

Boek: Een Wereld vol patronen door Rens Bod

Vertaler: Andy Brown

Fragment 1: Woord vooraf (blz 11 t/m 14)

Fragment 2: Taalkunde: een Babylonisch unicum – discontinue patronen (blz 53 t/m 58)

## **Fragment 1**

### **Preface**

#### **The wonder of science**

The idea that the world can be understood on the basis of patterns and underlying principles is one of mankind's most important insights and perhaps its most successful survival strategy. The search for patterns and principles started at least 40,000 years ago with striped patterns scratched on mammoth bones and has led to modern-day science. What paths has human knowledge followed to grow from these humble beginnings, via many detours and dead ends, to today's understanding of nature and culture? This book answers this question and shows what role patterns and principles have played in various regions and cultures. In doing so, I discuss not only the study of the natural world (the natural sciences) but also of culture (the humanities), medicine, mathematics, law and a number of activities that we no longer considered 'sciences'.

My previous book, *A New History of the Humanities* (2015),<sup>1</sup> started in classical antiquity, when the notions of patterns and principles were already partially formed. But I failed to see that these notions themselves have their own history. In this book, I expand my field of view and take a step back in time: I want to know how the notions of patterns and principles developed from the Stone Age onwards in different parts of the world. In doing so, I hope to find an answer to a question that I have been asking myself for many years: how did what we know now originate and grow?

I worked on this book much longer than I intended to. That is partly due to my own development from ivory tower scientist in the 1990s, to a publicly engaged scientist at the beginning of the century, and again to my role as an activist in the past year. This latter development in particular still surprises me: only a year and a half ago, I did not see myself as an activist in any sense of the word. The turning point occurred in the autumn of 2017 when it became clear that the Dutch government was planning to impose further cutbacks on university education and its close links to research. The amount of money that the government

provides per student has fallen by more than a quarter since 2001, and would fall even further in the government's new plans.<sup>2</sup> I realised that we could no longer offer our students what they were entitled to: research-driven education.

For these reasons, at the end of 2017, I set up the lobby group *WOinActie*.<sup>3</sup> The aim was to draw attention to the steadily declining funding and the excessive pressure of work in university education, and to campaign for structural investment in the sector. Since then, more than 5,000 scientists and academics have joined the group. But this book is not a pamphlet for *WOinActie*. On the contrary, in the first place it offers (or at least attempts to offer) a global history of the origins and development of knowledge. I wanted to write a book on this subject for many years, but a decade ago it seemed too ambitious. So, in 2008, as a kind of five-finger exercise, I started a less ambitious project: a global history of the humanities, also something that was sorely lacking. The resulting book, translated into English as *A New History of the Humanities*, was a much greater success than I could ever have hoped. Apart from English, it was translated into Chinese, Polish, Ukrainian, Korean, Armenian and Italian, and the history of the humanities has grown from a non-existent discipline to one with its own journal (*History of Humanities*), an annual conference (The Making of the Humanities), a book series, an international association, lecture series at universities throughout the world, and chairs in the History of the Humanities. In the Netherlands, the Dutch Research Council (NWO) and the Royal Netherlands Academy of Arts and Sciences (KNAW) referred to the book when emphasising the importance of cross-fertilisation between the natural sciences and the humanities.<sup>4</sup> And the American popular scientific magazine *Scientific American* devoted an opinion piece to the English translation in June 2015, concluding that '[r]egardless of which university building scholars inhabit, we are all working toward the same goal of improving our understanding of the true nature of things, and that is the way of both the sciences and the humanities, a *scientia humanitatis*'.

My initial project to write a global history of knowledge, however, remained on the shelf until January 2014, when I picked up the thread again. I was encouraged by the establishment of the Vossius Center for the History of Humanities and Sciences at the University of Amsterdam, where we have been welcoming Dutch and foreign researchers as fellows since 2016. The fruitful interaction with these fellows and with my two co-directors, Julia Kursell and Jeroen van Dongen, were a great source of inspiration. Now that it is finished, I realise how strange it is that a book like this has not been written before.<sup>5</sup> While a number of historians, such as George Sarton (1884-1956), have made impressive attempts to produce a global history of science, they nevertheless failed in the endeavour.<sup>6</sup> Sometimes,

they died before completing their work, but often because they had limited access to sources outside Europe, and even more so because of a strong bias towards the natural sciences.<sup>7</sup> The history of science has long been primarily the history of natural sciences in the West.<sup>8</sup> Consequently, the fruitful interaction with other sciences, both in the West and in other parts of the world, has been ignored.<sup>9</sup> What I want to show in this book is how the history of science looks when we depose both the natural sciences and the West from their central positions. A history of science on this basis tries to deal with as many disciplines from as many regions and cultures as possible on an equal footing.

Despite the wide variety of disciplines I discuss in the book, it became clear to me as I was writing that there is a certain unity among all the diversity. But it was not clear to me until I had completed my research just what that unity entailed. I then decided to write the book again from the start, and found myself falling in love over and over again with a region, a culture, a school of thought or a historical character. I still find it difficult to believe that the sixteenth-century Kerala school in India made so many new mathematical and astronomical discoveries that are largely unknown in the outside world. Or that so many female scientists and thinkers, all over the world, have been ignored by historiographers for so long. Or that the practice of inoculation was not invented in Europe, but in China. Or that the science of law – from the Roman to the Ottoman empires – served as a model for many other sciences. These examples may be familiar to specialists in the disciplines concerned, but they have never been brought together in a general history of the sciences.

Unfortunately, not everyone will find something to suit them in this book. I had to make choices and have focused on ten disciplines that have been practised in most regions since antiquity: astronomy, mathematics, mechanics, medicine, linguistics, history, musical history, philology, the science of law and art theory. These disciplines have by no means remained stable since antiquity, but they do display a large degree of continuity regarding their subject of study (see chapter 1). I also consider ten other disciplines intermittently: botany, zoology, geography, logic, poetry, theology, philosophy, astrology, magic and alchemy. I am fully aware that, with these choices, I do not do justice to many other, more recently emerging sciences, though I do discuss a number of them in the last chapter. And yet, my history does enable me at least to solve a number of puzzles: where and how did the search for systematic knowledge start? Are there similarities between knowledge-related activities in different cultures? In what way are knowledge disciplines related to each other (or not)? But, above all, I now know what I am campaigning for: the transfer of knowledge to

future generations, free research and education, and one of the greatest things that life has to offer: science.

## Notes

1 Originally published in Dutch as *De vergeten wetenschappen* (2010)

2 See <https://www.vsnul.nl/dalende-rijksbijdrage.html>.

3 WO is the Dutch abbreviation for *wetenschappelijk onderwijs*, university education.

4 See Implementation paper on NWO strategy 2015-2018, p7: ‘And conversely, with their way of working, the humanities also contribute to the development of other areas of science, as Rens Bod showed in his book *A New History of the Humanities: The Search for Principles and Patterns from Antiquity to the Present*.’ In its ‘Contours of an innovation and incentive programme’ (2012; pp. 10-11), the KNAW wrote: ‘That the differences between both areas of science are not as principled in practice as is often believed is illustrated by Bod in his book *A New History of the Humanities* (2010). He shows that, down the centuries, the dividing line between the areas of science we currently define as natural sciences and humanities was very thin and that researchers in the humanities have made very significant contributions to explaining phenomena and properties.’

5 On the surprising absence of great syntheses, see also Casper Hakfoort, ‘The Missing Syntheses in the Historiography of Science’, *History of Science*, 29(2), 1991, pp. 207-216.

6 George Sarton, *Introduction to the History of Science*, parts I, II and III, Williams and Wilkins, 1931-1947.

7 Although Sarton does include musical science and linguistics in his history of science, he does not consider the other humanities, like the study of literature and art. According to Sarton, the history of art only sheds light on science from ‘outside’ and does not contribute to scientific ‘progress’. See Sarton, *idem*, part I, p. 5. Sarton has often been criticised for his strong positivist approach.

8 See, for example, the classics: Eduard Dijksterhuis, *De mechanisering van het wereldbeeld*, Meulenhoff, 1950; Stephen Mason, *A History of the Sciences*, MacMillan, 1962; William Dampier, *A History of Science and Its Relation to Philosophy and Religion*, Cambridge UP, 1966; Rienk Vermij, *Kleine geschiedenis van de wetenschap*, Nieuwezijds BV, 2005; and Frederick Gregory, *Natural Science in Western History*, Wadsworth Publishing, 2007.

9 In addition, there are books that discuss other aspects of science, such as the history of knowledge institutions (Ian McNeely and Lisa Wolverton, *Reinventing Knowledge: From Alexandria to the Internet*, Norton & Company, 2008), or of locations of knowledge practices

(Christian Jacob, ed., *Lieux de savoir*, Albin Michel, 2007-2011) or of the social aspects of knowledge (Peter Burke, *A Social History of Knowledge*, 2 volumes, Polity Press, 2000-2012).

## Fragment 2

### 3.1 Linguistics: unique to Babylon – discontinuous patterns

Nothing is as matter of course as language: it is part of our daily lives, but we are mostly unaware of it. Although the Mesopotamians could write from about 3200 BC, the study of language – gathering, analysing and interpreting data on language – did not begin until around 1600 BC in Babylon. But that was still 1,000 years earlier than anywhere else in the world.

Today, linguistics – the science of language – has a rather ambiguous reputation. On the one hand, it is one of the most thriving scientific disciplines; on the other hand, there are so many different schools that some critics claim that there are more linguistic theories than linguists. And yet there are moments when linguists of the most widely diverse schools seek consensus. That occurs not at mass conferences but at more intimate locations, like Villa Serbelloni in the Italian village of Bellagio, now part of the Rockefeller Foundation. It was there, in the early years of this century, that – as a young computer language specialist – I attended a meeting to consider the question ‘are there linguistic phenomena that all linguists recognise and which apply to all languages? After a day of discussion, we all agreed that the phenomenon of discontinuity was a serious candidate.

Take, for example, the sentence ‘The dog on the hill is barking’. In this sentence there is a connection between ‘dog’ and ‘is barking’, but not between ‘hill’ and ‘is barking’, even though the latter two are contiguous (‘continuous’). And yet, no native speaker of English would interpret the sentence incorrectly. You could say that this is because, semantically speaking, a hill cannot bark. But that is not the reason, as we can see if we take the sentence ‘The young dog next to the old dog is barking’. Here, ‘is barking’ refers only to ‘the young dog’ and not to ‘the old dog’. Clearly, connected words in a sentence (such as here between subject and predicate) do not have to be contiguous, but can also be discontinuous. In fact, connections within a sentence can be extended almost endlessly, as in the sentence ‘The dog under the tree next to the house on the hill is barking’. This phenomenon is rightly considered one of the most important properties of human language: connections between words and phrases can be discontinuous in all known languages. This unique property of language was first described in Babylon around 1600 BC, and not between words in a sentence but between parts of a word.<sup>1</sup>

Babylon: discontinuous patterns within words

The incentives for studying language in Babylon were similar to those later in other parts of the world: they wanted to preserve old literature written in a dying language.<sup>2</sup> In Babylon, this old literature was written not in their own Akkadian language, but in Sumerian, a good example being the renowned Epic of Gilgamesh from the twenty-first century BC. In the third millennium BC, a cultural symbiosis emerged between the Sumerians and the Akkadians, resulting in the Sumerian language having a major impact on Akkadian, especially in the form of pronunciation and loan words. The two languages were otherwise not closely related: Sumerian is a language isolate, while Akkadian is the oldest known Semitic language. During the heyday of Babylon, around 2000 BC, Akkadian steadily replaced Sumerian. But the Babylonians wanted to retain their knowledge of Sumerian because it was used in ceremonial, literary and scientific works.

Where should the Babylonians start if they wanted to preserve a language that was not their own? They considered a dictionary the first requirement. But they also wanted to record the usage of words in their linguistic context, in both Sumerian and Babylonian, as a translation aid. Then they had to record the morphology – conjugations, declensions and compounds – in both languages. They saw the exact rules of syntax – word order – as less important – not surprising given that the most striking patterns are the regularities in the conjugations and declensions of words. The Sumerian verb *gar* (to put) has at least 227 variations.<sup>3</sup> In this chapter, I will focus on the Babylonian linguistic clay tablets known as the Old Babylonian Grammatical Texts (OBGT).<sup>4</sup>

What is remarkable is that the Babylonians recorded a phenomenon that remains relevant in linguistics 36 centuries later: discontinuity.<sup>5</sup> While we looked above at examples of discontinuity between words, there are also examples of discontinuity within words – not only in Sumerian but also in modern languages. ‘New’ words can easily be constructed in Dutch, for example, by joining existing words together. The Dutch words *bommen* (bombs) and *gooierij* (throwing) can be combined to make the compound word *bommengooierij* (bomb-throwing). We call the connection between the two contiguous (continuous): there is nothing between the two words in the compound. But the words can also be connected non-contiguously. Dutch journalists do this when they report on fireworks thrown through letterboxes at New Year. The word *bommen-door-de-brievenbusgooierij* (bombs-through-the-letterbox-throwing) dates back to the 1980s. Here, the connection between *bommen* and *gooierij* is discontinuous: the words are separated by the combination *door-de-brievenbus*. It is not the letterboxes that are being thrown (*brievenbusgooierij*) but the bombs. This is clear evidence of discontinuous connections within words in Dutch. The continuous variant – *door-*

*de-brievenbus-bommengooierij* (through-the-letterbox-bomb-throwing) is not possible: a discontinuous connection is sometimes required to make a word acceptable in Dutch.

The same applies to Sumerian, but for verbs. Clay tablet OBGT VI, for example, gives the following conjugations and constructions for the verb *gar* (to put).

	Sumerian	Akkadian	
VI § 2:	gar- <b>bi</b> -ib	šuškin	(get <b>someone</b> to put something down)
VI § 4:	gar-ra- <b>ni</b> -ib	šuškiš <u>šu</u>	(get <b>him</b> to put something down)
VI § 19:	gar- <b>mu</b> -ub	šuškin <b>anni</b>	(get <b>me</b> to put something down)
	ga- <b>ri</b> -ib-gar	lušaš <b>kikka</b>	(get me to put something down <b>for you</b> )

*Table 1. Transcribed forms of the Sumerian verb gar with translations into Akkadian, on clay tablet OBGT VI. The words in bold refer to the respective translations (the italics in the English are mine).*

What is striking is the word structure in Sumerian and Akkadian. A whole verb cluster, including personal pronoun and direct object, can be expressed in a single word. Such constructions do not exist in Dutch or English, but are used in other European languages like Italian and Spanish. For example, the Italian word *diciamoglielo* (let us tell him about it) expresses a verb in the infinitive (*dire*), a personal pronoun implicit in the conjugation (*diciamo*), an indirect object (*gli*) and a direct object (*lo*).

What we find in Sumerian but not in a language like Italian is the use of infixes, resulting in discontinuities or dependencies. These infixes – ‘*bi*’, ‘*ni*’, ‘*mu*’ and ‘*ri*’ – have to be placed within the verb. ‘*Gar-bi-ib*’ thus means ‘get someone to put something down’ and ‘*gar-ra-ni-ib*’ means ‘get him to put something down’. The verb is effectively split into two parts and another word (in this case, a personal pronoun) is placed between them, resulting in a discontinuous dependency for the verb and a new meaning for the word as a whole. It is quite possible that Babylonian lexicographers only became aware of this infix pattern when they placed the Sumerian words and their Akkadian translations next to each other (as in table

1). It must have been a veritable ‘eureka’ moment when they realised that a unit in the middle of a word changed its meaning, while the rest stayed the same.

None of the clay tablets, however, explain the pattern. In contemporary terminology we could describe it as follows: if  $x$ ,  $y$  and  $z$  stand for parts of a sentence (let us call them ‘linguistic units’) and if a subscript  $i$  expresses a connection between these units, we can depict the discontinuous pattern as  $x_i y z_i$ . This expresses not only the discontinuous connections in Sumerian, but also in other languages, as long as  $x$ ,  $y$  en  $z$  are linguistic units of unspecified size, ranging from sounds, syllables and words to phrases.

There are also linguistic clay tablets where no search is made for regularities. This the case, for example, with verb constructions used for fixed expressions in Akkadian and Sumerian (OBGT VII-X). The Dutch expressions ‘*de pijp uitgaan*’ and ‘*het loodje leggen*’, both of which are euphemisms for ‘to die’, cannot be translated literally into English, for example, (‘to go out of the pipe’ and ‘to lay down the plumb’) without losing their meanings. Such constructions are usually not based on rules or patterns. The Babylonians listed such exceptions extensively, alongside pattern-based constructions. They thus gave both patterns of accordance and patterns of difference. That made them the first linguists to observe the non-rule-based translatability of proverbial expressions. Babylonian lexicographers were not only interested in regularities, but recorded all possible irregularities and divergences between Akkadian and Sumerian with equal zeal. The distinction between patterns of accordance and patterns of difference would remain valid for millennia in the search for knowledge, not only in linguistics (see 4.1), but also in philology (4.3), astronomy (especially in China) (4.2) and the Roman science of law (4.7).

No linguistics in other regions in early antiquity

The linguistics of Babylon was unique. As far as we know, no other studies of regularities and irregularities in language were conducted anywhere else in the world for another millennium. This contrasts with disciplines like mathematics, astronomy and law, which do occur in other regions during early antiquity. It is not until classical antiquity, around 600 BC, that we encounter the first linguistic activity outside Babylon, in India, China and Greece.

## Notes

1 In my book *A New History of the Humanities* (2015), I ignored the Babylonians and claimed that linguistics started with Indian linguist Panini around 600 BC. But now, after having studied the Babylonian clay tablets in detail, I have changed my standpoint. Panini, however,

remains the earliest recorded description of language ‘as a whole’ (i.e. phonology, morphology, syntax, semantics and pragmatics altogether).

2 Thorkild Jacobson, ‘Very Ancient Linguistics: Babylonian Grammatical Texts’, in Dell Hymes, ed., *Studies in the History of Linguistics: Traditions and Paradigms*, Indiana UP, 1974, pp. 41-62.

3 Peter Huber, ‘On the Old Babylonian Understanding of Grammar: A Reexamination of OBG T VI-X’, *Journal of Cuneiform Studies*, 59, 2007, pp. 1-17.

4 For a review of all known linguistic clay tablets (including OBG T), see Benno Landsberger *et al.*, *Materialien zum Sumerischen Lexikon IV*, Pontificium Institutum Biblicum, 1956. See <http://ancientworldonline.blogspot.com/2012/09/early-materialien-zum-sumerischen.html>.

5 See for example the discussion in Stefan Frank, Rens Bod and Morten Christiansen, ‘How hierarchical is language use?’, *Proceedings of the Royal Society of London B: Biological Sciences*, 2012, rspb20121741.