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Modelling in the Humanities: Linking Patterns to Principles

Rens Bod^{*}

Abstract: »Modellieren in den Geisteswissenschaften: Verbindung von Prinzipien und Mustern«. Modelling is ubiquitous in the humanities: while scholars do many things, the search for patterns and principles, and the links between them, is found in all humanistic disciplines and periods. Modelling in antiquity consisted mainly of explaining and constraining patterns by means of principles. In the early modern period, modelling also included the prediction and refutation of patterns by means of these principles. Since the late nineteenth century, the focus shifted to interpreting and criticizing patterns by means of principles. I will discuss some commonalities between modelling in the humanities and in the sciences. The exploration of different modelling strategies and practices in the (history of the) humanities has just begun and may lead to a new field coined History and Philosophy of the Humanities (HPH), analogous to History and Philosophy of Science (HPS).

Keywords: Patterns, principles, modelling, exceptions, explaining, understanding, interpretation.

1. Understanding the World by Means of Patterns and Principles

The idea that the world can be understood in terms of empirical *patterns* and underlying *principles* is arguably one of humankind's most important insights. A pattern is a regularity observed across events or artefacts, with or without exceptions.¹ A principle is a generalization that brings together different patterns under a single denominator and which is usually said to explain the regularities. While patterns are empirical, principles are theoretical. Although patterns and principles had different meanings in different periods, the concepts seem to be universal. From China to Europe and from Africa to the Americas,

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¹ On the concept of pattern, see McAllister 2011.

people have searched for regularities and underlying principles in both the natural and cultural world.²

The quest for patterns and principles is not limited to the (natural) sciences, but is found in all knowledge-making disciplines, including the humanities.³ Besides discovering patterns and underlying principles in planetary movements, diseases and in the evolution of species, scholars have also found patterns and principles in the transmission of texts, the evolution of languages and the development of artistic, musical and literary styles – to name a few. Coming up with theoretical principles that generalize and explain empirical patterns is one thing, but showing that there is indeed an explicit relation between the patterns found and the principles proposed is quite another. In fact, the problem of understanding the relation between patterns and principles has hardly been touched upon in the philosophy of the humanities while it has received considerable attention in the philosophy of science.

I shall argue that the humanistic practice of connecting patterns to principles can best be understood as a form of “modelling”. However, the terms “model” and “modelling” are highly ambiguous in the literature. There appears to be no common terminology used by either scientists or philosophers.⁴ This is not in itself problematic as it gives us some freedom to redefine “modelling” in a humanistic context. We will see that our notion of modelling has some commonalities with notions of modelling used in the natural and social sciences.

To explore what may be needed for an understanding of modelling in the humanities, I shall start with a bird’s eye overview of this modelling practice in the history of the humanities. My overview, which focuses on the European tradition, suggests that questions such as “How does a philologist reconstruct a text from extant copies?”, “How does an historian interpret an historical event or process?”, “How does a musicologist analyze a piece of music?” and “How does an art historian interpret a painting?” are prime examples of modelling in the humanities. Yet they have rarely been analyzed from an epistemological perspective. This is partly due to the fact that humanities scholars tend to leave their modelling decisions implicit – and sometimes even deny that they are “modelling”. One of my long-term goals is to make the implicit decisions in humanistic practice explicit. I thus take from the field of historical epistemology the notion that knowledge can only be adequately understood if studied in its historical development.⁵ I maintain that modelling is not limited to the digital humanities, let alone to the sciences, but that concepts from the digital hu-

² See Bod 2013a.

³ I will not go into the question of how the humanities could best be defined. For this, see: Bod et al. 2016; Bod and Kursell 2015. For the scope of the current paper, it suffices to refer to Wilhelm Dilthey’s concept of the humanities (“Geisteswissenschaften”) as the disciplines that study the expressions of the human mind – see Dilthey 1883: 29-30.

⁴ For an overview, see Koperski n.d. 25 September 2017, <<http://www.iep.utm.edu/models/>>.

⁵ For an introduction to Historical Epistemology, see Nasim 2013.

manities – where the notion of pattern has been used from its inception⁶ – may help us in studying other humanities disciplines. In doing so, I will paraphrase questions like those given above in terms of patterns and principles. Thus the question “How does a philologist reconstruct a text from extant copies?” may be rephrased as: “What kind(s) of patterns does a philologist extract from extant copies and on the basis of what principle(s) does s/he use these patterns to reconstruct the original text?”.

We must keep in mind that humanistic practice is not limited to modelling. Humanities scholars do many things: they keep alive the works from the past through teaching and writing, they build and maintain archives, they aim at developing critical consciousness and historical responsibility, and they also pose research questions regarding humanistic artefacts. It is in these research questions that the notions of patterns and principles, and the relation between these two, are fully fleshed out.

2. Modelling in the Ancient Humanities: Explaining and Constraining

One of the oldest modelling practices in the humanities is found in philology. With the establishment of the Library of Alexandria hundreds of thousands of manuscripts – and remnants thereof – were brought together. Among the many copies of the same text, no two were alike. In some cases the differences were modest and had come about because of copying errors, but the discrepancies could also be substantial, consisting of whole sentences that appeared to be deliberate changes, additions or omissions. There were also texts that had only survived in the form of incomplete fragments. How could the original text – the archetype – be deduced from all this material? This was the guiding question for a long succession of librarians at the Library of Alexandria. Aristophanes of Byzantium (c.257-180 BCE) opted for an explicit philological method to figure out how an unknown word form in a manuscript can be identified as either an archaic word or as an error. He approached this problem on the basis of a concept of *analogy* (Callanan 1987). If one could establish that an unknown word was conjugated or declined following the same pattern as a known word, it could be taken as an archaic word; otherwise it was a corrupted word. Aristophanes defined five such patterns or rules that word forms had to comply with in order to be described as “analogous” (*analogía*). The word forms had to correspond in regard to *gender*, *case*, *ending*, *number of syllables* and *stress* (or sound). Aristophanes’s successor, Aristarchus of Samothrace (c.216-c.144 BCE), added a sixth rule: when comparing two word forms, both had to be

⁶ See e.g. Ramsay 2005; Bod 2013b.

compound (complex) or *non-compound* (simplex) (Schironi 2004). The Alexandrian philologists thus used the designation of *analogía* as the underlying principle that generalized over the various rules of comparison. New rules for reconstructing manuscripts could be (and in fact were) introduced, but they had to follow the principle of analogy. This principle served not only as a generalization of existing patterns and rules but also as a constraint for new rules. While there were competing schools as well, in particular the school of Pergamon that focused on exceptions (*anomalía*) rather than rules, the Alexandrian method has withstood the test of time as a critical approach to text reconstruction. We owe a debt of gratitude to the insights of the Alexandrians, as well as to succeeding generations of tragedians and historians who employed their method, for the editions of Homer, Hesiod, Pindarus, Archilochus and Anacreon which have been handed down to us.

Modelling practices are also found in other ancient humanistic disciplines. In their descriptions of the Persian and Peloponnesian Wars, the historians Herodotus (c.484-425 BCE) and Thucydides (c.460-c.395 BCE) believed they could recognize a pattern in past events, namely that of rise, peak and decline. Herodotus found this pattern in both people and states, such as the tyrant Pisistratus and Athens, King Croesus and Lydia, and Darius and Persia: their fortunes rose and fell. Herodotus considered the pattern to be the basic structure of history: “For many states that were once great have now become small, and in my lifetime those that are great used to be small.” (Herodotus, *Histories*, 1.5.) Thucydides also contended that the rise and fall of Athens and its disintegration during the Peloponnesian Wars had parallels with other historical periods. He believed that this pattern was analogous to human nature and could therefore serve as an “aid for interpreting the future” (Thucydides, *History of the Peloponnesian War*, 1.22.).

The Greek historian Polybius (c.200-c.118 BCE) found a different historical pattern, namely in the history of Rome. Polybius expressed great admiration for the way Rome succeeded where the Greeks had failed. Rome, he argued, refuted the pattern that had occurred in the history of Athens, i.e. a cycle of monarchy, aristocracy, oligarchy, democracy and, via tyranny, back to monarchy again (Polybius, *Histories*, 1.1-2.). Unlike Athens and other cities, Rome was immune to this cycle – and therefore to decline – because of its *mixed* constitution. Rome’s governmental structure at the time of Polybius included a monarchy (the consuls), an aristocracy (the senate) and a democracy (the people’s assemblies). According to Polybius this simultaneity broke the cyclical pattern, which turned the history of Rome into a non-cyclical history, or so he believed (ibid., 1.4.).

Although we know nowadays that Rome was also subject to decline, Polybius did try to find an explanatory principle for the two patterns he observed: the rise, peak and decline of the Greek city states, and Rome’s continuous flourishing without decline. His principle of mixed vs non-mixed constitutions leads in

the first case to prosperity and in the second to decline. Of course, Polybius' principle could only generalize over two patterns (one of which turned out to be incorrect), but he did search for a principle which explained the patterns he found. This principle could even make predictions for other city states, although Polybius never applied his principle to other situations.

The search for theoretical principles underlying observed patterns is also found in the study of literature, art and music. For example, Aristotle found regularities in classical tragedies that he explained by a set of poetical principles for "good" narratives (Aristotle, *Poetica*, XXIV, 60a16). These general principles were meant as descriptive generalizations underlying the patterns found in plays, poems and stories, but Aristotle's principles were soon used prescriptively by Horace and others as a normative guideline for constructing new poems. In the field of art history, Pliny found a pattern in Greek and Roman art, which could be defined by mathematical proportions known as the *canon* (Pliny, *Naturalis historia*, 34. 55.) Although Pliny did not find principles for what he called "beautiful" art, he did find mathematical principles for "good" art. In musicology, Aristoxenus found melodic regularities in Greek musical pieces, which he tried to explain by a few underlying principles that constrained the space of possible melodies without explicitly producing melodies (Gibson 2005, 169). These poetic, artistic and musical principles constrained the set of possible patterns without producing new pieces of theatre, art or music.

The relation between patterns and principles in Antiquity can thus best be described in terms of *constraints*. Patterns in the humanities cannot be formally reduced to principles, like in Euclidian mathematics. Instead, principles in the ancient humanities define the conditions or constraints within which these patterns and rules can play out. These principles are mainly used to explain patterns, and sometimes to predict and interpret patterns. This gives us a first clue as to the relation between principles and patterns.

3. From the Medieval to the Early Modern Era: Predicting and Refuting

After the fall of the West-Roman empire, European learning was concentrated in monasteries, cathedral schools and (later) universities. The basic university curriculum was formed by the *artes liberales*, which were subdivided into the so-called trivium, consisting of grammar, logic and rhetoric, and the quadrivium, which consisted of geometry, arithmetic, astronomy and music. While the practice of modelling continued, it was made subservient to biblical-theological authority. History writing in the West was dominated by Universal Histories that consisted of a narrative pattern that divided the time between the Creation and the Last Judgment into different periods (Mortley 1996). The underlying

principle was the notion of biblical coherence: all narrative patterns had to be in accordance with biblical narrative. In poetics the main goal was to bring textual interpretation in accordance with Biblical interpretation (Preminger, Hardison, and Kerrane 1974). In philology, the Alexandrian method was briefly revived by Lupus de Ferrière (c.805-62), but philological practice in the West remained subservient to ecclesiastical authority (Garipey 1967). Roger Bacon maintained that the old Latin manuscripts of the church fathers were the first authority in any attempted reconstruction of biblical texts (Roger Bacon, *Opus maius*, part III.).

With the advent of humanism, we see a renewed interest in empirical pattern searching and modelling. In philology, Angelo Poliziano (1454-1494) goes beyond the Alexandrian philological approach when he takes into account the genealogical relationship between extant copies (Poliziano 1970-1971). Poliziano realized that a group of completely consistent sources could still pose a problem. Assume that a number of sources – A, B, C and D – all agree on one point, and that B, C and D are entirely dependent on A for their information.⁷ Should B, C and D nevertheless be included as extra evidence of the authenticity of A? According to Poliziano they should not: if derived sources were mutually consistent, they should be identified and eliminated (Poliziano 1970-1971, I.39.). Sources should be ranked genealogically so that their dependence in regard to an older source becomes clear. One anomalous manuscript can refute dozens of consistent manuscripts purely on the basis of its position in the genealogical ranking. This underlying principle is known as the *eliminatio-principle* (from *eliminatio codicum descriptorum*) or the “oldest source principle” (Maas 1960, 2).

Poliziano used his method with exemplary precision. His quest for genealogies of manuscripts resulted in highly accurate reconstructions of Terence, Virgil, Seneca, Propertius and Flaccus. But it is mainly after Poliziano that his philological principle revealed some of the most surprising patterns found in the early modern period, especially in the work of the philologist and historian Joseph Justus Scaliger (1540-1609). Scaliger aimed at unifying all ancient histories (Graeco-Roman, Babylonian, Egyptian, Persian and Jewish) so as to create the definitive historical chronology (Grafton 1983-1993). Scaliger therefore reconstructed various historical texts, among them Manetho’s list of Egyptian dynasties. Using the information from these sources, particularly about the duration of the different dynasties, Scaliger was able to date the beginning of the first Egyptian dynasty to 5285 BCE. To his dismay this date was nearly 1300 years before the generally accepted day of Creation, which according to biblical chronology had to be around 4000 BCE. In order to “save the phenomena”, Scaliger introduced a new time pattern – the *tempus prolepticum* – a time

⁷ This example comes (with slight modification) from Grafton 1991, 56.

before time (Scaliger 1658 [1606]). He placed every event that occurred before the Creation, such as the early Egyptian kings, in this proleptic time. Scaliger's solution may come across as artificial, but for a Protestant in around 1600 it was inconceivable to cast doubt on the Bible. Yet at the same time Scaliger was too consistent to give up on his philological method. It was only a couple of generations later when scholars and philosophers like Isaac Vossius and Spinoza realized that the only possible interpretation of Scaliger's result was that the earliest Egyptian kings had actually lived before the biblical date of the Creation. This meant that the Bible could not be taken seriously as a historical source. Scaliger's pattern of world history conflicted with biblical chronology, and this triggered a chain of biblical criticism that finally resulted in the Enlightenment.⁸

Thus, in the early modern era, a temporal pattern was no longer neutral but could be used to refute a formerly well-established world view. This is not to say that patterns were neutral in Antiquity – Herodotus and Thucydides also interpreted their findings, but their pattern (of rise, peak and fall) corroborated their world view rather than challenged it. In the early modern period, however, the discovery of certain patterns became critical as they were in opposition to the then accepted world view which they effectively refuted. This was not only the case for Scaliger's discovery, but also for discoveries in other humanities disciplines. In linguistics, Johannes de Laet designed a number of principles for comparing words in different languages, showing that there could be no relationship whatsoever between American-Indian languages and Hebrew. This effectively refuted the idea that Hebrew was the cradle of all languages (de Laet 1643). In music theory no hard distinction – with whatever underlying harmonic principles – could be found to distinguish consonant from dissonant intervals. This rebutted the centuries-old Pythagorean cosmic harmony.⁹

4. The Modern Period: Interpretation and Criticism

The first conceptual distinction between the notions of “humanities” and “science” was put forward in Giambattista Vico's *Scienza Nuova* (1725), but his work was ignored for almost a hundred years. It was in the nineteenth century when Wilhelm Dilthey (1833-1911) gave a foundation for the disciplines that we nowadays call humanities. According to Dilthey the humanities (*Geisteswissenschaften*) are concerned primarily with *verstehen* (understanding), whereas science (*Naturwissenschaften*) is about *erklären* (explaining) (Dilthey 1883, 29-30). Humanities scholars would be failing if they observed,

⁸ At various places it has been argued that there is a direct line running from Scaliger via Saumaise and Isaac Vossius to Spinoza. See e.g. Israel 2002; Jorink 2010.

⁹ See Cohen 2010.

counted, measured or hunted for apparent regularities. What they should be doing is searching for the motives and intentions of historical figures. Laying bare these inner mainsprings is more important than studying the external manifestations of the human mind. In this context one also uses the distinction introduced by Wilhelm Windelband (1848-1915) between an “idiographic” approach to knowledge (which is the study of the unique and the special) and a “nomothetic” way of studying (which seeks to generalize) (Windelband 1904). While the humanities were supposed to search for the unique, the sciences would deal with the general. This vision turned out to be extremely influential as it gave the humanities a powerful identity enabling them to differentiate and emancipate themselves from the other disciplines.

This constitutive separation between the humanities and sciences, however, did not correspond to actual practice in the humanities before the nineteenth century, as we have already seen. The search for patterns and principles and the search for a connection between them (modelling), both before and after the nineteenth century, simply continued in all humanities disciplines. When Dilthey’s and Windelband’s visions were gaining ground – from the early twentieth century onwards – modelling practices in the humanities continued. Such practices are found not only in linguistics (e.g. De Saussure, Jakobson) but also in philology (Lachmann, Greg), musicology (Schenker, Lerdahl), literary theory (Propp, Todorov), art history (Wölfflin, Panofsky) and historiography (the *Annales* school), just to name a few.

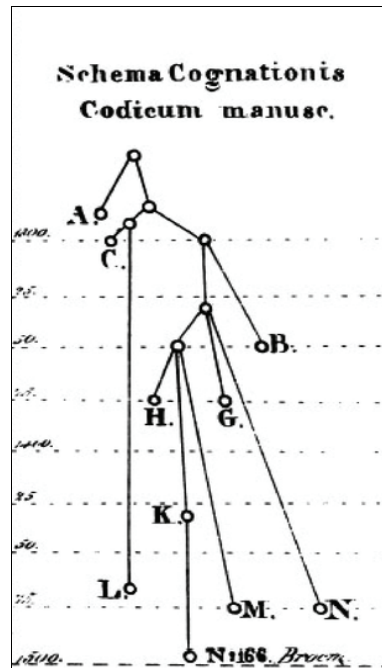
For example, in philology Karl Lachmann (1793-1851) created a principle-based method of text reconstruction that is known as *stematology*.¹⁰ In this method, an external representation (“model”) of surviving texts is built – a history tree or *stemma* – that can be used to reconstruct the original text from the patterns found in surviving texts. Many elements of stematology had already been in use for centuries, such as the concept of an archetype (the Alexandrians), the genealogical method (Poliziano), as well as the notion of a history tree which was used by Carl Johan Schlyter in 1827 (see Figure 1). However, Lachmann unified these separate elements into a systematic whole.¹¹ He believed that a history tree or stemma could be constructed on the basis of one underlying philological principle: *if an error is created in a version of a text then all descendants of that text contain the same common error*. On the basis of differences between extant texts, a stemma could be constructed. Lachmann distinguished three phases: *Recensio* (determining the genealogical relationship between the surviving texts in the form of a history tree), *Examinatio* (deciding on the primitive text) and *Emendatio* (emending so as to reconstruct the archetype). Thus modelling in stematology was not just a matter of

¹⁰ For the fundamentals of Lachmann’s theory, see Lachmann (1876) 2007. See also Ziegler 2000.

¹¹ Timpanaro 1963, 5-13. For an English translation, see Timpanaro 2005.

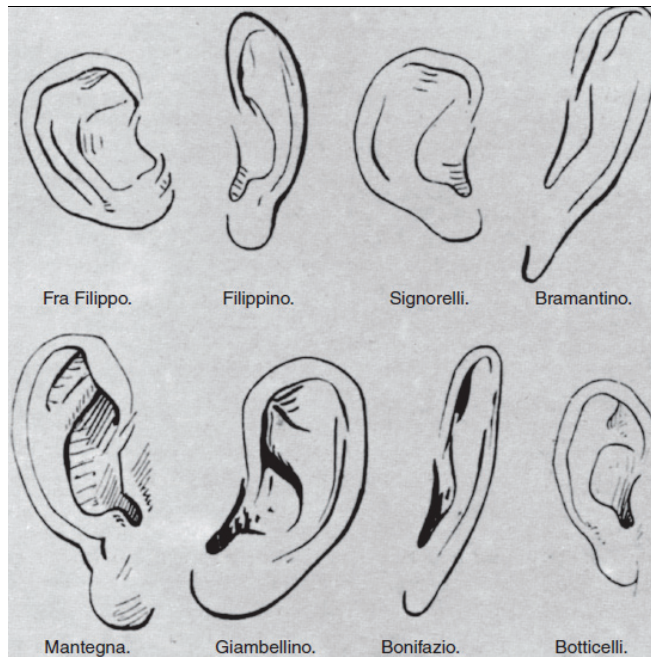
linking patterns in manuscripts to the underlying philological principle, but also of creating an intermediary representation, a stemma, which facilitated the modelling process.

Figure 1: The Earliest Known Representation of a Stemma by Carl Johan Schlyter (1827)



In art history, the analysis of stylistic patterns was initiated by Giovanni Morelli (1816-1891), who created detailed taxonomies of pictorial representations of ears, noses, hands and other parts of the body, as well as clouds, leaves, folds and individual brushstrokes in Italian art (Morelli 1890-1893). His underlying principle was that an artist's personal style is found in the details of a painting over which the artist has no control. Connoisseurs and art historians were trained in the Morellian method and learned how to compare stylistic patterns across a wide corpus of paintings (see Figure 2).

Figure 2: Giovanni Morelli's Study of the Depiction of Ears by Eight Different Renaissance Artists (Morelli 1980-1993)



Morelli's method was also used in archaeology to classify Greek vases and reliefs. But his stylistic analysis was entirely based on details. It is thanks to the work of Heinrich Wölfflin (1864-1945) that we have stylistic principles with which not only all the separate parts of a work of art can be examined, but also their relationship to the whole. In his *Kunstgeschichtliche Grundbegriffe* (1915), Wölfflin introduced a gamut of new stylistic concepts that he grouped in five pairs of opposites in order to characterize style transitions (in particular from Renaissance to baroque). He defined notions like linear versus painterly representations, flat versus deep composition, closed versus open forms and clear versus diffuse representations, among others. His notions still form the basis of historical art analysis today. Yet Wölfflin's principles were also criticized by people like Walter Benjamin who in his essay *Strenges Kunstwissenschaft* (1933), who argued that Wölfflin neglected the social and cultural interpretations of paintings. Later work by Aby Warburg and Erwin Panofsky did take such interpretations into account.

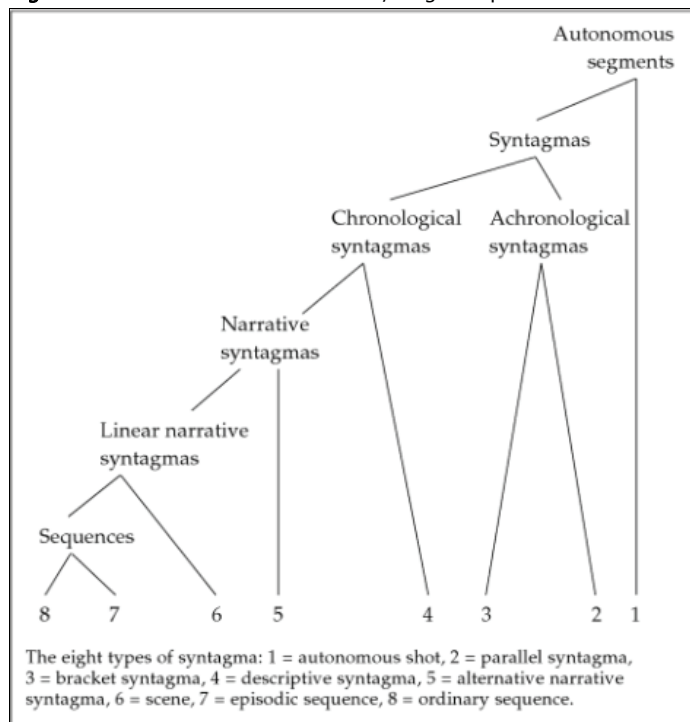
The quest for relating patterns to principles is also found in literary studies. While it may not be surprising to find pattern and principle-seeking practices in the work of early formalist and structuralist literary scholars like Propp, Jakobson and Todorov, it is less well-known that those who reacted to and criticized

structuralism – the post-structuralists – were also relying on patterns (as well as principles). This becomes particularly clear if we look at the work of Roland Barthes (1915-1980), who built on but also went beyond the long tradition set out by the formalists and structuralists. In his book *S/Z* (1970), Barthes started his famous analysis of Balzac's story *Sarrasine* by organizing the novella into a complex pattern consisting of 561 reading units ("lexies"). He then analyzed these units in terms of different meaning attributions, showing that Balzac's realistic text is full of symbolic and other connotations which can be interpreted in various different ways by the reader.

With these examples I do not want to say that modelling was uncontroversial in twentieth-century humanities. In historiography, for example, the opposition was strongly felt. While social-economic historians and (pre-war) cultural historians like Spengler and Toynbee searched for general patterns and underlying principles in history, their results were criticized by narratologists (who argued that only the "narrative" could give an account of an absent past), the critical school (which claimed that only general criticism could demythologize the past) and by postmodernists (who went farthest by arguing that any claim to historical truth is subject to deconstruction). Yet a closer look reveals that the pattern-rejecting historians criticized not so much patterns *per se* but "universal" patterns that were claimed to be culture independent. Their criticism made way for a quest for different patterns that were culture specific or ideological. In fact, some historians have found patterns in a historical epoch by employing categories and principles from that period. If a historian knows the rules of fifteenth-century art theory or rhetoric, for example, they can use them to analyze and interpret works of art, texts and other, even less obvious objects, dating from that time (Baxandall 1971).

In musicology and linguistics, as well as in the more recent disciplines of theatre studies, film studies, television studies and media studies, we find practices of pattern searching and the interpretation of these patterns by means of deeper principles. In film studies, for example, scholars have developed precise methods for analyzing a film by integrating insights from semiology, literary studies and linguistics. We see this perhaps most clearly in the work of Christian Metz (1931-1993), who developed his "Grande Syntagmatique," in which he called the building blocks of film *syntagmas*. In the spirit of Noam Chomsky's generative syntax (Chomsky 1957), Metz designed a number of theoretical principles to create a hierarchical organization for these syntagmas so that the cinematic structure of the film as a whole could be visualized and interpreted. Such a cinematic narrative structure is represented by a tree diagram where the leaves of the tree represent film scenes and the branched structure reflects the relationships between the scenes (see figure 3).

Figure 3: Christian Metz's "Grande Syntagmatique"



From: Buckland 2000, 115.

This formal, principle-based analysis into building blocks has led to some surprising results. For example, the narrative structure of the popular series *CSI: Crime Scene Investigation*, which has dragged on for years, has been found to consist of only eight narrative building blocks that are endlessly re-shuffled (Löwe, Pacuit, and Saraf 2009). This kind of narrative modelling thus uses an intermediate representation: the tree diagram.

It often occurs, however, that films, as well as novels and other narratives, cannot be represented by a tree diagram. This happens when narratives are neither linear nor tree-branching, but form a network that fans out and consists of a multiplicity of junctions without a clear beginning or end. Such a concept of an interwoven structure was articulated by Gilles Deleuze and Félix Guattari, who introduced the term "rhizome" to this end in *Mille plateaux* (1980).¹² The term rhizome is taken from botany, where it refers to an underground, usually horizontal, stem that often bends upwards again and thus creates a new

¹² For an English translation, see Deleuze and Guattari 2004.

plant. A rhizome is more complex than a hierarchical tree structure used in, for example, stemmatic philology. In a rhizome the different parts that are split up hierarchically in a tree structure can also be directly connected to one another. In mathematics and information technology, a rhizomatic structure is covered by the concept of *graph*.¹³ Thus the structure of a website or a video game cannot normally be represented as a linear or hierarchical structure but as a rhizomatic one. Both tree-diagrams and rhizomes are models in the humanities that mediate between patterns and their underlying principles.

5. Humanistic versus Scientific Modelling

While modelling in the long-term history of the humanities may seem quite different from modelling in the sciences, we find some commonalities as well. Our notion of modelling in the humanities is in fact analogous to the notion of modelling in Mary Morgan's and Margaret Morrison's influential work *Models as Mediators* (1999). According to Morgan and Morrison, phenomena in physics and economics can usually not straightforwardly be derived from underlying theories, but need to be connected by external models that serve as a kind of mediators. Their notion of linking between phenomena and theory in the sciences by means of models makes a strong analogy with our notion of linking between patterns and principles.

There is an important difference as well. Morgan and Morrison exclusively focus on models as external representations of the objects or phenomena under study. We have seen that such a notion of model is not valid for all humanities disciplines. In many of these disciplines, modelling consists of describing the steps needed to link patterns to principles. While some humanities disciplines do indeed use external representations such as trees, graphs or rhizomes to link patterns to principles (see above), other disciplines use procedures, rules or constraints to do this job. Thus models in the humanities can consist of either internal representations (like a set of rules for deriving the archetype of extant texts) or external representations (like a tree diagram for analyzing a film). But regardless of whether humanistic modelling makes use of internal or external representations, the main goal of linking patterns to principles is to explain, understand and interpret the expressions of the human mind.

My quick overview of modelling in the humanities has of course only scratched the surface. The exploration of different methodologies, strategies and practices in the humanities has just begun. But it has led to new questions, such as: what is the epistemological place of the notion of pattern or regularity in the humanities and how does it differ from the sciences? How can we under-

¹³ See Chartrand 1985. See also Moretti 2005.

stand the relation between the unique and the general? And how can singular events that are not part of a pattern be modelled in the humanities (see also the discussion below)? What we need to properly deal with these questions is a new discipline that we would call *History and Philosophy of the Humanities* (HPH), which should operate on par – and possibly in close alliance with – the already existing *History and Philosophy of Science* (HPS).

6. Discussion

Question (Fotis Jannidis): How do we reconcile patterns and the unique in the humanities? What about practices that are not defined by an interest in looking for patterns?

Answer: Indeed, as I have stated in the introduction, not all practices in the humanities are defined in terms of patterns and principles. But it should be kept in mind that patterns are not in opposition to unique events. Patterns actually consist of unique events or artefacts, and a unique artefact can often (but not always, as we will discuss below) be connected to underlying principles as well, so as to explain, understand, interpret or criticize that artefact. Take as an example the field of art history (but any other field would do): according to Wölfflin (see above), Baroque paintings share a certain common pattern, that is, they can be understood in terms of a number of stylistic principles typical for that style. But this also means that a single, unique Baroque painting can just as well be described by these principles: as a singular Baroque painting it shares common features with other Baroque paintings. At the same time, the art historian may be interested in the differences between the singular painting and other Baroque paintings (e.g. by highlighting the uniqueness of Caravaggio's style), but in all cases the art historian will have to refer to the particular Baroque pattern (and possibly the underlying principles). Thus even if one is interested in studying a single painting or literary work or musical piece, one may still use patterns and generalized principles in order to interpret a single artwork. And this is what I have called modelling.

Question (Fotis Jannidis): But how do we deal, then, with exceptions that do not fit patterns?

Answer: This is an interesting issue, especially if we consider exceptions that neither fit a pattern nor connect to underlying principles. As I said above: while modelling is found in all humanities disciplines, it is not the only practice in the humanities. Nevertheless, the problem of dealing with exceptions is found in almost all knowledge-making disciplines. And yet, common wisdom has it that the essential difference between the humanities and the natural sci-

ences lies in the notion and treatment of exceptions.¹⁴ The statement that “the exception proves the rule” seems unthinkable in natural science – although we should stress here that in the humanities this pronouncement is mainly used in the prescriptive tradition of secondary school grammars. All the same, there are most certainly exceptions in the humanities. However they are not solely to be found in the humanities, but in the natural and social sciences too. Theoretical physics, with its universal laws, is sometimes referred to as the only exceptionless discipline. This may represent a possible demarcation. Yet this demarcation characterizes not so much the difference between science and the humanities, as between theoretical physics and other fields. While theoretical physics permits no scope for exceptions, applied physics is full of ad hoc corrections, phenomenological constants, normalizations and so-called provisos. Although the universal laws of nature are considered to be exception-free, in mathematical derivations and explanations of specific phenomena ad hoc approximations and corrections are used more than once.¹⁵ We cannot assert anything other than that there is a gradual scale from disciplines with the least exceptions to those with the most. While theoretical physics reflects an ideal picture, it is not feasible for most natural sciences, such as biology, geology, forensic science and even chemistry, let alone for other academic areas.

In the humanities there is such a gradual shift from almost absolute sound shift laws in linguistics to less absolute harmonic rules in musicology to changeable culture-specific patterns in history. But there is also a gradual shift like this in the natural sciences – from the absolute laws of theoretical physics to the more approximate laws in chemistry to the local and variable patterns in biology. The eminent biologist Ernst Mayr contended that universal patterns do not exist in biology (1997, 62). Mayr admitted that the laws of physics and chemistry of course apply to biological systems at a molecular level. In a complex system, though, no biological regularity has ever been observed that complies with the rigorous definition of a “law” in theoretical physics. According to Mayr, what biologists mean by a “law” is a pattern that is usually local and not universally valid and is moreover often statistical. These regularities are widely used in the modelling of biological phenomena, without their being reduced to the fundamental physical or chemical laws.

This brings me to another issue, namely the notion of autonomous levels of explanation, which I take from the philosopher of science Philip Kitcher (1984). In biology the set of principles and explanations used at cell level is different from that at an ecological level, for instance. This does not exclude the reduction – sooner or later – of complex biological processes to physical ones. However, it does not always make sense to reduce a biological phenomenon to the “deepest” principles of elementary particle physics in order to ex-

¹⁴ For an overview of this discussion, see Bod 2013a, 356-8.

¹⁵ For an overview, see Cartwright 1983.

plain and understand it. In line with Kitcher I would argue that there are also autonomous levels of explanation, understanding and interpretation in the humanities, which have their own set of principles, just like in biology and other disciplines. Obviously the laws of (particle) physics also apply to the human brain, and therefore also indirectly to the products of that brain, and thus to humanistic artefacts. Yet it is not the case that we need to consult biology or physics for the modelling of humanistic artefacts like a literary work, a painting or a piece of music. The cognitive and neurosciences have produced important insights into the study of literature, art and music,¹⁶ but it becomes impossible and even senseless if we try to explain, understand or interpret a play by Shakespeare, a painting by Rembrandt or a symphony by Beethoven in terms of the sum total of all brain activities relevant at the time. It proves to be the case that autonomous principles of literary, artistic and musical analysis deliver the most insightful interpretations.

References

- Barthes, Roland. 1975. *S/Z: An Essay*. New York: Farrar, Straus and Giroux.
- Baxandall, Michael. 1971. *Giotto and the Orators: Humanist Observers of Painting in Italy and the Discovery of Pictorial Composition 1350-1450*. Oxford: Oxford University Press.
- Bod, Rens. 2013a. *A New History of the Humanities*. Oxford: Oxford University Press.
- Bod, Rens. 2013b. Who's Afraid of Patterns? The Particular versus the Universal and the Meaning of Humanities 3.0. *BMGN – Low Countries Historical Review* 128 (4): 171-80.
- Bod, Rens, and Julia Kursell. 2015. The History of the Humanities and the History of Science. *Isis* 106 (2): 337-40.
- Bod, Rens, Jaap Maat, Julia Kursell, and Thijs Weststeijn. 2016. A New Field: History of Humanities. *History of Humanities* 1 (1): 1-8.
- Buckland, Warren. 2000. *The Cognitive Semiotics of Film*. Cambridge University Press.
- Callanan, Christopher. 1987. *Die Sprachbeschreibung bei Aristophanes von Byzanz*. Göttingen: Vandenhoeck und Ruprecht.
- Cartwright, Nancy. 1983. *How the Laws of Physics Lie*. Oxford: Oxford University Press.
- Chartrand, Gary. 1985. *Introductory Graph Theory*. Mineola: Dover.
- Chomsky, Noam. 1957. *Syntactic Structures*. The Hague: Mouton.
- Cohen, H. Floris. 2010. Music as Science and as Art: The 16th/17th-Century Destruction of Cosmic Harmony. In *The Making of the Humanities, Vol. 1: Early Modern Europe*, ed. R. Bod, J. Maat and T. Weststeijn, 59-71. Amsterdam: Amsterdam University Press.

¹⁶ See e.g. Patel 2008.

- de Laet, Johannes. 1643. *Notae ad dissertationem Hugonis Grotii De origine gentium americanarum, et observationes aliquot ad meliorem indaginem difficillimae illius quaestionis*. Amsterdam: Elzevier.
- Deleuze, Gilles, and Félix Guattari. 2004. *A Thousand Plateaus*, trans. Brian Massumi. Continuum.
- Dilthey, Wilhelm. 1883. *Einleitung in die Geisteswissenschaften*. Leipzig: Duncker & Humblot.
- Garipey, Robert. 1967. *Lupus of Ferrieres and the Classics*. Darien, Conn.: Monographic Press.
- Gibson, Sophie. 2005. *Aristoxenus of Tarentum and the Birth of Musicology*. London: Routledge.
- Grafton, Anthony. 1983-93. *Joseph Scaliger: A Study in the History of Classical Scholarship*. Oxford: Oxford University Press.
- Grafton, Anthony. 1991. *Defenders of the Text*. Harvard: Harvard University Press.
- Israel, Jonathan. 2002. *Radical Enlightenment*. Oxford: Oxford University Press.
- Jorink, Eric. 2010. *Reading the Book of Nature in the Dutch Golden Age, 1575-1715*. Leiden: Brill.
- Kitcher, Philip. 1984. 1953 and All That: A Tale of Two Sciences. *Philosophical Review* 93: 335-73.
- Koperski, Jeffrey. n.d. Models. *Internet Encyclopedia of Philosophy*, <<http://www.iep.utm.edu/models/>> (Accessed September 25, 2017).
- Lachmann, Karl. 2007 [1876]. *Kleinere Schriften zur deutschen Philologie*. G. Reimer. Reprint, Oxford University Press.
- Löwe, Benedikt, Eric Pacuit, and Sanchit Saraf. 2009. Identifying the Structure of a Narrative via an Agent-based Logic of Preferences and Beliefs: Formalizations of Episodes from CSI: Crime Scene Investigation (TM). *Proceedings of the Fifth International Workshop on Modelling of Objects, Components and Agents, MOCA'09*: 45-63.
- Maas, Paul. 1960. *Textkritik*, 4th ed. München: Teubner.
- Mayr, Ernst. 1997. *This is Biology: The Science of the Living World*. Harvard: Harvard University Press.
- McAllister, James. 2011. The Ontology of Patterns in Empirical Data. *Philosophy of Science* 77 (5): 804-14.
- Morelli, Giovanni. 1890-1893. *Kunstkritische Studien über italienische Malerei*. Leipzig: Brockhaus.
- Moretti, Franco. 2005. *Graphs, maps, trees: abstract models for a literary history*. London/New York.
- Morgan, Mary, and Margaret Morrison, eds. 1999. *Models as Mediators*. Cambridge: Cambridge University Press.
- Mortley, Raoul. 1996. *The Idea of Universal History from Hellenistic Philosophy to Early Christian Historiography*. Lewiston: The Edwin Mellen Press.
- Nasim, Omar. 2013. Was ist historische Epistemologie? In *Nach Feierabend*, ed. M. Hagner and C. Hirschi, 123-44. Zurich/Berlin: Diaphanes.
- Ramsay, Stephen. 2005. In Praise of Pattern. *TEXT Technology* 14 (2): 177-90.
- Patel, Aniruddh. 2008. *Music, Language and the Brain*. Oxford: Oxford University Press.
- Poliziano, Angelo. 1970-1971. Miscellanea. In *Opera omnia*, ed. Ida Maier. Ravenna: Bottega d'Erasmus.

- Preminger, Alex, O. B. Hardison, and Kevin Kerrane, eds. 1974. *Classical and Medieval Literary Criticism: Translations and Interpretations*. New York: F. Ungar Publishing Co.
- Scaliger, Joseph Justus. 1658 [1606]. *Thesaurus temporum*. Leiden: Joannem Janssonium.
- Schironi, Francesca. 2004. *I frammenti di Aristarco di Samotracia negli etimologici bizantini: Etymologicum genuinum magnum, Symeonis, Megalē grammatikē, Zonarae lexicon*. Vandenhoeck und Ruprecht.
- Timpanaro, Sebastiano. 1963. *La genesi del metodo del Lachmann*. Le Monnier.
- Timpanaro, Sebastiano. 2005. *The genesis of Lachmann's method*, ed. and trans. Glenn Most. Chicago: University of Chicago Press.
- Windelband, Wilhelm. 1904. *Geschichte und Naturwissenschaft*. Strassburg: Heitz.
- Ziegler, Winfried. 2000. *Die "wahre strengthistorische Kritik": Leben und Werk Carl Lachmanns und sein Beitrag zur neutestamentlichen Wissenschaft*. Kovač.

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