step explanation of the process from the problem definition (chapter 8), the formulation of the research question (chapter 9), and data collection and analysis (chapter 10) to the discussion and conclusions (chapter 11).

Then, in part 3 (chapter 12), we start with an example of an interdisciplinary research project following the steps of our model, introduced in part 2. Furthermore, we share the stories about the careers of four interdisciplinary scholars in chapter 13.

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Part 1
The Handbook
‘The What’

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1 Introduction

Half a century ago, philosopher of science Karl Popper (1963) famously observed: "We are not students of some subject matter, but students of problems. And problems may cut right across the boundaries of any subject matter or discipline." This statement has become increasingly relevant. Today, many of the phenomena and problems that we are trying to understand and solve indeed 'cut across' the traditional boundaries of academic disciplines. Modern technological developments and globalization add to the complexity of problems and, in response, we are becoming increasingly aware that an integrated approach is necessary. Healthcare, climate change, food security, energy, financial markets, and quality of life are but a few examples of subjects that drive scientists to 'cross borders' and engage with experts from multiple fields to find solutions. In short, complex questions and problems necessitate an interdisciplinary approach to research.

Most real-life problems are multifaceted, in that they have multiple types of causes and determining factors. These different types of causes and determining factors often have to be addressed in different ways with different disciplinary methods. We know from research, for example, that alcohol intake is involved in over half of the violent acts that take place in the public domain. However, the relationship between the intake of alcohol and aggressive behavior is much more complex, and different disciplines have different perspectives on this relationship, as you can see in figure 1. Each discipline's focus is on another factor (in this case either nurture- of nature-related) at a different level of analysis, using different theoretical frameworks, and different methodologies.

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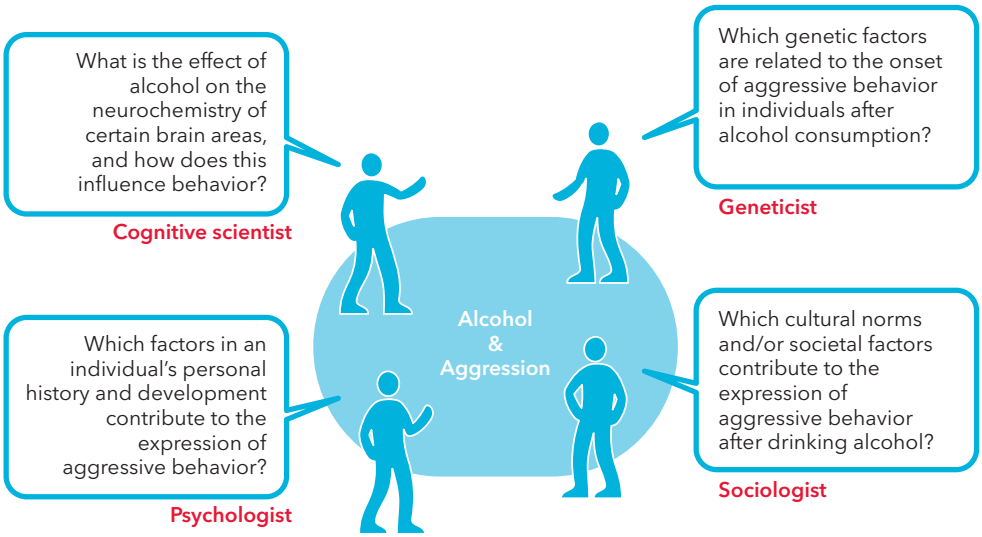

Figure 1 Different perspectives on the relationship between alcohol intake and aggression

Another example of a multifaceted problem is the financial crisis. Over the past five years, academics from different disciplines have tried to explain what caused the global economic recession. These disciplinary explanations, however, only shed light on part of the problem. When combined, they may offer a more comprehensive explanation, as you can see below in figure 2.

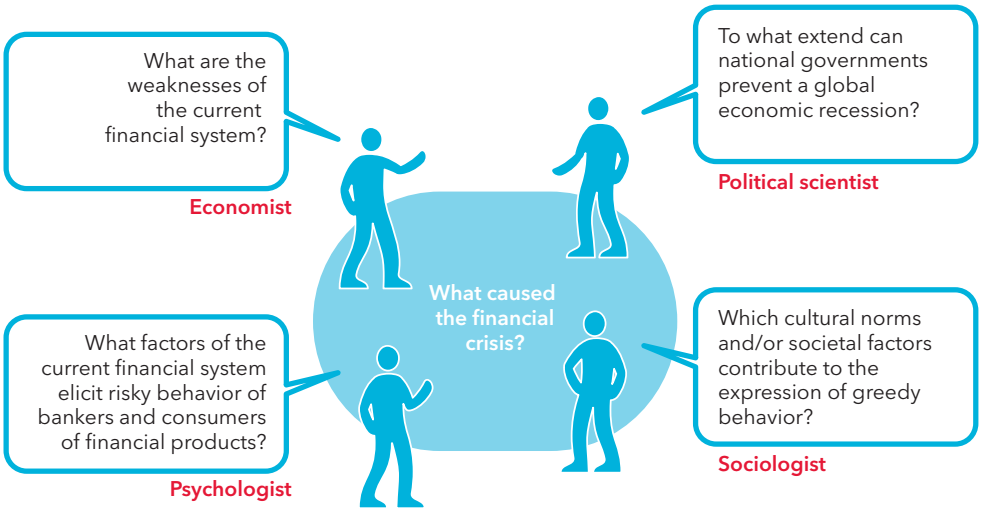

Figure 2 Different perspectives on the causes of the financial crisis

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The previous examples illustrate that knowledge is, to a large extent, generated within separate disciplines (see also box 1). Consequently, in interdisciplinary research we need these disciplines to provide insights into different aspects of our research problem. So, before we turn the focus to interdisciplinarity, it is essential to understand what an academic discipline is. For this, it is useful to understand the origins of academic disciplines, as well as their development. In the following chapter, we define the academic discipline before providing an overview of the discipline's inception and expansion throughout the science system and beyond. This is followed by a definition of the concept of interdisciplinarity and important related concepts (chapter 4). Chapter 5 focuses on the importance of complexity as the driving force behind interdisciplinarity, and provides an overview of the different manifestations of complexity. Finally, chapter 6 provides a description of the integration of disciplinary knowledge to produce new, interdisciplinary insights (see the example below on an interdisciplinary theory on poverty), which is the key feature of interdisciplinary research.

Box 1

An interdisciplinary theory on poverty

Eldar Shafir and Sendhil Mullainathan, respectively Professor of Psychology at Princeton and Professor of Economics at Harvard, developed an interdisciplinary theory on poverty. Their theory, published in the book *Scarcity – Why Having Too Little Means So Much*, was praised both in and outside academia.

The starting point for their research was the finding that poor people generally make bad decisions. Compared to middle-class people, poor people eat less healthily (even when healthy food is made available to them), take out loans with high interest rates more often, and are generally bad at taking long-term effects into consideration. However, as Shafir said: "No one was studying why poor people are making these bad decisions" (E. Shafir, pers. comm., 12 December 2013).

Shafir and Mullainathan started to connect findings from their disciplines. They found that the bad decisions poor people make are actually well researched in psychology. For example, poor people were discounting the future and showed loss aversion in their decisions, two effects known from research on decision-making. The question the researchers then investigated was: Why are poor people more prone to these effects than others?

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In their experiments, they found that psychological traits like bad character or low intelligence could not explain why poor people made more bad decisions than people with more financial resources. Instead, Shafir and Mullainathan came up with another explanation: It is often a person's context that dictates whether someone can make a good decision. Shafir again: "Slowly came the realization that many of the mistakes made by the poor are caused by poverty itself."
In their book, the researchers explain that when someone experiences scarcity – whether it is a lack of money, friends or time – this shortage 'captures' that person's mind. Her mind will intentionally and unintentionally deal with scarcity, and this leaves less cognitive capacity for other things, such as making a good decision.

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