Markus Schrenk

METAPHYSICS OF SCIENCE

A Systematic and Historical Introduction

ROUTLEDGE

Metaphysics of Science

Metaphysics and science have a long but troubled relationship. In the twentieth century the Logical Positivists argued metaphysics was irrelevant and that philosophy should be guided by science. However, metaphysics and science attempt to answer many of the same, fundamental questions: What are laws of nature? What is causation? What are natural kinds?

In this book, Markus Schrenk examines and explains the central questions and problems in the metaphysics of science. He reviews the development of the field from the early modern period through to the latest research, systematically assessing key topics including:

- dispositions
- counterfactual conditionals
- laws of nature
- causation
- properties
- natural kinds
- essence
- necessity.

With the addition of chapter summaries and annotated further reading, *Metaphysics of Science* is a much needed, clear and informative survey of this exciting area of philosophical research. It is essential reading for students and scholars of philosophy of science and metaphysics.

Markus Schrenk is Professor for Theoretical Philosophy at Heinrich Heine University, Düsseldorf, Germany. He is the author of *The Metaphysics of Ceteris Paribus Laws* (2007), co-author of *Einführung in die Sprachphilosophie* (2nd edition 2014), and editor of *Handbuch Metaphysik* (2016).

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A Systematic and Historical Introduction

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Preface

This book's primary aim is to introduce the reader to some of the key concepts within contemporary metaphysics of science: dispositions, counterfactual conditionals, laws of nature, causation, properties, natural kinds, essence and necessity.

These topics are closely connected. Consider the following relations: that something has a *disposition* to do something – for example, that these white granules are soluble – means, roughly, that the following *counterfactual conditional* is true of them: they would dissolve if they were put into water. The explanation for this potential behaviour might well be that the powder belongs to the *natural kind* salt which has *essentially* an ionic structure, *NaCl*, that figures in multiple *laws of nature*. These laws govern the *causal processes NaCl* can be involved in – for example, being torn apart by H_2O dipoles into the anionic/cationic subparts $Na+$ and $Cl-$. Finally, some laws might tell us that such causal processes happen necessarily.

The core questions Yet what exactly is a law of nature? What is a causal process? When is a sentence 'if such-and-such were the case, then this-and-that would happen' true? These are the questions philosophy of science asks and especially in its metaphysical department. Its epistemic section focuses primarily on the question how scientific knowledge – for example, about nature's laws and her regular causal processes – is accumulated. In this book we will focus on the metaphysical 'what is the nature of XYZ?' rather than the 'how do we know of XYZ?' question.

Entanglement For someone new to the subject it is a challenge that all these topics – laws, causation, etc. – are not isolated but entangled: getting to grips with one area within the metaphysics of science presupposes prior acquaintance with another which hinges on a third, etc. Yet we can turn this situation, this entanglement, into an advantage. A short historical detour will show how. It will also introduce another goal of the book.

A brief history of metaphysics of science and the plan for the book The book's secondary aim is to acquaint the reader with the

historical development of metaphysics of science beginning with the early modern period but especially throughout the twentieth and at the start of the twenty-first centuries. At the beginning of the twentieth century metaphysics as a whole fell into disrepute. Or, we should say, fell *once again* into disrepute. Early in the last century, the *Logical Empiricists* revived their eighteenth-century ancestors' metaphysics critique. They, as much as the ancestors, saw no merit in non-scientific theorising about the fundamental features of reality. Metaphysics, when understood as the philosophical investigation into the most basic, ultimate, fundamental features and structures of a reality that goes beyond what can be known via (experimental) observations and sensory experiences was thought to be pointless.

The Logical Empiricists declared that the only task left for philosophy/metaphysics is the clarification of concepts as they are used in the natural sciences. Particularly, philosophy should explicate how scientific sentences can be verified by observations and how scientific concepts can be reformulated in observational terms only. (These are terms like 'is red', 'is hot', etc. that refer to sense perceptions we experience directly.) It turned out, however, that satisfactory explications of this kind are not so easily available and that it is probably not possible for a multitude of scientific terms without making assumptions that were pejoratively labelled 'nonsensical metaphysics' by the Empiricists.

Dispositional predicates were an especially hard nut to crack. Dispositional properties – we have given the example of solubility; further dispositions are inflammability, elasticity, irascibility, etc. – have in common that many objects that have them only *potentially* act or react in a certain way when in certain circumstances. As long as something soluble is not put in water it does not show its solubility. Because of their only potential manifestation, they are properties of objects that are not directly observable.

Now, because the Empiricists' aim was to base all our factual knowledge on direct sense experience, they tried to translate what it means for a thing to be disposed (to be soluble, for example) into some statement that refers to observable things, properties and events only. Yet they failed.

History tells us that each attempt to amend the shortcomings of a prior analysis led the Empiricists either to acknowledge some metaphysical assumption and/or to refer, within their analyses, to one of the other core concepts within science, like *law of nature*, *causation, natural kind* and so forth. Needless to say, these other concepts were, consecutively, themselves in need of explication.

In this book we follow the history of the analysis of dispositions. Tracing it, we not only get acquainted, bit by bit, with analyses of *counterfactual conditionals*, *laws of nature*, *causation*, *natural kinds*, *essences* and

necessity but also with the metaphysical assumptions that have gradually been taken on board and, thus, made the philosophical scene open to metaphysics again. In other words, the (history of the) analysis of dispositional predicates will be our golden thread running through the web of the entangled core issues of metaphysics of science. Here's an overview of what awaits the readers in the individual chapters.

The prologue will offer a **brief history and critique of metaphysics**, starting with seventeenth- and eighteenth-century *Rationalism*, continuing with the classical Empiricist critique thereof, then introducing Kant's reaction to both, *Transcendental Idealism*, and ultimately arriving at twentieth-century *Logical Empiricism* and its infamous Verificationist theory of meaning. Here, the Empiricists' reasons will be given in detail for their strong anti-metaphysical stance as mentioned above. The consequences and also shortcomings of Logical Empiricisms and Verificationism will occupy a whole subsection.

The second chapter, 'Dispositions', starts with the Logical Empiricists' first attempt to reduce dispositional predicates to a vocabulary that refers to observable properties and objects only. We get acquainted with the difficulties that hide behind innocent looking 'if… then…' sentences, which lead, later, to the topics of *counterfactual conditionals.* We will also unearth how *laws of nature, causation* and the *nature of properties* become relevant. Related to properties, we will also, in the second half of the chapter, follow an ontological turn and move from semantic analysis of dispositional predicates to the ontology of categorical and dispositional properties. The grand metaphysical edifice of *Humean Supervenience* will be introduced. In this chapter we will also highlight two important aspects which are associated with dispositions: their modality (MOD) and their productive responsibility (PROD). These two features will accompany us throughout the book.

Counterfactual conditionals, the topic of Chapter 2, are if-then sentences with an antecedent that is counter to the facts: 'I keep it tight in my hands, yet, *if I were to drop this sugar cube in water then it would dissolve*'. These counterfactual conditionals seem perfect for spelling out what we mean by an attribution of a disposition to an object (here: solubility). Yet it is not so easy to say when such conditionals are true. To give their truth conditions is the topic of this chapter. In preparation, but also as a worthwhile subject in its own right, we will introduce the reader to possible worlds semantics. This also gives us the opportunity to speak about several kinds of modal properties like conceptual, metaphysical or nomological necessity and their complements, the respective possibilities.

Also: **what laws of nature say, our topic in Chapter 4**, seems to have counterfactual impact. For example, the law of gravitation claims that all massive objects are attracted by other masses – thus, if I were to let

loose this sugar cube it would fall. Yet what is a law of nature? A number of theories, starting with those inspired by Empiricism and ending with those offered within the past decade, will be introduced here. The topic of *Natural Properties* will be touched in passing.

Like the chapter on laws, **Chapter 5 on causation** acquaints us with the most important and most recent theories: when is it correct to say that one event *c* causes or has caused an event *e*, as my dropping the sugar cube into water caused it to dissolve?

The sixth chapter, 'Dispositional Essentialism', turns much of the story on its head: instead of trying to analyse dispositions in terms of counterfactual conditionals, in terms of laws of nature or in terms of causation – each respective chapter has its own section on such attempts – we show how philosophers have tried to spell out these other concepts in terms of the dispositional essences of natural kinds and properties. The chapter is organised in three parts: first, reasons for holding *Dispositionalism*, the stance that dispositions are respectable, unanalysable and real properties in their own right, are introduced; second, *Essentialism*, the idea that natural kinds have their features necessarily, is presented. The third section of the chapter unites the first two and unfolds the above-mentioned dispositional essentialist theories of counterfactual conditionals, laws and causation.

An epilogue called 'Meta-metaphysics' will engage with the latest self-conscious meta-reflection questioning again the tenability of (some) metaphysical assumptions and methods that have been so freely used in the past decades. Some worries in the style of the Empiricists' will re-emerge. **The afterword** reveals those areas within the metaphysics of science we were not able to cover for reasons of space. To avoid disappointment the reader might want to consult this final section of the book before starting with the first.

Reading manual

Throughout the book we will learn – learn by doing, so to speak – what metaphysics and especially what metaphysics of science is.

- All chapters and/or subsections (except those that are themselves a résumé) end with summaries in boxes like this one.
- The Preface and Afterword, Prologue and Epilogue, and the chapters Dispositions and Dispositional Essentialism are pairs and bracket the whole book.
- The dates of famous philosophers of the past are given where their names appear first in the text.

- There are cross-references (for example, Section 10.3) to other parts of the book where the same or an adjacent subject is covered.

Some definitions of metaphysics

- 'Metaphsyics is the study of ultimate reality.' (van Inwagen 1993: 1)
- 'Metaphysics is a philosophical inquiry into the most basic and general features of reality and our place in it.' (Kim and Sosa 1999: ix)
- '[I]ts central concern is with the fundamental structure of reality as a whole.' (Lowe 2002: 3)
- '[T]o characterize the nature of reality.' (Loux 2006: 10)
- 'Metaphysics is concerned with the foundations of reality. It asks questions about the nature of the world[.]' (Chalmers *et al*. 2009: 1)
- '[E]nquiry concerning the most general questions about the nature of reality including, for example, questions about the nature of matter, abstracta, fundamentality, space and time, and causation, law, necessity and probabiltiy – that at least captures metaphysics pretty well in extension.' (Ladyman 2012: 33)
- 'The most general attempt to make sense of things.' (Moore 2012: 1)
- See also: Kristie Miller's 'Metaphysics' in (Miller 2015: 193–236)

Further literature

- Tobin, E. (Forthcoming 2017) *Philosophy of Science: An Introduction to Contemporary Problems.* London and New York City: Continuum.
  (The latest up-to-date publication on our topics but seen from a more epistemic viewpoint. An ideal companion to our book.)
- Schurz, G. (2014) *Philosophy of Science: A Unified Approach.* Abingdon: Routledge.
  (This excellent overview combines a general introduction to philosophy of science with the author's own take on the unity of the sciences.)
- Psillos, S. (2002) *Causation and Explanation.* Chesham: Acumen.
  (An outstanding book focusing on the metaphysics of science; there's a large chapter on laws, too, although the title does not indicate this.)

- Okasha, S. (2002) *Philosophy of Science: A Very Short Introduction.* Oxford: Oxford Paperbacks.
  (What it says: 'very short', but great for its length.)
- Ladyman, J. (2001) *Understanding Philosophy of Science.* Abingdon: Routledge.
- Bird, A. (1998) *Philosophy of Science.* Montreal and Kingston: McGill-Queen's University Press (both highly recommended books). Ladyman and Bird have substantial parts on epistemological issues related to the sciences.
- See also Kristie Miller (2015).

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1 Prologue

A brief history of metaphysics

Rumours have it that one of the founding fathers of Logical Empiricism – Rudolf Carnap (1891–1970) – never went to sleep without a copy of Friedrich Nietzsche's (1844–1900) *Thus Spoke Zarathustra* under his pillow. In this book, Nietzsche does not only have Zarathustra declare that God is dead, he also lets Zarathustra put great emphasis on the insight that all that has ever happened will recur infinitely many times. With great admiration for Nietzsche, Carnap might have read, night by night, about the eternal recurrence of the same, and other Nietzschean themes. And, yet, Carnap did not, in some sense, believe a word of what that philosopher wrote. How is this possible?

Carnap and many of his colleagues within the so called Vienna Circle, a group of scientifically minded thinkers, which held its meetings in the Austrian capital in the 1920s, believed that most philosophical problems are meaningless and especially that a certain kind of metaphysical question should be eliminated from any rational or, at least, any scientific discourse altogether. The Vienna Circle's goal, to foster the scientific world-view,[1] was perceived to be in harsh contrast to any cloudy metaphysical inquiry.

Thus, when Nietzsche presents the doctrine of the eternal recurrence of the same without basing it on prior scientific investigation, i.e. without the support of empirical observation and experiments, it must, by the standards of the Vienna Circle, be judged to be speculative metaphysical nonsense on the same level of obscurity as statements about the absolute spirit or claims concerning the essence of being and nothingness.

Interestingly, there is, in current physics, a theoretical model of an oscillatory universe that, over and over again, begins with a big bang and ends with a big crunch and, thus, goes through the same events infinitely.[2] Should this theory prove to be empirically true the Logical Empiricists could start to believe in Nietzsche's proclamation of the eternal recurrence for scientific reasons.

Their scientific-mindedness does, of course, only indicate and not justify why the Vienna Circle was so hostile to almost all metaphysical questions. Indeed, the above paragraphs make Carnap, Moritz Schlick

(1882–1936), Otto Neurath (1882–1945), Friedrich Waismann (1896–1959) and other members[3] seem to be a group of spoilsports who reject a long-standing tradition of philosophy for dubious reasons.

However, these philosophers' challenging convictions are, as we shall see, embedded into an intriguing philosophical world-view and an exciting research programme – namely, Logical Empiricism, or Neo-Positivism. In what follows in this chapter and also in the rest of the book, we will become acquainted with the Logical Empiricists' invigorating philosophical manifesto and why for Carnap and others it seemed worthy of believe and defence. We will get to know why, surprisingly, this research programme was, in the twentieth century, the origin of a discipline we today call the Metaphysics of Science, despite the fact that the name alone might have caused the Logical Empiricists a headache. As we go along, we will also find an answer to the apparent contradiction that Carnap should be an enthusiastic Nietzsche devotee even though these two thinkers' philosophical methods and aims are so dissimilar.

To appreciate Logical Empiricism's place within the development of philosophical thought we must look at the philosophical history from which it arose. I have chosen, somewhat arbitrarily and to keep the chapter shorter than it could be, to start recounting this development with the early modern period. (Some of the metaphysics of the Scholastics and also the Ancients will find its way into the book later – see *universals* and *powers* – in Sections 4.4, 6.2 and 6.4) In this introduction we will start with Rationalism, continue with the classical Empiricists' response, turn to Kantian reconciliation of the two and ultimately arrive at the Logical Empiricists, who we discuss in more detail.

In the remainder of the book we will consecutively rebuild some of the metaphysical edifices the Empiricists left in ruins. Throughout, but especially in the final chapter, we will reflect on the legitimacy of this reconstruction scheme.

1.1 Rationalism

Those philosophers with whom we start our brief historical overview, namely the so called *Rationalists* like René Descartes (1596–1650), Baruch Spinoza (1632–77) and Gottfried Wilhelm Leibniz (1646–1716), thought that *metaphysical investigations* reveal the most fundamental structure of the world, that which Goethe's Faust would describe approximately 200 years later as what 'girds the world together in its inmost being' and on which all other reality depends.[4] Equally important, the Rationalists believed that a metaphysical inquiry should deliver its insights *with absolute certainty*. It should deliver *first principles* about which there cannot be any doubt.

Note that this latter issue, *certainty*, is an *epistemic interest*, i.e. a requirement regarding our *knowledge* of metaphysical truths, whereas the former issue, the fundamental structure part, is an *ontological concern*, i.e. one focusing on *what there is* and *how it is organised*.

Concerning the epistemic part, Descartes, for example, urges us in his *Discourse on the Method*[5]

> never to accept anything for true which [we] did not clearly know to be such [. . .] and to comprise nothing more in [our] judgment than what was presented to [our] mind so clearly and distinctly as to exclude all ground of doubt.
>
> (Descartes 1637: Part II.7)

Certainty not established by the senses For the goal of achieving absolute certainty, the Rationalists found one possible source of knowledge, namely sense perception, to be wanting. It is a far too unreliable resource because our senses can be and have been frequently deceived, as, for example, optical illusions show. Two of Descartes' famous examples are a round tower that, from afar, looks square, and a huge statue that seems small from a certain distance. Descartes continues: 'In these and countless other such cases, I found that the judgements of the external senses were mistaken' (Descartes 1641: Meditation VI: 76 (53)).[6] Worse, when we are vividly dreaming or hallucinating, we only believe we perceive something real but actually do not see, hear, feel, etc. any truly existing object at all (as, again, most famously described by Descartes in his *Meditations on First Philosophy* 1641, in the dream scenario: Meditation I: 18–20 (12–14)). And, so, Descartes judges the senses negatively in that he concludes 'it is prudent never to trust completely those who have deceived us even once.' (Descartes 1641: 18 (12)).

Because of the doubtfulness of sensory perceptions, the Rationalists watched out for a different source of (metaphysical) knowledge and they thought to have found it in pure reason:

> Accordingly, if there is any certainty to be had, the only remaining alternative [to the senses, MS] is that it occurs in matters that are clearly perceived by the intellect and nowhere else.
>
> (Descartes 1641: 145 (105))

Axioms and deduced theorems The Rationalists model for such pure rational knowledge beyond doubt was mathematics and their reference point was Euclid's treatise on the *Elements*, in which Euclid (360–280 BC) axiomatised geometry. Axiomatisation means that Euclid was able to deduce mathematically a large number of geometrical truths from only a limited number (ten, to be precise) of fundamental axioms.

(In mathematics, one speaks of *axioms* when one means these first principles and of *theorems* to refer to the propositions deduced from these axioms.) A well-known example for one of the unquestioned primary statements, the axioms, is the fifth, the *parallel postulate*, which says that through a point that is not on a given line only one further line can be drawn that is parallel to the first. An example for one of the theorems, i.e. those sentences which follow from the ten fundamental axioms, is Pythagoras' theorem: if a, b and c represent the lengths of the sides of a right-angled triangle, c being the longest side, then $a^2+b^2=c^2$.

Descartes now writes:

> arithmetics, geometry and other subjects of this kind, which deal only with the simplest and most general things, regardless of whether they really exist in nature or not, contain something certain and indubitable. For whether I am asleep, two and three added together are five, and a square has no more than four sides. It seems impossible that such transparent truths should incur any suspicion of being false.
>
> (Descartes 1641: 20 (14))

Descartes, Leibniz and the other Rationalists believed that the certainty of mathematics could be achieved in philosophy, too. Metaphysical truths were thought to be logically deducible by pure reason as theorems from a few fundamental axioms. For the aim of deduction, Leibniz started to devise a logical calculus (for example, in his 1666 *Dissertation on the Art of Combinations* (in Leibniz 1969)) that should ultimately allow us to proceed with philosophical language and philosophical problems as mathematics does with numbers or geometrical figures. What is possible in mathematics should also be possible with philosophical and metaphysical concepts and words. So that, ideally, 'when there are disputes amongst persons, we can simply say: Let us calculate [lat. *calculemus*], without further ado, and see who is right' (Leibniz 1685: 51). As we shall see later, the enormous importance put on logic is a feature which unites the (in other respects very different) Logical Empiricists with Leibniz.

First principles Two questions present themselves: first, which are the metaphysically *first principles* that correspond to the mathematical axioms; and, second, where do they get their authority from? We can find five or six such metaphysically basic principles in Leibniz (there is room for dispute here about which principle shall be counted and which not), at least two of which will be of concern later: the *Principle of Contradiction* which states that 'a proposition cannot be true and false at the same time, and that therefore A is A and cannot be not A' (Leibniz 1989: 321) and the *Principle of Sufficient Reason* which states that there is no

event without a sufficient cause for it, i.e. necessarily, anything that happens has been brought about by something else. The latter principle, says Leibniz, 'must be considered one of the greatest and most fruitful of all human knowledge, for upon it is built a great part of metaphysics, physics, and moral science' (Leibniz 1969: 227), thereby highlighting again the axiomatic structure of metaphysics. Indeed, the *Principle of Sufficient Reason* clearly lies at the heart of or is presupposed by all scientific endeavour.

Still, how do we know this and the other principles to be true? By and large, Leibniz and the other Rationalists simply found them to be self-evident and not in need of any further argument (this holds, by the way, also for the mathematical axioms). Descartes' way of putting this is to count as first principles only what is perceived 'clearly and distinctly' by the intellect (Descartes 1641: 35 (24)). As an example, he gives his famous *cogito* argument: 'I think therefore I am'. When confronted by Pierre Gassendi (1592–1655) with the allegation that we could be deceived even when we believe we know *clearly and distinctly,* Descartes denied this. He offered as a reliable test for clear and distinct knowledge that when we consider it we cannot doubt it (Descartes 1641: 145 (105)), and this is allegedly the case with the *cogito*. Whether this is satisfactory or a *petitio principii* might well be questioned, for wasn't indubitable truth (= certainty) our goal in the first place? Although this allegation of circularity might be right, it is not the route of critique we want to follow here.[7]

Monadology Rather, we wish to have an exemplary, brief look at what kind of overall metaphysical theory supposedly follows from, say, Leibniz's axioms. We cannot trace the whole argumentation here and Leibniz's deductions are not in all cases as transparent as they should be, even by his own standards. Apologies are nonetheless due for we will clearly do some injustice to Leibniz's grand oeuvre in presenting it here somewhat oversimplified. With this precautionary note, we nonetheless allow ourselves to say that his *Monadology* (Leibniz 1714) is an eccentric example of metaphysics that provides an easy way to unfold what later anti-metaphysicians found so doubtful in Rationalist, speculative metaphysics.

So, here it comes: for Leibniz, the ultimate building blocks of the world are what he calls *monads*: atom-like, simple substances with at least basic 'mental' capacities that allow them to perceive the world and to desire or will or have an 'appetite' for particular ends. Leibniz's reason for this stipulation is that he wanted physical matter to be itself a source of causal activity: 'A Substance is a being capable of action' (Leibniz 1989: 207) and 'we can show from the inner truths of metaphysics that

what is not active is nothing' (Leibniz 1686: 64).[8] Now, because for Leibniz only something like minds can originate such activity, the world must ultimately consist in avid monads.

BOX 1.1 Rationalism

- The **Rationalists**, like Descartes (1596–1650), Spinoza (1632–77) and Leibniz (1646–1716) **distrusted the senses** as guides to metaphysical knowledge.
- This knowledge was supposed to be about the **fundamental nature of the world**, its basic building blocks and its structure.
- Moreover, it should be gained with **absolute certainty**: something the senses could not deliver – **reason** alone could.
- The Rationalists thought it was possible to **deduce from a few clear and distinct, indubitable truths** (as axioms) all the other truths about the fundamental structure of the world.
- Leibniz's ***Monadology*** is a prime example of a metaphysical system of the Rationalist kind.

1.2 Empiricism

Commit it to the flames In the preface to the first edition of his book on Leibniz, Bertrand Russell (1872–1970) writes: 'I felt – as many others have felt – that the *Monadology* was a kind of fantastic fairy tale, coherent perhaps, but wholly arbitrary' (Russell 1900: xxi).[9] This is precisely what the next philosopher we need to consider might have felt too: David Hume (1711–76), one of the greatest critics of metaphysics, enters the stage at the height of metaphysical speculation of the *Monadology* kind. He writes if not in direct reaction to Leibniz then certainly to the Rationalists' metaphysics as a whole:

> If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, *Does it contain any abstract reasoning concerning quantity or number?* No. *Does it contain any experimental reasoning concerning matter of fact and existence?* No. Commit it then to the flames: for it can contain nothing but sophistry and illusion.
>
> (Hume 1748: Sect. XII, Part III§132:165)

If it was up to Hume, Leibniz's *Monadology* would have seen the flames. But why exactly? In order to understand the thrust of Hume's outburst – especially to apprehend the two questions he asks and answers

negatively, and also why he asks precisely these two – we need to make a little detour.

Hume's impressions and ideas Early on in his take on philosophy, Hume distinguishes between *impressions* and *ideas*. Impressions are all kinds of sense experiences, i.e. the 'lively perceptions, when we hear, or see, or feel, or love, or hate, or desire, or will' (Hume 1748: Sect. II, §12: 18).

Ideas, now, fall into two categories: (1) some of them are recollections of impressions, the memory of the experience of a red spot, say, or a sour taste. Ideas are also said to subsume classes of resembling experiences. So, the idea red gathers memories of all red-impressions. As memories of sense impressions ('copies', as Hume also calls them) ideas are said to be less forceful or lively than the original experiences. Yet this aspect is less significant for us here.

Next to these elementary ideas, which were copied from simple impressions and which also subsume them, there are, (2), complex ideas that are compositions of the elementary ideas. A compound idea could, for example, be that of an apple which is composed out of the simpler ideas round, red, juicy, sweet, sour, etc. Even abstract ideas, and also those that lack a full counterpart in reality, like that of a unicorn, are still said to be composed of elementary ideas that ultimately relate via the simplest ideas to the sense impressions we actually had. In short, there is a hierarchy of ideas, at the base of which are recollections of simple impressions[10] and at the top are ideas that are composed, maybe in a rather complex way, of simple ideas.

> Our thoughts or ideas, however compound or sublime, we always find that they revolve themselves into such simple ideas as were copied from a precedent feeling or sentiment [impression, MS].
>
> (Hume 1748: Sect. II, §14: 19)

The latter need and can have no further analysis:

> These [simple] impressions are all strong and sensible. They admit not of ambiguity. They are not only placed in a full light themselves, but may throw light on their correspondent ideas, which lie in obscurity.
>
> (Hume 1748: Sect. VII, Part I, §49: 62)

Word meanings and sense experiences There is also a semantic aspect of Hume's impressions and ideas theory. For, even if Hume nowhere presents us with a fully worked out philosophy of language – that is, a theory of what words mean – he implicitly identifies *word meanings* with *ideas*: in his *Enquiries*, for example, we find formulations like 'among different

languages [. . .] it is found that words expressive of ideas [. . .] do [. . .] correspond to each other' (Hume 1748: Sect. III, §18: 23).[11]

When such an identification is made, i.e. that the meaning of a word is an idea, then we can claim that any word that has a meaning is ultimately linked to some sense experience(s), namely those simple impressions the corresponding idea is ultimately connected to. This word-impression connection might be complicated, for not all words have elementary ideas associated with them. Still, eventually – maybe via complex inter-relations of ideas to other, simpler ideas which do connect to simple sense impressions – there is a link from each meaningful word to some perception(s).

Now, putting together everything we have just learned about words, ideas and impressions, we arrive at the starting point of one aspect of Humean metaphysics critique: words that do not have any idea associated, that can ultimately be decomposed into the simplest ideas/impressions, are meaningless and confused. It comes as no surprise that, for Hume, many philosophical/metaphysical terms are candidates for such meaningless words. Hume states:

> When we entertain, therefore, any suspicion that a philosophical term is employed without any meaning or idea (as is but too frequently), we need but enquire, *from what impression is that supposed idea derived?* And if it is impossible to assign any, this will serve to confirm our suspicion.
>
> (Hume 1748: Sect. II, §17: 22)

Examples of meaningless terms are, for Hume, *substance*, *the self* and *soul*. None of these words correspond to an idea that is either directly copied from a sense impression (we have, for example, not yet seen a soul) or that can be analysed into simpler ideas that correspond to direct sense impressions. On these grounds alone, Leibniz's monads could be criticised, and so we have arrived at the first way in which a Humean metaphysic-critique operates.

Relations of ideas vs. matters of fact There is a second albeit related way. We initially started with Hume's famous 'commit it to the flames' quote, where he commands us to incinerate any metaphysical oeuvre if the two questions he asks about it are answered negatively. Having now introduced what Hume means by ideas and impressions, we can begin to make sense of that quote.

According to Hume, all possible human knowledge falls in precisely two categories: 'to wit, *Relations of Ideas and Matters of Fact*' (Hume 1748: Sect. IV, Part I: 25).[12] This explains already the number of his

questions: any knowledge is about either of these two kinds – no more, no less. There is no other kind of knowledge to be had.

Items which fall in the first category, i.e. the Relations of Ideas, are, Hume continues, 'discoverable by the mere operation of thought, without dependence on what is anywhere existent in the universe' (Hume 1748: Sect. IV, Part I: 25). As his primary example for *Relations of Ideas* he takes mathematics ('quantity or number'), and mathematical truths are, indeed, known by mere operation of thought. Hume quotes, for instance, Pythagoras' theorem. From considerations we find elsewhere in his work it is clear that, next to mathematics, conceptual truths like 'all bachelors are unmarried' or 'my sister is female' are also to be subsumed under the heading *Relations of Ideas*.[13] Here, too, we already know from considering in our mind the concept or idea *bachelor* that bachelors are unmarried. This relates back to what we learned about ideas (and impressions) earlier: the analysis of the idea *bachelor* into simpler ideas, *man* and *unmarried*, delivers the outcome without us having to research empirically the social life of bachelors. Mere operation of thought yields the result.[14]

Matters of Fact, i.e. facts about what the world is like, are, on the contrary, known to us only by the 'testimony of our senses' (Hume 1748: Sect. IV, Part I, §21: 26): that there is an apple on the table, for example. Such knowledge cannot be gathered by mere thought: no merely mental analysis of the idea *apple* and of the idea *table* will reveal to us that there is one in front of us on the table. Only the actual impressions that we have can reveal this to us.

As already noted, the dichotomy of *Relations of Ideas* and *Matters of Fact* is exhaustive: there is no further kind of knowledge and no further way to gain it. Crystal-ball reading as much as divine revelation is not accepted as an epistemic resource.

Consequences for (Rationalist) metaphysics Now, how is all this in conflict with Descartes and Leibniz? Well, Hume vehemently denies that anything but truths of mathematics and conceptual truths are discoverable by the mere operation of thought. Yet these truths are not facts about what the world is like: 'Our reason, unassisted by experience, [cannot] ever draw any inference concerning real existence and matter of fact' (Hume 1748: Sect. IV, Part I: 27). And so, according to Hume, the Rationalists' grand project to gain metaphysical knowledge, i.e. knowledge of the fundamentals of the world, by pure thought is bound to fail.

If we want to gain knowledge about the world we need to use our senses. That, however, was unwelcome to the Rationalists, for, remember, next to wanting to get at the fundamental structure of the world they

wanted to get at it with absolute certainty. However, perceptual knowledge, which does tell us about the world, as opposed to conceptual and mathematical knowledge, is, unfortunately, uncertain and fallible: 'our evidence of their truth, however great, [is not] of a like nature with the foregoing' (Hume 1748: Sect. IV, Part I, §21: 25). This is a dilemma: in the only place where certainty can be gained, in *Relations of Ideas*, there is nothing to be found about what the fundamental structure of the world is like; and where we find the latter, in *Matters of Fact,* certainty cannot be had. Thus, metaphysics – as an inquiry that, first, wishes to establish the most fundamental truths about the world and, second, to do this with absolute certainty – is not possible.

Rationalist metaphysics, so we conclude with Hume, hangs in mid-air. Instead of being inferred from indubitable axioms, metaphysical results are foggy speculation:

> But this obscurity in the profound and abstract philosophy [i.e. metaphysics, MS], is objected to, not only as painful and fatiguing, but as the inevitable source of uncertainty and error. Here indeed lies the justest and most plausible objection against a considerable part of metaphysics, that they are not properly a science; but arise either from the fruitless efforts of human vanity, which would penetrate into subjects utterly inaccessible to the understanding, or from the craft of popular superstitions, which, being unable to defend themselves on fair ground, raise these intangling brambles to cover and protect their weakness.
>
> (Hume 1748: Sect. I, §6: 11)

The Empiricist doctrine This ends our overview of the *general* way in which Hume made the metaphysical foundations of Rationalist philosophy shake and crumble. Before we see his critical instruments and his anti-metaphysical attitude at work in a concrete case – causation – a general term for Hume's philosophy has to be introduced: *Empiricism*. Empiricism quite simply contrasts with Rationalism and is a credo held not only by Hume but also by his predecessor Empiricists John Locke (1632–1704) and George Berkeley (1685–1753). Empiricism, to put it briefly, is the doctrine that all our ideas/concepts and all knowledge about the world derive from sense experience and from sense experience alone.

A prime example: causation We turn now to our concrete example, an example, actually, that will accompany us throughout the book: Hume's famous and influential views on causation. At that time, the orthodox view was that causation – say, between the event (the cause) that one moving billiard ball bumps into another and the event that the second ball starts rolling (the effect) – is a kind of necessitation: *the cause necessitates its effect*; *the effect must happen, given its cause*. Thomas Hobbes[15] (1588–1679), for example, writes 'all the effects that

have been, or shall be produced, have their *necessity* in things antecedent' (Hobbes 1655: 9.5, emphasis added) and, similarly, Baruch Spinoza: 'From a given determinate cause an effect *necessarily follows* [logically or conceptually, MS]' (Spinoza 1677: Axiom 3, emphasis added).

Now, by necessity two matching things were meant. The first interpretation situates necessity in the abstract or mental realm as a matter of the inconceivability of the opposite: 'It cannot be conceived but that the effect will follow' (Hobbes 1655: 9.7). The second interpretation makes necessity a worldly connection amongst events: the first billiard ball's bumping into the other is a necessitating, driving force for the second's movement.

Although we can distinguish these two meanings of necessity, the Rationalists equated the two: 'The order and connection of ideas is the same as the order and connection of things' (Spinoza 1677: Part II, Prop. 17), i.e. abstract necessity and the driving force in nature coincide or are even seen as more or less one thing.

Note that a typical instance of the inconceivability of the opposite (the first interpretation) can be found in conceptual truths: in no way can someone be a bachelor and married, because what it means to be a bachelor is to be unmarried. Thus, it is inconceivable that there could be a married bachelor. Now, if the Rationalists were right that causal relations are of that kind then neither could there be a cause, a billiard ball bumping into another, without its effect, i.e. the second one starting to roll.

Having distinguished between *Relations of Ideas* and *Matters of Fact* Hume can now criticise this belief in causation as a necessary connection in a twofold way.

Causal necessitation is no Relation of Ideas First, he points out that a causal link is not discoverable through reason alone. There is no reasoning by which we can *deduce* effects from causes:

> The mind can never possibly find the effect in the supposed cause, by the most accurate scrutiny and examination. [. . .] A stone or piece of metal raised into the air, and left without any support, immediately falls: but to consider the matter *a priori* [i.e. merely considering the *Relations* of the *Ideas* 'matter', 'air', etc.] is there anything we discover in this situation which can beget the idea of a downward, rather than an upward, or any other motion, in the stone or metal?
>
> (Hume 1748: Sect. IV, Part I: §25: 29)[16]

Moreover, pace Hobbes, Spinoza and the other Rationalists, it *is* conceivable that something else and not the expected effect happens. Here Hume speaks of our billiard balls bumping into each other:

> May I not conceive, that a hundred different events might as well follow from that cause? May not both these balls remain at absolute rest? May not

> the first ball return in a straight line, or leap off from the second in any line or direction? All these suppositions are consistent and conceivable. Why then should we give the preference to one, which is no more consistent or conceivable than the rest? All reasoning *a priori* will never be able to show us any foundation for this preference.
>
> (Hume 1748: Sect. IV, Part I: §25: 29–30)

So, causal connections do not belong to the realm of *Relations of Ideas*, i.e. causation is after all no necessary relation of ideas. The first meaning we gave to necessity fails. Here, the Rationalists were clearly wrong.[17]

Causal necessitation is no matter of fact Are, then, causal relations at least a matter of a necessary wordly affair, i.e. can we find necessary connections amongst *Matters of Fact*? More precisely, is there an *Impression* (or are there *Impressions*) from which the (possibly complex) idea of a necessary causal connection can be extracted?

> We must consider the idea of causation, and see from what origin it is deriv'd. [. . .]. Let us therefore cast our eye on any two objects, which we call cause and effect, and turn them on all sides, in order to find that impression, which produces an idea of such prodigious consequence.
>
> (Hume 1739–40: Book I, Part III, Sect. II: 75)

Hume continues, of course, to argue that there is no such impression. A necessary connection is not discoverable by the senses: we only see one billiard ball moving, then the other, but we do not perceive the causal necessity with which that allegedly happens. There is no impression of the senses that is the impression of causal necessity or power or force:

> The scenes of the universe are continually shifting, and one object follows another in an uninterrupted succession; but the power or force, which actuates the whole machine, is entirely concealed from us, and never discovers itself in any of the sensible qualities of body. [. . .] External objects as they appear to our senses, give us no idea of power or necessary connection.
>
> (Hume 1748: Sect. IV, Part I: 63–4)

Hence, neither of the seemingly possible ways of establishing a necessitating causal link is successful: it is not discoverable within the Relations of Ideas nor are there suitable impressions that would reveal some Matter of Fact about causal necessity. This explains Hume's severe scepticism when it comes to the existence of causal necessity.[18] Before we continue with what remains of causation if we follow the Humean path, it is important to highlight two things that have been going on in the background of the argument.

1. **Conceivability and possibility.** Hume, like Hobbes, identified *conceivability* with *possibility* when he proved that causation is no relation of ideas and, thus, no matter of conceptual necessity. That is, his argument hinges on the identification of the conceivable with the possible: it is *conceivable* that the first billiard ball bumps into the second but the second does not move. Therefore, it is *possible* that the first but not the second happens; further, that what possibly does not happen cannot be *necessary*, for if it were necessary, it would definitely happen. Thus, because it is conceivable that the first happens without the second there is no necessity that the second must happen when the first does.[19]
2. **Production, causation, necessitation and necessity.** Consider the following cascade of statements: '*c causes e*', '*c necessitates e*', '*it is necessary that when c then e*'. Moving from one statement to the next seems to be a natural thing to do and, once causation is identified with necessity, it is plausible that causation cannot be observed simply because necessity cannot be observed: our senses only register *what is* but not *what must be the case, what is necessarily so*.

Next to the cascade of statements from *c causes e* to *c necessitates e* to *it is necessary that when c then e*, the Rationalists, Hume and many subsequent metaphysicians have implicitly or explicitly endorsed the following, equally plausible chain: *c* produces *e*, *c* brings about that *e*, *c* causes *e*. Linking the two chains at their common joint – *c causes e* – we smoothly move from *production* via *causation* to *necessity*.[20]

The assumption that there is a link between causal production and necessity is still prevalent. Many modern day Humeans and anti-Humeans alike believe in it. The Humeans, of course, reject causal production because of the connection to necessity, and the anti-Humeans try to prove that there is worldly necessity (and thus causation) after all.

There is a third way, though, one that became visible only much later in history. It asks us to keep only the first link from production to causation (and vice versa) but to cut the connection which production had to necessitation/necessity. This view urges us to conceive of production in a different way, one that is more akin to, say, enforcing (rather than necessitating). This is meant quite literally in the sense of Newtonian forces: that a push against the table might very likely move it forward. If it is forceful enough, it almost certainly will. Yet, this is only *almost certainly* so, for when there is a counterforce it will not. Now, think of causal production this way and not in terms of indomitable necessity, i.e. the heavy burden inherited from its Rationalist origin. Then, maybe, a causal link is observable because such a production

view of causation, devoid of necessity, is immune to Hume's no-necessity attack in matters of fact (see Schrenk 2011 and 2014).

For now, however, we will go along with the production–causation–necessitation identification (we return to the alternative in Chapter 6) and make an important and revealing remark about the future development of the metaphysics of science: metaphysics critique is, due to Hume's excellent example of causation, often tied to the critique of necessities in nature. With their role model, Hume, in the background, today's anti-metaphysicians try, first and foremost, to avoid assumptions about any kind of necessity or other modality in nature. Phrased the other way round, the still ongoing assaults on necessity are, justifiably or not, thought to be a fight against bad speculative metaphysics in general (see Section 7.8).

Back to causation What remains, then, after Hume's attack, of our concept of causation when there is no necessary production? For, undoubtedly, we still make causal claims in the sciences and in everyday life and cannot simply drop it from discourse. Hume has two separate stories to tell. For one thing, alleged *causal necessity* shrinks, for him, to a mere fact about human psychology: we are accustomed to interpret certain regularities causally and *expect very strongly* that events of certain kinds that have succeeded other kinds of event in the past will also do so in future. There is, indeed, that strong expectation, that vivid feeling we have *in us*, but there is still no real necessity out there in the unfolding of events in the world:

> Either we have no idea of force or energy, and these words are altogether insignificant, or they can mean nothing but that *determination of the thought*, acquir'd by habit, to pass from the cause to its usual effect.[21]
>
> (Hume 1739-40: 657, from the later published abstract to the Treatise, emphasis added)

In other words, while there is no impression and idea of causal necessity that derives from some observations *of the world*, there is, still, the impression of the habitual transition *in our minds* from one kind of perception to another (see Moore 2012: 110 for this interpretation). So, *necessary causal connection* is not an entirely meaningless term but it means something entirely different from what we thought it means. To repeat: *necessary connection* does not refer to anything outside but to the mere habitual feeling of anticipation in us.

Here is a metaphor for what we have just said: when two objects are glued together we might come to know this because, (1), we see the glue between them or, (2), we infer from the fact that these kinds of objects usually stick together that these two exemplars are also glued. That is,

in the second case we come to judge that they stick together without perceiving the glue. We are simply informed about a regularity. Now, Hume's fairly negative account of causation from above says that, when it comes to causation, there is no glue: there is no such connecting stuff in the world. At best, because of the regular observation of the co-occurrence of two events, we are trained to strongly expect them to happen together. Thus, the only glue that exists exists in our head, evoked by custom and habit.

A regularity theory of causation Hume does not end his thoughts on causation here. He still wonders what in the world rather than merely in our heads could make causal claims true. For a solution, he capitalises on the above-mentioned regular co-occurrence of alike events. Indeed, Hume ultimately offers us a tripartite definition of causation in which necessary connections do not play any role any more and in which regular co-occurrences do all the work (see also Hume 1739–40: Abstract of *A Treatise of Human Nature*: 649–50). He says:

> An actually occurring event c is a cause of an actually occurring event e if and only if:
>
> (1) **[Contiguity] c is spatially in contiguity with e:**
>
> > 'I find in the first place, that whatever objects are consider'd as causes or effects, are contiguous. [. . .] We may therefore consider the relation of contiguity as essential to that of causation.'
> >
> > (Hume 1739–40: Book I, Part III, Section II: 75)
>
> (2) **[Succession] e happens temporally after c:**
>
> > 'The second relation I shall observe as essential to causes and effects [. . .] [is] that of priority of time in the cause before the effect.'
> >
> > (Hume 1739–40: Book I, Part III, Section VI: 75–6)
>
> Again (1) and (2) together:
>
> > 'Like objects have always been plac'd in like relations of contiguity and succession.'
> >
> > (Hume 1739–40: Book I, Part III, Section VI: 88)
>
> (3) **[Regularity] all events of the same type as c are followed in spatio-temporal succession, as in (1) and (2), by events like e:**
>
> > 'a cause [is] an object, followed by another, and where all objects similar to the first are followed by objects similar to the second.'
> >
> > (Hume 1748: Sect. VII, Part II, §60: 76)

As an example, we might again think of a billiard ball *c* bumping into a billiard ball *e*, whereupon *e* starts rolling.

This concludes our brief introduction to Hume's thoughts on matters of causation. We will return to them later and also to a further Humean idea for causation, the counterfactual analysis, in Section 5.3. There, we will critically assess not only Hume's but also many other theories of causation.

We end now this very short summary of Hume's philosophy by drawing attention to the fact that he was not only extremely critical of metaphysics – he uses the term *metaphysics* often in a disapproving way (as in the final section of his *Enquiries*) – but that he was also very self-consciously cautious to avoid speculations he could not substantiate by empirical input (as his thoughts on causation attest).[22] Whether he always succeeded is controversial but the intention was clearly there.

BOX 1.2 Empiricism

- The **Empiricists** – our focus has been on David Hume (1711–76); John Locke (1632–1704) and George Berkeley (1685–1753) – believed that **all our knowledge about the world** derives from sense experience and **from sense experience alone**.
- Hume distinguished between such **matters of fact** and **relations of ideas**: the latter can be known by pure thought but only because they are merely about **word meanings**, like 'all bachelors are unmarried'. **Mathematics and logic** are also subsumed amongst relations of ideas. They too yield no knowledge about the world.
- **Metaphysics**, as the Rationalists conceived of it, namely as the pure rational inquiry which yields **certainties** about the **fundamentals of nature** is, accordingly, not possible.
- All research into **what the world is like** has to go **via the senses** but the **senses are fallible,** and **thought about words or concepts** discovers **nothing worldly** although it might deliver certainties.
- Thus, **Rationalist metaphysics** lives nowhere and is **obscure speculation**.
- Hume uses **causation** as his prime example for a metaphysics-laden concept. He shows how the **orthodox interpretation of it as necessary connection in nature** falls prey to his metaphysics critique. However, he also offers an attempt to show how **causation could become matter-of-factual**: his regularity theory.

1.3 Transcendental Idealism

We can describe *Transcendental Idealism* as a mediator between Rationalism and Empiricism. Immanuel Kant (1724–1804) was one of the first philosophers to fully realise how devastating Hume's assault on Rationalist metaphysics was. In the introduction to his *Prolegomena to Any Future Metaphysics* Kant reports appreciatively that Hume awakened him from his 'dogmatic slumber', and he continues that Hume gave his own 'investigations in the field of speculative philosophy a completely different direction' (Kant 1783: 260). Yet, rather than leaving Rationalist philosophy completely behind, Kant understood his *transcendental philosophy* as a mediator between Empiricism and Rationalism.

Empiricism claims that all our knowledge about the world derives from sense experience *and from sense experience alone*. The italicised part is an aspect we have so far neglected. It says that sensory perceptions, completely on their own, deliver insights into the world: that is, without, for example, contribution of the mind or intellect. In other words, for Empiricists, sense perceptions are not only necessary but also sufficient to acquire factual knowledge. Locke alluded to the sufficiency part with his now famous comparison of the mind to a blank slate, a *tabula rasa*, onto which sensory experiences add data without any further aid or input:

> Let us then suppose the Mind to be, as we say, white Paper void of all Characters, without any *Ideas*; How comes it to be furnished? Whence comes it by that vast store which the busy and boundless Fancy of Man has painted on it, with an almost endless variety? Whence has it all the materials of Reason and Knowledge? To this I answer, in one word, From *Experience*: in that all our knowledge is founded; and from that it ultimately derives itself.
>
> (Locke 1690: Book II, chapter I, §2: 104)

Thoughts without content are empty; intuitions without concepts are blind Now, Kant rejects this latter facet of Empiricism that the intellect plays no active role when we gain perceptual knowledge. In this respect, Kant makes concessions to the Rationalists: even in the acquisition of knowledge about *Matters of Fact*, to use that Humean phrase again, the mind is involved. Our intellect *does* make a significant contribution to what we perceive. Only if what we perceive is processed by our mind can we speak of knowledge acquisition. (We come to how precisely that is supposed to work shortly.)

Yet Kant does agree with Empiricism in the necessity part, i.e. he also believes that pure reason alone (in Hume, 'mere operation of thought') does not, unaided by the senses, have the power to accumulate knowledge about the world. Observations with our senses are indispensable.

Kant's famous slogan 'thoughts without content are empty, intuitions without concepts are blind' (Kant 1781/1787: A51/B75) summarises his position well: mere operations of the intellect ('thoughts') without empirical input are vacuous, but mere sense impressions ('intuitions') without the intellect's assistance do not accumulate knowledge either.

We return to our overall theme, metaphysics and its critique, for we can now reveal Kant's idea of what metaphysics could be. According to Kant, the one and only possible field of metaphysical exercise is to find out exactly the role the intellect plays in the formation of (perceptual) knowledge. Note that this change of perspective is a kind of 'Copernican revolution' (as Kant himself calls it) because metaphysical principles are no longer interpreted as posits about what the fundamentals of the world itself are like. (To establish those would be impossible and such claims nonsensical. Here, again, Kant is in agreement with Hume.) Rather, the task of metaphysics is to make transparent the ordering principles with which our mind structures our sense experiences. In other words, we now look inwards not outwards, plus we turn to a considerable degree towards epistemology, the theory of knowledge.

Here are some examples: 'Every event has a (deterministic) cause', 'Nature is uniform', 'Physical space is Euclidean'. These are, according to Kant, not findings about the structure of the world itself but about how our intellect organises sense perceptions. In fact, for Kant, there is no choice here: our mental set-up is such that our mind automatically and unalterably does and must pre-structure everything our senses reveal to us in the way the three exemplary principles just given have it.

Transcendental Idealism From here, a possible route for us to go further would be to focus on what Kant calls *Transcendental Idealism*, one part of which is the thought that the world, as it is in itself, is forever concealed from us: we can only see it through our native lenses. We cannot change them and pick others, nor can we get in touch with things in themselves in an unmediated way (Kant uses the term *noumenon* for the *thing in itself*). This is not Idealism in the strongest sense (the view that the external world does not exist but only our mind and its ideas): Kant agrees, there is a world. Yet the world is given to us only through appearances, never immediately, and our perceptions of it are heavily impregnated by our own ingredients. *Transcendental* is the notion Kant uses to signify that *our faculty of cognition* (Kant 1781/1787: B25) is his concern: not the world but *how we cognise it* (see Moore 2012: 121).

Categories of understanding Kant unearths twelve *categories of the understanding* (*Verstandeskategorien* in German), i.e. basic concepts our faculty of cognition operates with. These twelve fall into four groups: *quantity*, *quality*, *relation* and *modality* (see Kant 1781/1787: A79–80/

B105–6). It is less important for our purposes how Kant arrives at these categories than two other things: first, that the categories are features of our intellect (concepts it operates with) that make judgements about what we perceive to be possible in the first place instead of being extrapolated afterwards from our sense experiences. The categories belong to the preconditions of the possibility of empirical knowledge; they are not learned from perceptual experiences. Second, amongst the abovementioned relational categories is the principle of causation. In other words, the principle of causation too belongs to the preconditions of the possibility of perceptual knowledge.

Pure intuitions of receptivity Distinct from these *categories of the understanding* (which are the ordering mechanisms of the *intellectual*, *conceptual side of our judgements*) are the *pure intuitions of receptivity* (*reine Formen sinnlicher Anschauung* in German). The latter pre-structure our perceptions and thus operate more directly on the *experiential side of our knowledge acquisition* than on the conceptual one. What are the pure intuitions or receptivity? Space and time! The things we perceive are spatio-temporal, i.e. in space and time, because we read space and time into our perceptions. According to Kant, space and time are not features of the world as it is in itself.

It becomes clear again why Kant calling his approach a 'Copernican revolution' is apt: he reverses the order of what is perceived of the world and what is projected into it:

> Up to now it has been assumed that all our cognition must conform to the objects [. . .] [Let] us once try whether we do not get farther with the problems of metaphysics by assuming that the objects must conform to our cognition [. . .] This would be just like the first thoughts of Copernicus, who, when he did not make good progress in the extrapolation of the celestial motion if he assumed that the entire celestial host revolves around the observer, tried to see if he might not have greater success if he made the observer revolve and left the stars at rest.
>
> (Kant 1781/1787: BXVI)

The transcendental method But how do we uncover these *preconditions of the possibility of cognitive achievements*? What is the path to this kind of knowledge? Kant calls the method with which we can arrive at such judgements *transcendental deduction*. Transcendental arguments (as they have also been called[23]) have the following general form: we show that A is a necessary precondition for the possibility of B. Then, because B indeed happens to be the case, we can logically deduce that A exists as well, for B could not have been without A. Here is a sketch of two examples (do not worry, for now, whether they have any

validity): scientific research into planetary orbits presupposes that we think/perceive space and time to be Euclidean and absolute – that is, as a rigid container with the three coordinates (length, width and height) in which events happen in temporal succession. If our intellect were not to project these features automatically onto the perceived world our observations of the planets (through telescopes) would not deliver knowledge. So, transcendental argumentation yields judgements like 'physical space is Euclidean'. Second, going back to Descartes, we might want to reconstruct his famous *cogito* argument as a transcendental argument: Descartes claims he cannot doubt that he exists. Why so? Because if it were not true that he exists he could not think or doubt that he exists. His existence is a necessary precondition for the possibility of him thinking or doubting.

Synthetic versus analytic judgements We can put the way in which Kant exceeds Hume in another framework. We said that Hume divides things we can know into *matters of fact* (what the world is like) and *relations of ideas* (abstract mathematical and conceptual truths). Kant agrees to a high degree with this pair but he introduces a further dichotomy so that, in total, four combinations are possible. One of the four will turn out to be empty. Yet this still leaves Kant with three and not just the Humean two boxes.

First, Kant distinguishes between 'synthetic' and 'analytic' judgements. He writes:

> In all judgments in which the relation of a subject to the predicate is thought [. . .] this relation is possible in two different ways. Either the predicate B belongs to the subject A as something that is (covertly) contained in this concept A; or B lies entirely outside the concept A, though to be sure it stands in connection with it. In the first case, I call the judgment analytic, in the second synthetic.
>
> (Kant 1781/1787: A6–7)

Thus, 'All singers are musicians' is an analytic statement: the concept 'musician' belongs to the concept 'singer'. 'Ian Bostridge is a singer', however, is a synthetic statement: the concept 'singer' is not contained in the meaning of the proper name 'Ian Bostridge'. The distinction synthetic–analytic only almost corresponds to Hume's matters of fact/relations of ideas. It is very important to see that it does not do so entirely.

The *a priori* versus the *a posteriori* In order to appreciate the difference we need to turn to Kant's second dichotomy: truths known 'absolutely independently of all experience and even of all impressions of the senses' (Kant 1781/1787: B2–3) and, second, truths known *with* the

help of the senses. That is, we need to distinguish further between truths known *a priori* and things known *a posteriori*.

Having done so, four possibilities principally emerge from the Kantian double dichotomy:

(1) *Synthetic a posteriori* judgements, where the predicate does not already contain the subject and where, thus, observations are necessary to know whether they are true – that there is an apple on the table, for example.
(2) *Analytic a priori* judgements: because analytic truths already emerge from the concepts they are composed of there is no need for discovery by the senses, and, so, they are *a priori* – take the 'all bachelors are unmarried' example.
(3) The third combination, *analytic* and *a posteriori*, is an empty class, for, again, what is already contained in concepts does not need to be discovered by the senses.
(4) The fourth combination is the famous Kantian *synthetic a priori*, where mathematical truths[24], amongst others, can be found. More details on that important class of judgements follow later.

Note, first, where there is agreement between Hume and Kant. The *synthetic a posteriori* corresponds fairly well to Hume's *matters of fact*. Also, when it comes to conceptual analytic truths, like 'All singers are musicians', there is concordance between the two philosophers: our intellect alone can, in an *a priori* fashion, i.e. without the aid of our senses, reveal these truths. They are known without sensory experiences because, as per Kant, their subject terms contain their predicate terms or, as per Hume, the second ideas are already contained within the first ideas. Also, there is agreement on the certainty with which the latter truths are known. As Kant writes, they are based on the logical principle of contradiction, 'for the predicate of an affirmative analytic statement is already thought in the concept of the subject, *of which it cannot be denied without contradiction*' (Kant 1783: 267, emphasis added).

The synthetic *a priori* The disagreement between Kant and Hume is in the realm of *synthetic a priori* knowledge. Sure, there are matters of fact that are known *a posteriori*, via the senses (here they agree), yet Kant recognises also synthetic ('new') knowledge that is acquired without the aid of our senses, i.e. that is acquired *a priori*, by pure reason.[25]

Kant's first example for the synthetic *a priori* is mathematics: mathematical proofs, according to Kant, go clearly beyond what numbers and mathematical functions mean. That $e^{i\pi} = -1$, is, for example, not immediately obvious by considering e, i, π, and -1. Kant's own example is the much simpler equation $7 + 5 = 12$, where 12 'is by no means already

thought merely by thinking of that unification of seven and five [. . .] One must go beyond these concepts' (Kant 1781/1787: B15–16). So, mathematics is synthetic (*new* or *unexpected*, if you wish) but still *a priori* because you do not need your senses.[26]

Yet if mathematics reveals some interesting synthetic truths in an *a priori* fashion, why should there not be other such kinds of knowledge? Indeed, with Kant, we know such truths already: transcendental arguments, for example, deliver such genuinely new knowledge. It is a synthetic not an analytic statement that space is Euclidean: what the words 'space' and 'time' mean does not analytically deliver that what we perceive is necessarily structured in a Euclidean way. Still, this is not something that we have learned from experience, *a posteriori*, either. Rather, seeing things through the spectacles of Euclidean space is the precondition for (sense-)experiencing the world and its objects:

> *The conditions of the possibility of experience* in general are at the same time conditions of the possibility of the objects of experience, and [. . .] for this reason they have objective validity in a *synthetic a priori judgement*.
> (Kant 1781/1787: AI58/BI97, italics added)

Metaphysics is possible in Transcendental Arguments The fundamental difference between Hume and Kant is, thus, that for Kant, but not for Hume, some synthetic judgements can be known *a priori*, and it is precisely here where Kantian metaphysics has its habitat. In the chapter *Solution of the General Question [. . .] 'How Is Metaphysics Possible as Science?*' (Kant 1783: 365–71) Kant explicitly states that all synthetic *a priori* judgements together constitute a new realm for respectable substantive metaphysics. Sometimes he also says that all metaphysics is transcendental philosophy, by which he means philosophy that concerns the synthetic *a priori*. Again, additionally to mathematics, we can enquire in a synthetic *a priori* fashion into the preconditions for the possibility of perception, i.e. the ways in which our experience of the world is prestructured, and other such aspects of our cognitive apparatus.

This completes our general take on Kantian metaphysics.[27] Just as we proceeded with Hume, we now consider Kant's views on causation in order to see his metaphysics at work. For Kant, as for Hume, causation is nothing in the world as it is in itself. In fact, any judgement about what the world or things-in-themselves really are – 'noumena', as Kant calls them – is meaningless for him. Only bad metaphysics would claim to have knowledge thereof (see, for example, Kant 1781/1787: A369).

Yet, against Hume, we do not happen to make causal judgements merely out of habit *after* we have been confronted with and become accustomed to regular occurrences like billiard balls bumping into

each other. Rather, according to Kant, we can only perceive billiard-ball collisions as such because we interpret what we see in a causal manner. Possessing the concept of the connection of cause and effect is necessary to be able to make sense experiences of the billiard-ball case in the first place. Naked perceptions, not ordered by a causal structure, would be a meaningless mess for us. They would be so disorderly that no habit could even arise from them. (Note that Kant has no need to deny that causation happens with regularity. In fact, he endorses that part of Hume's theory.)

Thus, the rough picture is this: the world and its objects do affect our senses. Yet in order for us to make sense of these perceptions of the world our immanent cognitive apparatus (pre-)structures these experiences for us: we perceive events as happening in space and time in causal succession. This is a claim about our cognition, not the world itself. Knowledge about how our cognition structures experience is located within the realm of the synthetic *a priori*: it is *a priori* because we do not need experiential input to acquire it, and yet it is synthetic because it tells us something new about our cognitive apparatus.

BOX 1.3: Transcendental Idealism

- Immanuel Kant (1724–1804) is a negotiator between the **Rationalists** and the **Empiricists**. He agrees with the latter that knowledge about the empirical world can only derive from sense experiences. However, more in accordance with the former, he also points out that our mind too has a contribution to make in that **our cognitive apparatus pre-structures our experiencing.**
- The pre-structuring is done both by the **categories of the understanding**, which are the ordering mechanisms of the conceptual side of our judgements, and the **pure intuitions of receptivity**, which pre-structure our perceptions and thus operate more on the experiential side of our knowledge acquisition.
- To consider not only what is perceived but also to focus on the perceiver's cognitive set-up makes the term ***Copernican Revolution*** apt for Kant's epistemology.
- Another central pillar of Kant's philosophy is a double dichotomy. First, the semantic one: **synthetic–analytic**; and, second, the epistemic one: ***a priori–a posteriori***.
- A judgement 'A is B' is **analytic** if 'the predicate B belongs to the subject A as something that is (covertly) contained in this

concept A' ('all bachelors are unmarried' is an example); and when 'B lies entirely outside the concept A' the judgement is **synthetic**.
- Truths known 'absolutely independently of all experience and even of all impressions of the senses' are ***a priori***, and those known with the help of the senses ***a posteriori***.
- In opposition to Hume, **metaphysics** is (again) possible for Kant: all **synthetic judgements *a priori*** together constitute respectable metaphysics. **Transcendental arguments**, i.e. those that concern the conditions for the possibility of empirical knowledge, are a means to arrive at such judgements.

1.4 Logical Empiricism

1.4.1 Aufbau (Construction)

The purpose of this section is to introduce Logical Empiricism's key ideas and to highlight its relations to classical Empiricism and Kantian philosophy. In part 1.4.2 we focus on the shortcomings of Logical Empiricism[28], especially on the problems of one of its central pillars: Verificationism.

Relations to Kant Quite some time passes between Kant and the Logical Empiricists. Many important philosophical works were written in the meantime. Yet it is fair to say that Carnap, Schlick, Neurath and other twentieth-century Empiricists almost completely ignored the grand figures in the interim – for example, the German Idealists Johann Gottlieb Fichte (1762–1814), Friedrich Wilhelm Joseph Schelling (1775–1854) and Georg Wilhelm Friedrich Hegel (1770–1831). Where they did refer to figures from this school of philosophy they did so pejoratively. Kant, however, was seen as an immensely important thinker and the Logical Empiricists were highly influenced by him. For example, they agreed with Kant that metaphysics, as an inquiry into what the world in itself is like, is impossible. This is not to say that they were Kantians – on the contrary, in important respects they were not – but that they referred implicitly or explicitly to Kantian themes.[29]

Dropping the synthetic *a priori* (as a possibility for metaphysics) A major discrepancy is that the Logical Empiricists dropped the initially attractive synthetic *a priori* as a non-empty category of knowledge (see Carnap 1928/1998: §106). Remember that Kant believed that we can find out *a priori*, by mere thought, how our mind conditions our perceptions – for example, that we perceive all things happening in a Euclidean space embedded into a deterministic causal nexus and that this is a truth

about us, not the world; that it belongs to the unshakeable pillars of our cognition: we cannot see anything but through that causal lens as contained in three dimensional space.

The Empiricists denied that this can be right. They did so for the following reason: the revolutionary physical theories at the turn of the twentieth century contradicted several of Kant's synthetic *a priori* principles. First, Einstein's relativity theory postulated that space-time is non-Euclidean, especially that the *parallel postulate* does not hold. Also, the latent idea of space being absolute, i.e. being a rigid container in which things are located and events happen, had to be given up. Second, as quantum mechanics tells us, some events happen not with a clear deterministic cause but spontaneously and with a certain probability only. Now, if the to-date most successful scientific theories speak against Kant's Euclidean space and against the postulate that every event has a deterministic cause then what were thought to be indubitable synthetic judgements *a priori* are, in fact, unstable, revisable assumptions. We were able to formulate these revolutionary scientific theories and to develop them in the light of experimental, observational findings. Thus, according to the Logical Empiricists, it cannot be true that the intellect or our cognitive capacities, as Kant thought of them, are fixed and inflexible. So, after all, these alleged synthetic *a priori* truths did not constitute the conditions for the possibility of empirical knowledge, especially of scientific knowledge.[30] Therefore, the Logical Empiricists again started to accept only the analytic (not the synthetic) *a priori*.

Naturalising the understanding and anti-metaphysics As a corollary to this difference with Kant, the Logical Empiricists sympathised with the naturalistic thought that can be found in the philosophy of David Hume – namely that the human brain and the workings of our mind are just as much objects for empirical research as any other entity in the world. If true then we can empirically discover why creatures like us make certain 'metaphysical' assumptions about the world. That might be, for example, because making these assumptions gives us an advantage in evolutionary fitness. Causal thinking could be a case in point. Therefore, Kant's categories of the understanding and the pure intuitions of receptivity become not only revisable but are objects of empirical research, especially of cognitive and perceptual psychology, and not of *a priori* transcendental arguments.

These departures from Kant have an immediate consequence for the possibility of metaphysics. If there is no synthetic *a priori*, where metaphysical claims could be located, then there is, after all, no place for them.

What Kant said about our example case, causation – namely that causal thinking belongs to the preconditions for the possibility of

empirical knowledge – was dropped again in favour of a broadly Humean conception: first, the fact that we categorise certain events within a causal matrix is only a contingent truth about human cognition and, second, that a definition of *c* causes *e* can be given in terms of c- and e-event regularities: 'Questions about the "inner nature of the causal relations" that go beyond the discovery of certain regularities in the successions of events [are senseless]' (Carnap 1931: 237/167, my translation).

Relations to classical Empiricism After the comparison to Kant, let us now ask what the relation of logical to classical Empiricism is and why it bears the attribute *logical*. All Empiricists, old and young, share the core doctrine that knowledge about the world originates in sense perception and in sense perception alone. The major advance from seventeenth- and eighteenth-century Empiricism to twentieth-century Neo-Empiricism is an even stronger concentration on language. (Remember that we extracted already some semantic theses about word meaning from Hume and Locke.)

Logic and language As we shall see, the Logical Empiricists take these theses about language to the extreme: the Empiricist epistemic doctrine about knowledge will be fully remoulded in *semantic terms*. The possibility of that step arises mainly because of advances in formal logic and the logical analysis of language in the nineteenth and early twentieth centuries, as, for example, in Gottlob Frege's (1848–1925) *Begriffsschrift* from 1879 which bears the subtitle: *A Formal Language of Pure Thought Modelled upon that of Arithmetic*. Also extremely influential was Bertrand Russell's and Alfred North Whitehead's (1861–1947) *Principia Mathematica* from 1910–13. Bertrand Russell commented later:

> Modern analytical Empiricism [. . .] differs from that of Locke, Berkeley, and Hume by its incorporation of mathematics and *its development of a powerful logical technique*. It is thus able, in regard to certain problems, to achieve definite answers, which have the quality of science rather than of philosophy.
> (Russell 1945: 834, emphasis added)

Thus, the aspiration to clarity and simplicity of thought and the focus on language as an instrument for philosophical rigour became a driving force, even the defining criterion of Logical Empiricism (and, in fact, also of one of its grandchildren, namely *Analytical Philosophy* (see Dummett 1993: chapter 2)).

There are two main ways in which the Logical Empiricists exceeded the language affinity we found in classical Empiricism:

(1) The first is *the central pillar of Logical Empiricism*: the *verification principle of meaning*. This is a principle not about what

singular words mean (see Hume and Locke) but about the meanings of whole sentences.

(2) *Logical syntax* – that is, roughly, the grammar of sentences – is discovered as another means to criticise 'metaphysical nonsense'. We turn to Verificationism almost immediately; logical syntax has to wait a little longer.

Rationalism First, a brief final word on the relation of Logical Empiricism to Rationalism is in order: Logical Empiricism inherits its classical Empiricist ancestors' animosities against Rationalism but with one exception:[31] the above-mentioned revival and major advancement of Leibniz's *calculemus*!

Verificationism about sentence meaning The verification criterion of sentence meaning claims that a sentence – 'There is a red apple on the table', say – has meaning – that what we cognitively have to grasp in order to understand the sentence – if and only if we can specify the observation that would prove that sentence right or wrong, i.e. the observation that would verify or falsify that sentence.[32] More precisely, the criterion says something even stronger, namely not only that a sentence *has meaning* but that the method of its verification by means of observation *is its meaning*:

> The meaning of a sentence *is* the method of its verification. [. . .] A sentence that can not eventually be verified, is not verifiable at all; it then lacks meaning altogether.
>
> (Waismann 1930–1: 229, my translation and emphasis)

In the apple example above it seems fairly easy to describe an observation that would verify that sentence. 'There is a red apple on the table' is indeed a meaningful sentence: we can judge that it is true, roughly, if and only if we have a red-and-round apple impression when looking at the table. Otherwise the sentence is false. But no matter whether true or false, it is definitely meaningful because there is a method to test for it.

From epistemology to semantics Note something important: Verificationism aims to cast the Empiricists' epistemic doctrine that all factual knowledge comes from sense perception as a semantic doctrine. Indeed, if we believe that what we know is expressed (or at least expressible) in meaningful sentences then the transition from Empiricist epistemology to semantics is straightforward: all factual knowledge is expressed in meaningful sentences; only those sentences for which we are able to give a method of verification in observation are meaningful.

We cannot emphasise strongly enough that Verificationism does not simply say that it is quite useful to be able to provide a method for the verification of sentences so that we can easily observe whether they are true or not. Much more strongly, Verificationism entails that a sentence that is *in principle not verifiable* by observation *has no meaning*, i.e. no cognitive content whatsoever. Non-verifiable sentences are meaningless pseudo-sentences. The reader will already guess which (philosophical) subject is thought to be merely capable of producing meaningless pseudo-sentences like 'the Absolute enters into, but is itself incapable of, evolution and progress' (Ayer 1936/2001: 17, ascribing that sentence to F. H. Bradley). We come to this in the section on metaphysics.

Analytically true sentences We must mention a special class of sentences that need no verification in observation (it would even seem to be impossible to say which observations would falsify them): *analytic sentences* which are true in virtue of the meaning of their constitutive words alone and which are therefore knowable *a priori*. Examples are conceptual, logical or mathematical truths: 'Sisters are female siblings', '*p* or not *p*' and '2 + 2 = 4'. Neither the classical Empiricists nor the modern Empiricists had trouble accepting those sentences. Someone stating these truths, so they say, does not claim to make any factual statement whatsoever and since they are devoid of the pretence of saying something about the world they are not violating the Empiricist doctrine.

What do these statements do instead? One dominant interpretation from the debate amongst the Empiricists was that their role is to define the conceptual framework on which empirically meaningful sentences can be composed. Metaphorically speaking, they are the rules of the game, not the moves. They register conventions of language or say how we use (or ought to use) the words or symbols they contain.

Two classes of acceptable sentence In short, the Logical Empiricists, just like the old Empiricists, accept two kinds of sentences as meaningful:

> The meaningful sentences fall into two kinds: first, there are sentences which are true already because of their [logical] form ('Tautologies' after Wittgenstein; they correspond approximately to Kant's 'analytic judgements'); they do not state anything about reality. To this kind belong the formulae of logic and mathematics; they themselves are no factual statements, rather they make possible the transformation of such statements. [. . .]
>
> The truth or falsity of all the other sentences can be decided [by observations];[33] they are, therefore, (true or false) *observational sentences* and belong to the realm of the empirical sciences.
>
> (Carnap 1931: 236/166, my translation)

The hierarchy of language Verificationism about meaning says that a (non-analytic) sentence like 'There is a red apple on the table' has meaning if and only if we can describe which observation would prove it true. In this case, and similar ones like 'This bird is singing' or 'It smells of fresh coffee', our task seems fairly simple, for we can easily see the apple, hear the bird and smell the coffee. Although these sentences about observations in our daily lives cause far more trouble for Verificationism than one might prima facie think (a topic we unfortunately cannot go into in depth) we move on to more difficult statements, namely those about the imperceptible entities the sciences are involved with.

Statements about unobservables Remember that, for the Logical Empiricists, the progress of science, especially the explanatory and predictive successes of fundamental physics and the technical advances that sprang from it, became quite generally the ultimate model for any kind of intellectual endeavour.[34] Now, because the natural sciences and their theories are the paradigms for good empirical knowledge, clearly their statements should come out as perfectly meaningful in accordance with Verificationism. Yet what counts as the verifying observation for (and is thus the meaning of) sentences that contain references to unobservable, theoretically postulated entities like 'an electron passed the double slit' or 'quarks turn out to be one-dimensional oscillating strings'?

The Empiricists' answer is indirect: sentences that contain non-observational vocabulary have to be translated into sentences that do contain (only) observational terms. If such a translation succeeds the verification criterion can be fulfilled because then we can give the method for the verification of the second sentences in terms of naked eye (ears, etc.) observations.

Translations into observational vocabulary This translation method has at its core a thesis that is implicit in the Verificationist criterion for sentence meaning: our language, or at least the worthy parts of it, can be put into a hierarchical structure where terms that refer to immediately perceivable things are the basis and all further notions can be translated into or analysed in terms of this basic vocabulary. If this sounds very much like Hume's postulation that all meaningful complex ideas are compounds of the simplest ideas, which, in turn, stem from immediate impressions, then that is no coincidence. Just what Hume advised us to do with ideas, the Logical Empiricists ask us explicitly to do with words:

> For many words, and especially for almost all scientific words, it is possible to trace their meaning back to other words ('constitution', 'definition'). [. . .] In this way, every word of our language is reduced to other words and ultimately to those words figuring in [simple observational statements].
>
> (Carnap 1931: 222/152, my translation)

To indicate how the translation issue is supposed to work, we look at a slightly simpler sentence than the electron or quark example from above: 'This liquid has a temperature of a 100°C'.

While we are able to tell roughly whether something is hot, lukewarm or cold, we cannot feel temperature in a quantitative sense, i.e. we would be unable to feel/measure with our bare hands that the temperature is exactly 100°C. Hence, even for these simple sentences some intermediate steps are needed in order to fulfil the verification criterion.

Let us now see how this might work. 'Object O has temperature T' could be translated into 'If you put a mercury thermometer into O or hold it close by, then the mercury will rise (or fall) to mark T'. If we agree that all we refer to in this new sentence is directly observable (the thermometer, the mark, etc.) then we have a good candidate for the reduction/translation of the unobservable to the observable. With the help of the general reduction we can now give the method of verification for and thus the meaning of the specific liquid case. The sentence 'This liquid has a temperature of a 100°C' can be tested by the following operation: if you stick a mercury thermometer into the liquid and the mercury column rises to mark 100°C then the sentence is true, otherwise false. Thus, the temperature statement is meaningful.

The *actual* definition/reduction of all terms (or sentences) to an observational vocabulary is, of course, a utopian dream and also unnecessary for our purposes. A proof of the theoretical possibility would already be enough to support the Empiricists' credo. In fact, Rudolf Carnap, in his infamous *The Logical Construction of the World* (which we'll abbreviate as *Aufbau* from its German title *Der logische Aufbau der Welt* (Carnap 1928/1998), which explains the title of Section 1.4.1) gets down to business to prove the general possibility. It is here, in these analyses and definitions, where the advances in modern logic proved to be of indispensable help.

Sense data and the given Actually, back at the times of the *Aufbau*, Carnap's aim was even more ambitious. There, he attempted to reduce every such sentence to even more fundamental observations than those of thermometers, liquids, tables and chairs. His determined goal was to reduce everything to absolutely basic, atomic sensations like 'hot here now', 'green there', etc. which the Empiricists called 'sense data'.[35] These correspond to Hume's *impressions*, and where it was Hume's goal to show that all complex ideas can be analysed in terms of the simplest impressions, Carnap's was to 'give a rational reconstruction of the concepts of all fields of knowledge on the basis of concepts that refer to the *immediately given*' (Carnap 1928/1998: XVII, my translation, emphasis added). *The given* was Carnap's and the other Logical Empiricists' term for the sum of all simple impressions/sense data a person has.

This (over-)ambitious programme was later abandoned again and reference to observable medium-sized physical objects was allowed (see Neurath 1932–3).[36] Unfortunately, we cannot discuss the reason why the Empiricists focused on sense data and the given rather than on 'bigger' observables like tables and chairs and thermometers and liquids and why they gave up this austere programme later. However, we might occasionally speak of the Empiricists' aim to reduce everything to sense data or the given.

Anti-metaphysics We have already gathered a couple of Logical Empiricist anti-metaphysical bits and pieces: Kant's synthetic *a priori* as a possible realm for metaphysics was abandoned again. We have also mentioned the Logical Empiricists' chief weapon against sentences that allegedly express metaphysical insights: Verificationism. We can now explicitly formulate what we hinted at above when talking about Verificationism and sentence meaning.

Metaphysical pseudo-sentences In the light of a Verificationist theory of meaning, metaphysical statements such as 'humans have immortal souls', 'the laws of nature are god's will' or 'the monad is nothing but a simple substance' are allegedly revealed to be senseless pseudo-sentences. They are devoid of meaning because, according to the Empiricists, it is hard to see how they could be verified under any observation or be translated into sentences that can (which perception or, scientifically speaking, which experiment would show that monads are a simple substance, or that they are not?). Thus, metaphysics 'produces sentences which fail to conform to the conditions under which alone a sentence can be literally significant' (Ayer 1936/2001: 15).

As a consequence, metaphysical claims turn out not only to be *epistemically dubious* but, stronger, they do not even have any real *cognitive content*: they are nonsense. This verdict kept looming large within the philosophy after Logical Empiricism. All attempts to make even the most modest metaphysical claims were stigmatised.[37]

Logical syntax The significant improvements of logic (by Frege, Russell and others) allowed the Logical Empiricists to criticise metaphysics in yet another way, namely on the basis of sentence grammar/logic. This is the second advance of Logical Empiricism compared to classical Empiricism and one that exists in parallel to the Verificationist method described above. How can metaphysics be criticised on the level of grammar or syntax without the need to proceed to meaning?

Das Nichts selbst nichtet An infamous example of that method at work is Carnap's onslaught[38] on a claim Heidegger made in 1929 in his inaugural address *What is Metaphysics?* in Freiburg, namely 'Nothingness itself nothings'[39] (Heidegger 1927: 37, my translation). Carnap's

critique (Carnap 1931: 230/160) is a combination of pointing out that there is no such observable event of *nothing nihilating* (Hume could have done that already) and, moreover, a syntactical/logical analysis of that sentence's form (this is the new aspect: Hume did not have Fregean/Russellian logic in his toolbox for this kind of attack).

Where, in ordinary language, we sometimes use *nothing* as a subject term, a name, or a noun, as in 'Nothing is left in the chocolate box', a logical analysis reveals that we do not mean to say that there is still *a something* in the box, namely *the nothing* or *nothingness*. Rather, we mean to utter a negative existential claim: there is no item x such that x would be in the box (= it is not the case that there is something in the box; or, in logical language: $\neg\exists x \mathrm{B}x$). Thus, Heidegger's *reification of nothingness* is, according to Carnap, a mere syntactical mishap.[40] Sentences like these – Carnap gives 'Caesar is and' as a further example (Carnap 1931: 227/157) – 'are effectively eliminated automatically already by grammar' (Carnap 1931: 228/157).

Metaphysics-free philosophy Frustrated, on the one hand, with the philosophical tradition of the past centuries and its grand speculative edifices, and thrilled, on the other hand, with the successes of empirical science, the Logical Empiricists declared that philosophy shall be nothing but *philosophy of science*. Carnap writes:

> What remains for *philosophy* if all sentences, that have meaning, are of an empirical nature and can be subsumed under the empirical sciences? What remains are not sentences, no theory, no system, but merely *a method*, namely logical analysis. The application of this method [. . .] serves as excision of meaningless words and senseless pseudo-sentences. In its positive use philosophy serves to clarify meaningful terms and sentences. The indicated task of logical analysis [. . .] is what we mean by '*scientific Philosophy*' in contrast to metaphysics.
>
> (Carnap 1931: 237–8/167–8, my translation)[41]

Carnap's Nietzsche admiration Carnap has something else to say about metaphysics. Interestingly, he believes that there is something valuable that metaphysicians want to get at. Yet this is not expressible by theoretical philosophical inquiry. Rather, metaphysicians secretly want to convey their

> *attitude towards life* [. . .], the mindset in which a person lives, the emotional, intentional position to his or her environment, to his or her fellow human beings, to his or her responsibilities in which s/he is engaged, to the fates s/he has to endure.
>
> (Carnap 1931: 238/168)

Carnap underlines the importance these attitudes have in our lives. He just does not think that academic theoretical metaphysics is the right means to express them. Rather, he believes that the arts are the place where these matters should prosper (Carnap 1931: 240/170). This, finally, leads us back to Carnap's Nietzsche admiration, which seemed so unlikely at the very beginning of chapter 1:

> Our guess that metaphysics is an *ersatz*, yet an inadequate one, for art seems also to be confirmed by the fact that the one metaphysician who possibly had the highest artistic talent, namely Nietzsche, made the fewest mistakes of this confusion. [. . .] In the work in which he expresses strongest what others express via metaphysics or ethics, namely in the 'Zarathustra', he chose not a misleading theoretical form, but explicitly the form of art, of poetry.
>
> (Carnap 1931: 240/170)

Where do we go from here? You hold a book on the metaphysics of science in your hands and, having read about Empiricism, classical and logical, you might be tempted to commit it to the flames. What should keep you from doing so?

BOX 1.4.1: *Aufbau* (Construction)

- Although great admirers of Kantian themes, the Logical Empiricists returned to some Humean ideas: they had good arguments for why **the category of *synthetic a priori truths* is probably empty** (see empirical findings about the nature of space and time and quantum mechanics). They added that examining **the ways in which we think and perceive is a matter of empirical research**.
- They also pushed **classical Empiricism to the extreme** in that they turned the classical Empiricist **epistemic dogma** (that all factual knowledge, i.e. knowledge about the world, has to derive from sense experience and sense experience alone) fully into the **semantic Verificationist doctrine** that the **meaning of a sentence *is* the test method through which the sentence's truth or falsity can be established by observation.**
- Together with Verificationism, the **logical analysis of the grammar or syntax** of sentences was supposed to reveal whether statements are meaningful or whether they contain sheer **metaphysical nonsense**. The only acceptable sentences

that are correct independently of sense perceptions are **analytically true sentences**.
- As well as **metaphysics ethics** and **aesthetics** were supposedly areas of philosophy that at best transport an **attitude or a feeling towards life** (*ein Lebensgefühl*) but they do **not really express meaningful propositions**.

1.4.2 Demolition

The downfall of Empiricism Logical Empiricism and specifically the Verificationist criterion of meaning is too good to be true. Philosophy of science, at least in the first two thirds of the twentieth century, was preoccupied battling the shortcomings of both, and, despite many rescue attempts, the consensus today is that Logical Empiricism and Verificationism failed, at least in their most radical forms. That means specifically that their critique of metaphysics is also untenable. Good for us, one should say, because metaphysics of science, the topic of this book, would otherwise not be possible.

We shall see in the coming chapters how philosophers regained the confidence to tackle metaphysical issues. In fact, the more they saw that the radical restrictions of Logical Empiricism were indefensible the more metaphysical territory they seem to have regained.

Here, we will sketch five of the core objections against Empiricism and Verificationism. Together, they were decisive against this prima facie attractive programme. We do not have the space to go into depth here (and there are objections other than these five) but later, especially in Chapter 2, on dispositions, we will see in more detail the problems Empiricism and especially Verificationism had to face.

(1) The myth of the given In his paper 'Empiricism and the Philosophy of Mind' (Sellars 1956)[42] Wilfrid Sellars (1912–89) attacks the Empiricist idea of raw, pre-theoretic and simple perceptions as free from any conceptualisation. Sellars coined the apt phrase 'the myth of the given' for this (untenable) presupposition, which we introduced above as Locke's blank-slate idea. Sellars argues that observation reports are contaminated by the ingredients of the observer's theoretical background assumptions. Observations are 'theory-laden': there are no impartial, neutral sense data.

Remember that the Empiricists did acknowledge some involvement of our cognition in perception: we saw this when we compared them to Kant.[43] Yet they did not realise just how much involvement there is. We

cannot follow the intricacies of perception in detail but we need to keep in mind that the blank-slate idea of Empiricism was put into doubt.

(2) Provisos Earlier, we wrote confidently that a sentence like 'This liquid has a temperature of a 100°C' can easily be tested by the following operation: if we stick a mercury thermometer into the liquid and the mercury column rises (or falls) to mark 100°C then the sentence is true, otherwise false. Since all this is observable, the original temperature statement can count as meaningful. However, even such a simple sentence confronts us with a whole bunch of challenges.

For example, we have to add constraints for the right conditions, for pressure and for the workings of the thermometer and lighting, so that we do not misread the scale; also, strictly speaking, we have to exclude the case where we mistake a trick gadget for a thermometer. In other words, we have to add a whole lot of provisos (sometimes called *ceteris paribus* clauses) to the simple verification criterion: the 100°C sentence is observed to be true if and only if, under ideal conditions, while we are well awake and not hallucinating, we see a properly working, real thermometer rising to mark 100. And still we would not be at the end of our journey to get verification conditions that are watertight. We are sure the reader will find further necessary adjustments.

In other words, we are confronted with a possibly infinite number of provisos that we would have to add, some of which we are probably not aware. Therefore, it is likely that the ultimate, correct verification conditions can never be formulated. Yet, then, the true meaning of the 100°C sentence remains forever concealed from us – and that, apparently, we do not know the meaning of such a simple sentence is a strange result. It speaks against Verificationism being a correct theory of meaning for sentences.[44]

(3) Verification of universally quantified sentences The thermometer sentence form above was a singular sentence. It referred to the temperature of a particular liquid. Even more challenging are universally quantified statements. Many law statements have this form: all samples of water boil at 100°C, all electrons are negatively charged, all masses attract each other, etc. The difficulty here is that even if we have observed many single samples of, say, water boiling at 100°C, we have not done so and cannot possibly do so with *all* samples, past, present and future. Which method of verification, i.e. which meaning, could then be given for 'all such-and-such do or are this-and-this' statements? Alfred Ayer highlights this challenge for Verificationism:

> It is of the very nature of these propositions that their truth cannot be established with certainty by any finite series of observations. But if it is

> recognized that such general propositions of law are designed to cover an infinite number of cases, then it must be admitted that they cannot, even in principle, be verified conclusively.
>
> (Ayer 1936/2001: 18)

Within the Verification theory of meaning this riddle weighs heavy. Not only is it impossible to verify all cases, but within a Verificationist framework this has the consequence that universally quantified statements are meaningless nonsense! Thus, law statements would have to be banned from scientific discourse for their lack of meaning. This is, of course, absurd for they belong to the very heart of science.

Weak Verificationism. The Empiricists tried to meet these hurdles with two strategies. First, there were attempts to weaken the verification criterion to the effect that observations had only to be *somehow relevant* for the truth or falsity of a sentence in order to convey meaning instead of conclusively verifying or falsifying it. However, even these reformulations failed in the end because of further insurmountable test cases.

Meaningless law statements. The other strategy was more radical. Its proponents simply bit the bullet: they held that statements of natural law are neither true nor false and make no factual claims about the world; they are mere guidelines for scientific endeavour. Frank Ramsey (1903–30), for example, endorses the view that law statements 'are not judgments but rules for judging "If I meet a ϕ I shall regard it as a ψ"' (Ramsey 1929: 149; see also Ayer 1936/2001: 18–19, referring to Schlick 1931; for more on laws see Chapter 4).

Needless to say, those Empiricists who took this bold step owe us an explanation why exactly these statements and not others are so promising as background assumptions (that water boils at 30°C, for example). Thus, neither the weakening of the verification criterion nor the courage to accept the original's consequences did, in the end, convince.

(4) Meaning holism and the fall of the analytic–synthetic distinction
In the eyes of many, the next critique of Verificationism brought it to its knees. Take again the sentence 'This liquid has a temperature of 100°C' and its (simplified) verification conditions: if we stick a mercury thermometer into the liquid and the mercury column rises (or falls) to mark 100°C then the sentence is true, otherwise false. Suppose, now, an actual observation counts against its truth (the mercury stops at, say, 66.6°C). It will not come as a surprise that we could, in principle, nonetheless defend the claim that the liquid has a temperature of 100°C. This is possible if we revise or drop other items of our belief system. As Willard Van Orman Quine (1908–2000) writes: 'Any statement can be held true come what may, if we make drastic enough adjustments elsewhere in the system' (Quine 1951: 43).

We could, for example, doubt that mercury always expands under heat, or we could doubt that the environmental pressure is normal, or we could claim the thermometer was wrongly calibrated, etc.[45] Of course, we would have to verify each of these claims in their own right. Yet, should observations count against them, we could play the same game all over again and shield also these claims from falsification: 'A recalcitrant experience can [. . .] be accommodated by any of various alternative reevaluations in various alternative quarters of the total system' (Quine 1951: 44).

The tribunal of experience. Given the possibility of revisions elsewhere in our convictions in order to save a given sentence from falsification, Quine concludes that the Empiricists' assumption that singular sentences face the *tribunal of sense experience* alone and in isolation is wrong. Singular sentences are too small a unit for a verification principle. Rather, according to Quine in his paper 'Two Dogmas of Empiricism', 'the unit of empirical significance is the whole of science' (Quine 1951: 42).[46] That is, it is always *the entire theory or the corporate body of our beliefs* that is under scrutiny. Verificationism, as a theory of isolated sentences' meaning, fails.

The second dogma that Quine demolishes had not only been supported by the Empiricists but also and especially by Kantians, namely that there is a clear distinction between analytical sentences, which are true by the meaning of their constitutive words ('Sisters are female siblings'), and synthetic truths ('My sister is a schoolteacher'), which need observations. Quine's meticulous argumentation cannot be traced here but one of his reasons to give up the synthetic–analytic distinction is related to the possibility of revision mentioned above.

The short version of the argument is this: even extreme revisions to our belief system could be considered. Quine makes this plausible by reference to quantum mechanics. There, a revision of the logical law of the excluded middle has been proposed so that, for example, light can at the same time be both a wave and not a wave (namely a particle) – and if revisions even to logic are possible then why not also revisions of analytical sentences? In the light of some observation (transsexual or transgender people may be a case in point) we might revise the proposition that sisters are female siblings.[47] If Quine is right, two central dogmas of Empiricism are untenable and the whole theory is put into doubt.

(5) The status of Verificationism itself Here is a final embarrassment for Verificationism: it does not meet its own standard, for which observation would prove that the meaning of each sentence is the method of its verification by observation? If no such method can be given then the central claim of Logical Empiricism has no semantic meaning: it would be a pseudo-sentence itself, expressing nothing.

There are two albeit fairly similar ways to deal with this quandary. Instead of treating the verification criterion as an empirical sentence, we could take it for an analytic truth which specifies the meaning of the terms it contains. To make this move more palatable we might want to rephrase the criterion in the following way: 'In every rationally conducted science the meaning of each of its empirical statements is identical with the method in which we establish the sentence's truth or falsity'. Now, the criterion defines, partially at least, what it means for an enterprise to be rightly called 'rationally conducted science'. The second alternative (Carl Gustav Hempel (1905–97) and Alfred Ayer were advocates of it) changes this reformulation from a definitional analytical statement into a prescriptive claim or a recommendation: 'In each rationally conducted science the meaning. . . *shall be identical to*. . .'.

In isolation, this final trouble for Verificationism might not weigh too heavily. One might well be willing to accept it as pragmatic advice. Yet the other shortcomings we have gathered, at least when taken in concert, make Verificationism untenable. We summarise these five reasons in Box 1.5.

BOX 1.4.2 Demolition

We were confronted with five challenges to Empiricism/Verificationism:

- **The given is a myth**: perceptions are not theory-neutral but rather **theory-laden**.
- A possibly infinite number of **proviso clauses** has to be attached to verification conditions. It might also be unclear from the outset which clauses these are.
- It is uncertain what Verificationism should say about **universally quantified sentences** like **law statements** for which there is no finite verification method. Similar to these sentences are **statements about the past or future** for which, too, there are no specifiable direct observations that could prove those sentences right or wrong.
- The **Quine–Duhem thesis of meaning holism** says that all convictions within a theory or any kind of belief system cling together. In the light of negative evidence any of a variety of sentences can be given up instead of the one allegedly under scrutiny. So it is **not singular sentences that face the tribunal of observation, as Verificationism has it, but whole theory or belief system.**

- The **application of the verification criterion to itself** reveals that it can at best be taken as **methodological advice for good science** instead of an empirically meaningful statement.

LITERATURE

- An excellent introduction to Logical Empiricism and its problems is Peter Godfrey-Smith's ***Theory and Reality*** (Godfrey-Smith 2003). The strengths and weaknesses discussed here can be found in his chapter 2.

1.4.3 Reconstruction: the road ahead

We know now that the Verificationist theory of meaning failed. This chief weapon of Logical Empiricism against metaphysics is dysfunctional: if Verificationism is false, metaphysical statements are not immediately nonsense. Their meaning or meaninglessness has to be proven on different grounds. Maybe some epistemic Empiricist doubts can be upheld against them but new arguments need to be formulated.

Still, in Chapter 2 we return to Verificationism and especially what it demands of sentences that contain dispositional predicates like 'This sugar cube is water soluble' or 'That match is inflammable'. Yet isn't going back to Verificationist ambitions an otiose enterprise? Why should we further bother and engage with some specific details of Verificationism if we have already seen decisive reasons for it being an obsolete theory?

Here's why. In having a detailed look at where exactly a Verificationist reduction of dispositional predicates to observational language fails we can see which of the metaphysical assumptions dropped by the Empiricists have to be taken on board again, gradually and cautiously. We will also see in Chapter 2 that almost all of the core concepts used within science – those of *counterfactual conditionals* (Chapter 3), *laws of nature* (Chapter 4), *causation* (Chapter 5), of *natural kinds*, of *necessity* (Chapter 6), etc. – are inseparable from theories of them. This has the welcoming side effect that the metaphysics surrounding these other concepts will also be unearthed bit by bit and, thus, the metaphysics of science will be told.

Notes

1 *The Scientific World Conception: The Vienna Circle* (Carnap *et al.* 1929).
2 For a non-formal introduction see Steinhardt and Turok (2003).
3 Other famous participants at some of the Circle's meetings in Austria were Kurt Gödel (1906–78), Karl Popper (1902–94), and Ludwig Wittgenstein (1889–1951). In Germany the Berliner Society for Empirical Philosophy met under the lead of Hans Reichenbach (1891–1953), Richard von Mises

(1883–1953) and Carl Gustav Hempel (1905–97). In the UK, young Alfred Ayer (1910–89) attracted attention with his Neo-Positivist pamphlet *Language, Truth and Logic* (Ayer 1936).

4 Legend has it, by the way, that Andronicus of Rhodes (ca. 60 BC), the first editor of Aristotle's works, placed the volume that deals with issues like being, essence, change, potentiality, cause, etc. on the shelf *behind* (meta: μετὰ) those volumes dealing with *physics* (φυσικά). If at all true this is a remarkable concordance of form and content. (Or, maybe, the editor intended the bibliographical sequence to match the curricular order. I owe this suggestion to Oliver R. Scholz.)

5 The full title of the book, *'Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Sciences*', indicates that Descartes here offers one of the first treatises on correct epistemic pursuit in the natural sciences.

6 Many such examples can, by the way, be found already in the works of the ancient sceptics. See, for example, Sextus Empiricus's *Outlines of Pyrrhonism*, especially the ten tropes of Aenesidemus.

7 Descartes himself was probably aware of the fact that his answer is wanting and so also proposed as a reason that the denial of such judgements would be self-contradictory (Ayer 1936: 30–1).

8 The reader is invited to later compare Leibniz to what Dispositional Essentialists say (Chapter 6).

9 We must not omit that, immediately afterwards, we read in Russell: 'At this point I read the *Discours de Metaphysique* and the letters to Arnauld. Suddenly a flood of light was thrown on all the inmost recesses of Leibniz's philosophical edifice. I saw how its foundations were laid, and how its superstructure rose out of them'. When we come back to Leibniz's monads once in a while and use them as examples of 'bad' metaphysics we only do so from the perspective of a radical anti-metaphysician. We do not at all wish to denigrate Leibniz's philosophy, and rather side with Russell than with over-ambitious, dismissive metaphysics-critics.

10 Hume allows already for some complexity in some impressions.

11 Hume's fellow Empiricist John Locke explicitly offers such a semantic theory of word meaning (Book III in his *Essay Concerning Human Understanding* (Locke 1690)) and a similar critique of metaphysical terms as conjured up and empty.

12 Interestingly, we already find a similar distinction in Leibniz: 'truths of reason' vs. 'truths of fact' (Leibniz 1714: §§33–5), yet Leibniz puts it to a different use.

13 We have here identified *concepts* with *ideas*, a move that can be allowed for our purposes.

14 This is not in conflict with the demand that all ideas are ultimately grounded in sense experiences, for, while this might be true, the interrelation of ideas can, once their individual meanings are known, be derived without further sense data.

15 Hobbes is a bit of both – Empiricist (for example, when it comes to semantic meaning) and Rationalist (as in the above example) – and therefore hard to categorise.

16 We can already note at this point that this has more or less been the consensus ever since.

17 Much later, this insight was confronted by Donald Davidson's (1917–2003) famous critique, which, however, does not take away the gist of Hume's general point:

> Surely not every true causal statement is empirical. For suppose 'A caused B' is true. Then the *cause of B* = A; so substituting, we have 'The cause of B caused B', which is analytic. The truth of a causal statement depends on what events are described; its status as analytic or synthetic depends on how the events are described.
>
> (Davidson 1963: 14, emphasis added)

18 In the very recent literature, there has been a dispute whether Hume is merely sceptical when it comes to our epistemic access to a necessary causal connection in the world or whether he outright denies its existence. The latter has been the orthodox reading of Hume (for the mere *skepsis*, or caution, interpretation, see, for example, Strawson 1989). We need not enter into these exegetical issues here and treat, for matters of simplicity, Hume in the orthodox way as 'the greater denier of necessary connections' (Lewis 1986: ix–x).

19 Whether conceivability and possibility are identifiable is still a matter of debate (Gendler and Hawthorne 2002): there could well be things we cannot conceive of (because of the limits of our imagination) but which are nonetheless possible (think, for example, of wave–particle dualism in quantum mechanics). Also, there might be impossible things of which we believe we can conceive (we come to possible candidates in Section 6.3).

20 If we were to go with the Rationalists we would even end up with conceptual/logical necessity (not only the worldly variety we have here in mind). As noted already, ever since Hume this latter link has been irreversibly cut.
21 Note that here, again, the semantic aspect of Hume's Empiricism shines through: 'and these *words* are altogether insignificant' or '*mean* nothing but that determination of the thought'.
22 See Adrian Moore's *The Evolution of Modern Metaphysics* (Moore 2012), where he underlines this point and presents many valuable short introductions to the metaphysics of 23 philosophers, including those mentioned here, such as Descartes, Spinoza, Leibniz, Hume, Kant and, soon to follow here, Carnap.
23 Peter Strawson (1919–2006) made these arguments popular again under the 'transcendental arguments' term in his *Individuals* (Strawson 1959). We will encounter arguments akin to the Kantian/Strawsonian ones throughout the book and reflect on their validity in Chapter 7 on meta-metaphysics.
24 So says Kant, deviating from Hume who subsumed them in (2).
25 So that every analytic statement is known *a priori*, but not every *a priori* judgement is analytic: some of the latter (and of a very interesting kind) are synthetic.
26 This contradicts Hume, who, on the contrary, thought that we do not have to go beyond the concepts/ideas of 7, 5 and 12 to establish the equation.
27 To which, it should be mentioned, the *Groundwork of the Metaphysic of Morals* (Kant 1785) also belongs.
28 An almost synonymous name for Logical Empiricism is logical positivism (for a subtle difference see Wesley C. Salmon 2000). The founding father of classical positivism (and also the inventor of that name) is Auguste Comte (1798–1857).
29 Neo-Kantianism, as, for example, defended by the Marburg School (Hermann Cohen (1842–1918), Paul Natorp (1854–1924) and especially Ernst Cassirer (1874–1945)) was an influence on the Logical Empiricists (see Friedman 2000).
30 In note 28 above, we mentioned Neo-Kantianism. One way to react to the findings of modern science while still remaining within such a Kantian scheme is to say that Kant was merely wrong about the precise content of the synthetic *a priori* principles but that, still, there are such principles. The task of modern Kantians would then be to transcendentally deduce the correct principles.
31 In fact, there is another one to come: foundationalism, which we will discuss shortly.
32 A better phrase for the theory would have been *testability theory of meaning* because *to verify* literally only means *demonstrate to be true* (from the Latin *verum*, or truth) where the Empiricists indeed meant prove to be either *true or false* (see Godfrey-Smith 2003: 27).
33 Carnap writes 'protocol sentences' instead of 'observations'. We come to protocol sentences shortly.
34 This, by the way, was no less true for Hume and his self-ascribed 'experimental method'. See the subtitle to his *Treatise*: 'Attempt to Introduce the Experimental Method of Reasoning into Moral Subjects'. Of course, for Hume, Newtonian mechanics was the role model, not relativity theory or quantum mechanics, as for the modern Empiricists.
35 Other names that circulated for the perceptually immediately given were *appearances*, *sense data*, *sensibilia*, *mental images*, *percepts*, *ideas/impressions* and *qualia*. Ernst Mach (1838–1916) (1886), Bertrand Russell (1914–19) (1986), the early Ludwig Wittgenstein (Wittgenstein 1921: §4.21ff) and the younger Rudolf Carnap (1928/1998: II C) were all friends of this sense-data atomism.
36 This happened not only because this austere form of sense-data Empiricism was hard to handle in respect of all the translations that would ideally have to be made: a further issue was that 'the given', i.e. sense data, are always only the immediate sense experiences of an individual subject so that intersubjective communicability and comparability was hard to obtain.
37 At this point one might remember that the Empiricists did accept a class of sentences, the analytically true ones, that were not in need of empirical verification. Can metaphysics ever thrive in the realm of analytic truths? Decidedly not, says Ayer (Ayer 1936: 24; Carnap 1931: 236/166), for metaphysical statements aim to reach out for factual propositions about the world. Analytic sentences, however, are about word meaning, not worldly facts.
38 As with our all too brief remarks on Leibniz earlier, it would, of course, be a great mistake to judge Heidegger's philosophy on the basis of this isolated quote. We report the Heidegger–Carnap debate because it is a striking event in the history of two grand philosophical traditions – the so

called *analytic* and *continental* traditions – and not to defame either of them. For more on the debate see Friedman (2000) and Braver (2007).

39 German: *Das Nichts selbst nichtet*. The verb *to nothing* (*to noth* or *to nihilate*) is not a neologism in English only: *nichten* does not exist in ordinary German either. Heidegger was a great inventor of philosophical terminology.

40 As Simon Blackburn sums up so aptly in his *Dictionary of Philosophy*: 'The difference between existentialists and analytical philosophers on the point is that whereas the former are afraid of Nothing, the latter think that there is nothing to be afraid of' (Blackburn 1994: 265, entry: 'Nothing').

41 All this was, by the way, seen not only as an attack on metaphysics but also on ethics and aesthetics: 'The objective validity of a value or a norm cannot […] be empirically verified or inferred from empirical sentences' (Carnap 1931: 237/167, my translation).

42 For a further famous critique of sense data see John Austin (1911–60) (1962). For theory-ladenness see also Thomas Kuhn's (1922–96) *The Structure of Scientific Revolutions* (Kuhn 1962).

43 Keep in mind that when post-logical Empiricists speak of the involvement of our cognition in perception, they talk about contingent facts of human perception revealed by empirical psychology, not about the necessary preconditions of the possibility of all experience.

44 The issue of provisos and *ceteris paribus* clauses is a theme that will frequently recur in our book (especially in Sections 2.1, 5.3 and 6.2.3).

45 Compare this to problem (3), the proviso clauses: it and holism are two sides of the same coin.

46 To be fair to both Quine and Pierre Duhem (1861–1916) we should mention that Quine acknowledges in endnote 17 of *Two Dogmas* that 'this doctrine was well argued by Duhem: 303–28 [Duhem 1906]'. The doctrine is therefore known under the name *Quine–Duhem thesis*.

47 Because the analytic–synthetic distinction fell, the *a priori–a posteriori* difference was left on shaky grounds too. At best, relativised versions of it can be upheld, but we do not have the space here to argue this.

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- See also Kristie Miller (2015).

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