Chapter 1
The Regress Problem

Abstract
The attempt to justify our beliefs leads to the regress problem. We briefly recount the problem's history and recall the two traditional solutions, foundationalism and coherentism, before turning to infinitism. According to infinitists, the regress problem is not a genuine difficulty, since infinite chains of reasons are not as troublesome as they may seem. A comparison with causal chains suggests that a proper assessment of infinitistic ideas requires that the concept of justification be made clear.

1.1 Reasons for Reasons: Agrippa's Trilemma

We believe many things: that the earth is a spheroid, that Queen Victoria reigned for more that sixty years, that Stockholm is the capital of Finland, that the Russians were the first to land on the moon. Some of these beliefs are true, others are false. A belief might be true by accident. Suppose I have a phobia which makes me believe that there is a poisonous snake under my bed. After many visits to a psychiatrist and intensive therapy I gradually try to convince myself that this belief stems from traumatic and suppressed childhood experiences. One fine day I finally reach the point where I, nervous and trembling, force myself to get into bed before first looking under it. Unbeknownst to me or the psychiatrist, however, a venomous snake has escaped from the zoo and has ensconced itself under my bed. My belief in the proposition 'There is a poisonous snake under my bed' is true, but it is accidentally true. I do not have a good reason for this belief, since I am

ignorant of the escape and agree with the psychiatrist that reasons based on my phobia are not good reasons.

If however a belief is based on good reasons, we say that it is epistemically justified. Had I been aware of the fact that the snake had escaped and in fact had made its way to my bedroom, I would have been in possession of a good reason, and would have been epistemically justified in believing that the animal was lying under my bed.

According to a venerable philosophical tradition, a true and justified belief is a candidate for knowledge. One of the things that is needed in order for me to *know* that there is a snake under my bed is that the good reason I have for it (namely my belief that the reptile had slipped away and is hiding in my room) is itself justified. Without that condition, my reason might be itself a fabrication of my phobic mind, and thus ultimately fall short of being a *good* reason.

What would count as a good reason for believing that a snake has escaped and installed itself in my bedroom? Here is one: an anxious neighbour knocks on my door, agitatedly telling me about the escape. But how do I know that what the neighbour says is true? It seems I need a good reason for that as well. My friendly neighbour shows me a text message on his cellphone, just sent by the police, which contains the alarming news. That seems to be quite a good reason — although, how do I know that the police are well informed? I need a good reason for that as well. I call the head of police, who confirms the news, and says that he was apprised of it by the director of the zoo; I call the director, who tells me that the escape has been reported to her by the curator of the reptile house, and so on. True, my actions are somewhat curious, and they may well signal that a phobia for snakes is not the only mental affliction that plagues me. The point however is not a practical but a principled one. It is that a reason is only a good reason if it is backed up by another good reason, which in turn is backed up by still another other good reason, and so on. We thus arrive at a chain of reasons, where the proposition 'There is a dangerous snake under my bed' (the target proposition q) is justified by 'A neighbour knocks on my door and tells me that a snake has escaped' (reason A_1), which is justified by 'The police sent my neighbour a text message about the escape' (reason A_2), which is justified by A_3, and so on:

$$q \longleftarrow A_1 \longleftarrow A_2 \longleftarrow A_3 \longleftarrow A_4 \ldots \tag{1.1}$$

Such a justificatory chain, as we shall call it, gives rise to the regress problem. It places us in a position where we have to choose between two equally unattractive options: either the chain must be continued, for otherwise we

cannot be said to *know* the proposition *q*, or the chain must come to a stop, but then it seems we are not justified in claiming that we really can know *q*, since there is no reason for stopping. Laurence Bonjour called considerations relating to the regress problem "perhaps the most crucial in the entire theory of knowledge", and Robert Audi observes that no epistemologist quite knows how to handle the problem.[1]

The roots of the regress problem extend far back into epistemological history, and scholars often refer to the Greek philosopher Agrippa. Little is known about Agrippa, apart from the fact that he probably lived in the first century A.D. and might have been among the group of sceptics discussed by Sextus Empiricus, a philosopher and practising physician who allegedly flourished a century later. Sextus' most famous work, *Outlines of Pyrrhonism*, contains an explanation and defence of what he takes to be the philosophy of another shadowy figure, namely Pyrrho of Elis (*c.* 365–270 B.C.), who himself wrote nothing, but became known for his sober life style and his aversion to academic or theoretical reasoning. So-called Pyrrhonian scepticism advocates the attainment of *ataraxia*, a state of serene calmness in which one is free from moods or other disturbances. An important technique for reaching this state is the practicing of argument strategies known as *tropoi* or modes, i.e. means to engender suspension of judgement by undermining any claim that conclusive knowledge or justification has been attained. For example, if it were claimed that a particular sound is known to be soft, a Pyrrhonian would point out that to a dog it is loud, and that we cannot judge the loudness or softness independently of the hearer. Typically, a Pyrrhonian will try to thoroughly acquaint himself with the modes, so that reacting in accordance with them becomes as it were a second nature. In this manner he will be able to routinely refrain from assenting to any weighty proposition *q* or ¬*q*, and thus avoid getting caught up in one of those rigid intellectual positions that he loathes so much.

In Book 1 of *Outlines of Pyrrhonism*, Sextus discusses five modes which he attributes to "the more recent Sceptics" (to be distinguished from what he calls "the older Sceptics"), and which Diogenes Laertius in the third century would identify with "Agrippa and his school".[2] Of these five modes the

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[1] Bonjour 1985, p.18; Audi 1998, 183–184. The thought is echoed by Michael Huemer when he writes that regress arguments "concern some of the most fundamental and important issues in all of human inquiry" (Huemer 2016, 16).

[2] Sextus Empiricus, *Outlines of Pyrrhonism*, Book I, 164; see p. 40 in the translation *Outlines of scepticism* by Julia Annas and Jonathan Barnes. Diogenes Laertius, *Lives of eminent philosophers*, Volume 2, Book 9, 88. We thank Tamer Nawar and an anonymous referee for guidance in matters of ancient philosophy.

three that are of especial interest are the Mode of Infinite Regress, the Mode of Hypothesis, and the Mode of Circularity or Reciprocation. Here is how Sextus explains them:

> In the mode deriving from infinite regress, we say that what is brought forward as a source of conviction for the matter proposed itself needs another source, which itself needs another, and so on *ad infinitum*, so that we have no point from which to begin to establish anything, and suspension of judgement follows. ... We have the mode from hypothesis when the Dogmatists, being thrown back *ad infinitum*, begin from something which they do not establish but claim to assume simply and without proof in virtue of a concession. The reciprocal mode occurs when what ought to be confirmatory of the object under investigation needs to be made convincing by the object under investigation; then, being unable to take either in order to establish the other, we suspend judgement about both.[3]

In other words, whenever a 'dogmatist' (as Sextus calls any philosopher who is not a Pyrrhonian sceptic) claims that he knows a proposition q, the Pyrrhonian sceptic will ask him what his reason is for q. After the dogmatist has given his answer, for example reason A_1, the sceptic will ask further: what is your reason for A_1? In the end it will become clear that the dogmatist has only three options open to him, jointly known as 'Agrippa's Trilemma':

1. He goes on giving reasons for reasons for reasons, without end.
2. He stops at a particular reason, claiming that this reason essentially justifies all the others that he has given.
3. He reasons in a circle, where his final reason is identical to his first.

In the first case the justificatory chain is infinitely long, in the second case it comes to a halt, and in the third case it forms a loop. The sceptic is quick to point out that none of these options can be accepted as a justification for q. The first option is impossible from a practical point of view, since we are ordinary human beings with a restricted lifespan. Moreover, even if we were to live forever, continuing to give reason after reason, we would never reach the origin of the justification, since by definition the chain does not have an origin. The second option is also unsatisfying. For why do we stop at this particular reason and not at another? If we can answer this question, we have a reason for what we claimed is without a reason, so we actually did not stop the chain. And if we cannot answer the question, then stopping at this particular reason is arbitrary. The third option is likewise unacceptable, for

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[3] Sextus Empiricus, *Outlines of scepticism.* Book I, 166–169. Translation by Julia Annas and Jonathan Barnes, 41.

justifying the object under investigation by calling on that very object is not particularly convincing.

The Pyrrhonian takes the moral of this discouraging story to be that we are never justified in claiming that we know a proposition q. Proposition q might be true, it might be false, we simply have no way to know for sure. The only viable option open to us is to suspend judgement. Suspension of judgement (*epoche*) does not imply that we will be paralyzed; it does not mean that we cannot form any beliefs, are incapable of making decisions, or cannot perform actions on the basis of these decisions. Although we should desist from making a truth-claim, it is perfectly acceptable to abide by appearances, customs, and natural inclinations, and to act in accordance with them. Thus, to return to our snake example, it is altogether acceptable and even recommended to take your neighbour's word for it and proceed correspondingly — that will actually make you a better, and at any rate a more normal person than to engage in highly abstract reasoning. The fact that we must take recourse to suspension of judgement should therefore not sadden of demoralize us. Quite the contrary. We should welcome this fact and embrace it, since that will free us from the futile and fruitless attempt to arrive at knowledge, certainty, or justified beliefs, and bring us closer to *ataraxia*.

Pyrrhonian scepticism appears to have been quite a popular philosophical outlook in the first century A.D. However interest in it slowly waned in the second and third century, and by the fourth the movement had practically disappeared.

About the same time that the Pyrrhonian movement petered out, appreciation for the ideas of the recently rediscovered Aristotle (384–322 B.C.) was on the rise. It turns out that Aristotle had anticipated something like the Agrippan Trilemma in his *Posterior Analytics* and in his *Metaphysics*. Unlike the Pyrrhonians, however, he does not use the trilemma as a means for arguing that we can never know a proposition. In fact the opposite is true. Rather than arguing that none of the three possibilities in Agrippa's Trilemma produces justification, Aristotle gives short shrift to possibilities one and three, and claims it to be evident that the second possibility *is* a proper justificatory chain, and so *does* give us knowledge of some kind, be it practical, theoretical, or productive. Here is how Aristotle phrases his position in the *Posterior Analytics*, where 'understanding' refers to what we have called 'knowledge', and where 'demonstration' is used for 'justification':

> Now some think that because one must understand the primitives there is no understanding at all; others that there is, but that there are demonstrations of everything. Neither of these views is either true or necessary.

For the one party, supposing that one cannot understand in another way, claim that we are led back *ad infinitum* on the ground that we would not understand what is posterior because of what is prior if there are no primitives; and they argue correctly, for it is impossible to go through infinitely many things. And if it comes to a stop and there are principles, they say that these are unknowable since there is no *demonstration* of them, which alone they say is understanding; but if one cannot know the primitives, neither can what depends on them be understood *simpliciter* or properly, but only on the suspicion that they are the case.

The other party agrees about understanding; for it, they say, occurs only through demonstration. But they argue that nothing prevents there being demonstration of everything; for it is possible for the demonstration to come about in a circle and reciprocally.

But *we* say that neither is all understanding demonstrative, but in the case of the immediates it is non-demonstrable — and that this is necessary is evident; for if it is necessary to understand the things which are prior and on which the demonstration depends, and it comes to a stop at some time, it is necessary for these immediates to be demonstrable. So as to that we argue thus; and we also say that there is not only understanding, but also some principle by which we become familiar with the definitions.[4]

A similar reasoning can be found in the *Metaphysics*:

There are [people who demand] that a reason shall be given for everything; for they seek a starting-point, and they wish to get this by demonstration, while it is obvious from their actions that they have no conviction. But their mistake is what we have stated it to be; they seek a reason for that for which no reason can be given; for the starting-point of demonstration is not demonstration.[5]

This is not the place, nor do we have the competence to deal with historical details or with intricacies of translation from the Greek. Relevant for our purpose is the observation that the above passages of Aristotle herald the birth of what in contemporary epistemology became known as *foundationalism*. Foundationalism comes in various shapes and sizes, but its essence is an adherence to a foundation, be it a basic belief, a basic proposition, or even a basic experience. It thus can be described as joining Aristotle in embracing the second option of Agrippa's trilemma. Like Aristotle, foundationalists maintain that justified beliefs come in two kinds: the ones that do, and the ones that do not depend for their justification on other justified beliefs. It is not always clear what the nature of the latter kind is, but in most versions of

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[4] Aristotle 1984a, *Posterior Analytics*, Book I, Chapter 3, 72b 5-24. Translation by Jonathan Barnes, 117.

[5] Aristotle 1984c, *Metaphysics*, Book IV, Chapter 6, 1011a 3-13. Translation by W.D. Ross, 1596.

foundationalism these justified beliefs are in some sense self-evident and so not in need of other beliefs for their justification.

During the Middle Ages foundationalism became the dominant school of thought concerning the structure of justification. Especially Thomas Aquinas (1225-1274), whose Aristotelian outlook so greatly influenced Western epistemology, contributed to the view that the Agrippan Trilemma could be resolved by a foundationalist response to the regress problem. In his *Commentary on Aristotle's Posterior Analytics*, Aquinas starts by defending the traditional view that knowledge (*scientia*) of a proposition q implies that one has a particular kind of justification for q. The justification for q is either inferential or non-inferential. In the first case q is justified by another proposition, for example A_1, that is both logically and epistemically prior to q; here we know *q per demonstrationem*, that is through A_1. In the second case we know q by virtue of itself (*per se nota*). Aquinas follows Aristotle in arguing that inferential justification cannot exist without non-inferential justification. We may know many propositions *per demonstrationem*, but in the end every justificatory chain must culminate in a proposition that we know *per se*.

The end of the fifteenth century evinced renewed interest in Sextus Empiricus, whose texts were brought to Italy from Byzantium. A Latin translation of Sextus' *Outlines*, which appeared in 1562 in Paris under the title *Pyrrhoniarum Hypotyposes*, kindled the interest of European humanists, who had a taste for using sceptical arguments in their attack not only on astrology and other pseudo-science, but also on mediaeval scholasticism and forms of all too rigid Aristotelianism.[6] An important rôle in the revival of Pyrrhonian scepticism in the sixteenth century was played by the French philosopher and essayist Michel de Montaigne (1533–1592). In the manner of Sextus and Pyrrho, Montaigne stressed that knowledge cannot be obtained, and that we should suspend judgement on all matters. He accordingly propagated tolerance in moral and religious matters, as Pyrrho had done, and espoused an undogmatic adoption of customs and social rules.

Although Montaigne's work was highly influential at the beginning of the seventeenth century, his impact was soon overshadowed by the authority of his compatriot René Descartes (1596–1650). This supersession turned out to be definitive: when today epistemologists talk about philosophical scepticism, they generally have Descartes rather than Montaigne or Pyrrho in mind. Cartesian scepticism is however quite different from scepticism in the

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[6] Thanks to Lodi Nauta for helpful conversations.

Pyrrhonian vein.[7] Whereas Pyrrhonians cheerfully embrace the adage that knowledge cannot be had because information obtained by the senses and by reason is unreliable, Descartes aims at no less than a theory of everything, a coherent framework that could explain the entire universe. The way in which he tried to reach this goal has become part of the canon: in an attempt to arrive at a proposition that can resist all doubt, so as to make it the basis on which to erect his all encompassing framework, Descartes applies his sceptical method of doubting every proposition that could possibly be false. Thus he arrives at the allegedly indubitable truth of the *cogito ergo sum*. But of course, the adherence to the *cogito* as the foundation for all our knowledge eventually makes him more a foundationalist than a sceptic. In a sense, the difference between the two kinds of scepticism could not be greater: whereas a Pyrrhonian uses the sceptical method as a means towards *ataraxia*, the state of imperturbability where one is at peace with the supposed fact that knowledge cannot be had, for Descartes it is a way of acquiring knowledge of the entire external world and of our place therein.

1.2 Coherentism and Infinitism

Already in the seventeenth century there was severe criticism of the *cogito*, and of the whole Cartesian method of doubt. The foundationalist thrust of Descartes' philosophy, however, was generally accepted, since it harmonized perfectly with the dominant tradition in epistemology. Most philosophers before Descartes were foundationalists concerning justification, as were many after him. The English empiricists of the eighteenth century, John Locke, George Berkeley, and David Hume, all had a foundationalist outlook. The same can in a sense be said of the great German philosopher of the Enlightenment, Immanuel Kant, although he appears to have been a bit more cautious. In his *Critique of Pure Reason* he emphasizes that from the fact that every event has a cause, it does not follow that there is a cause for everything. Similarly, from the fact that every proposition has a reason, it does not follow that there is a reason for the entire justificatory chain.[8] Yet, says

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[7] For a good explanation of the differences between Cartesian and Pyrrhonian scepticism, see Williams 2010.

[8] The difference is nowadays known as one of the scope distinctions. The statement 'For each y there is an x to which y stands in the relation R' ($\forall y \, \exists x \, yRx$) differs from 'There is an x to which each y stands in the relation R' ($\exists x \, \forall y \, yRx$). Standard example: 'Every mammal has a mother' differs from 'There is something that is the

Kant, humans have a natural inclination to posit such a foundational cause or reason, and Kant's text does not always make it very clear whether this inclination should be resisted or put to practical use.

In the nineteenth century, Hegel developed an anti-foundationalist epistemology, as did Nietzsche, but it was not until the twentieth century that a serious alternative to foundationalism surfaced in the form of coherentism (although major figures in the twentieth century like Bertrand Russell, Alfred Ayer, and Rudolf Carnap remained convinced foundationalists). The main motivation behind the rise of coherentism was dissatisfaction with the foundationalist approach, especially with the idea that basic beliefs are somehow self-justifying and could exist autonomously. "No sentence enjoys the *noli me tangere* which Carnap ordains for the protocol sentences", writes Otto Neurath in 1933 about Carnap's attempt to logically re-erect the world from a bedrock of basic elements or protocol sentences, as he calls them.[9] According to Neurath and other coherentists, sentences are always compared to other sentences, not to experiences or 'the world' or to sentences that have some sort of sovereign standing.[10]

Coherentism is described in many textbooks as the attempt to put an end to the regress problem by embracing the third alternative of Agrippa's Trilemma. For example, A_2 can be a reason for A_1, which is a reason for q, which in turn is a reason for A_2. The position is however markedly more sophisticated: rather than advocating reasoning in a circle, it maintains that justification is not confined to a finite or ring-shaped justificatory chain. What is justified, according to coherentists, are first and foremost entire systems of beliefs or propositions, not individual elements in these systems. Justification of individual beliefs through one-dimensional justificatory loops is a special case only, a degenerate form of the holistic process that constitutes justification.

According to coherentism, the more coherent a system is, the more it is justified. But what exactly does it mean to say that beliefs in a system cohere with one another in that system? Twentieth century coherentists have worked hard to find a satisfying definition of 'coherence', but Laurence Bonjour has argued that there is no simple answer to the question, since coherence de-

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mother of all mammals'. The difference was already acknowledged in the Middle Ages and perhaps even by Aristotle, but has not always been applied consistently across the board.

[9] Neurath 1932-1933, 203. See also Carnap 1928.

[10] In the telling words of Donald Davidson: "what distinguishes a coherence theory is simply the claim that nothing can count as a reason for holding a belief except another belief" (Davidson 1986, 310).

pends on many different conditions being fulfilled; in fact, an entire list of
different coherence criteria can be made.[11] A complicating factor in finding
a definition of coherence is that we want this definition also to incorporate
a *measure*, so that we can determine *how* coherent a particular system is.
Many ingenious suggestions for formal coherence measures have been put
forward.[12] All these measures are vulnerable to a classic criticism, namely
that coherence is not truth-conducive: a system of propositions can be co-
herent to the highest degree while all of the propositions are in fact false.
The criticism was already ventilated by Bertrand Russell at the beginning
of the twentieth century and is sometimes referred to as the Bishop Stubbs
objection:

> Whatever the standards of coherence may be, it seems likely that alternative
> sets of propositions will meet them: as Russell 1906 pointed out, although
> the highly respectable Bishop Stubbs died in his bed, the proposition "Bishop
> Stubbs was hanged for murder" can readily be conjoined with a whole group
> of others to form a set which passes any plausible coherence test; and indeed,
> the same can be said of the propositions that make up any good work of real-
> istic fiction.[13]

In fact the Bishop Stubbs objection to coherentism cuts even deeper than
Russell envisaged. As Luc Bovens and Stephan Hartmann showed in 2003,
a system which is more coherent than another system cannot even be said to
have a *higher probability* of being true than the other system.[14]

At the beginning of the twenty-first century a third approach to the episte-
mological regress problem entered the philosophical arena, one that is now
known as 'infinitism'. While foundationalism and coherentism are said to
avoid the regress problem by opting for the second, respectively the third,
possibility of Agrippa's Trilemma, infinitism chooses the first. According
to infinitists, it is not *prima facie* absurd that the process of giving reasons
for reasons might go on without end, so that the justificatory chain will be
infinitely long.

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[11] Bonjour 1985, 97-99.

[12] See for example Olsson 2001, 2002, 2005a, 2005b; Shogenji 1999. For the rela-
tion between coherence and confirmation, see Fitelson 2003; Dietrich and Moretti
2005; Moretti 2007. For defences of coherentism in general, see Quine and Ullian
1970; Rescher 1973; Bonjour 1985; Davidson 1986; Lehrer 1997.

[13] Walker 1997, 310. Although in this quotation Walker refers to propositions, a
similar objection, albeit one that is somewhat more complicated, could be made
with reference to beliefs. Ibid. 316. See for Russell's argument, Russell 1906.

[14] Bovens and Hartmann 2003. See also Olsson 2005b.

To say that infinitism has consistently had a bad press would be claiming too much. Infinitism had no press at all, since until very recently nobody took it seriously. The reason for this is not difficult to discern. In an epistemological tradition dominated by Aristotelian and Cartesian foundationalism, a position like infinitism is highly counterintuitive to say the least; for how could anybody, in Aristotle's words, "go through infinitely many things"? It is therefore not surprising that infinitism is hardly, if ever, mentioned in treatises or textbooks; and if it is mentioned, then it usually serves as an example of a blatantly ridiculous way to go. Yet it cannot be denied that infinitism sits well with some modern ideas about the nature of knowledge, such as that knowledge is essentially fallible, and that the human search for it is, indeed, without end. Despite many attempts to show the contrary, it is not at all clear how these ideas, which so many of us endorse, can be smoothly combined with foundationalism or even coherentism.[15]

In this book we will investigate the consequences of an infinitist response to the regress problem. We do not propose to defend infinitism as such. Rather our aim is twofold. On the one hand, we intend to show that some standard objections to the position are not as strong as they might seem at first sight. On the other hand, we explain how our analysis of these objections brings about insights that cast new light on the traditional positions, foundationalism and coherentism; as we will see, a careful analysis of infinite justificatory chains will teach us interesting novel facts about finite ones. In the end we somehow try to get it all, sketching the contours of an infinitist version of coherentism, which also acknowledges the foundationalist lesson that we should somehow make contact with the world. We will return to this in the final chapter.

All-important for the development of infinitism was the work by Peter Klein. Around 2000 Klein wrote a number of papers in which he took the bull by the horns and presented infinitism as a genuine competitor to coherentism and foundationalism. Here is how Klein introduces his view in a relatively early paper:

> The purpose of this paper is to ask you to consider an account of justification that has largely been ignored in epistemology. When it has been considered, it has usually been dismissed as so obviously wrong that arguments against it are not necessary. The view that I ask you to consider can be called "Infinitism". Its central thesis is that the structure of justificatory reasons is infinite and nonrepeating. My primary reason for recommending infinitism is that it can

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[15] For a prominent attempt at reconciling foundationalism and fallibilism, see Audi 1998.

provide an acceptable account of *rational beliefs*, i.e. beliefs held on the basis of adequate reasons, while the two alternative views, foundationalism and coherentism, cannot provide such an account."[16]

Klein is a convinced advocate of infinitism. As he sees it, infinitism is not just a third way to solve the regress problem beside two other approaches — it is the *only* viable solution to the regress problem.[17] The reason is that infinitism is the only account that can satisfy "two intuitively plausible constraints on good reasoning" which jointly entail that the justificatory chain is infinite and non-repeating.[18] The two constraints are the Principle of Avoiding Circularity (PAC) and the Principle of Avoiding Arbitrariness (PAA). Here is Klein about the first constraint:

> PAC: For all q, if a person, S, has a justification for q, then for all A_i, if A_i is in the evidential ancestry of q for S, then q is not in the evidential ancestry of A_i for S.[19]

By the term 'evidential ancestry' Klein refers to the order of the links in the justificatory chain for q. So in our justificatory chain (1.1), proposition A_2 is in the evidential ancestry of A_1 and q, and A_3 is in the evidential ancestry of A_2, A_1 and q. Klein considers PAC to be "readily understandable and requires no discussion", and hence refrains from further defending it.[20]

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[16] Klein 1999, 297. The term 'infinitism' was however not coined by Klein. He gives the credits for inventing the term to Paul Moser, who uses "epistemic infinitism" to refer to "inferential justification via infinite justificatory regresses" (Moser 1984, 199). See Klein 1998, 919, footnote 1. Charles Sanders Peirce is often paraded as the first infinitist (Peirce 1868), but James Van Cleve has suggested that what Peirce actually defends is "the possibility that each cognition of an object be 'determined' by an earlier cognition", not the possibility of an infinite regress of *justification* (Van Cleve 1992, 357, footnote 29).

[17] "I conclude that neither foundationalism nor coherentism provides an adequate non-skeptical response to the epistemic regress problem. Only infinitism does." (Klein 2011a, 255); "...only infinitism is left as a possible solution on offer to the regress problem" (Klein 2007, 16). In his later work, however, Klein made a plea for a "rapprochement" between foundationalism and infinitism by arguing that basic beliefs are contextual: whether a particular belief is basic or not depends on the context (Klein 2014). John Turri also made an attempt to bring foundationalism and infinitism together by presenting an exampe of a justificatory chain which, although infinite, can nevertheless be handled by foundationalists (Turri 2009, 161-163). For criticism of this example, see Peijnenburg and Atkinson 2011, Section 6, and Rescorla 2014, 181-182.

[18] Klein 1999, 298.

[19] Ibid., 298-299. For convenience we have adjusted Klein's notation.

[20] Klein 2005, 136.

The Principle of Avoiding Arbitrariness is:

PAA: For all q, if a person, S, has a justification for q, then there is some reason, A_1, available to S for q; and there is some reason, A_2, available to S for A_1; etc.

In contrast to the first constraint, PAA is likely to generate a lot of discussion. For what does it mean to say that a proposition A_n is *available* to S as a reason for A_{n-1}? The answer to this question is clearly very important, for it involves what we mean by 'epistemic justification', and thus what we mean by the arrow in our justificatory chain:

$$q \longleftarrow A_1 \longleftarrow A_2 \longleftarrow A_3 \longleftarrow A_4 \ldots$$

Although Klein acknowledges the importance of the question, he believes that the discussion about the pros and cons of infinitism can be carried out without delving into the matter. He argues that A_n is available to S as a reason for A_{n-1} if and only if A_n is both *objectively* and *subjectively* available. *Objective availability* is about the relation between two propositions: A_n is objectively available as a reason for A_{n-1} if and only if it really *is* a reason for A_{n-1}. Klein remarks that what makes a proposition a reason "need not be fleshed out", since "there are many alternative accounts that could be employed by the infinitist"; hence the "thorny issue" of what makes a proposition a reason "can be set aside".[21] *Subjective availability* is about the relation between a proposition and a person: A_n is subjectively available as a reason to S if and only if A_n is "appropriately 'hooked up' to S's beliefs and other mental contents".[22] It need not imply that S actually believes or endorses A_n; it only means that S must in some sense be able to "call on" A_n.[23] For example, it is not necessary for S to know or believe that $366 + 71$ = 437 in the sense in which S knows or believes that $2 + 2 = 4$. It is enough for subjective availability if S is able to do the calculation when called on to do so. In Klein's words, "The proposition that $366 + 71 = 437$ is subjectively available to me because it is correctly hooked up to already formed beliefs."[24]

Unlike Klein, we do not believe that an investigation into the viability of infinitism can evade the question as to what makes a proposition a reason for

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[21] Ibid., 136-137.

[22] Ibid., 136.

[23] Klein 1999, 300, 308-309.

[24] Ibid., 308. Coos Engelsma has argued that Klein's distinction between objectively and subjectively available can be variously interpreted (Engelsma 2015, Engelsma 2014).

another proposition. Thorny as the issue may be, the meaning of 'justifica-tion' cannot be set aside if we want to examine whether chains of justification must be finite or can be infinite. Klein is right that there exist many different accounts of epistemic justification, but it is not so that all these accounts can be used without problem. Some of the accounts will be useful to infinitists, while others might be more advantageous to foundationalists or coheren-tists. It is therefore important to have an account of justification, however provisional it may be, on which everybody agrees, and then see whether this account allows infinite justificatory chains — and if so, in what sense.

William Alston has argued that such a neutral account of justification is impossible.[25] In his view, no definition of justification can serve as an im-partial starting point or as a tool for adjudicating epistemological debates. Every definition will eventually take sides, and favour a particular position in the epistemological debate about the structure of justfication. Alston's ad-vice to the epistemological community therefore is to abstain from attempts at defining justification and instead turn to spelling out what he calls 'epis-temic desiderata'. That will be more fruitful for the theory of knowledge than undertaking ill-fated attempts to find a definition of justification.

Alston's point is well taken, but we think it applies primarily to material accounts of justification, less so to formal ones. As we will argue in Chapter 2, focusing on the formal properties of epistemic justification might generate more consensus than Alston deems possible. Moreover, as we will show in Chapters 3 to 6, a focus on formal properties casts doubt on several objec-tions to the idea that justificatory chains can be infinitely long. In the end, our formal explication of justification provides us with means to preserve many, although not all, of Peter Klein's intuitions about the value of infinitism.

1.3 Vicious Versus Innocuous Regress

Epistemology is of course not the only place where infinite regresses occur. They can also be found in other philosophical disciplines, as well as in areas outside philosophy. Many of these regresses are not troublesome at all. Espe-cially mathematics abounds with regresses that are benign: every integer has both a successor and a predecessor, every line segment can be divided into two, every natural number can be doubled, and so on. Outside mathematics there are benign regresses too, such as the regress arising from the statement

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[25] Alston 1989, 1993, 2005a.

that, in arriving at the Louvre, I had already reached the midpoint of the distance to the Louvre, and the midpoint of the distance to the first midpoint, and so on.

How do we distinguish between between vicious and harmless regresses? This is an intriguing question, but an attempt to answer it might be overly ambitious. As Daniel Nolan has argued, it will be difficult if not impossible to find a general answer: there simply is not one criterion that applies to all cases.[26] A more feasible plan, although still not an easy one, is to ask ourselves why exactly it is that *justificatory* regresses are widely perceived as vicious. Why are infinite justificatory chains readily consigned to the bad batch? The fact *that* they have been treated with hostility or neglect goes almost without saying. "It can hardly be pretended", writes David Armstrong, "that this reaction to the regress [i.e. calling it virtuous] has much plausibility. ...it is a *desperate* solution, to be considered only if all others are clearly seen to be unsatisfactory".[27] Here are a few more quotations that serve as illustrations. All are taken from epistemology textbooks which were published after Peter Klein launched his controversial view, for earlier books are often simply silent about the possibility.

> We humans, for better or worse, do not have an infinite amount of time.
> ...Evidently, then, proponents of infinitism have some difficult explaining to

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[26] Nolan 2001. The same point is made by Nicholas Rescher (2010): "There is nothing vicious about regresses as such" (ibid., 21); "Infinite regression is not something that is absurd as such, involving by its very nature a fault or failing that can be condemned across the board. Its viciousness will depend on the specifics of the case." (ibid., 62). Even so, Rescher offers several rules of thumb for distinguishing a benign from a vicious regress. One of them involves the difference between regresses that are time-compressible and those that are not: the former are often harmless, but the latter may well be vicious: "any regress that requires the realization of an infinitude of [not time-compressible] actions is thereby vicious" (ibid., 53). A related distinction is that between consequences or co-conditions on the one hand and pre-conditions or pre-requisites on the other hand (ibid., 55-61). The former are time-compressible, the latter are not, so a regress with consequences or co-conditions will often be harmless while a regress with pre-conditions or pre-requisites will mostly be vicious. We briefly return to time-compressibility in Chapter 5.

Michael Huemer has made the interesting suggestion that an infinite regress is vicious (i.e. cannot exist) if it requires the instantiation of "an infinite intensive magnitude" (Huemer 2014, 88). He considers this suggestion to be a first step towards "a new theory of the vicious infinite" (ibid., 95). On evaluating infinite regress arguments in general, see Gratton 2009, which is a study in argumentation theory; Wieland 2014 also deals with the subject.

[27] Armstrong 1973, 155.

do. As a result, infinitism has attracted very few public supporters throughout the history of epistemology. It is, nonetheless, a logically possible approach to the regress problem, at least according to some philosophers.[28]

> The least plausible ... response to Agrippa's trilemma involves ... holding that an infinite chain of justification *can* justify a belief. The position is known as infinitism. On the face of it, the view is unsustainable because it is unclear how an infinite chain of grounds could ever justify a belief any more than an infinite series of foundations could ever support a house. Nevertheless, this view does have some defenders ...[29]

> [Infinitism] tells us that evidential chains can be infinitely long, and so need not terminate. [It] allows that [a belief] can be supported by an evidential chain that has an infinite number of links ... Such an infinite chain would have no final or terminating link. One difficulty with this option is that it seems psychologically impossible for us to have an infinite number of beliefs. If it is psychologically impossible to have an infinite number of beliefs, then none of our beliefs can be supported by an infinite evidential chain.[30]

> For one thing, justifications that never come to an end are not the sort of justifications we typically prize from the standpoint of learning more about the world. For another, [infinitism] seemingly would commit us to the idea that humans have an infinite chain of beliefs. ... Although the normal person undoubtedly has an indefinitey large number of beliefs, that person is unlikely to have a limitless supply of beliefs.[31]

Note that three of the four cited authors criticize infinitism because it supposedly implies that people have an infinite number of beliefs. The complaint dates back as far as Aristotle, and is known as the finite mind objection. We discuss this objection in Chapter 5. For the moment we restrict ourselves to observing that the intuition behind the finite mind objection is not so natural and widely shared as it may seem at first sight. Even among philosophers opposed to infinitism, there are some who *do* believe that people can have an infinite number of beliefs. Richard Fumerton, for example, writes in his paper on classical foundationalism:

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[28] Moser, Mulder, and Trout 1998, 82.

[29] Pritchard 2006, 36.

[30] Lemos 2007, 48.

[31] Crumley 2009, 109-110.

> Klein is right that we do have an infinite number of beliefs, but I think he
> misses the real point of the regress argument for noninferentially justified be-
> liefs. The viciousness of the regress is, I believe, *conceptual*.[32]

Do we have a finite mind? This is not so clear. We have finite brains, and
minds supervene on brains, but does that mean that our mind is finite? What
exactly does it mean to have a finite mind? That we cannot have an infinite
number of beliefs? But how to count? Moreover, even if we have a finite
mind in the sense that our beliefs are finite and therefore countable, this does
not prevent us from saying many cogent things about infinities — how is that
possible?

The routine manner in which epistemologists have rejected infinite justi-
ficatory chains is reminiscent of the customary ways in which infinite *causal*
chains have been cast aside. Again, Aristotle appears to have played a major
rôle here. His familiar arguments against infinite causal chains in his *Physics*
and *Metaphysics* became a well-entrenched part of the philosophical canon.
Yet Aquinas and other mediaeval scholars had already pointed out that Aris-
totle's arguments may be more restricted than they appear: not every causal
regress seems to be vicious, it all depends on what is meant by 'causal con-
nection'. So let us take a closer look at Aristotle's objection to causal re-
gresses and the criticism thereof by the mediaeval schoolmen. This might
help us to see why exactly it is that justificatory regresses have been rejected
without much ado, and to assess whether such a hasty rejection is appropri-
ate. In Chapter 8, in the final section, we will discuss causal chains in a more
modern setting, namely that of causal graphs.

Aristotle's main argument against a causal regress is that it purports to
explain a phenomenon, but in fact fails to do so. Suppose an event, an object,
or a process *A* is explained by saying that it is caused by *B*, and *B* is causally
explained by pointing to *C*, and so on. If this series were to go on indefi-
nitely, it would remain unclear why *A* occurred in the first place. The only
way to explain the occurrence of *A* is to refer to a principal or first cause,
i.e. something that causes all the other elements in the series, but is itself
uncaused. Aristotle stresses that his argument is not confined to a particu-
lar kind of causation, but applies to any of the four different causes that he
distinguishes, i.e. material, efficient, final or formal:

> Evidently there is a first principle, and the causes of things are neither an infi-
> nite series nor infinitely various in kind. For, on the one hand, one thing cannot
> proceed from another, as from matter, *ad infinitum* ... nor on the other hand

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[32] Fumerton 2001, 7. We will say more about the conceptual objections to infinitism
in Chapter 6.

can the efficient causes form an endless series ... Similarly the final causes cannot go on *ad infinitum*. ... And the case of the formal cause is similar. ... It makes no difference whether there is one intermediate or more, nor whether they are infinite or finite in number. But of series which are infinite in this way, and of the infinite in general, all the parts down to that now present are like intermediates; so that if there is no first there is no cause at all.[33]

Aristotle's argument is the most intuitive when he talks about causation as setting something in motion. Suppose object *A* moves because it is moved by object *B*, and *B* moves because it is moved by *C*, and so on. Then, unless the series comes to rest in an Unmoved Mover, we cannot explain why *A* moved in the first place:

> Now this [a thing being in motion] may come about in either of two ways, either ... because of something else which moves the mover, or because of the mover itself. Further, in the latter case, either the mover immediately precedes the last thing in the series, or there may be one or more immediate links: e.g. the stick moves the stone and is moved by the hand, which again is moved by the man; in the man, however, we have reached a mover that is not so in virtue of being moved by something else. Now we say that the thing is moved both by the last and by the first of the movers, but more strictly by the first, since the first moves the last, whereas the last does not move the first, and the first will move the thing without the last, but the last will not move it without the first: e.g. the stick will not move anything unless it is itself moved by the man. If then everything that is in motion must be moved by something, and by something either moved by something else or not, and in the former case there must be some first mover that is not itself moved by anything else, while in the case of the first mover being of this kind there is no need of another (for it is impossible that there should be an infinite series of movers, each of which is itself moved by something else, since in an infinite series there is no first term) — if then everything that is in motion is moved by something, and the first mover is moved not by anything else, it must be moved by itself.[34]

In other words, if a man moves a stone by moving a stick, the movement of the stone is not explained by referring merely to the movement of the stick. We must point to the man who moves the stick, for without him the stick would be at rest. The man's own movement, however, cannot be explained in this manner, since the man is not moved by anybody or anything outside him — he moves himself.

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[33] Aristotle 1984c, *Metaphysics*, Book II, Chapter 2, 994a, 1-19. Translation by W.D. Ross, 1570.

[34] Aristotle 1984b, *Physics*, Book VIII, Chapter 5, 256a, 4-21. Translation by R.P. Hardie and R.K. Gaye, 427-428.

Thomas Aquinas pointed out that Aristotle's picture of a causal regress appears to be too simple. There are at least *two* different causal regresses, each of them covering Aristotle's four causes, one being vicious and one being benign. Aquinas and other scholastics refer to the distinction as a causal series *per se* versus a causal series *per accidens*. The difference should not be confused with the distinction we mentioned in Section 1.1 between knowing a proposition *per se* and knowing it *per demonstrationem*. Nor should it be simply put on a par with the distinction between necessary and accidental properties. Causal series *per accidens* and *per se* are about the ways in which its members are ordered, i.e. the way in which the causes in the series are linked. A particular cause can have necessary properties but be linked to other causes in an accidental way. Conversely, a cause may have accidental properties, but be part of a series of which the members are ordered in an essential way.

In a causal series *per se* each intermediate member (that is each member except the first and the last) exerts causal power on its successor by virtue of the causal power exerted on this member by its predecessor. Aristotle's stone-stick-man example in the above citation involves such an essential ordering of causes. The stick causes the stone to move by virtue of the fact that the man causes the stick to move. This series consists of three elements, of which only the second (the stick) exerts causal power on its successor (the stone) by virtue of the causal power exerted on it by its predecessor (the man). Of course there will be more intermediate members if the essential ordering is longer. If for example the stone were to move a pebble, the stone would cause the pebble to move by virtue of the fact that it was moved by the stick. The salient point is that the intermediate members depend for their causing on their being caused.

Things are different in a causal series *per accidens*. Here each member (except the last) exerts power on its successor, but not by virtue of the causal power exerted on it by its predecessor. The standard example is Jacob, who was begotten by Isaac, who in turn was begotten by Abraham. Again we have a series of three elements, but none of them, not even the second one, causes by virtue of the fact that it is caused. Isaac fathers Jacob not because of the fact that he was fathered by Abraham, but because of having had intercourse with Rebecca. A stick needs a hand to move the stone, but Isaac does not need Abraham to sleep with Rebecca. Of course, Isaac needs Abraham for his existence: if Abraham had not existed, then Isaac would not have existed either. But neither Abraham nor Abraham's intercourse with Sarah is the cause of Isaac begetting Jacob. As Patterson Brown formulates it in his outstanding paper on infinite causal regressions:

Abraham's copulation causes Isaac's conception, Isaac's copulation causes Jacob's conception, Jacob's copulation causes Joseph's conception. Each member has one attribute qua effect (being conceived) and quite another attribute qua cause (copulating).[35]

In an essential ordering of causes, on the other hand, the attributes qua effect and qua cause coincide:

...it is the same function of the stick (namely, its locomotion) which both is caused by the movement of the hand and causes the movement of the stone. Again, a series where the fire heats the pot and the pot in turn heats the stew, causing it to boil, is also essentially ordered; for the warmth of the pot is both caused by the warmth of the fire and cause of the warmth of the stew, while the warmth of the stew is both caused by the warmth of the pot and cause of the stew's boiling.[36]

The above examples suggest that the causal relation in an essentially ordered series is *transitive*, whereas the causal relation in an accidentally ordered series is *intransitive*.[37] If the man moves the stick, and the stick moves the stone, then the man moves the stone. But if Abraham begets Isaac, and Isaac begets Jacob, then it is not the case that Abraham begets Jacob.

The scholastics all agree that an essential ordering of causes needs a first member, whereas an accidental ordering does not. Consider again the case where we explain the moving of object A by pointing to B. The idea here is that we have not really explained the movement of A if B is moved by C; at best we have only postponed the explanation of A's movement, or better: we have now dressed it up as the question of how to explain B's movement. Unless we arrive at a first mover X, embodying the origin of the movement, the cry for an explanation will not be deadened and the explanation of A's movement will be woefully incomplete.[38] The situation is entirely different in an accidental ordering of causes. If we explain Jacob's conception by referring

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[35] Brown 1966, 517.

[36] Ibid.

[37] Ibid. R.G. Wengert tried to formalize the transitivity of essentially ordered causes by means of Gottlob's Frege's ancestral relation (Wengert 1971).

[38] C.J.F. Williams argued that Thomas Aquinas in his *Summa Theologiae* commits a *petitio principii*: by assuming that the only 'movers' are either first or second movers, Thomas excludes by fiat the possibility that an infinite sequence may be doing the moving (Williams 1960). J. Owens doubts whether Williams' critique "come[s] to grips with the argument of Aquinas in the argument's own medieval setting", but he grants the point "as it stands from any concrete background and time" (Owens 1962, 244).

to the fact that Isaac made love to Rebecca, we have given a full and satisfactory explanation. Of course, we could go further and ask for an explanation of Isaac's lovemaking. But such an explanation, as Patterson Brown deftly notes, "will center on his actions with Rebecca, rather than on his having been sired by Abraham."[39] Therefore, according to Thomistic schoolmen, a causal regress *per se* is vicious because an essential causal ordering needs a first member; but a causal regress *per accidens* is harmless since an accidental ordering can exist without a member that is the first. Aristotle, when talking about causality, seems however to have had in mind solely causal orderings and regresses *per se*.

Still, it is not at all easy to find out how exactly an essential causal ordering differs from an accidental one. Is it because the former is transitive and the latter intransitive? That seems unlikely, for one can think of accidental causal orderings that are transitive. For example, Abraham is an ancestor of Isaac, and Isaac of Jacob, but Abraham is also an ancestor of Jacob. This ordering is transitive, but it is not essential: it is not the case that Isaac's being an ancestor is caused by Abraham's being an ancestor or that it causes Jacob's being an ancestor. So while it is true that the Abraham-begetting-Isaac example is intransitive, the intransitivity might be a feature of the example, not of the fact that it illustrates an accidental causal ordering. Conversely, as Brown notes, the relation '*A* is moved by *B*' need not always be used in a transitive manner.[40]

Another difficulty, not less serious, concerns the question why exactly the mediaeval schoolmen thought that an essential causal regress is vicious and an accidental causal regress is harmless. Why is it that a causal ordering *per se* needs a first member and a causal ordering *per accidens* does not? Brown discusses the possibility that it is simultaneity that does the trick. The idea is that, because causes in an essential ordering occur simultaneously (the man, the stick, and the stone all moving at the same time), it is impossible to have an infinite number of causes. For were we to allow an infinity of causes all happening instantaneously, we would defy Aristotle's ban on actual infinities, and no true Aristotelian would ever go that far. In an accidental causal series, however, the causes are ordered chronologically and thus do not occur at the same time; if they were to be infinite in number, they would form a potential, not an actual infinity. However, Brown argues that it is not the supposed simultaneity which requires that an essentially ordered series has a first term. His argument is strong: Aristotle and his followers themselves

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[39] Brown 1966, 523.
[40] Ibid., 518.

explicitly deny that the argument for a first cause is related to the question whether an infinite number of concurrent intermediate causes is possible or not.[41]

What does the above excursion concerning causal regresses teach us about justificatory regresses? We have said that the hostility towards justificatory regresses, early and late, parallels a hostility towards causal regresses, especially in Aristotle's work. However, we have seen that it makes sense to distinguish between two different causal regresses (even if the distinction is not always crystal clear and even if it is unclear whether the dichotomy is exhaustive). Thus the question arises whether the same goes for justficatory regresses. Can they be divided in a similar dichotomy? Is a typical justificatory regress more like a causal regress *per se* or is it more like a regress *per accidens*? Does it resemble the vicious man-stick-stone example or is it similar to the benign Abraham-begets-Isaac paradigm? With respect to all these questions, the jury is still out. Some philosophers apparently have the intuition that justificatory regresses mirror the man-stick-stone example, transitivity and all:

> Consider a train of infinite length, in which each carriage moves because the one in front of it moves. Even supposing that that fact is an adequate explanation for the motion of each carriage, one is tempted to say, in the absence of a locomotive, that one still has no explanation for the motion of the whole. And that metaphor might aptly be transferred to the case of justification in general.[42]

Others however hold that in justificatory regresses transitivity fails:

> [regressive transitivity] will often fail — for example in the much-discussed regress of reasons. For …A_2 can afford a good reason for A_1's acceptance, and A_1 for q's, without A_2 being a good reason to accept q.[43]

To complicate the matter still further, contemporary epistemologists discussing infinitism generated their own paradigm cases. One involves the analogy with basketball players throwing around the ball:

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[41] Ibid., 520. Brown hypothesizes that the concept of responsibility has something to do with it. Calling in mind the etymology of 'cause' (which goes back to the Greek 'aitia', a term that occurs mainly in legal contexts), Brown argues that it is precisely the connotation of 'cause' as something that is *responsible* for its effect that is crucial here: an essentially ordered series needs a first member because it needs a member that is responsible for the entire series.

[42] Hankinson 1995, 189.

[43] Rescher 2010, 83, footnote 1. We have changed the symbols so as to make them match ours.

> Consider the analogy of basketball players ... passing the ball to another.
> ... the question is this: how did [the ball] get there in the first place? [44]

Here epistemic justification which goes from one proposition to another is compared to a ball that is passed from one player to another. Is this a helpful picture? Not so sure: the picture suggests that justification is something that is lost once it is handed over to the neighbouring proposition, and this is not something that we associate with justification. We do not believe that, if A_i justifies A_j, the former thereby loses the property of being justified — quite the opposite. In this respect justification seems more like dharma transmission or like an infectious disease: holy man A_i can impart dharma to person A_j without losing his holiness, just as the sick person A_i can pass on his infection to person A_j without thereby being cured. [45]

In logic and mathematics, a necessary condition for establishing whether a series continues indefinitely is to know the domain and the relation in question.[46] Take the formula $\forall x \exists y\, Rxy$. Whether this formula is true or false depends on the domain over which the variables x and y range and on the nature of the relation R. That is, we need to know what the objects in the series are and also what the relation between those objects is. The statement S: 'For all objects x there is an object y such that y is smaller (or less) than x' is true if x and y are integers; S then unproblematically covers an infinitude of objects. But if x and y are natural numbers, then S is false, since there is a smallest natural number. However, if we change S into S': 'For all objects x there is an object y such that y is *greater* than x', then we obtain a truth even with the interpretation of x and y as natural numbers. This illustrates that not only the character of the objects is important, but the nature of the relation between the objects too.

As do the causal cases, these mathematical considerations intimate that, also in the field of epistemic justification, we must at least make clear what the meaning is of the A_n, the objects, and of $\longleftarrow$, the arrow which symbolizes the relation between the objects. What are reasons in a justificatory chain? And how are they related? Only after having settled these questions could

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[44] Klein 2011b, 494.

[45] John Turri also noted that 'justification' does not imply that something gets lost (Turri 2014, 222). However, he uses the word 'transmission' for the latter case. In Turri's terminology, if a property gets transmitted from A_j to A_i, this means that A_j loses the property while A_i receives it. Our use of 'transmission' is different, in that it does not imply that A_j no longer has the property.

[46] *Cf.* Beth 1959, Chapter 1, Section 4.

we hope to assess whether a justificatory chain of infinite length is sensible or nonsensical, and we will address these matters in the next chapter.