

OLEG SOBCHUK

Charting Artistic Evolution:
An Essay in Theory



DISSERTATIONES LITTERARUM ET CONTEMPLATIONIS COMPARATIVAE
UNIVERSITATIS TARTUENSIS

18

DISSERTATIONES LITTERARUM ET CONTEMPLATIONIS COMPARATIVAE
UNIVERSITATIS TARTUENSIS

18

OLEG SOBCHUK

Charting Artistic Evolution:
An Essay in Theory



UNIVERSITY OF TARTU
Press

Faculty of Arts and Humanities, Institute of Cultural Research, Department of Literature and Theatre Research, University of Tartu, Estonia

This dissertation is accepted for the commencement of the degree of Doctor of Philosophy in Comparative Literature on October 3, 2018, by the Institute of Cultural Research, University of Tartu.

Supervisors:	Professor Arne Merilai (University of Tartu) Professor Franco Moretti (Stanford University; École polytechnique fédérale de Lausanne)
Reviewers:	Dr. Mathias Clasen (Aarhus University) Dr. Katja Mellmann (Ludwig-Maximilians-Universität München)
Opponent:	Dr. Katja Mellmann (Ludwig-Maximilians-Universität München)
Commencement:	Senate Hall of the University of Tartu (Ülikooli 18), November 16, 2018, at 12:00

ISSN 1406-913X
ISBN 978-9949-77-881-2 (print)
ISBN 978-9949-77-882-9 (pdf)

Copyright: Oleg Sobchuk, 2018

University of Tartu Press
www.tyk.ee

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	7
FOREWORD. THE LONGITUDINAL CUT	10
1. INTRODUCTION. A THEORY OF HISTORY	13
1.1. Problems	15
1.2. Emotion Machines	21
1.3. Forms Evolve	25
2. CHANCE	30
2.1. A Literary Invention	31
2.2 The Evolutionary Logic of Discovery	33
2.3. Creativity Pumps	38
2.4. Networks	41
3. BRICOLAGE	46
3.1. The Pressure for Novelty.....	47
3.2. Long Chains of Invention	51
3.3. Cumulative Literature	57
3.4. The Fabric of Evolution	64
4. SUCCESS	69
4.1. Cultural Attraction	70
4.2. Hedonic Selection	74
4.3. Social (and Technical) Selection	84
4.4. Drift	91
5. THE EVOLUTION OF DIALOGUES: A QUANTITATIVE STUDY OF RUSSIAN NOVELS (1830–1900)	98
5.1. A Problem	98
5.2. A Method	98
5.3. A Graph	101
5.4. Why the Number of Dialogues Increased	102
5.5. Why the Increase Was Not Linear	107
5.6. Highly Dialogic Novels in the 1830s	108
6. BROKEN TIME, CONTINUED EVOLUTION: ANACHRONIES IN CONTEMPORARY FILMS	111
6.1. Initial Steps	112
6.2. Branching	114
6.3. Beginning, Middle, and Ending	117
6.4. Timelines	119
6.5. Exaptation	124
6.6. Scaffolding	125
CONCLUSIONS	132

REFERENCES	135
SUMMARY	145
SUMMARY IN ESTONIAN	148
CURRICULUM VITAE	151
ELULOOKIRJELDUS	154

ACKNOWLEDGEMENTS

The idea for this thesis came to me in the summer of 2013. Back then, I was not in the best place intellectually: several studies on which I had been working had turned out to be less of a breakthrough than I had hoped. The result? A disappointment in the humanities as such. I seriously considered changing my field of study completely. But that lucky summer, I read three books that turned my view of the humanities upside down: Franco Moretti's *Distant Reading*, Alex Mesoudi's *Cultural Evolution*, and Steven Johnson's *Where Good Ideas Come From: The Natural History of Innovation*. Each book, in its own way, combined culture and evolution theory. Each book suggested a new view of cultural history: history as a biology-like process of evolution by means of (cultural) mutations, (cultural) selection, and (cultural) survival. These books motivated me to come up with my own project: an evolutionary theory of art.

Between the initial idea and the completed manuscript, however, lie five years of study and research. I am deeply thankful to everyone who helped me during these years: with their knowledge, their example, or their friendship. First of all, to my supervisors: Arne Merilai and Franco Moretti. This dissertation project was risky; it took its subject matter from the humanities, but its theory and methods from the sciences. Despite (or due to) this risk, they supported me in all stages of my work. Arne Merilai encouraged my initiatives and guided me with good advice. Franco Moretti was my main inspiration over these years: in fact, this thesis follows the line of research he started more than thirty years ago in the article "On Literary Evolution."

Kalevi Kull from the Department of Semiotics has always spoken of evolution with passion, and he set a stimulating example. Overall, semiotics was the point of departure for my interest in theoretical humanities, and I am thankful to those with whom I had a chance to discuss it: Rostyslav Semkiv and Nazarii Nazarov in Kyiv, Peeter Torop, Mihhail Lotman, and Silver Rattasepp in Tartu. Marina Grishakova invited me to the Institute of Cultural Research, and her knowledge of narratology – another theoretical discipline important for this thesis – was inspiring. At the Institute, I have always felt friendly support from Ülo Valk.

I had a chance to spend a semester at the creative and welcoming environment of the Stanford Literary Lab, where I was supervised by Franco Moretti. I have learned much from conversations with Mark Algee-Hewitt, Ryan Heuser, J.D. Porter, and Hanna Walser.

The reviewers of this thesis – Mathias Clasen and Katja Mellmann – examined the manuscript with great care and attention and suggested many good pieces of advice. Additionally, I was lucky to have two more careful readers – Roman Leibov and Olivier Morin – who provided many useful comments. I tried to improve the thesis after these suggestions, but any mistakes, of course, are on me. Speaking of mistakes: I am not a native speaker of English and was

fortunate to have Michelle Mueller as my editor. She was particularly attentive to all the stylistic nuances of my Ukrainian English.

Good ideas are rarely born in solitude – says Steven Johnson in his book *Where Good Ideas Come From*. They are born from friendly conversations at cafés and in kitchens. I am thankful to my co-thinkers Artjom Shelya and Peeter Tinitis: many good ideas arose from conversations with them. Together, we organized a seminar on cultural evolution and a conference, co-authored a few research papers, co-taught a few courses, co-translated a few books, and, most importantly, collectively thought through all the research problems we considered important. It is a rare fortune to have such close academic colleagues.

Doctoral studies don't only consist of research, though. An equally important part is "life." I am thankful to my good friends – Merit Rickberg, Masha Kanatova, Sasha Miljakina, and Tatjana Pilipovec – with whom we have lived through many good and bad moments and who supported me in any trouble. But I am not good at keeping my "life" separate from "work," and so I also co-authored an article with some of them, which is included here as Chapter 6.

Finally, I am deeply thankful to my infinitely patient parents. Having their son far away from home, with only the occasional Skype calls for communication, probably wasn't easy. And yet, they never doubted that I should do this work. Moreover, they believed that I could produce something of public interest. For this, and for more, дякую!

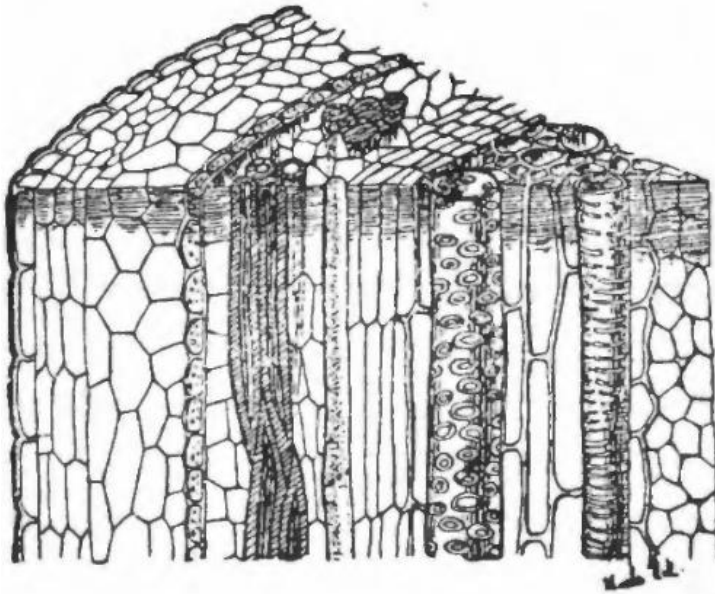


Figure 1. “... if the stem of a plant is cut transversely, a rather complicated design is formed by the cut surface; the design is simply one perspective of the longitudinal fibers, and we would be able to see them on making a second cut perpendicular to the first. Here again one perspective depends on the other; the longitudinal cut shows the fibers that constitute the plant, and the transversal cut shows their arrangement on a particular plane; but the second is distinct from the first because it brings out certain relations between the fibers – relations that we could never grasp by viewing the longitudinal plane.” (Saussure 2011: 87–88)

FOREWORD

THE LONGITUDINAL CUT

Let's begin with an image. Figure 1 is one of many images in *Course of General Linguistics* by Ferdinand de Saussure. And probably the strangest: What is the stem of a plant doing in a book on linguistics? It is probably also the most important. This image shows the gist of Saussure's novel approach – an approach that would eventually lead to a completely new way of studying language: structuralism. Structure, opposition, signifier vs. signified, *langue* vs. *parole* – these would become the buzz-concepts of the twentieth-century humanities and social sciences. And they all grew from the idea visualized in Figure 1.

Saussure used this image to draw the distinction between two perspectives of language – synchronic and diachronic. A transversal cut: a language system in a particular moment of time, linguistic synchrony. A longitudinal cut: the history of changes, linguistic diachrony. Diachrony illuminates why the transversal cut looks the way it does. Synchrony reveals the web of interconnections among linguistic elements: the *structure* of language.

Before Saussure, synchrony received little attention from linguists; after him, it became the main object of linguistic research for a large chunk of the twentieth century. Structural linguistics in its purest form. In a couple of decades, structuralism spread to anthropology, folkloristics, and semiotics, but probably, its greatest impact was in the field of literary studies and, more generally, studies of art. The rise of literary Theory (with a capital T) in the 1960s as a new big force in the academe – with such superstars as Roland Barthes, Julia Kristeva, and Tzvetan Todorov – happened because of structural linguistics. Linguistic structuralism provided the initial building blocks for a new theory of literature; synchrony was its key building block.

Inspired by Saussure, structuralist literary scholars began inspecting the synchronic plane of literature to search for regularities in literary forms. Linguistic structuralism transformed literary critics into pattern-seekers. Their search usually resulted in taxonomies, and it should not be a surprise that the most famous structuralist books – Hjelmslev's *Prolegomena to the Theory of Language* (1953), Barthes's *Elements of Semiology* (1964), Genette's *Narrative Discourse* (1980) – resembled dictionaries. They were extended descriptions of the new suggested taxonomies and overcrowded with new terminology. Some of them even contained proper dictionaries with these new terms.

This obsession with structuralism in literary and art studies ("obsession" in the most positive sense: creative mania without which there can be no true progress) was short-lived. The grand Theory of structuralists collapsed... But the main idea on which structuralism stood – the idea of a synchronic cut – stuck. All the approaches to theorizing after structuralism had the same idea of synchrony at their core. All of them were operating almost exclusively on the surface of the "transversal cut": only this time they were using a different

conceptual apparatus – not oppositions, but psychoanalysis, feminist theory, hermeneutics, cognitive science, and so on. As a (paradoxical) result, in contemporary literary studies the word “theory” forms an opposition pair with the word “history”: as if all theories should be a-historic – that is, synchronic.

This obsession with structuralism, despite all its achievements, had a deleterious side-effect: amnesia. Literary studies have completely forgotten that, originally, structuralism had never intended to undermine history. For example, let’s listen to one of the classics of structuralism, the folklorist Vladimir Propp, whose *Morphology of the Folktale* became one of the central books of structuralism. For Propp, studying the structure of folktales was important not as an exercise for itself, but as a... prerequisite. He compared folkloristics to botany:

[T]he problem of classification of the tale finds itself in a somewhat sorry state. Yet classification is one of the first and most important steps of study. We need merely recall what a great significance Linnaeus' first scientific classification had for botany. Our studies are still in their "pre-Linnean" stage. (Propp 1968: 11)

Pre-Linnean was botany before scientific classification, pre-Proppian was the study of folktales before morphological analysis. In both cases, creating a taxonomy was only the first step.

And what is the second step? History! Propp, again:

We shall insist that as long as no correct morphological study exists, there can be no correct historical study. If we are incapable of breaking the tale into its components, we will not be able to make a correct comparison. And if we do not know how to compare, then how can we throw light upon, for instance, Indo-Egyptian relationships, or upon the relationships of the Greek fable to the Indian, etc.? If we cannot compare one tale with another, then how can we compare the tale to religion or to myths? (Propp 1968: 15–16)

Morphology and history, therefore, complement each other. Propp’s own work is a good example of how complementary they can be. After the “first and most important step” – his *Morphology* – he took the second step: *Historical Roots of the Wonder Tale* (1946). Both cuts of Figure 1 were investigated by Propp with equal attention. However, unlike *Morphology*, his *Historical Roots* are little known in the West and were never properly translated into English: an illustration of the “somewhat sorry state” of diachronic formal analysis.

Historical analysis of artistic forms was forgotten for the most of the twentieth century. It has started to receive more attention only recently – mostly within two research domains: digital humanities and cultural evolution. The growing popularity of “distant reading” (Moretti 2013a) is a good sign that a diachronic revolution is on its way. Genres and artistic techniques are now increasingly studied in their temporality: today, we already have some data collected and a growing number of temporal trends found in it. So we finally have this data – and probably will continue to have more of it. What we do not have,

however, is a way to create coherent general hypotheses that would explain these trends. We do not yet have a diachronic theory of art.

What is a diachronic theory? Like a synchronic theory, it should search for and explain regularities. But this time – regularities in history. And while synchronic theories – that of Barthes, Genette, or Eco – ask the question *how* (how is *x* structured?), diachronic theories are concerned with *why*. Why, before 1900, paintings were mostly mimetic, but, after 1900, mostly abstract? Why did the Russian novel reach its height in the second half of the nineteenth century – not earlier or later? Why does *vers libre* prevail in contemporary lyrical poetry? These are all questions for a diachronic theory to answer.

This thesis presents an essay of such a diachronic theory. An essay – because it certainly is far from perfect. It tentatively combines the findings and concepts from several disciplines and suggests rather general hypotheses, which may not always be supported by sufficient empirical evidence and therefore may sound speculative. And yet, I agree with the anthropologist Dan Sperber who once said: “I will not apologize for the speculative character of the attempt. At this stage, either the question is answered in a vague, fragmentary and tentative way, or it must be left alone” (Sperber 1996: 77).

We must *not* leave be attempts to build a diachronic theory of art, so between two evils I am choosing the lesser: to pursue generalizations without full certainty of the particularities. Let’s take this thesis for what it is: not a store of ready-made answers, but an invitation to collectively investigate the longitudinal cut.

1. INTRODUCTION

A THEORY OF HISTORY

A diachronic theory of art – what should it look like? If we addressed this question with the scholars of the past, their answers would vary. A polymath sociologist would search for cyclical patterns in art history (Sorokin 1937). An art historian might use Herbert Spencer’s theory of progressive evolution (Munro 1955, 1960). A historian of English literature could rely on Freudian psychoanalysis (Bloom 1973). A semiotician might draw inspiration from the complex systems theory (Lotman 2009). What a diversity!

In most cases, diversity is good – it is a sign of a healthy state of things. But not in this case. Here, the diversity is a sign of poor connectedness of multiple individual efforts. Overall, during the twentieth century, there weren’t too many attempts to construct diachronic theories of art. And those attempts that did transpire usually did not take preceding attempts into account. Thus, every time someone addressed this topic, they had to start from scratch. And so: no agreement, no common ground, virtually no accumulation of knowledge.

Disconnected efforts of lone enthusiasts: the situation in the twentieth century. In the twenty-first century, things started to change; in recent years we have witnessed a growing interest in culture’s diachrony. Mostly within two academic domains: digital humanities and cultural evolution.

Digital humanities scholars are doing something that has so far been done little in art history: they collect temporal data and look for trends in it. For example, Ryan Heuser and Long Le-Khac (2012), examining a corpus of English novels, have found that during the nineteenth century there was a decline in the use of abstract words (“moderation,” “sensibility,” “virtue,” and so on), and instead a rise of words with concrete meanings (colors, body parts, or action verbs). Or, another trend: James F. English (2016) discovered that the majority of Anglophone novels nominated for literary prizes in recent decades have been historical novels; at the same time, historical novels have almost disappeared from the best-seller lists – an interesting discrepancy between the “prestigious” and the “popular” in literature.

Temporal trends and precise numbers – this is what digital humanists are hunting for with their increasingly sophisticated computational weapons. And the results are impressive. However, they almost never discuss the general principles responsible for these trends and numbers. They provide lots of interesting data that could (potentially) be used to construct a diachronic theory, but they do not build theories themselves.

At the same time, building theories is precisely the main goal of scholars studying cultural evolution (Mesoudi 2011, 2017). Members of this new adventurous research field combine the main merit of digital humanists – the pursuit of temporal trends – with the search for *regularities* across these trends. And when regularities are found – through data mining, experiment, or agent-based

simulations – they aim to *explain* these regularities. If we use the examples from above, an evolutionist would ask: Could the trends found by Heuser, Le-Khac, and English also be found in other national literatures, or could there be any general cognitive/economic/social factors responsible for this regularity? Not that digital humanists do not think about these problems, but rather general explanations attract them much less than trends do.

However, despite the many positive sides of cultural evolution, it has a major flaw: it ignores art.¹ There are some good exceptions, but the general tendency is clear: digital humanities are fully immersed in literature or film, while paying little attention to theory; cultural evolution does the opposite – it is fully immersed in theory, while ignoring literature or film. The goal of this thesis is to unite the efforts. It will suggest a diachronic theory of artistic evolution that:

- a) is based on the *cultural evolution* theory;
- b) aims at answering the problems posed within the *humanities*.
- c) employs computational methods inspired by the *digital humanities*;

Let's add more grain to these three points.

My **theoretical framework** will be the theory of cultural evolution. As was demonstrated on many occasions, some concepts from biological evolution can be successfully adapted to studying culture (not all concepts, of course: any adaptations of this sort should be made wisely). These concepts, for example, include population thinking (Godfrey-Smith 2009), neutral evolution (Kimura 1983; Bentley et al. 2004), or punctuated equilibrium (Atkinson et al. 2008; Eldredge & Gould 1972). At the same time, cultural evolutionists themselves have developed a range of theories suited specifically for explaining culture: cumulative cultural evolution (Caldwell & Millen 2008), cultural attraction (Sperber 1996), and others.

I will try to show that these and other theories can help us understand art history better. Various **questions** relevant for the humanities can be approached (if not explained) via cultural evolution. Why do certain artworks become canonical while others become simply popular? Why are certain locations and periods so fruitful (Renaissance or modernism) while others are not? Can a genre be invented, and do these inventions have inventors? And, after all, an overarching problem: are there any *laws* of artistic evolution – or, at least, any fuzzy regularities? Detecting them would be important – not for predicting the future of arts, as might be suggested by some (a bit idealistically), but for a clearer vision of the past. My main argument is that it is possible to detect such regularities in art history.

¹ Out of all the arts, music is more frequently studied by evolutionists (e.g., Mauch et al. 2015; Ravignani et al. 2016; Savage et al. 2015). Other arts – literature, painting, film – are each represented by only a few research articles (for example, literature: Morin & Acerbi 2017; Moretti 2000; painting: Morin 2013; film: Cutting et al. 2010).

Answering such questions would require precision, and so I will mostly rely not on the qualitative analysis, but on **quantitative methods**: mainly, the quantitative analysis of historical datasets. Using quantitative methods allows detecting precise trends, which is important for understanding the historical dynamics of art. Large-scale quantitative studies are already quite usual in the digital humanities, and are associated with the term *distant reading* (Moretti 2013a). Although distant reading is not a name of a particular method, it is a suitable name of the general methodological perspective used throughout this dissertation.

Hopefully, such a combination – cultural evolution, digital humanities, and the (traditional) humanities – will be useful to each party. Cultural evolutionists may want to align themselves more closely with objects of studies in the humanities and expand their theory there. Digital humanists may benefit from a theory that could help explain the trends they find in their data. Humanities at large may want to acquire a completely new perspective of the arts to open a whole new research field: a new type of theory, a diachronic theory.

Introduction serves as a basis for the rest of the thesis. It consists of three sections. Section 1 will assess the previous attempts to construct diachronic theories – all these individual efforts – and why they did not grow into a collaborative effort. Section 2 touches upon the most basic (and yet crucial and problematic) question that should precede any attempt to build a diachronic theory of art: What is art? I will provide the understanding of art that is most convenient for the theory that I will present in the following chapters. Since this theory will be based on the theory of cultural evolution, Section 3 introduces – in the most general terms – cultural evolution. I will not explain it in detail: all the necessary concepts and findings of cultural evolution will be explored later in the thesis.

One final note: this thesis is written so that virtually any chapter can be read separately, and even though sequential reading is still preferred, a reader interested in a specific chapter should not be lost if he or she decides to read out of order.

1.1. Problems

The history of diachronic theories of art is not a history of continuous progress. Nor is it a history of continuous interest: with multiple efforts, critical debates, and numerous theoretical schools studying the longitudinal cut. In other words, it is nothing like the history of synchronic theories. Synchronic theories enjoyed precisely that. Formalism in Russia, structuralism in Prague, Paris, and the U.S.S.R., narratology in Germany and the United States, stylistics in Great Britain – for almost a century, they all dealt with similar problems and thus agreed on some concepts, rejected others, and debated over everything in between.

The history of diachronic art theories is different. Early attempts were made in the late nineteenth and early twentieth centuries. In Russia, the main figure was Aleksander Veselovsky (1940), who proposed an ambitious project of “historical poetics”: he suggested a systematic approach to folklore and literature that would trace the evolution of the simplest narrative units, motifs. Motifs are invented, combined, and copied by generations of storytellers: a view clearly inspired by evolutionary ideas in biology. Works by literary historian Ferdinand Brunetière (1890, 1905), who suggested a similar evolutionary approach – although in a less systematic way – were published around the same time in France. However, both projects failed to achieve recognition. Brunetière’s evolutionary writings did not significantly impact literary studies and are rarely recalled nowadays. Veselovsky’s work met a similar fate: his book on historical poetics remained incomplete (he managed to write only the first three chapters).² His followers had the same bad luck. The literary critic Yuri Tynjanov, who had ideas to write a book on literary evolution, managed to write only two short articles (Tynjanov 1987; Tynyanov 2000). Another Russian scholar Boris Yarkho, one of the most science-minded literary scholars of the twentieth century, died of tuberculosis in a Stalinist deportation, and his thick volume, *A Methodology of Precise Literary Study*, remained a rough draft: yet another unfinished project of a diachronic theory (Yarkho 2006).

It was almost as if the study of literary evolution was cursed. This misfortune continued for the whole of the twentieth century. Ambitious projects of an evolutionary theory of art either remained incomplete or, even if completed, did not receive much attention. To name just a few: Alastair Fowler’s (1971, 1982) theory of genre evolution, John Cawelti’s (1976) evolutionary theory of literary formulas, and Colin Martindale’s (1990) theory of artistic evolution. Other evolutionary theorists did inspire followers, but, most likely, this was not because of their diachronic component. For example, in Russia, the work of Mikhail Gasparov (1996), who is obviously an evolutionary thinker (the endpaper of his *A History of European Versification* shows a tree of verse evolution), inspired multiple followers. However, they followed Gasparov’s quantitative method – the precise counting of rhyme types and rhythm patterns – and not what was hidden behind the numbers: his evolutionary thinking.³ Something similar happened to Franco Moretti. His books – *Atlas of the European Novel* (1998), *Graphs, Maps, Trees* (2005), and *Distant Reading* (2013) – were praised for quantification but criticized for their evolution theory. Numerous followers of Moretti copy his “distant reading” methods, but usually avoid the “distant reading” theory.⁴

Why this lack of success? So many efforts, and yet – they all remained *individual* efforts, they did not grow into a movement. Why?

² In recent years, interest in Veselovsky has been revived: see Kliger & Maslov 2016; Tihanov 2017.

³ A sole exception here may be the Estonian philologist Jaak Põldmäe (1971).

⁴ As usual, not without exceptions: e.g., Paige 2017; Underwood 2016.

I can think of at least three possible answers.

(1) *Zeitgeist*. One possible answer is historical: cultural *Zeitgeist* did not favor diachronic theories. Created in the twentieth century, they were somewhat ahead of their time. This is a well-known story if we think about a somewhat different domain: the history of technological inventions. As was shown by many authors, even the best ideas of technological improvements can fail if they appear at the wrong time. This is exactly what happened to the British inventor Charles Babbage, who got the idea for a computer (a “difference engine,” as he called it) in the early nineteenth century. The general principle, devised by Babbage, was not much different from that of a modern computer, but, unfortunately, it was introduced in a time before the invention of transistors. Thus, Babbage’s machine was purely mechanical: hundreds of gears powered by cranking a handle. Babbage never managed to build his mechanical computer. It was built only in 1991 – and it worked perfectly well.

This archaic mechanical computer was born prematurely: earlier than the conditions required for it to become something more than a curiosity. Is it possible that some of the mentioned diachronic endeavors were prematurely born too?

It seems so. The reasons are similar to those of Babbage’s failure: the technologies of their time did not allow for the fulfillment of their grand ideas. Some theorists had clearly understood that it was not enough for them to simply claim a theory: they also had to test it. And to do so, they needed to collect and analyze data. Herein lay the problem. Consider this confession by one of the pioneers, Boris Yarkho:

Compilation of a comparative dictionary of aesthetically (that is, emotionally) meaningful words alone in the comedies and tragedies of Corneille should result in the amount of about 100 000 words, selection and processing of which would take three years of a single man’s work. Add here a card index of stylistic figures, and the scholar would face the picture of true self-sacrifice. Who would choose to waste years of qualified work for solving an insignificant part of a single problem, while its largest portion (selection and control) require only the work of well-prepared students, and a team of 20 people might conduct it with a large pedagogical usefulness in some 6 or 8 months? (Yarkho 2006: 403–404)

A picture of true self-sacrifice. This is what Yarkho’s own life was. The grandeur of the task did not stop him; he manually quantified thousands of stylistic elements in literature. Today, however, we can solve many of these problems in a matter of days (or, when it comes to the time of actual computation, in a matter of seconds). No “years of qualified work” anymore. No self-sacrifice. Just the routine of computational analysis.

The truth is that diachronic theories require much more data – to be proven or disproven – than a synchronic theory. A synchronic theory requires good knowledge of a genre or a stylistic technique at one moment of time. Consider the data used in some of the best pieces of synchronic theorizing: Gerard Genette’s (1980) narrative theory takes all its examples from a single literary

text, Proust's *In Search of Lost Time*. Boris Uspensky's (1973) theory of points of view in fiction uses examples mainly from Tolstoy's *War and Peace*. A single (though gigantic) book! And now: How many books does one need to inspect a diachronic change in the history of points of view over a century? Hundreds? Thousands? Hundreds of thousands? The more, the better.

Apparently, many of the attempts made until very recently *were* actually cursed. Diachronic theories were doomed to lack the requisite data. The empirical support they did have were often only anecdotal examples. Instead of analyzing the whole amount of artworks of some period – to detect trends – they analyzed a small number of “important” artworks. Today, this is clearly a dead end: an unlimited number of anecdotal examples support an unlimited number of *ad hoc* theories. But back then, it wasn't so clear.

Hence, we approach the second problem:

(2) *Unfalsifiable theories*. Not everyone wanted to ground his or her theory in solid empirical evidence like Yarkho. Other scholars took a more traditional path: anecdotal evidence. It may be a coincidence, but in many cases these theories had one thing in common: they consisted of just one or two simple principles.

Simplicity is not a bad thing, of course. Unless these simple principles are so simple (and so broad) that they can fit almost any example. Such overly general theories have a common fault too: they appear to be correct, but, in reality, they balance on the edge of unfalsifiability.

For example, the theory of literary evolution suggested by Russian formalists in the 1920s. The theory is so simple that its gist can be presented in a couple of paragraphs:

And it is not just that the *boundaries* of literature, its “periphery”, its frontier regions, are unstable: no, it is the very “centre” we are talking about. It is not a case of one single age-old stream moving and evolving in uninterrupted succession in the centre of literature, while the new phenomena merely float in from the sides. No, these selfsame new phenomena actually occupy the centre itself, while the centre shifts down to the periphery.

At a period when a genre is disintegrating, it shifts from the centre to the periphery, and a new phenomenon floats in to take the place in the centre, coming up from among the trivia, out of the backyards and low haunts of literature. (This is the phenomenon of the “canonization of the younger genres” which Viktor Shklovsky has written about.) This is how the adventure novel became cheap reading matter, and how the same thing is happening now to the psychological tale. (Tynjanov 2000: 33; original emphasis)

At first glance, Tynjanov's theory may sound interesting. However, it simply describes the fact that something unpopular (“peripheral”) can eventually become popular (“central”) and vice versa. Note that this theory does not predict much: it does not describe the conditions required for a peripheral genre to become central, it does not predict when this displacement of genres should

happen. It simply states that this transition does happen sometimes. And so, whenever we observe this “sometimes” in art history, the theory is “confirmed.”

The ease with which these simple theories can be “confirmed” may be the reason for their success – still moderate, of course. Jazz music, which rose from the African-American neighborhoods of New Orleans, became a central – even canonical – phenomenon of American culture, Arthur Conan Doyle’s detective stories have entered schoolbooks, TV series are now quickly outgrowing the status of guilty pleasure. We may be tempted to see the confirmation of Tynjanov’s insight in each of these cases. The simplicity of his theory is its main strength.

But simplicity is also a weakness. Such simplistic, unfalsifiable theories do not offer room for further exploration. If you can only agree with a theory, why would you develop it? And why would anyone else continue your research? This is, however, exactly what is needed for a discipline to appear. And this may be the reason why some (simplistic) diachronic theories did not become larger academic movements, and why, in the end, Tynjanov’s intended book on literary evolution was never written.

Conceptual leaps. Some diachronic theories were too simple to become widespread. Others, on the contrary, were far too complex: overly-structured and overly-predictive. These theories were grounded in the assumption that the world is harmonic, and that culture is as orderly as physics or chemistry. For example, let’s take the theory of artistic evolution created by the psychologist Colin Martindale. Unlike Tynjanov’s theory, it cannot be captured in a single paragraph.

Look at Figure 2 instead – the “graphic summary of theoretical predictions,” as Martindale called it. “Arousal potential” is the potential of a stimulus to be pleasant. Poems, novels, or films can have more or less of this potential – and so they will be more or less liked by the audience. Martindale predicts that, on average, the arousal potential of artworks should increase over time. Why? “Hedonic selection”: humans tend to choose genres and styles that produce arousal. According to Martindale, “hedonic selection has exerted a constant pressure in the same direction throughout human history” (Martindale 1990: 41).

Next, Martindale distinguishes between two types of cognition: abstract cognition and free-associative cognition (which he calls “primordial”). From this, he makes a speculative assumption: “primordial” (that is, associative) cognition is required for creativity, and “to produce a novel idea, one must regress to a primordial state of consciousness. To produce an even more novel idea, one must regress to an even more primordial state” (Martindale 1990: 58). This positive correlation between “more creativity” and “more primordial thought” is questionable – but not for Martindale, who takes it for granted.

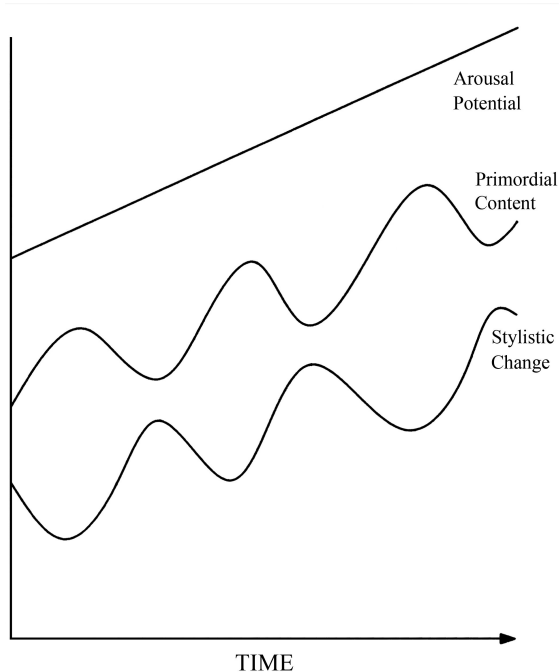


Figure 2. Colin Martindale’s
“graphic summary” of his theory
(from Martindale 1990: 41)

However, after this speculative assumption, Martindale makes quite a bold “jump” in his reasoning. He claims that after an idea is produced, it must undergo the stage of “elaboration,” which “consists in seeing whether an idea is in accord with current stylistic rules” (Martindale 1990: 58). He borrows the terms “primordial thought” and “elaboration” from mid-century behaviorist psychology, where they were used to describe the creative process within a *single* individual’s mind. However, Martindale assumes that these two stages of the creative process have historical equivalents. That is, there should be a historical stage when artworks would be highly “associative” (whatever that means) and a successive historical stage when they would tend towards the opposite pole, order. So, he finds speculative support for the old idea that stages of chaos are changed by stages of order in history. The fluctuation of the two lines in Figure 2 show exactly that.

This complex theoretical construction already seems unstable. But Martindale adds yet another speculation: he assumes that these two distinct cognitive processes (“primordial” association and elaboration) can be detected in artworks by simply observing them – in a rather straightforward way. Simply, if a painting looks “mysterious” (he takes paintings by Salvador Dali as his examples), then it has more primordial content, and thus it is more “creative,” thereby producing more arousal potential. This logical chain – which is not just speculative but clearly false – allows Martindale to detect “primordial content” in all kinds of artworks by simply counting these “primordial” (i.e., chaotic) elements. The methodology itself, too, is problematic: for example, Martindale uses contemporary viewers to evaluate the amount of “primordial content” in Renaissance

paintings. For a historian, however, it would be clear that an artwork that looks chaotic (“primordial,” associative, surreal...) to an American college student from the 1980s might have been perfectly orderly for its contemporaries.

All these problems do not undermine Martindale’s effort. They simply point to the fact that it is extremely hard for a single man – however brilliant – to create a theory of such complexity. (Take into account that Martindale had no collaborators and did not rely on other scholars’ work: all the data he used he collected himself.) Individual work necessarily results in countless flaws, which would further prevent a theory from gaining collaborators. A vicious circle of bad luck.

Fortunately, today the situation has changed. Artistic data are no longer collected by lone scholars, and theories do not emerge in a lone scholar’s brain; but rather from multiple data-collectors and multiple brains. This is the main reason why today we can approach the problem of diachronic theory for the arts with more success. The curse upon diachronic theories for the last hundred years can now be broken, after all – this is the hope.

However, before we rush into diachronic theorizing of art, we should ask one crucial question – one that, for some strange reason, many diachronic theorists did not bother to ask:

What is art?

1.2. Emotion Machines

Imagine a group of Martians with an unusual ritual. Every so often, some of them come from various corners of their Martian cities (yes, they do have cities) and sit next to each other in a spacious room. They do not communicate or touch one another – they sit almost motionless for several Martian hours. This situation is strange by itself. However, even stranger is the fact that they sit in almost complete darkness, and the only light during this ritual comes from a colorful wall in front of them, on which colors constantly change: sometimes abruptly, from light to dark, sometimes smoothly. The ritual affects the Martians’ psychology: in response to the change of colors, their hormonal levels (they have hormones too) also change. Some color combinations release their “pleasure hormones,” while others make them feel sad. At the end of the ritual, the Martians return home, and, if they felt satisfied with a particular color combination that they experienced, they remember its name and recommend it to their Martian friends and coworkers. As strange as this ritual may sound, humans have it too: it is called cinema.

This Martian example is trite (most made-up examples of this kind are), but it is meant to stress a thought that hopefully is not trite. Art – any art, not just cinema – is a *strange* phenomenon. We are so accustomed to it that we can hardly imagine how “alien” it is. Before the 1890s, nobody was staring at moving images projected on walls, nobody felt pleasure or pain from watching them. If a time traveler (another trite example) went back to the times of King

Arthur and showed an episode of *Star Trek* at the Round Table, this practice of watching would most probably be considered insane. However, even today some watching practices might be called insane: for example, binge-watching a complete season of *Star Trek* overnight.

There is nothing “natural” about film, literature, or music. In this respect, they resemble the technological miracles of today: a jet aircraft that brings us from London to New York in several hours, or the Internet that lets us access most of the world’s knowledge in mere seconds. We tend to appreciate the weirdness of technologies that are relatively new, but we no longer appreciate the technological miracles that appeared long ago: mirrors, clean tap water, or artificial lighting.⁵ They were once new and incredible, and now they are routine. Most artworks are like these mundane miracles: fascinating long ago, standard today.

Even the very word “art” is mundane and does not capture anything substantial. What is art? The music of Chopin and Tchaikovsky? Everything stored in art museums? Or, maybe, *Star Wars*, 2Pac’s rapping, and the computer game *Dota 2*? The answer is elusive because most of what we call “art” resembles these old technologies. Shakespeare? Malevich? Those gothic cathedrals that every self-respecting European city should have? They are not as fascinating as new technologies – not a neural network or a driverless car; rather, a boring refrigerator or a radio. It is hard to properly understand anything so conventionalized. To be able to talk about art, we need to separate it from the everyday.

The parallel between art and technology that I keep drawing is not just a stylistic figure, like the story about the Martians. I do believe that the best way to understand art is to view it for what it is: a technology. The idea that art is a technology – with a precise function – is not widespread today, but it is not new. It was discussed in one of the most curious pieces of literary criticism: “The Philosophy of Composition” (1846) by Edgar Allan Poe. This short essay describes, step by step, the process of composing Poe’s poem “The Raven” – the poem that brought him long-awaited fame. Poe begins the essay with the idea crucial for understanding art as technology – effect:

I say to myself, in the first place, “Of the innumerable effects, or impressions, of which the heart, the intellect, or (more generally) the soul is susceptible, what one shall I, on the present occasion, select?” Having chosen a novel, first, and secondly a vivid effect, I consider whether it can be best wrought by incident or tone – whether by ordinary incidents and peculiar tone, or the converse, or by peculiarity both of incident and tone – afterward looking about me (or rather within) for such combinations of event, or tone, as shall best aid me in the construction of the effect (Poe 1846).

⁵ The adventurous feeling these “boring” technologies used to have is nicely captured by Steven Johnson (2014).

Poe understands art (say, poetry) as a technique for achieving a particular effect. For example, consider the poem's beginning:

Once upon a midnight dreary, while I pondered, weak and weary,
Over many a quaint and curious volume of forgotten lore—
While I nodded, nearly napping, suddenly there came a tapping,
As of some one gently rapping, rapping at my chamber door.
“’Tis some visitor,” I muttered, “tapping at my chamber door—
Only this and nothing more.”

The narrator (“the lover”) then supposes again who might be the person tapping at the door:

And the silken, sad, uncertain rustling of each purple curtain
Thrilled me—filled me with fantastic terrors never felt before;
So that now, to still the beating of my heart, I stood repeating
“’Tis some visitor entreating entrance at my chamber door—
Some late visitor entreating entrance at my chamber door;—
This it is and nothing more.”

This uncertainty continues for six stanzas. In the essay, Poe explains: “The idea of making the lover suppose, in the first instance, that the flapping of the wings of the bird against the shutter, is a ‘tapping’ at the door, originated in *a wish to increase, by prolonging, the reader's curiosity*” (Poe 1846; my emphasis). Poe wants to evoke a specific psychological effect (curiosity), and to achieve this effect he chooses a suitable tool (prolonging). Instead of revealing the answer in the first stanza, Poe keeps it a secret for several stanzas, making the readers increasingly curious.

In popular culture, Poe is often presented in a Romantic way: a creator whose works are straightforward reflections of the “soul” and emotions. But, clearly, this image is wrong. The artist who would become the main inspiration for the Symbolist literary movement – Romanticism 2.0 – had a mechanistic “philosophy of composition.” He even begins his essay with mentioning “the mechanism of *Barnaby Rudge*” (a novel by Charles Dickens).

So, a novel as a mechanism. *Art* as a mechanism. And the task of this mechanism is evoking emotions – mostly pleasant ones.

Poe explained his “philosophy” in 1846. Seventy years later, in 1917, this same mechanistic “philosophy” was offered – this time, much more explicitly – in pre-revolutionary Russia by a young and iconoclastic literary critic Viktor Shklovsky (1990). Shklovsky wrote that the work of art is no more than a sum of devices – techniques – each aimed at influencing a particular feeling in readers (viewers, listeners, etc.). The arch-device is *ostranenie* – usually translated as estrangement (also: defamiliarization). Estrangement consists of showing a well-known, usual object from a new, unusual angle, thus making it as if new again.

Estrangement became the most famous device described by Shklovsky and his fellow literary critics – the Russian formalists – but it was not the only one. The others included wordplay, rhythm, rhyme, various plot constructions, including the prolonging mentioned by Poe. Art is all about using these devices, intensifying them, making them increasingly effective. Other parts of an artwork are somewhat secondary, wrote Shklovsky, and not essentially artistic. For Poe, the raven, the lover, and the tapping are secondary elements required only to introduce the main functional element: prolonging. Poe considered it *his* way of creating art. Shklovsky said: *all* of art works like this.

For Shklovsky, as well as for Poe, art is an emotion machine. It is a technology that can change our inner state of mind, direct our feelings. Such machines – a poem, a film, a song – can make you laugh or cry, make you feel curiosity, suspense, sadness, fear... Today, with the recent rise of empirical and neuro-aesthetics, we have ever the more reason to agree with Poe and Shklovsky: artworks do influence our psyche in predictable ways. Films, poems, and songs significantly influence various neurotransmitters, such as dopamine or norepinephrine, thus causing us to experience various emotions – usually pleasant ones (Salimpoor et al. 2011; Chanda & Levitin 2013; Skov 2010).

Devices, genres, plot schemes as... emotion machines. This idea opens new pathways for theorizing. If art is a machine, a technology, then, as any technology, it can be invented. Neither Poe nor Shklovsky pronounced this explicitly, but it can certainly be deduced from their writings. Later, it was developed by other scholars: for example, by sociologist of literature John Cawelti (1976). Cawelti studied “literary formulas”: stable combinations of devices that occur in multiple texts over decades or even centuries. He explicitly stated that formulas are invented and then reproduced by other authors. For example, he credited Charles Dickens for inventing the formula of “social melodrama” – by combining the elements of widespread melodramatic novels (multiple scandals, miraculous coincidences, a virtuous protagonist, moralism) with the depiction of social problems (poverty, crime). The genre that appeared as a result of this combination proved to be highly successful and was later reproduced by many authors.

We may continue the list of formal, or formulaic, inventions. For example, Poe himself can be credited for inventing several important formulas. He introduced key elements for what would later become the detective genre (in stories like “The Murders in the Rue Morgue”). His novel *The Narrative of Arthur Gordon Pym of Nantucket* became the model for Jules Verne, who developed it into the genre of the *roman scientifique* (Evans 2009: 16–17). And, of course, Poe’s horror stories: the forerunners of the American gothic genre, which began to thrive in the early twentieth century. In Chapter 3, I will argue that searching for a single mastermind inventor has serious flaws, and yet the idea of an artist-as-inventor is very useful and deserves to be stressed multiple times.

So, to summarize: art is a technology. As any technology, it has a function: to evoke positive emotions. As any technology, it consists of parts, devices. As any technology, it can be invented and reproduced.

Art as an emotion machine: this shall be our estranged definition of art.⁶

1.3. Forms Evolve

In Cawelti's book on literary formulas, we can find this line: "The process through which formulas develop, change, and give way to other formulas is a kind of *cultural evolution* with survival through audience selection" (Cawelti 1976: 20; italics added). A very similar line can be found in Franco Moretti's paper on literary evolution: "The slaughter of literature. And the butchers – readers: who read novel A (but not B, C, D, E, F, G, H, ...) and so keep A "alive" into the next generation, when other readers may keep it alive into the following one, and so on until eventually A becomes canonized." (Moretti 2000b: 209).

Both these scholars, who thought deeply about artistic forms, come to a similar conclusion: an audience's preferences have the same role for art as natural selection has for biology. The audience determines which forms are to survive and which forms are to go extinct. Mammoths became extinct as the climate warmed, and black and white movies were outlived by their color competitors – as they were more enjoyable for the audience. Extinction of the least interesting, least beautiful, least original...

"*A kind of* cultural evolution..." – says Cawelti. In 1976, he felt the need to add this uncertain "a kind of" as probably, back in the 1970s, the phrase "cultural evolution" sounded awkward. It was an uncertain step into a yet-to-be-discovered territory. Cawelti never really enters this territory, he only hints in its direction. Fortunately, today we do not need "a kind of": there exists a large

⁶ Of course, this is not the only possible way to define art. The question "what is art?" has a long history, and the answers are varied. Today, it is most actively discussed by literary Darwinists, many of whom suggest that art is a biological adaptation that emerged in the Paleolithic (e.g., see Carroll 2011). Many of their claims make sense: for example, the ability to tell stories – narrative capacity – clearly has a huge practical value. But is this art? Often, Darwinists narrow down the broad narrative capacity to a subset of narratives: imaginative, or fictional, ones. But, still, I don't think that this subsetting helps us grasp the essence of art. Many fictional narratives aren't artistic. Lies, schizophrenic hallucinations, or stories that are wrong unintentionally (e.g., false memories) are all fictional narratives.

Thus, I approach art from a different end: formalism. Essentially, art has little to do with narratives or imagination – though these three things frequently overlap. Art is a subset of cultural items (not necessarily narrative, and not necessarily fictional), with an "artistic" *add-on*. This add-on is a set of techniques, or devices, that provide a fairly direct access to emotions. This definition resembles two definitions of art, mentioned by the Darwinists: art as a by-product of evolution, and art as a technology (Davies 2012), which, I think, are essentially the same thing.

research field of Cultural Evolution, which aims to further develop the parallel with natural selection noticed by Cawelti, Moretti, and other scholars.

The theory of cultural evolution has grown out of such hints and metaphorical parallels. Those hints can be traced back to Darwin himself, who pointed out that “[t]he formation of different languages and of distinct species, and the proofs that both have been developed through a gradual process, are *curiously parallel*” (Darwin 1871, my italics). Today, however, cultural evolution is much more than curious parallels: it is a large field of research dealing with a wide range of topics – from archaeology and folkloristics to economics and musicology.

Cultural evolution aims to detect and explain regularities in cultural history. Regularities – trends, patterns, or even “laws” – are infrequent heroes in art scholarship. Traditionally, art has been studied in the *ideographic* way. Artworks were approached as unique phenomena. For example, art scholars might have explained why Michelangelo’s paintings are so compelling, or what the structure of Tolstoy’s *War and Peace* is. But in the vast majority of cases, they were not explaining harmony as such, nor were they explaining the general structure of the Russian novels of the late nineteenth century. That is, they were avoiding the *nomothetic* approach.

The distinction between ideographic and nomothetic approaches was suggested by German philosopher Wilhelm Windelband in 1894 (Lamiell 1998). Windelband’s distinction drew a line not only between two approaches to research, but also – almost accidentally – drew a border between the sciences and the humanities. Sciences are nomothetic, they look for patterns and laws; humanities are ideographic, they study Shakespeare.⁷ Art research is situated at the extreme pole of the ideographic approach: the most humanitarian of all the humanities. Until recently, scientific methods (quantitative data analysis, experiments) and scientific theories (seeking for general patterns, or even “laws”) were mostly absent from art research (see Gottschall 2008 for a review).

But times have changed. Progress in the scientific neighbors of the humanities – cognitive science, neuroscience, anthropology, humanities computing – has narrowed the gap between the ideographic and the nomothetic. Narrowed it so much that it is now possible to build bridges. And one of those bridges is called cultural evolution.

Cultural evolution in its modern form descends from several pioneering books: *Cultural Transmission and Evolution* (1981) by Cavalli-Sforza and Feldman, *Culture and the Evolutionary Process* (1985) by Boyd and Richerson, and *Explaining Culture: A Naturalistic Approach* (1996) by Dan Sperber. There are many differences between them: for example, the first two are full of mathematical models, while the latter does not have any. However, they share an underlying idea: in addition to the ideographic humanities, we need a nomo-

⁷ Since Windelband, there have been numerous attempts to redraw the border. Some were successful, such as the quantitative history of the Annales school (especially in its Braudel’s version). Others were not, such as literary structuralism.

thetic approach to culture, and this approach can borrow a lot from biology. Biology already has a well-developed theory of history – evolution – and so it can be useful for studying culture’s diachrony.

Such a nomothetic approach would allow us to see things still virtually unseen: the patterns of culture. The tectonic shifts that usually escape the human eye. The human mind is good at conceiving individual objects (a painting, a book, a song) as they can be consumed in their entirety; but the human mind is bad at distinguishing large patterns. We know culture’s highest achievements, its peaks towering above the culture’s landscape – “The Raven,” *Guernica*, *Citizen Kane* – but we do not know culture’s valleys and rivers, its islands and continents. Why is the genre of the detective novel so long-lived, while silver fork novels existed for merely three decades? Why are most popular music pieces songs? Are most films today book adaptations? How, when, and why do certain styles dominate the artistic market? The patterns of culture...

These patterns are yet to be discovered. Others, however, are better known – for example, the patterns in Figure 3. The scholars of cultural evolution have discovered that some cultural phenomena evolve in the same tree-like manner as many biological species. They evolve mostly by branching, and so, to study them, we can use the same methods as those for studying biological evolution. For example, by comparing the traits of Paleolithic arrowheads, a cultural evolutionist can establish which arrowheads branched out from where, which ones evolved earlier and which are more recent (O’Brien et al. 2001). The same has been done with languages (Gray et al. 2009; Greenhill et al. 2017), folktales (da Silva & Tehrani 2016; Tehrani 2013), traditional weaving cultures (Buckley & Boudot 2017), supernatural beliefs (Watts et al. 2015), or kinship terminology (Guillon & Mace 2016).

Now, can such phylogenetic trees be built for novels, films, or paintings? The existing phylogenetic trees were built for such cultural phenomena that evolve relatively slowly: languages, traditional beliefs... Those are, to a large extent, “inherited” by children from their parents – very much like genes – and so using phylogenetic models here is justifiable.⁸ But would they be equally justified for more recent cultural phenomena? American TV sitcoms are probably evolving much faster than the English language spoken by its characters. Also, in this case, speaking of “parents” and “children” would be a stretch. So, would tree models of evolution be useful for studying contemporary arts? And a more general question: Would evolution theory as such be useful for the arts?

The rest of this thesis is one long argument supporting this statement: the scholars of literature, film, or visual arts will benefit from cultural evolution. However, I will also stress that evolution in the artistic domain may be quite different from evolution elsewhere. Remembering the specificity of art is crucial to the proper application of cultural evolution theory.

⁸ At the same time, many elements in traditions and languages are learnt not from parents but from peers. Still, it was shown experimentally that such instances don’t pose a big problem for studying linguistic evolution with phylogenetic trees (Currie et al. 2010; Greenhill et al. 2009).

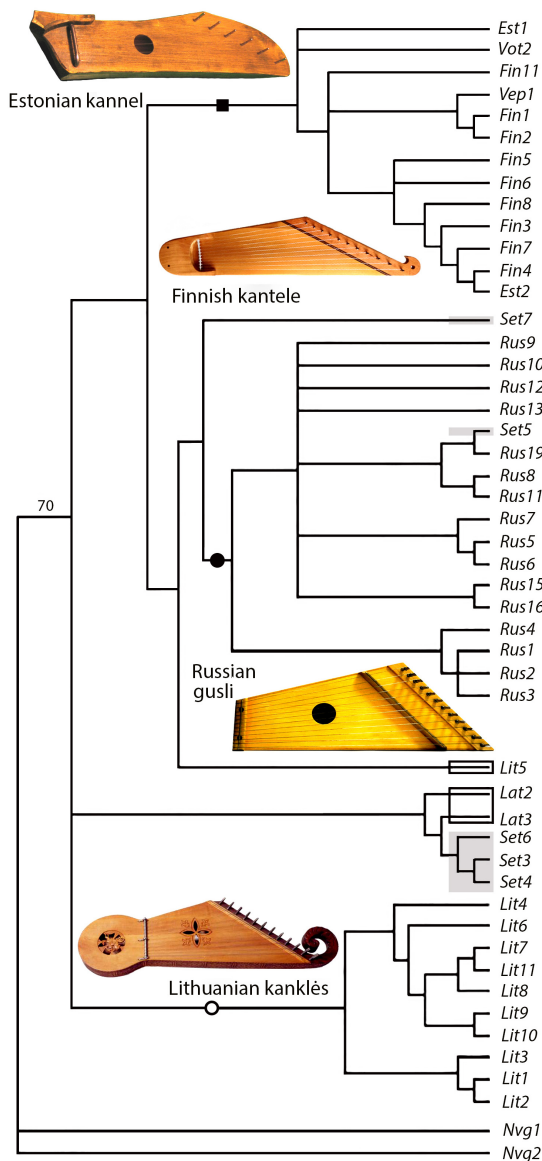


Figure 3. A tree of the Baltic psaltery. Phylogenetic methods, adopted from evolutionary biology, allowed Tëmkin & Eldredge (2007) to reconstruct “family relationships” between various forms of this music instrument. To construct the tree, each instrument was presented as a combination of 59 traits (e.g., size, design of the soundhole, etc.). If two instruments share many traits, they will be placed close to one another on the tree. The tree is a hypothesis about the history of psaltery, possible borrowings between the different traditions, and common ancestors (also see Tëmkin 2004).

Finally, before we take off, a few words about the structure of this thesis:

Chapters 2 and 3 discuss the growth of variation in art. How are new artistic forms invented? What are the necessary criteria for quickening this process? How is invention in art different from invention in other cultural domains? And are there any consequences of this difference?

Chapter 4 discusses how, after being invented, some artistic forms become successful – sometimes even canonical – while others (in fact, the majority) fail. What are the mechanisms of cultural selection of artforms? Are they selected

because we “like” them (cognitive factors) or because there are appropriate social conditions (social factors)? Or, maybe, is it just luck?

Chapters 5 and 6 are built on top of the theoretical framework of Chapters 2–4. They demonstrate how (the essay of) a theory of artistic evolution can help us better understand certain episodes in art history. Chapter 5 is about one specific device used in novels: dialogue. It is a quantitative study based on a corpus of Russian novels from the nineteenth century. Chapter 6 investigates another specific device: flashbacks and flashforwards in American films. However, these are not typical case studies; they too arrive at broader observations of art evolution.

2. CHANCE

1827. A new form of literature, the novel, is quickly spreading across Europe. In each country it appears, it immediately becomes popular – more exciting and more immersing than any other literary form of the time. Early bestsellers (usually gothic or historical novels) are produced in England or France and then disseminate throughout the continent. At first as translations, but later, even more importantly, they inspire replicas: Spanish and Italian historical novels, German and Austrian gothic. Replicas – this weird form of creativity where you don't know exactly what you are dealing with: *new* novels, but borrowed, known forms.

So, this is the picture – but only of western and central Europe. On the eastern periphery, in the Russian Empire, the situation is different. It has already been covered by a wave of translations: the intelligent audience in Moscow and St. Petersburg passionately reads Walter Scott and Ann Radcliffe (both in French) – but there are almost no attempts to write anything similar. At first glance, strange. Doesn't Russia – the land that will produce Ivan Turgenev, Fyodor Dostoevsky, and Leo Tolstoy – have enough literary power to compete with foreign invaders for its own readers?

Apparently, in 1827, it doesn't. It already has some accomplishments in Romantic poetry, but not in prose. The Russian market of the novel is stuffed with translations, not with replicas. Thus, the question: how come in some forty years – which is not a long time for cultural history – there will appear *War and Peace* and *Crime and Punishment*? Two texts that far exceed the status of local replicas, but, on the contrary, constitute some of the best achievements of *world* literature. How does it happen that the Russian community of writers will manage to change the distribution of powers in literary Europe so quickly? We should resist the temptation to explain it simply as individual talent. This would work if we had one or two geniuses, but that is not the case here: Nikolai Gogol, Ivan Goncharov, Nikolai Leskov, Nikolai Chernyshevsky – a large cohort of writers who not only managed to win back the local market, but also, in many cases, to sell their bestsellers abroad? "Individual talent" means exception, but our case is not an exception. It is a pattern.

This chapter aims to give a likely explanation of this pattern. I will sketch out a hypothesis: why the development of the novel in Russia was so rapid and versatile. However, my overall goal is more general – to approach the questions: How do formal innovations in literature happen in the first place? What are the necessary conditions for a formal development, and, in particular, for a *rapid* development, such as the one that happened in Russia? Russian literature will be a convenient example, but the task will be more abstract. Creative explosions – or adaptive radiations – are an essential part of the evolution theory in biology, but for cultural evolution they may be even more important. And especially important – for literature, as most canons are built on the remnants of such creative outbursts.

So, let's start from the beginning – at the outset of a formal explosion.

2.1. A Literary Invention

1827, Russia. Alexander Pushkin, the greatest Russian poet who helped introduce Romanticism in Russia, comes to a realization: poetry is on the decline, prose is on the rise. Particularly, this new kind of prose: the novel. Having made one important innovation in poetry, Pushkin intends to make another – to become a premiere Russian novelist. In fact, he seems to be a suitable candidate for this task. Pushkin is used to writing large texts – his long narrative poems and versed tales have already earned him fame. After all, his most famous poem *Eugene Onegin*, completed in 1825, has the subtitle: “a *novel* in verse.” Writing a novel in prose appears to be even easier to him: one is not restricted by the narrow bounds of rhyme and rhythm.

However, Pushkin doesn’t simply want to create a Russian replica of Walter Scott or comparable western belletrists – something that will be done in several years by his literary competitors, with considerable success.⁹ Pushkin is more ambitious: he wants to create a *new* type of novel. This novelty consists of a feature that will distinguish his work from the rest of the prose writers he knows. Pushkin wants his narration to be “objective,” similar to scholarly historical writing. This objectivity, for Pushkin, consists of shifting perspective. All the novels he knows are told through a narrator’s “mask,” a visible figure of the storyteller, who often has a name, a biography, and sometimes playfully addresses the reader, as explains the narrator of *Ivanhoe* (Scott 2008[1820]): “But it would be cruel to put the reader to the pain of perusing the remainder of this description...” Most of the acclaimed writers of the time – E. T. A. Hoffman, Washington Irving, Walter Scott – exploit this technique. Pushkin created similar narrators in his long poems, but he doesn’t want them to become a part of his novels. Using narratological terminology, we can say that he wanted to create a depersonalized, omniscient narrator. Now we know that it was indeed a brilliant idea: some ten years later, this narrative device – omniscience – will truly revolutionize literature. But in 1827, it is a risky, uncertain path.

With this novelty in mind – “objective” narration – Pushkin makes his first serious attempt to write a historical novel, to which he does not give a title, but which will be later known as *Peter the Great’s Moor*. The prototype of the main character is Pushkin’s great-grandfather Abram Gannibal, who was brought to Russia from Africa in early childhood. Pushkin manages to write only a small part of the intended novel. There are many possible reasons why the text remains incomplete, but one seems quite probable: he does not succeed in making the novel as good as he intended. The “objective” style is there, but, apparently, it is not enough to make a good novel. Having killed the storyteller, Pushkin does not substitute this figure with anyone else. A viable alternative would be to create lively, persuasive character figures, but Pushkin’s characters do not resemble lively human beings, which is regrettable, since liveliness is exactly

⁹ Here I mean authors such as Nikolai Zagoskin, Ivan Lazhechnikov, or Rafail Zotov.

the feature Pushkin admires so much. His thoughts about Shakespeare's characters:

Characters created by Shakespeare are not, as Molière's, types exemplifying some passion or vice, but living beings, compacted of many passions and many vices; and circumstances unfold to the spectators their varied, many-sided personalities. Molière's Miser is misery – and that is all; Shakespeare's Shylock is misery, resourceful, vindictive, a fond father, witty. Molière's Hypocrite trails after his patron's wife – hypocritically; takes on the care of the estate – hypocritically; asks for a glass of water – hypocritically. Shakespeare's hypocrite pronounces judgment with proud severity but with equity; he justifies his cruelty with the thoughtful arguments of a statesman; he seduces innocence with irresistibly beguiling sophisms, and not by some ludicrous combination of piety and flirtation. (Cited in Wolff 1998: 464–465)

Pushkin's own characters are far from this standard. How so? One of the biggest problems is their speech: it is too concise and it does not reflect their individuality or differentiate their speech from the narrator's. To make the situation worse, the protagonist – the moor – barely speaks at all, pronouncing only snippets of dialogue here and there. *Peter the Great's Moor* is a failure. During the next three years, Pushkin attempts several times to write different novels – with similar results. Creating a novel with an omniscient narrator isn't too complicated, but filling it with interesting characters is a problem.

Let's stop for a minute. Omniscient narrator, "objective" style – what could be simpler? From the mid-nineteenth century onwards, this will become the *default* style, the *default* type of narrator. The simplest and most widespread kind of writing. Isn't it strange that the greatest mind in the history of Russian literature fails to use it? He is well-read, an experienced writer, and undoubtedly talented – or even genius. And now – this simple obstacle...

Simple, yet so overwhelming that at a certain point, in 1831, Pushkin even drops the idea of "objective" narrative entirely and does exactly the opposite. He creates a cycle of five short stories titled *The Tales of the Late Ivan Petrovich Belkin*, which are written in a short time, meant as a joke, and published not even under Pushkin's full name, only his initials. *Tales* are a parody of the type of narrative Pushkin wants to avoid – with a visible narrating figure, telling his subjective experience to the "dear reader." As if trying to pull this device of a narrator's mask *ad absurdum*, Pushkin multiplies his imaginary narrators: an anonymous "publisher", Belkin himself, first person narrators in some of the stories, and, moreover character narrators in the embedded stories. In the terminology of Russian formalists, Pushkin lays the device bare – he uses it so often that it becomes visible, or even banal.

For us, *The Belkin Tales* are interesting not by themselves, but for what came after them. After writing these tales, Pushkin finally succeeded in making a good third-person story: *The Queen of Spades*. It was a success – not only in Russia – and became one of the first Russian prose writings translated into

many foreign languages. How to explain this? Here is a clever guess by Paul Debreczeni:

Carrying the narration by means of several different storytellers in *The Belkin Tales* meant endowing each of them with speech characteristics, which was almost equal to creating characters. In this case, working on the *Tales*, Pushkin acquired an excellent experience. In the following works Pushkin only had to use it in a different way, endowing with the speech characteristics not the storytellers but the characters and creating at the same time a new, faceless storyteller, whose task would be limited to setting the scenery for the action. (Debreczeni 1983: 156)

So, in *The Belkin Tales*, Pushkin split one first-person narrator into several first-person narrators. The next step was simple: to transform his subjective narrators into characters. In *The Queen of Spades*, he did exactly that, finally managing to make his characters speak individual, distinct voices.¹⁰

Pushkin found the solution to his problem not where he was looking for it. He did it almost accidentally, while playing around with literary forms, not intending for anything serious. The next step was just to realize the importance of this finding and to make the best use of it. Accidents in literature – this topic is almost uninvestigated.¹¹ How many literary forms – tropes, motives, genres – were discovered by chance? And how many of them would we agree to treat as results of such fortunate accidents?

2.2 The Evolutionary Logic of Discovery

The role of chance is much better realized in the history of science than in the history of literature. According to the economic historian Joel Mokyr (2004), most discoveries before the Industrial Revolution were accidental, and there is enough evidence to think that even after 1800, lucky accidents – or “serendipities” – continued to play an important role. Alexander Fleming discovered penicillin by accident while experimenting with the influenza virus. Wilhelm Röntgen found X-rays by luck: he noticed an unusual glow in his lab during his experiments with cathode ray tubes. More recently, Andrei Geim and Konstantin Novoselov discovered a radically new material with unusual properties – graphene – by playing with Scotch tape; they intended to test something completely different – whether graphite could be used as a transistor. Giacomo

¹⁰ I gave the example of Pushkin’s invention to illustrate how new ideas can appear in arts: by a lucky coincidence. I don’t mean, however, that Pushkin is *the* inventor of the third-person psychological narration, globally. He dealt with a specific problem: the lack of such narration in the *Russian* prose. Simultaneously, similar inventions were made by the authors in England and France. The problem of multiple inventions is an interesting one – and it’s yet to be applied to art history (see Ogburn & Thomas 1922).

¹¹ As usual, there are some good exceptions, such as the books by Yuri Lotman (2009; 2013).

Rizzolatti and his team accidentally discovered mirror neurons while studying motor neurons in monkeys; one of the experimenters took an object (food), and the monkey's neurons responsible for grasping objects were suddenly activated by simply observing the experimenter's action.

This list could be continued,¹² but the idea is clear now: sometimes an accident or an error can play a crucial role in a scientific breakthrough.

Sometimes? According to Donald T. Campbell, the founder of evolutionary epistemology, this happens *every time*: "A blind-variation-and-selective-retention process is fundamental to all inductive achievements, to all genuine increases in knowledge, to all increases in fit of system to environment" (Campbell 1960: 380). For Campbell, creativity in science, as well as in any other domain, is the result of a trial-and-error process, which is blind. "Blind" here does not mean "random"; it means that in any act of true creativity, there is a moment when the best solution is unknown, and the only option for the inventor (be it scientist, writer, engineer, composer, etc.) is to try it. These trials can be unintentional – as in the case of Rizzolatti: he had not even previously had the idea that one should test motor neurons to observe an action. Or, they can be planned, as is typical of chemistry, where hundreds of various combinations of chemicals are simply tried out one by one in the hope that at least some of them will result in a potentially useful substance. What unites both cases is the absence of *foresight* in the discovery.

This lack of foresight in cultural inventions makes them similar to "inventions" in nature. New biological variants appear as genetic mutations or recombinations – without any prior idea that some new feature would increase an organism's fitness to the environment, that the new trait would provide better chances for survival. For Campbell, this was not the only thing that makes cultural creativity like creativity in nature – he considered the whole process to be evolutionary in its essence, operating according to the main principles postulated by Charles Darwin. Dean K. Simonton, one of Campbell's followers, gives a neat summary of these principles:

1. There exists some process that generates variations. Just as biological evolution must begin with numerous genetic recombinations and mutations, so must creativity begin with the production of many diverse ideational variants.
2. These variations are subjected to some consistent selection mechanism. For biological evolution the fitness of variants is decided by natural or sexual selection. In the case of human creativity, the selectors are more likely to be cognitive or cultural in nature.
3. There is some retention procedure that preserves and reproduces the variations so selected. Where natural evolution retains and propagates the best genes through biological inheritance, the mental evolution that produces creative ideas requires a memory system, plus an ability to communicate the stored ideas to others. (Simonton 1999a: 26–27)

¹² Many more examples can be found in Roberts (1989).

Variation, selection, retention – the three cornerstones of evolution. Let’s take scientific discovery as an example: at first, scholars produce new ideas, theories, and concepts, the most radical and revolutionary of which occur without any foresight – either as mistakes or otherwise (which will be discussed later). Secondly, scholars test the validity of these ideas with experiments; in other words, experimentation works as an equivalent of natural selection, helping to choose the best hypotheses and thus transform them into new knowledge. Finally, scholars preserve these results and transmit them further – as papers at conferences, journal articles, chapters in collective monographs, and so on.¹³ Popper:

The growth of our knowledge is the result of a process closely resembling what Darwin called “natural selection”; that is, the natural selection of hypotheses: our knowledge consists, at every moment, of those hypotheses which have shown their (comparative) fitness by surviving so far in their struggle for existence; a competitive struggle which eliminates those hypotheses which are unfit. (Popper 1979: 261)

“The growth of our knowledge” – says Popper; “all genuine increases in knowledge” – says Campbell. Both are interested in the growth of *scientific* knowledge, but they certainly don’t mean that their Darwinian model works only in science. Can we take this model from science and use it to explain literature? I think this is not only what we can do, but what we should do, and justifying this claim will be the task of all the following pages of this dissertation. But the task of this chapter is smaller: to provide some initial evidence for the first of three evolutionary principles: inventions and discoveries in literature resulting from chance, luck, or fortunate coincidence. New literary devices that emerge almost by themselves – often without an author’s plan or intention. By taking this perspective, we get rid of writers-as-demiurges, and, instead, get writers-as-inventors who devise new literary

¹³ Evolutionary epistemology finds support in psychology. First, it is supported by dual-process theories, such as the one suggested by Daniel Kahneman (2011). Kahneman distinguishes between the two “systems” in the brain: processes in System 1 are quick, unconscious, and involuntary; processes in System 2 are slow, based on logic and language. System 1 is evolutionarily old and is present also in other animals; System 2 is much younger and present only in humans. Speaking of creativity, System 1 helps make new (often – chaotic) associations between the concepts, while System 2 works as a selection mechanism that filters sensible ideas out of the pool of these associations (for a general review of dual-process theories see Kaufman 2011). Another psychological model that supports an evolutionary approach to creativity is the Geneplore model suggested by Ward et al. (1995; 1999). According to it, a creative process has two stages: the generative stage during which an individual forms associations based on memory or observable objects at hand, and the exploratory stage, when an individual evaluates these associations. In both cases – in dual-process theories and the Geneplore model – one part works as a mechanism of producing variation, and another part works as a mechanism of selection.

“technologies.” Sometimes due to hard work, but sometimes simply due to a lucky insight from the right book at the right moment.

Pushkin found the new type of novel accidentally: having a vague initial idea of how it should look, but not knowing where his work with prose would bring him. And the examples of similar accidental discoveries in literature – as in science – are numerous. Let me give several more.

According to Yuri Lotman, the structure of Pushkin’s *Eugene Onegin* – his most famous text – was also formed by chance:

While working on the first chapter [of *Eugene Onegin*], Pushkin did not plan at all to continue it, expecting to confine himself to “excerpts from a novel” (as he did with *The Robber Brothers* – “excerpts from a poem”). The creation of the novel and its publication as separate chapters, often – with large intervals between them, was influenced by the biographical circumstances, in the course of which the author’s plan was changing. Having finished the sixth chapter, Pushkin supposed that he had completed the first part of the novel, that is, he expected to write approximately the same number of chapters... Instead, Pushkin abruptly breaks the novel on the eighth chapter, which had partly become a surprise to himself. Nevertheless, the novel in this form became a factor that not only changed drastically the situation in the subsequent Russian literature, but also defined much of the future fortunes of Russian intelligentsia, and, thus, Russia as a whole. (Lotman 2002[1989]: 130)

What is described here by Lotman is the role of chance in the history of a particular literary text – one of the most canonical texts in Russian literature. But for us it would be more interesting to observe a role of chance in the emergence of some general regularities in literature, such as genres.

Here is what Franco Moretti writes about Arthur Conan Doyle and his discovery of clues – the game-changing device in the genre of detective fiction:

During a paradigm shift no one knows what will work and what won’t ... [Conan Doyle] proceeds by trial and error, making fewer errors early on, when the problems are simpler – and more errors later, when they are more complex. It makes perfect sense. And as for finding a great device and not recognizing it, the same thing happened to Dujardin, in the same years, with the stream of consciousness: he found it, and he immediately lost it. And the reason that he and Conan Doyle didn’t recognize their discoveries is simple: they were not looking for them. They found them by chance, and never really understood what they had found. (Moretti 2000b: 215)

Moretti’s quantitative study nicely demonstrates this unexpected finding: although Conan Doyle discovers the clues, that is, some pieces of information based on which a reader potentially can identify a criminal himself, most of his stories still don’t contain any clues. And only a small number of stories do have the possibility of readers’ participation in the detection.

One more example of the unintentional invention of a device crucial to a particular genre is Herbert Wells and the genre of “scientific romance.” Prior to

becoming the father of modern science fiction, Wells was interested in something different. One of his early intentions was to write a plausible story about the future evolution of life on Earth. He made two attempts: an early short story "The Chronic Argonauts" and the essay "The Man of the Year Million." Both texts described how humans would evolve in the future, but both texts also had a serious flaw: they lacked a proper explanatory mechanism as to how the narrator got his knowledge about the future. To fill this gap, Wells started looking for a way to explain the time travel and subsequently came up with the idea of a time machine. For Wells, the time machine had a subordinate function – it was the scaffolding meant to help build something "more important." However, for literary evolution this scaffolding appeared to be much more valuable than the building itself:

Wells's time machine became the first of a series of facilitating devices that opened up the farther reaches of time and space to a kind of rational enquiry that had previously been severely handicapped by its reliance on obsolete narrative frameworks. The crucial invention of *The Time Machine* [1895] was the establishment of a paradigm example of a whole new class of narrative devices. The antigravity technology of Cavorite, employed by Wells in *The First Men in the Moon* (1901), was the most obvious equivalent of the time machine and its most necessary supplement. The publication dates of these two works defined the brief interval in which Wells produced all his important scientific romances; not only did he never use the time machine or Cavorite again but he never invented or used any significant facilitating device after 1901. (Stableford 2003: 24)

As with serendipitous scientific discoveries and inventions, the list of literary inventions is inexhaustible. However, truth be told, with literary "discoveries" it is somewhat more complicated. We are not accustomed to considering writers as inventors, and therefore, we often don't notice their inventions. Dickens is usually regarded not as the inventor of the genre of social melodrama, which brought him fame, money, and centrality in the British literary field (Cawelti 1976: 268), but as the author of *Dombey and Son*, *David Copperfield*, *Little Dorrit*, *Great Expectations*... That is, not as the creator of a *general* principle, but as the creator of *unique* texts. And this uniqueness of texts is usually regarded as justification for the uniqueness of their creator. But what about a different perspective: a successful writer as the inventor of an important new principle, a new literary tool? Pushkin as the inventor of the omniscient narrative in Russia, Doyle as the creator of clues, Wells as the inventor of "scientific romance"... And, as will be later claimed, it is this *invention of a general principle* (a device, genre, plot formula) that makes them truly unique.

Having said this, I should stress two things. First, I do not mean that chance played an equally important role in all literary texts. "All genuine increases of knowledge" – this was Campbell's formulation, and we certainly cannot say that all literary texts are genuinely creative. Quite the contrary, the majority are based on well-known formal structures. Herbert Wells and Conan Doyle are

prominent literary inventors, while most other writers aren't. Not all inventions are equal. Some are sudden breakthroughs, while others are minor improvements: more predictable, less revolutionary. Breakthrough inventions, like the genre-defining inventions made by Wells or Conan Doyle, resemble what the sociologist Niklas Luhmann called "evolutionary advances" – sudden increases in complexity, which often weren't sought:

We need not dispute that solutions to problems can be purposively sought. But far-reaching evolutionary advances mostly do not come about in this manner. Discoveries are often made, evolutionary advances often develop under false or peculiar perspectives ... Evolutionary advances accordingly do not come about because they are suitable for solving certain problems. The problems arise with the advances. Only when there is magic does one see what it can be used for. Only when municipal offices are established to get rid of kings does filling them have to be politicized and do conditions have to be created that will later be celebrated as "democracy." (Luhmann 2012: 307)

Evolutionary advances depend on chance, but not all inventions are advances. More on this – in Chapter 3.

Second, I certainly do not mean that those writers who actually made these big discoveries in literature were just lucky and played no active part in them. Campbell was particularly clear here: his evolutionary epistemology does not "deny individual differences in creative intellect. Indeed, the blind-variation-and-selective retention model of creative thought predicts such talent differences along all of the parameters of the process" (Campbell 1960: 391).

How could it be? On the one hand, we have chance and coincidence, on the other – talent. Isn't this a contradiction?

2.3. Creativity Pumps

To answer this question, we must look more closely at how discoveries in science happen. Of course, chance plays an important role, but usually fortunate insights occur not to a grocery store worker, but to a scholar in the lab. "Chance favors only the prepared mind" – says Louis Pasteur in his famous quote. Or, a similar thought by Kevin Dunbar and Jonathan Fugelsang, but put more broadly:

[...] rather than being the victims of the unexpected, [scientists] create opportunities for unexpected events to occur, and once these events do occur, they have specific reasoning strategies for determining which of these events will be a clue to a new discovery. [...] Scientists are not passive recipients of the unexpected; rather, they actively create the conditions for discovering the unexpected and have a robust mental toolkit that makes discovery possible. (Dunbar & Fugelsang 2005: 74)

So scientists do need "the unexpected" to make a discovery, which means: there is no foresight, the creative process is blind. However, one may intentionally

create the conditions that increase chances for a discovery to happen. In some sense, scientists organize a situation around themselves that resembles a mutagen, or, they intentionally bring themselves to a mutagen: they don't know what is going to happen, but they hope for the best. To illustrate this idea further, let me make a crude but illustrative metaphor. One cannot control the mutations that happen in one's genome. However, if you really want to, you may go to some radioactive place and try your luck – to quicken the process. This is what scientists do: they create specific conditions in their brains and their environment for a cultural mutation to happen. Mutations themselves, however, do not obey human will. They obey probability theory.

But if we put crude metaphors aside, what are the conditions that quicken mutations? Or, to put it more generally, how do we make our system (an individual, a lab, a scholarly circle) more creative? To answer this, we should return to the three principles described by Darwin and adapted by Campbell: variation, selection and reproduction. Modifying any of these parameters would make a difference, increasing or decreasing the creativity of the system.

For now, I will discuss only one such process: the increase of variation leading to more creativity. Campbell: “[...] thinkers can differ in the number and range of variations in thought trials produced. The more numerous and the more varied such trials, the greater the chance of success” (Campbell 1960: 391). So, quantity and diversity. With quantity, it is simple: creative persons just have to be passionate about what they do – even obsessed – so that they can attempt more often to produce a genuine innovation. With diversity, it is somewhat more complex. Being diverse does not mean simply doing “different things.” Different, yes, but this difference requires a balance: a step to the left, and the different thing you are doing becomes a hobby – interesting, but useless; a step to the right – and you fall back to the narrow domain of your “expertise.” Somewhere in between lies what we are interested in: different activities that are distinct and similar at the same time. Howard E. Gruber gave a name to this pattern of activities – a *network of enterprise*:

I use the term “enterprise” to cover groups of activities extended in time and embracing other activities such as projects, problems, and tasks. Commitment to an enterprise is exhibited by the recurrent reappearance of activities belonging to it. [...] Enterprises rarely if ever occur singly in a creative scientific life. [...] A common pattern in creative work is this *simultaneity* of enterprises. The creative person is often engaged in more than one enterprise at a time. [...] A second feature that a network of enterprise reveals is *continuity*. By organizing the work into distinct enterprises, it becomes possible to put tasks aside and resume them without always starting from scratch. (Gruber & Bödeker 2005: 89, 55; my emphasis)

A good example of the network of enterprise is the scientific career of Charles Darwin. The theory of evolution was not his only strand of inquiry. Instead, Darwin was working on at least four different (but similar) directions: geology, zoology, psychology, and botany. His contributions include a theory of coral

reef formation, investigations of animal emotions, and the discovery of co-evolution of plants and insects. Another well-studied network of enterprise is that of Jean Piaget, which consists of at least ten distinct activities: natural history, sociology, epistemology, ontology, logic, biology, education, and others. It wouldn't be hard to make this list of thinkers with many interests much longer – including the scholars from the humanities too. Viktor Shklovsky, Roland Barthes, Umberto Eco are some of the most innovative thinkers, and some of the most versatile at the same time.

But why would networks of enterprise foster creativity? Are these different activities simply a way to “put eggs in different baskets?” It turns out that everything is more complicated. The network operates as a mechanism, or heuristic, for creating unexpected combinations of ideas – enabling a connection of concepts that don't logically imply one another. Eco: semiotics helps to create a new, “postmodern” type of novel. Barthes: obscure Hjelmslevian linguistics gives rise to a radically new field of literary studies – narratology. Shklovsky: avant-garde poetry merges with literary criticism to give rise to the theory of literature. Gruber and Bödeker, again:

Resuming work on an enterprise after a lapse means that the fruits of work gained from other enterprises can be applied to the work at hand; techniques learned or refined, or knowledge acquired in one enterprise can be put to use in another. Another way of looking at patterns of interrelationships of this kind is to see them as *a web of interruption and resumption*, such that a task or project undertaken in one enterprise becomes an interruption in another. Seen in this way, the interruption itself eventually moves the creator to resume work in the interrupted enterprise. (Gruber & Bödeker 2005: 89; my emphasis)

So, in a sense, the network of enterprise stands in a line of many other culturally developed techniques aimed to enhance certain cognitive processes. As the method of loci is a technique to enhance memorization, the network of enterprise is a technique to enhance creativity. Technique: that is, a culturally developed way to cope with – human – nature. The better organized it is, balancing between rigidity and chaos, the higher the chances that a new idea will appear somewhere on the intersections of the nodes of this network.

Now, on to literature. If my assumption is correct – that literary creativity does resemble creativity in science or engineering – then we should find some networks of enterprise here too. In fact, there has been little research done on literary inventions, where Gruber's terminology would be used. However, this kind of interconnected versatility, which may be called network of enterprise or otherwise, can be found in many writers.

Edgar Allan Poe, this Edison of literature, was working on many fields – literary criticism, poetry, short story writing, etc. – and managed to make an enormous amount of big discoveries, becoming the founding father of a particular strand of science fiction, the precursor of the classical detective story, the first representative of symbolism, and one of the strongest influencers of

modern horror fiction. Pushkin is another good example of how a diverse network of enterprise results in creative inventions. His network included poetry, drama, historical writings, prose... And it was organized exactly in the way described by Gruber – as the web of interruption and resumption. Stuck with his first novel, Pushkin switched his attention to other subjects: he wrote historical nonfiction, long narrative poems, and, finally, his parody short stories. On the one hand, all these activities were valuable in themselves, and some have become true masterpieces, but at the same time, one of these “interrupting” activities helped Pushkin to find the missing component of his novel – lively characters having their own distinct voices. So Pushkin managed to invent a new type of prose through a kind of backdoor. He made several attempts to write “proper” prose and then, when finally exhausted with the attempt, turned to writing completely “improper” fiction. But, paradoxically, this was exactly what worked out! “Improper” fiction was the node on his network of enterprise that pushed him to his discovery. Unexpected, but also impossible (or highly unlikely) without the network itself.

There is no contradiction between chance and individual qualities (talent, effort, etc.). A discovery does happen by lucky coincidence, but very often we can also find a mechanism that increases the chances for this coincidence to happen. And in many cases, this mechanism turns out to be a network.

2.4. Networks

Creating a network – this is how one can increase the chances for creative ideas to appear. But not only at the level of an individual – the same principle may also work at the level of a social group: a handful of like-minded colleagues, a cluster of neighboring cities, a tight network of countries... Simonton:

Creative individuals are most likely to appear when a multiethnic civilization is fragmented into a large number of separate nations, which would presumably enhance the cultural heterogeneity while permitting cross-fertilization of ideas. The city-states of the Greek Golden Age and the Italian Renaissance offer typical instances. (Simonton 1999b: 317)

Heterogeneity and cross-fertilization – aren’t these the two features of the networks of enterprise? And these are two features that make society as a whole more creative. Classical Greece was a true creative explosion, probably the most important outburst of creativity in the history of human civilization. And the important question here is *why* did it happen in that particular time and place? One explanation would be that it was a coincidence – it occurred simply because there happened to be more talented people there than elsewhere. Another much more viable explanation: that region had social structures in place more conducive to a rapid cultural evolution. And that structure may have been a network.

Network as a creativity pump – can we find historical support for this idea? Classical Greece and the Renaissance are two good examples, but we need more evidence. Let’s look for more similar examples.

Moretti explains the reasons for European domination in literature, which began around the sixteenth century, according to the geographical properties of the continent itself:

Europe doesn’t simply offer “more” space than any nation state, but especially a different space: discontinuous, fractured, the European space functions as a sort of archipelago of (national) sub-spaces, each of them specializing in one formal variation. If seen “from within”, and in isolation, these national spaces may well appear hostile to variations; they “fix” on one form, and don’t tolerate alternatives. But if seen “from the outside”, and as parts of a continental system, the same nation states act as the carriers of variations. (Moretti 2013a: 12–13)

Europe as archipelago – that is, Europe as *network*. Contrary to contemporary China, Europe allowed different literary forms to develop within separate nation states, and the best achievements of these separate literary traditions always had an opportunity to be exchanged with other states.

Joel Mokyr is interested in another kind of domination – economic. For him, the Industrial Revolution, which occurred around 1790–1840, was the creative explosion that played a crucial role in the future economic domination of Europe over the rest of the world. And the main question here is, again: why Europe? What was so special about these territories that many crucial inventions were made or successfully implemented there, leading to bigger economic power and prosperity? For Mokyr (2017), this snowball of inventions in Britain and other European countries was due to two phenomena that happened earlier and created the preconditions for the Industrial Revolution. One, already stated by Moretti, was the political fragmentation of Europe. Small states (if compared to China or Russia) were put into situations where they had to compete at the international “market of ideas.” Another crucial phenomenon was the “Republic of Letters,” which emerged in the late seventeenth century. This was an international community of thinkers who corresponded with each other, exchanging, among other things, information about their discoveries and inventions. These two counter-forces: division by state borders, and connection by correspondence enabled the cascade of inventions, the first stage of which was the Industrial Revolution, and the later stages of which we experience nowadays.

Finally, the macrosociologist Randall Collins, explains creative explosions in philosophy:

“Golden Ages” of widespread creative outbursts occur in a distinctive *network pattern*: where several rival circles intersect at a few metropolises. This pattern is found world-wide, in ancient Athens and Alexandria for Greek philosophy, as in medieval Baghdad and Basra at the height of Islamic philosophy, or at the great monastery-university Nalanda in medieval India where the several Buddhist sects debated their Hindu counterparts; similar patterns are found for the multiple

schools at Kyoto and Edo in the efflorescence of Tokugawa Japan, and again at the creative moments in the European West. Conversely, structural extremes are deadly for philosophical creativity: concentration of all resources in a single faction stifles innovation; so does dispersion of intellectual life into a large number of centers. (Collins 2005: 73–74; my emphasis)

Here Collins agrees with Moretti and Mokyr: a distinctive social shape – a network – triggers creative explosions. How can we explain this regularity? Of course, the network may give many benefits, such as the “emotional energy” that arises from interpersonal communication and “charges” individuals for their intellectual work (Collins 1998: 19–53). However, the crucial element of the explanation here is one suggested by evolution theory: the dense social network is a mechanism that produces more variation of ideas than is usual in two other cases: completely homogeneous intellectual landscape, as well as completely heterogeneous, disjointed intellectual space. Within a divided-but-connected space, distinct “nodes” of the network (nation states, intellectual schools, etc.) create a great diversity of cultural variants, and, consequently, much higher chances that one of these variants will be selected by the cultural “environment.” Any cultural explosion is in fact the explosion of cultural *variants*.¹⁴

Ancient Greece, the Italian Renaissance, Modern European literature, the Industrial Revolution, Buddhist and Islamic philosophy – each of these creative explosions was initiated by an underlying network. Can we add one more example to this list – the rise of the novel in Russia? Here, we return to our starting question: Can we explain the emergence of the great Russian novel? Or, we can even make it more precise: Could the rise of the great Russian novel be explained by a network of some sort?

Apparently, yes. The quick rise of the novel in Russia was a rather unique phenomenon, so it makes sense to have a look at some equally unique antecedents of it. The Russian novel started to quickly develop in the late 1830s, while another important cultural entity evolved around that time: the “thick” journal. A thick (sometimes: fat) literary journal was a large volume, around 300–500 pages, which contained diverse materials – critical essays, poems, translations, scholarly articles and so on. However, literary prose, particularly novels, constituted the core of it.

Such journals were extremely popular. A simple illustration: most novels of that time were initially published in journals, and only afterwards, if they were appreciated by the subscribers, were reprinted as separate books. There were many reasons for that, but financial reasons often were a key factor: an author’s emoluments for a book publication were almost ten times smaller than for publication in a journal. There are two reasons why thick journals gained such attention and economic success. First, they filled the void created by a lack of

¹⁴ There is also substantial empirical evidence from other disciplines regarding the important role of networks as the structures enhancing innovation; for instance, see Bhattacharyya & Ohlsson (2010); Staber (2008).

public libraries. Libraries in Russia would start to appear only in the 1860s, and prior to this, journals fulfilled the function of providing diverse readings for the whole family. The first thick journal, which was an immediate success and soon became a model for the others, was even called *The Library for Reading* (*Biblioteka dlia chteniia*). The thick journal was akin to a small library in its contents, and it functioned as one: usually it was read not by a single subscriber, but travelled from hand to hand, borrowed and closely studied by one's family members, friends, and neighbors. So, a literary journal benefited from the lack of competitors; it filled an empty niche. The second reason for the popularity of thick literary journals is similar to the first, because it also can be explained by an empty niche. Due to censorship restrictions, Russia lacked publications where authors could discuss political issues, and so the *literary* journal became the closest substitute. The political energy of the day was charging the engines of literature. A thick journal became a weird combination in which intense critical debates about literature partly substituted political combats. Novels were becoming political pamphlets, and critical essays – political manifestos.

This ideological component also explains why journals never were simply journals: they were *communities*. “For a reader, the regular reading of a particular journal usually meant finding a social or cultural group with which one could identify himself or herself” (Reitblat 2009: 40). Journals that did not associate themselves with a certain ideological position usually quickly disappeared. Besides, in any period the number of thick journals never exceeded 8–10 titles, which was probably because this number was enough to cover all the positions in the ideological field. Ideology influenced the selection of authors too. Usually, every journal had not only a community of readers, but also a community of authors who were more or less tightly associated with it:

The journals were a center around which writers would structure their social and literary identity. Groups of like-minded authors and editors would gather around a successful journal – and sometimes move together from journal to journal – for long periods of time. They would read the same books, attend the same lectures and great public occasions, and learn from their colleagues the substance of books they had not read. (Belknap 1997: 92)

The relationships between the authors and the journals were of mutual benefit: well-known novelists could help the journal attract a new audience, and a journal with a significant audience could provide a platform for beginner writers.

Thick journals started appearing in the mid-1830s and met a decline in the 1880s. “Can it be mere coincidence that the rise of the novel and of large-scale critical essays coincided with the rise of the thick journal, and that all these forms declined simultaneously too?” – asks Robert A. Maguire (1997: 7); rhetorically, of course. “This close personal, artistic, political, and financial support-system fostered the intellectual survival and growth of an extraordinary generation of writers. [...] The community of journals – reviewing, praising, attacking and parodying one another – made the Russian literary world a *tight*

and structured whole” (Belknap 1997: 92; my emphasis). Far from coincidence, indeed.

Let’s make this clear: most probably, there would be no Tolstoy, no Dostoevsky, no Turgenev, no Goncharov, no Leskov, no Chernyshevsky – as great writers – without this “tight and structured whole.” As in Mokyr’s example, there would be no Industrial Revolution, with all its miracles – trains, steam boats, telegraphs, photographs, and so on – without such a “banal” thing as people exchanging letters. The “tight and structured whole” – this network – of thick journals worked as a creativity pump. It created the preconditions necessary for a creative explosion: ideologically separate groups of writers had the ability to quickly exchange information about each other’s successes and failures through the system of journals.

3. BRICOLAGE

Random cultural mutations, discussed in the previous chapter, are one way new forms are brought to life. Mutations can be unpredictable and fast: for example, one mistake in the DNA, and an organism becomes an albino. But the majority of changes – both in biology and in culture – may come from elsewhere. The famed biologist Ernst Mayr explained, “Even though all new genes are produced by mutations, most of the phenotypic variation in natural populations that is available for selection is the product of recombination” (Mayr 2001: 98). “Novelties come from previously unseen association of old material. To create is to recombine” – wrote another famed biologist, Francois Jacob (1977: 1163), who called this combinatory process “bricolage.”¹⁵ Every time two parental genomes are merged together in a reproductive process, a unique genetic bricolage appears: their offspring. Often these offspring are not much different from their parents, but sometimes they are highly original. Especially, when parental genomes are significantly different from one another: for example, if they belong to members of different species.

Such cases are rare, though. Usually, genetic recombination happens between members of a *single* species. But when different species do interbreed, beautiful hybrid creatures with hybrid names are born: “ligers” (a combination of lion and tiger), “zonkeys” (zebra and donkey), or “camas” (camel and lama). In most cases, they fail to become widespread, but sometimes they get lucky. One example is the plum, which is believed to be a natural hybrid of blackthorn and cherry plum.

Why am I speaking about plums in a book about culture? Because recombination takes active part in cultural evolution too, and its role here is no less important than in biology. Joel Mokyr, who studied technological evolution for many years, wrote:

[...] in the theory of [biological] evolution recombination has limited power in explaining the variety and diversity of life, because it can only combine the genetic material of two similar creatures. In production of technology, cross-species exchanges occur as a matter of routine. (Mokyr 1996: 71)

In culture, we can recombine not only members of the same “species” (e.g., two different types of rhyming in poetry) or close “relatives” (e.g., combining poetry and prose in a single text), but also things that are different in their form. For example, we can merge a novel and a comic book and, as a result, have a graphic novel – a serious genre that, instead of Superman or Wonder Woman, tells us about surviving the Holocaust (Art Spiegelman’s *Maus*) or growing up during the Iranian Revolution (Marjane Satrapi’s *Persepolis*). A seemingly

¹⁵ There are surprisingly many names for this process of making “unseen associations of old material.” Besides recombination and bricolage, also tinkering, reticulation, and horizontal transmission.

barren offspring of two contrasting parents: low-brow comics and high-brow prose. And yet, it is a highly successful cultural form.

But not all cultural recombinations are successful. Like their biological counterparts, they often remain just interesting oddities (sometimes – beautiful in this oddity). For example, take Cinerama, a strange movie theater that was considered the future of cinema in the 1950s. The initial idea was promising: to create the most immersive film experience, Cinerama had a gigantic curved screen so that film reality would literally surround the spectators. To achieve this, Cinerama combined three separate film projectors, each showing a different picture on the left, central, and right parts of the curved screen. If the projectors were synchronized properly (which wasn't simple), the audience could see one large picture on the gigantic curved screen. But Cinerama failed: the mid-century technologies did not allow this brilliant idea to become an equally brilliant reality. Cinerama was too complex of a technology, and so the intended effect of realistic immersion was constantly disturbed by the lack of synchrony between the projectors, vibration, and visual distortions.

In technology such as Cinerama, noticing bricolage is easy: usually, you can *see* the combination of distinct parts (for example, three projectors). In the arts, bricolage may not be so obvious: the “parts” of artworks are often elusive, with blurred edges. The task of this chapter is to make artistic recombination visible. Additionally, I will make three particular claims. First, bricolage in arts is faster than in many other cultural domains because of specific catalysts that quicken it (section 1). Second, bricolage allows for an increase of complexity in culture at large and in arts in particular: so we may discuss certain “progress” in arts, however heretical it may sound (sections 2 and 3). Finally, I pose the question: should we reconsider the traditional metaphor for evolution – a tree – if we are to take bricolage as a major drive of cultural innovation (section 4)?

3.1. The Pressure for Novelty

Let's start with a widely discussed example. Speaking about the history of the novel, Franco Moretti formulates an important principle of literary evolution: “in cultures that belong to the periphery of the literary system (which means: almost all cultures, inside and outside Europe), the modern novel first arises not as an autonomous development but as a compromise between a western formal influence (usually French or English) and local materials” (Moretti 2000a: 58). To test this hypothesis, Moretti dives into the bottomless ocean of national literatures, and everywhere – in Turkey, Russia, Spain, China, Poland – he finds support for this principle. Authors borrow foreign forms – genres and devices – from abroad and combine them with local parts: a local setting, their national history and language, or with their personal writing style.

Moretti speaks about the “compromise” between all these parts, but another word would be equally suitable: bricolage. That is, recombining known forms that results in new, *unknown* forms. Compromise becomes the driver of inno-

vation. I tend to think that the principle discussed by Moretti is not confined to the history of the modern novel. Rather, it is a general pattern: artistic forms travel around the world, trying on various national “clothes.” The examples here may be numerous, but – to widen our perspective – we may take them from different artistic domains: from both poetry and music.

In poetry, Romanticism is a striking example of rapid (by nineteenth-century standards) expansion of a whole set of artistic forms. Having two loosely related places of origin – Scotland and, later, Germany – this movement grew stronger within these early centers and then spilled over to the neighboring territories. Devices and themes invented or excelled at by Robert Burns, Schiller, Byron, and others were imported (and “compromised”) by other countries. And wherever there was a young nation, there appeared local variants of Romanticism: the highly “Byronic” and “Schillerian” poetry of Pushkin in Russia and Mickiewicz in Poland, or the Burns-like poetry of Taras Shevchenko in Ukraine. These authors were adjusting borrowed forms for their local needs – by combining them with local forms and materials.

In music, something similar happened to jazz. Jazz is a particularly convenient example because we know the exact place and time of its origin: New Orleans, the 1900s. Jazz itself was a bricolage of many elements – mostly African, but also European. This combination, which proved to be highly attractive to many listeners, crossed the ocean and arrived in Britain in the late 1910s, and then, in the 1920s–1930s, quickly began to spread across the tightly connected network of European countries, almost simultaneously becoming popular in France, Germany, and Belgium; a bit later – in the 1930s – it gained traction in Italy, Sweden, Poland, and even the U.S.S.R. In each country, jazz took a somewhat different form – combining borrowed jazz motives, local lyrics, and local musical traditions.

Bricolage almost inevitably occurs when forms travel in space. Why so? And why so often? Why do artists recombine existing forms instead of developing their own? Why *French* jazz, *Ukrainian* Romanticism, *Russian* futurism, *Brazilian* expressionism, *American* cubism, *Hungarian* detective fiction – and so on? Here is a likely explanation: this is simpler. Inventing forms from scratch – by trial and error (as discussed in Chapter 2) – requires much time. Besides, it is risky: a completely original form may turn out to be a failure – so long as it remains unused, no one knows how it will behave or what its strengths and weaknesses are. Thus, many writers, painters, or film directors take the simpler route: adopting and reusing forms that have *proven* to work well.

However, beyond this simple principle of artistic evolution lies a more important one, explaining why, without an overstatement, bricolage lies at the core of art. Unlike many other technologies, art is a disposable thing. A good watch can serve a person for many years, while a good book... Well, a good book can be reread several times, but this doesn’t happen too often. Usually, it’s read only once. Moreover, many books are meant to be read just once, such as detective novels. This happens because in literature, and in other arts, we have what Colin Martindale (1990: 12) called the *pressure for novelty*: audiences prefer new

things over old things. Readers, viewers, and listeners want to be surprised and amazed; and they can hardly be surprised by something they have already read or seen.¹⁶ It's been more than a century since the literary theorist Viktor Shklovsky wrote these words, but probably no one has formulated it better since:

What we call art exists to bring back the feeling of life, to perceive objects, to make the stone stony. The aim of art is to give the feeling of objects – as seeing, not as recognizing; the technique of art is the technique of “estrangement” of objects [...] art is a way to live through the making of an object, and the made in art is unimportant. (Shklovsky 1914; my translation)

Old, well-recognized techniques and genres cannot give this “feeling of life.”¹⁷ That which once made your heart race will, after numerous rereadings (or relistening, or rewatchings), become usual. And “usual” in art means useless. This is why art exists (as art) only for a short time, which makes it quite special, compared to other cultural items. Most fiction books become useless much sooner than the paper on which they were printed can deteriorate. To substitute old art, new forms must appear – to fill in the constantly emerging void – and so art is constantly rushing forward, inventing newer, even more “estranged” forms. The pressure for novelty makes art evolve much faster than any other cultural item. This is a pressure for more “compromised” borrowings and more bricolage.

But don't get me wrong: I am not saying that audiences prefer art that is *completely* new. The situation is a little more complicated. In addition to the (well-recognized) pressure for novelty, there is another pressure that plays a major role in artistic evolution: something that we may call the conservatism of audiences. Readers (or viewers, or listeners) want new artistic products – for example, a new novel X – because they would like to feel the *same* good emotions they felt while reading some previous novel Y; and novel X is the only hope of feeling these emotions, as novel Y *doesn't work* anymore: it has already been read, it's useless. Imagine that you couldn't eat the same kind of food more than once, and so your every meal would be one you have never tasted before. Sounds weird, but this is exactly how art works. As a result, picking a novel for reading involves certain risks. Every time we choose a book, we make a bet: it may turn out to be a pleasant, joyful, suspenseful, deeply moving experience... or a waste of time. Literary gambling. And to win in this casino called the literary market, one needs a strategy.

¹⁶ I will talk more about psychological drivers of evolution, such as surprise, in Chapter 4.

¹⁷ Shklovsky's theory of estrangement is old but still very reasonable and potent (which doesn't happen often to century-old theories). Here are recent empirical studies supporting it: Bohrn et al. 2012; Wiele 2016. But, contrary to Shklovsky's theory, sometimes new and unfamiliar things are *not* pleasant. A recent study of music demonstrated that the more we listen to songs, the more we like them (Madison & Schiölde 2017): a surprising result, which is yet to be understood.

The strategy should satisfy pressure for novelty, on one hand, and “conservative pressure” on the other. Balancing between these two poles may be complicated: completely new novels (e.g., randomly picked from a bookshelf) have the maximum level of unpredictability, so choosing them is maximally uncertain; rereading old novels is safe but, in many cases, boring. That is why most readers follow this strategy: they start looking for novels with the same set of formal devices, but with a new orchestration. For example, they search for the plot formula they like, but with different characters and settings: a story about love set not in Victorian England this time, but in medieval Paris; or a story of crime set this time on a plane, not in a countryside manor, and so on. This is the strategy of picking *similar but not the same*. “Similar” formal structures, while “not the same” setting, characters, and other non-formulaic elements.

Bricolage, so abundant in literature and other arts, seems to be rooted in this reading strategy. This strategy encourages authors to combine well-known forms with new materials. This simple principle has huge consequences for the literary system: it creates a tremendous *diversity* of art, but also a tremendous *continuity*. This continuity has many manifestations, ranging from the similarity between works by a single author, who reproduces one successful device multiple times, to the similarity between works by different authors – the similarity we call “genre.” Readers require something similar but not the same, and authors provide them with it.

Here is my favorite example. One of the first movies by the Lumière brothers was *Arrival of a Train at La Ciotat* (1896). This fifty-second film became particularly famous due to the illusion it created: the moviegoers of that time were amazed by the fact that the approaching train looked like it would break the screen and, instead of arriving at La Ciotat, would arrive right into the middle of the movie theatre. It is even believed that some viewers were so scared that they ran away from the theatre (Loiperdinger 2004). All this is well-known. It is less known, however, that there appeared a small genre of short films depicting the arrival of trains: *Arrival of a Train (Joinville Station)* (1896), *Arrival of a Train at Vincennes Station* (1896), *Arrival of McKinley's funeral train at Canton, Ohio* (1901), *Arrival of Tongkin Train* (1901), and so on. Were trains the only thing filmmakers could shoot? They were not. The future of a new breathtaking art of cinema was unfolding before them – with so many devices to be discovered – and yet they were showing trains arriving at different stations. The same train arriving at a new station: probably this could be a metaphor of what art evolution is, in most cases.

An example of a similar pattern – but on a much larger scale – is popular fiction, such as detectives. A subgenre of detectives called whodunit, so widespread in the 1920s and 1930s, always contained a stable structure: the “skeleton” that remained almost unchanged from one text to another. Viktor Shklovsky (1990) has famously demonstrated the stability of this structure in the stories about Sherlock Holmes, which could even be compared to the stability of folktale plots analyzed by Vladimir Propp (1968). However, this rigid structure was always combined with new materials: almost every Sherlock

Holmes story includes “The appearance of the client. The business part of the story,”¹⁸ but every time there is a new client with a new “business” – a new mystery. The skeleton satisfies the conservatism of the readers, who want to recognize familiar patterns; a new mystery satisfies their urge for novelties.

The pressure for novelty, coupled with conservative pressure, results in a huge amount of artistic bricolage. Bricolage as such can be found everywhere in culture, but in the arts it may be more widespread than in any other cultural domain.

3.2. Long Chains of Invention

Bricolage is frequent in culture, and it is particularly frequent in the arts. But besides being so frequent, cultural recombination has one more important feature, noticed by Joel Mokyr:

The mechanics of technological recombination [...] differs from that of living beings: in biology, the genome contains information that can be characterized as a set of linear combinations between the male and female chromosomes; innovations consist of changing weights. In all knowledge systems, including technological knowledge, no such constrain exist: information can be taken from a large number of sources and *added onto* existing forms. (Mokyr 1996: 71; my emphasis)

A biological organism’s genotype can be quite different from the genotypes of its parents, but the length of the genome will be the same as the length of the parental genomes. In culture, however, something remarkable happens: the number of parts of which an artifact consists can increase without limitation.¹⁹

Scholars of technology sometimes use this measure – the number of parts – as an estimate of artifact complexity. Of course, this measure is rough: complexity is hard to define, and there are many possible ways of doing so. However, even such a rough measurement can show the dramatic increase in technological complexity over the last several centuries. Look at Figure 4 (Ayres 1992). The advanced technologies of the early nineteenth century, such as muskets, had about 50 parts; the advanced technologies of the late twentieth century, such as the Space Shuttle, have about 10 million parts. Notice that the increase is exponential: it is accelerating.

This concerns not only technology, but culture at large. I claim that the development of art follows a similar trajectory: it becomes *more complex* over time. Anticipating immediate criticism, I will specify: I am not speaking about an overarching physics-like “law.” No, only about a general tendency.

¹⁸ This is what Shklovsky called this structural element.

¹⁹ Of course, I am not saying that biology cannot become more complex. Quite the contrary: the increase in complexity is common in biology, too, but the exact mechanisms of this increase are different. For more, see McShea & Brandon 2010.

Obviously, certain forms of art don't become more complex; and others even get simpler – similarly to some technologies that also stop developing in a certain convenient spot. For example, most hammers used in contemporary households are not much different from their ancestors from centuries ago: they still consist of only a few simple parts as they have no need of more.²⁰ Some art forms are like hammers; but many others resemble space rockets: they become increasingly complex.

Let's take film history as an example. We can intuit that since *Arrival of a Train*, films have become more sophisticated. The early films of the Lumière brothers had no plot, no color, no sound, no camera movement, no special effects. They resemble contemporary films no more than a musket resembles a Space Shuttle – they are creatures from different dimensions. But can we quantify this intuition? Can we learn *how far* away the early films are from the contemporary ones? Quantification is also important for another reason: our intuition could be wrong. Rather complex early films did exist; and today, too, there are short simple ones. So, how can we measure film complexity?

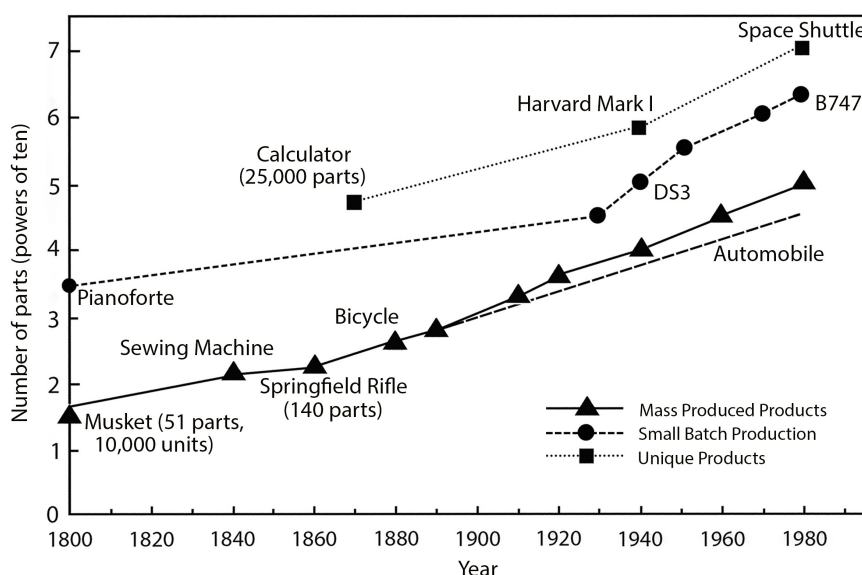


Figure 4. The advanced technologies of today are much more complex than the advanced technologies of the past. At least, if the number of parts is a good proxy for complexity. Note that the vertical scale is logarithmic (from Ayres 1992).

²⁰ Even hammers – in all their seeming simplicity – show signs of complexity growth (of the kind that cannot be measured by the number of parts, however). George Basalla (1988: 4–5) uses contemporary hammers as an example of the stunning diversity of artifacts. Probably, the growing diversity of a *system* of artifacts can also be regarded as a sign of growing complexity.

The problem is that we cannot take the proxy used in technology studies – the number of parts. It is hard to define a “film part.” Number of shots? Yes. Number of actors? Sure. Number of filming locations? This too. Depending on the angle from which we dissect a movie, the definition of a “part” will be different. However, unlike most novels or paintings, films are *collaborative* products. To produce it, you need a large crew, each person having a different function. Person A is a cameraman, Person B is an editor, Person C is a screenwriter, Person D is the personal driver for Leonardo DiCaprio, and so on. So, instead of counting the parts in a film, we can count the number of units in film *production*. Instead of analyzing the artifact itself, we can analyze its manufacturing. Is there any growth in the number of parts there?

Figure 5 shows crew sizes in 1,000 American films from the early twentieth century until today.²¹ The trend here resembles the one we have seen in technology. At the early stages of film history, crews used to be small – consisting of around ten members: director, producer, cinematographer, editor, and a few others. As time went on, this number grew – for instance, in the 1930s, the commercial hit *Frankenstein* (1931) had 44 crew members. This crew size, however, seems ridiculously small compared to the blockbusters of today: *Titanic* (1997) – 1,621 crew members, *The Lord of the Rings: The Return of the King* (2003) – 1,859, *Avatar* (2009) – 2,962. As with the history of technology, the increase is exponential.

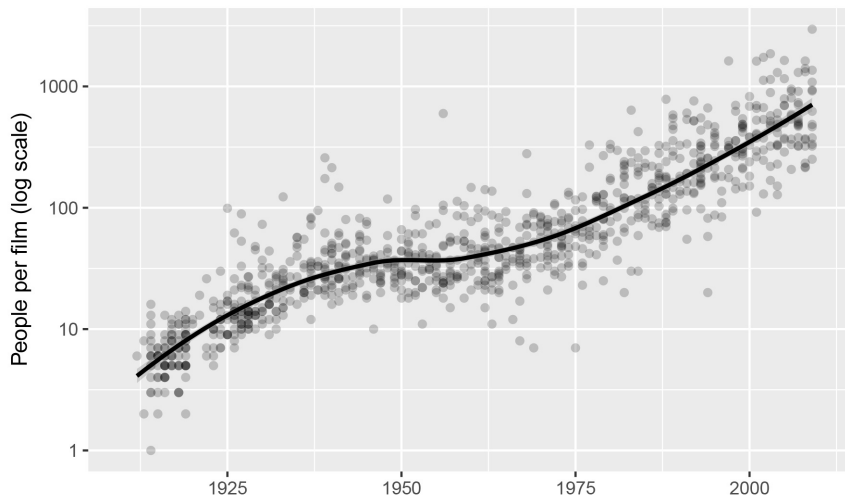


Figure 5. 1,000 Hollywood films. During the twentieth century, the size of crews, involved in film production, grew exponentially: from less than 10 people – in the early silent experiments – to the small town-sized crews of modern blockbusters. Note that the vertical scale is logarithmic.

²¹ The data was collected from the Internet Movie Database (IMDb) by Peeter Tinitis, as a part of our collaborative project, currently prepared for a separate publication.

The direction of this increase is easy to explain: films crews became larger because new *functions* appeared that required new crew members. Sound editors were not needed before sound films were made, but when this function was added into movies, so too were sound editors. The same happened to many other film “parts”: decorations, screenwriting, costume design, make up, stunts, casting, coloring, CGI, and so on. New functions in film production were invented – and so more professions were required to fulfil them. Film history resembles a set of LEGO bricks, where new types of bricks are invented over time, enabling us to create increasingly sophisticated figures from them.

In cultural evolution, the process of making inventions and accumulating them is called the “ratchet effect”:

The basic idea [of the “ratchet effect”] is that the cultural traditions and artifacts of human beings accumulate modifications over time. Basically none of the most complex human artifacts or social practices—including tool industries, symbolic artifacts, and social institutions—were invented once and for all at a single moment by any one individual or group of individuals. Rather, what happened was that some individual or group of individuals first invented a primitive version of the artifact or practice, and then some later user or users made a modification, an improvement, that others then adopted perhaps without change for many generations, at which point some other individual or group of individuals made another modification, which was then learned and used by others, and so on over historical time. (Tomasello 2006: 205)

The ratchet effect may sound self-evident; however, it changes our idea of what constitutes an innovation. Innovation necessarily becomes a *collaborative* process. Even the invention of such a “simple” thing as a fork was a long process of trial, error, and improvement, made by *many* people (Petroski 1992: 3–21). The most striking conclusion of the ratchet effect is that there is no single inventor for pretty much anything. Conventional wisdom keeps telling us entertaining stories of how a brilliant idea occurred in the mind of a single (often, slightly mad) individual. And this does happen sometimes, as shown in Chapter 2. But most stories of invention are different: instead of a single big invention, out of nothing – a long succession of smaller ones. A chain of inventions.

The ratchet effect explains why only humans can produce extremely complex objects: we never make them alone. Not alone in space (for example, making a film requires a small town-sized crowd), and not alone *in time*. The invention of a useful object is just the tip of the iceberg; below the visible surface are tons of less successful, less efficient versions of the same object, made by preceding inventors, who usually remain forgotten.

Let’s look at some examples. First, a convenient one, from technology. Afterwards, in section 3, I will give a much less convenient, more questionable example from literary fiction. I will try to convince you that inventions in literature are collaborative too, and the ratchet of culture works there equally well. But for now – bicycles.

Figure 6 shows the most interesting period of bicycle history – the nineteenth century (van Nierop et al. 1997). Numbers from 1.1 to 3.7 represent the models of bicycles produced in a respective year. “Fitness” stands for the estimated popularity of a type of bicycle. For example, as we can see, three- and four-wheeled machines were quite popular in the 1850–1870s – much more than the two-wheelers so common today. Two-wheeler – or, more precisely, the “safety” kind of two-wheeler, with two same-sized wheels, back-wheel chain drive, and several more features – became *the* bicycle in the twentieth century. But the nineteenth century was the time of diversity: different numbers of wheels, different wheel sizes, different frames, and so on. There were rather strange creatures among them, for instance, Docteur Richard’s four-wheeled cart (made in 1696; number 1.1), pedaled by one person and steered by another. Or Bauer’s tricycle (1820; 1.2), indirectly driven by hand levers.

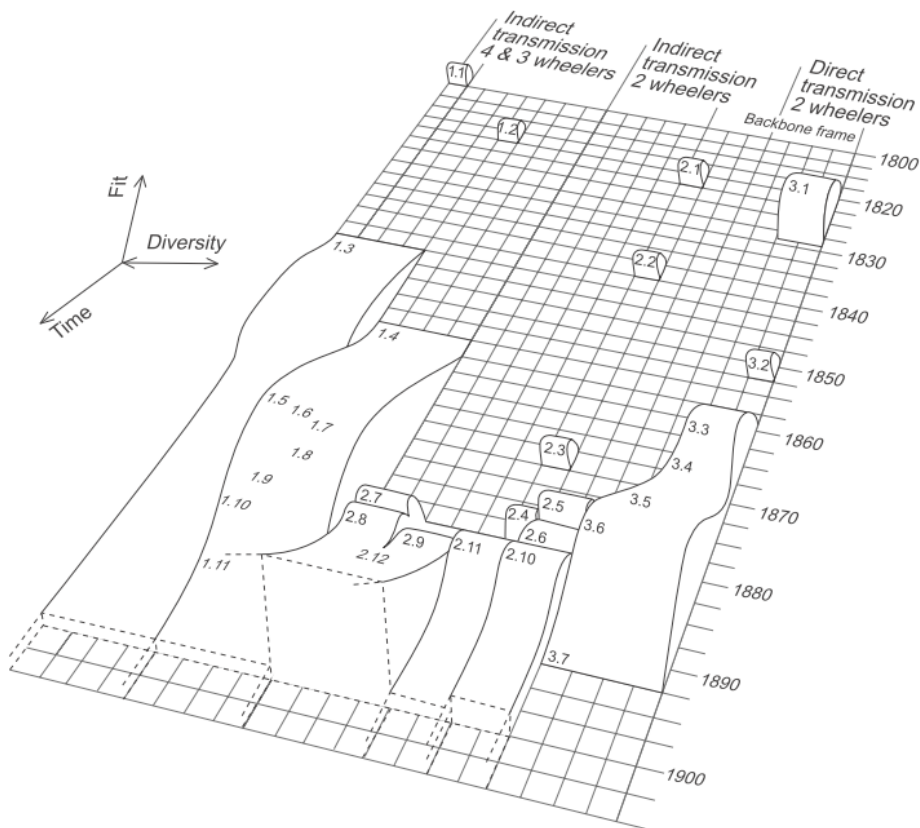


Figure 6. Today, bicycles are more popular than ever before. But they are not as interesting and diverse as they used to be. The second half of the nineteenth century was the period of rapid creativity in bicycle design: a short explosion of forms. Each number (from 1.1 to 3.7) indicates the time when a particular model of bicycle was introduced. The height of slopes shows the relative success of models (from van Nierop et al. 1997).

Most of these strange bicycles were not popular. But they were important for another reason: they introduced many inventions, which later ratcheted up into the popular bicycle we know today. To get a taste of this accumulation of innovations, here are several of them. In 1818, Baron von Drais suggested his wooden “running machines” (3.1), which introduced an important (and new) idea that a man can move faster using a simple two-wheeled device and just his muscles. In 1869, the French “Michauline” (3.3) became the first bicycle made of wrought iron. During the same year, there was another breakthrough, also in France: the watch-maker Gulimet presented the first bicycle with indirect drive by means of chain (2.3). Bicycles started taking the modern shape. But they were still uncomfortable for daily use. So, in 1870, John K. Starley made an important improvement – attaching solid rubber tires to the wheels of his model (3.4). Solid rubber was good, but not good enough, and so in 1887, the veterinary surgeon John B. Dunlop outfitted his tricycle with pneumatic tires (1.10). Thus, one last step: to use pneumatic tires on a two-wheeler, which was done around 1892 (2.12). A modern bicycle was born.

Most of these inventions, on their own, didn’t make a big difference, and only when they were combined – in the process of creative accumulation – did they result in something significant. So, no single inventor, and no single moment of invention. Instead, a long chain of inventions and improvements that ratchet up. Now, another question: Are all of them equally important?

Joel Mokyr suggested a useful distinction between *micro* and *macroinventions*. The former are “small, incremental steps that improve, adapt, and streamline existing techniques already in use, reducing cost, improving form and function, increasing durability, and reducing energy and raw material requirements” (Mokyr 1990: 13). The latter are “those inventions in which a radical new idea, without clear precedent, emerges more or less *ab nihilo*.” (Mokyr 1990: 13) Microinventions are more frequent and more predictable than macroinventions – those are almost impossible to predict. Substituting a wooden frame with a steel frame in bicycles was a microinvention; important and useful, but not “genius”: had this idea not come to the blacksmith Pierre Michaux, it would most probably have found its way into someone else’s mind. However, this probably cannot be said about von Drais’s “running machine” – it rather resembles a case when an excellent idea emerges without “clear precedent.” Macroinventions are the *leaps* of evolution. However, often evolution needs not leaps but *steps*. Many small steps.

So, not all the “links” on the chain of inventions have equal weight. Rare and unpredictable macroinventions, which often happen by mistake – as lucky serendipities – are intertwined with multiple microinventions, which (I will add) tend to be recombinations, bricolage. Which are more important? Both, equally – claims Mokyr:

Asking whether the major breakthroughs are more important than the marginal improvements is like asking whether generals or privates win a battle... The essential feature of technological progress is that the macroinventions and micro-

inventions are not substitutes but complements. Without subsequent micro-inventions, most macroinventions would end up as *curiosa* in *musea* or sketch-books. Indeed, in some historical instances the person who came up with the improvement that clinched the case receives more credit than the inventor responsible for the original breakthrough, as is the case of the steam engine, the pneumatic tire, and the bicycle. (Mokyr 1990: 14, 13)

Let's make an interim summary: the ability to add to existing cultural forms makes the creative process look like a long chain of inventions. Whenever these inventions are useful, they ratchet up, combine with existing artifacts, thus making them more complex. Invention of any single artifact is a highly collaborative process, to which separate inventors usually make only small contributions. The popular tendency to name a single "mastermind" inventor is more of a fiction than reality. However, as Mokyr noted, we do tend to give most of the credit to the inventor who made the one final improvement crucial to an artifact's wide use.

This summary seems to accurately describe the evolution of bicycles. But, having finally clarified all these issues, we can approach our main question: How about art? Does it develop in a similar way?

3.3. Cumulative Literature

Literary historians usually do not speak about the *invention* of genres: the term is too mechanistic and thus not appropriate for describing the domain of sensibility. For describing technology – yes, sure; but not for the emotional sphere, such as poetry, drama, or novels. However, there is a genre so deprived of emotion that literary historians made an exception for it: detective fiction. Less of a literature, more of a puzzle, a game between the author and the reader. And there is little disagreement about who invented this game: "Poe was the inventor of the detective story," wrote Borges in 1936 (Borges 1981: 89). "[I]f anyone can be taken to be the inventor of detective fiction, it is Poe" (Lee 2010: 369), writes a literary critic in 2010. A single genius who comes up with a brilliant idea. So convenient!

However, even the most convenient ideas should sometimes be revised. The history of the detective genre is a story about a single genius inventor no more than the history of a bicycle is a story about a single genius engineer. Quite the contrary: like bicycles, detectives evolved due to ratcheting up inventions. Some of them were predictable – literary microinventions – others were lucky serendipities – literary macroinventions. But this was the long chain of invention that made up the detective as a genre. So, as odd as it may sound, detective fiction is an invention without an inventor. At least, without a single inventor.

First, let's look at Figure 7. It shows the frequency of phrases "detective story," "detective fiction," "detective novel," and "crime fiction" in the English sub-corpus of the Google Ngram Viewer, the largest existing book corpus. Prior to the 1880s, these phrases were extremely rare. "Detective story" grew first, "detective novel" and "detective fiction" started rising in popularity only in the

1920s, and the now widespread term “crime fiction” became popular only in the 1970s–1980s. Edgar Allan Poe published the first of his “tales of ratiocination” (as he called the stories now labeled as detectives), *The Murders in the Rue Morgue*, in 1841. Why is there this gigantic gap of almost 40 years between the supposed invention of the detective story and its popularity?

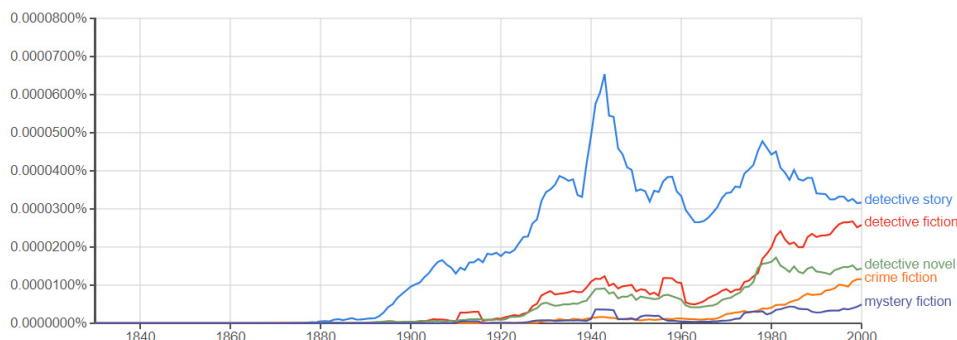


Figure 7. Was detective genre invented in the 1840s? The name for the genre certainly wasn’t. Word frequency of “detective story” before the 1890s was insignificant. “Detective novel” started to rise only thirty years later. “Detective fiction” had a similar trajectory, while its contenders – “crime fiction” and “mystery fiction” – came even later.

To answer this question, let’s return to Figure 6. The first two-wheeled “bicycle” was made by Baron von Drais in 1818. However, this technology became truly widespread only at the tail end of the nineteenth century. And the reason is clear: this “running machine” wasn’t really a bicycle. It was, well, a running machine. A device completely unprepared for mass production. It took almost a century to develop it into something that would be useful and comfortable for most people. Poe’s case may be similar: his “tales of ratiocination” were... tales of ratiocination. To transform them into “detective stories,” almost a half-century of improvement was needed. A half-century of experimentation, bricolage, and ratcheting up.

Below, I give a brief “technological” history of the detective genre: from the first important inventions until the crystallization of the modern form of the “whodunit” novel. As an arbitrary endpoint, I will take Agatha Christie’s first book, *The Mysterious Affair at Styles* (published in 1920), which initiated the craze for detective novels (reflected in Figure 7). Christie’s book became a blueprint for hundreds of other talented and talentless writers, who copied her ingenious plot twists, her flat characters, and her countless traps set for her readers. However, as I will claim, all these components didn’t actually belong to Christie: most of them were invented during the nineteenth century by many famous and fame-less literary inventors. The “first lady of crime” just happened to be the last link in the long chain of inventions, the final improvement, after which the mechanism of the detective novel was ready for mass production.

Chronology of Literary Inventions²²

1794. William Godwin composes the plot of his *Caleb Williams* in a highly unusual manner: from cause to effect. This will become an underlying principle of almost any detective story: the effect (the story of investigation) is presented before the cause (the story of murder) (Symons 1972: 26). This basic temporal transposition is claimed to be a crucial device in triggering the feeling of curiosity in readers – the most distinctive emotion associated with the genre (Sternberg 1978; for more details, see Chapters 4 and 6 of the present book). Edgar Allan Poe “specifically credited William Godwin’s *Caleb Williams* for teaching him how to write a narrative backwards (that is, to envision the ending first and then work toward the beginning, a method Poe used in the Dupin tales)” (Lee 2010: 379).

1841. Poe writes the short story “The Murders in the Rue Morgue,” which “was the first in those hundreds of locked-room mysteries which propose the puzzle of a dead body found in a room which seems to be effectively sealed” (Symons 1972: 35). Besides, it contained several more important inventions: primarily, the detective is depicted as a “reasoning machine” (Symons 1972: 39), the story is told by the simple-minded detective’s companion, and a part of the narrative tension comes from the competition between an amateur detective and the professional police. Those four inventions will become the standard elements of the detective formula later.

1842. Poe’s “The Mystery of Marie Rogêt” appears. “The innovation here is that the story is told through newspaper cuttings” (Symons 1972: 36). Also, “this story is the first piece of ‘armchair detection’” (Symons 1972: 36). Both clearly are microinventions, although the armchair detection will later develop into a small subgenre in some of the Sherlock Holmes stories, Baroness Orczy’s “The Old Man in the Corner” (1908), and the Nero Wolfe series by Rex Stout (1930s–1970s).

1843. “The Gold-Bug,” another Poe “tale of ratiocination,” which is not strictly a detective story. It introduces a minor invention: the use of cryptography and ciphers, which will reappear from time to time in later detective fiction (Symons 1972: 37).

1844/45. The publication of Poe’s “The Purloined Letter.” This is “the prototype of the detective novels and short stories which take as their theme the idea that the most apparently unlikely solution is the correct one” (Symons 1972: 36). This is the second-most important psychology-related invention – after Godwin’s reverse chronology. This enables a detective story to combine two crucial pleasant effects: curiosity and surprise (see Segal 2010).

²² The main criterion for including an invention into this list was novelty. I attempted to find the first instances of inventions in detective literature. However, in literary history, good promotion of a device can be no less important than its invention. If a promising new technique is buried in the books of a third-rank writer, or in a marginal book of a first-rank writer, it is invisible. And invisible means: non-existent. So, I tried to find a balance between the first use of a form, and the first *successful* use of a form, including both when possible.

1862–1863. The publication of *The Notting Hill Mystery* by someone hidden behind the pseudonym “Charles Felix.” Its main innovation is that it probably is the first English-language detective *novel*. Besides, it contains an important microinvention: “it includes a map, a practice which was not to become common for a good many years, as well as facsimiles of a marriage certificate and of a fragment torn from a letter” (Symons 1972: 53). The practice of showing clues to the readers will become a rule much later.

1864. A minor invention by Sheridan Le Fanu in his sensation novel *Wylder’s Hand*: showing “the reappearance of Wylder just at the moment when we have decided that he must be dead” (Symons 1972: 60). In the twentieth century, this move will become frequently used, for example, by various French authors, such as the co-authors Pierre Boileau and Thomas Nercéjac, or Sébastien Japrisot.

1866. Emile Gaboriau’s novel *L’Affaire Lerouge* appears. Gaboriau clearly borrows many elements from Poe, but incorporates them into a novel, not a short story (Knight 2010: 48), and the novel, unlike *The Notting Hill Mystery*, gains popularity. Another element, which will later be copied by some writers, including Conan Doyle (*A Study in Scarlet*, 1887), is the split story: the plot of *L’Affaire Lerouge* is clearly divided into two parts: a story of investigation and a story of crime.

1868. In his sensation novel *The Moonstone*, Wilkie Collins makes several macroinventions. This novel “involves a crime committed in a quiet country house at which a number of people have been gathered together by circumstance [and] there is circumstantial evidence against virtually all of these people” (Pykett 2005: 210). This innovative feature – a closed circle of suspects – will become a standard plot device in the majority of whodunits in the 1920s and 1930s. Another less important feature is that “the novel’s main mystery (the disappearance of the diamond) is solved by gathering together some of the main protagonists and re-enacting the crime” (Pykett 2005: 210).

1878. The publication of *The Leavenworth Case* by the American author Anna Katharine Green. Her novel becomes very successful in America and so is therefore republished in London in 1884 (Knight 2010: 54). Following some earlier examples, Green wrote her novel as a locked-room mystery, but also made several innovations. For instance, she “avoids the improbable events that Collins, Felix and [Seeley] Regester had relied on” (Knight 2010: 53). Another interesting element, which will become widely used, is that the murdered person is a “wealthy man about to change his will” (Cook 2011: 44).

(Let’s make an important note. Novels such as Gaboriau’s or Green’s were not detectives proper: “Neither Gaboriau nor Green consistently laid out clues for the reader to follow in any organized way, nor did they assemble a wide range of possible suspects to entice and bemuse the reader’s speculations” (Knight 2010: 80). They were “blind variants,” as the philosopher Donald Campbell might have called them: that is, they were written without any intention of being “detective novels” and without the knowledge that such a genre would ever exist.)

1886. Fergus Hume's *Mystery of a Hansom Cab*, which is a close replica of Gaboriau's novels, appears. The importance of this book, which will become an unexpected bestseller, is its popularization of the main inventions of Gaboriau among English readers (and writers). "Hume, via Gaboriau, made the crime novel a major force in the market" (Knight 2010: 52).

1886, 1890. The publication of *A Study in Scarlet* and *The Sign of Four* by Arthur Conan Doyle. According to Symons: "It cannot be said that either of Doyle's first two Holmes books is a very original or well-devised novel. [...] he took the basic plot of *A Study in Scarlet* from an episode in *The Dynamiters*, and in *The Sign of Four* the Indian sub-plot with its theme of a treasure which is cursed owes an obvious debt to *The Moonstone* [...] the prime defect of both books, indeed, is that they could have been condensed to short stories" (Symons 1972: 67–68). If anything, "Sherlock Holmes's professional and private status may well be the most innovative single feature of Conan Doyle's stories" (Knight 2010: 52).

1891–1892. Conan Doyle publishes a series of short stories about Sherlock Holmes in *The Strand Magazine*. According to Moretti, the main novelty of these stories is that some of them contain (potentially) "decodable" clues, based on which readers (potentially) can identify the murderer (Moretti 2000b). By introducing clues, Conan Doyle creates a new type of literature: literature-game, in which readers have to outwit the author, solving the puzzle faster than the detective. So, instead of passive reading – a competition. The detective story is created. But not a novel, yet.

1892. Israel Zangwill writes *The Big Bow Mystery*, where he employs the "locked room mystery" element into his novel. Somewhat later, in **1907**, Gaston Leroux publishes *The Mystery of the Yellow Room*, a similar locked room mystery novel. Both are highly popular and reprinted multiple times.

1909. Publication of the novel *The Clue* by Carolyn Wells. It already contains all the main elements of a "proper" detective novel: "by removing the [Anna Katharine] Green type of story from the city and its social world, by making a whole family the location of the mysterious tensions, and by moving meticulously through suspicions and possibilities, Wells has imagined into being the essence of the 'golden age' story." However, "Wells had neither the literary style nor the technical polish that brought fame to later clue-puzzlers" (Knight 2010: 81).

1920. Agatha Christie publishes her first novel *The Mysterious Affair at Styles*. This novel is a bricolage of many elements invented or popularized by her predecessors, starting from the backward narration of Godwin, through the floor plans of *The Notting Hill Mystery*, the country house crime of Collins, the clues of Conan Doyle, until the locked room of Zangwill and Leroux – to name just a few. This bricolage is unexpectedly successful: the novel becomes a model for countless followers, who have started writing similar books stuffed with country houses, floor plans, clues, and locked rooms. Still, besides being a great tinkerer, Agatha Christie does invent one original thing: her book "is a puzzle story which is solely that, which permits no emotional engagement with

the characters. [...] Christie's first book is notable because it ushered in the era during which the detective story came to be regarded as a puzzle pure and complex, and in which interest in the fates of the characters was increasingly felt to be not only unnecessary but also undesirable" (Symons 1972: 100; my emphasis). She removes the emotions to which novel readers are so accustomed. She does the same thing that Conan Doyle did three decades prior – turned literature into a puzzle – but this time, it is a much more complex kind of literature: a novel. History does repeat itself sometimes.

So, when was the detective genre invented? And who was the inventor? The question is puzzling, because the question is incorrect. The detective genre does not have a single inventor, and it wasn't invented at a single moment in time. Instead of one breakthrough invention, a long history of ratcheting them up. Importantly, these inventions were not lost but were incorporated as parts of later stories and novels. To have a better picture of this process, look at Figure 8. This "chronicle" of the evolution of the detective genre shows one important thing. Between William Godwin's *Caleb Williams*, which technically isn't a detective novel, and Agatha Christie's *The Mysterious Affair at Styles*, which certainly is, there lies more than a century of inventing, borrowing, and recombining. It's not at all easy to make sense of this complicated evolution (although I will make a modest attempt in the next section), but one thing can be said for sure: the detective genre as such becomes increasingly complex over time – the same pattern we have already seen in film history. Godwin's novel, the distant predecessor of contemporary detectives, has just *one* element of the genre, Christie's novel, the mature whodunit, already has – at least – *eleven* key elements. The ratchet of literary evolution works, and inventions, once made, don't disappear. Inventions accumulate.

This process is called cumulative cultural evolution, or simply *cumulative culture* (see Dean et al. 2014 for a review). Certain environmental conditions can quicken such accumulation, others can slow it down, or even reverse it. Culture accumulates well in large, tightly connected societies, and not so well in small and disconnected ones (Henrich 2004; Kobayashi et al. 2016). Think of modern cities, where millions of people live close to one another. Millions of people means millions of ideas in their heads, and thus – millions of information "bricks" that could recombine with each other, resulting in unique and increasingly complex artifacts. And, contrarily, if a society decreases in size and connectedness, cumulative culture can be reversed: societies can lose their knowledge, and their culture can become increasingly primitive.

So, if certain conditions are met, culture can be cumulative. As can literature. Granted that it develops in highly populated and highly connected areas, literature can accumulate, becoming increasingly complex. (Probably it is not a coincidence that most of the authors in Figure 8 lived in the mega-cities of that time: Godwin, Collins, Doyle, and Christie – in London; Gaboriau and Leroux – in Paris.) Cumulative literature – this is what we can call it.

AMERICAN	E. Poe RC RM DC LR RC RM DC AD RC RM DC US RM DC C		A. K. Green RC RM W		C. Wells RC RM US CH			
BRITISH	W. Godwin RC	C. Felix RC M	F. Hume RC RM US	A. Conan Doyle RC RM DC US C M DC PD		A. Christie RC RM LR DC US M CH MS W DC PD		
		W. Collins RC RM CH MS		I. Zangwill RC RM US PD LR				
FRENCH	E. Gaboriau RC RM US		G. Leroux RC RM US PD LR					
	1790s	1840s	1850s	1860s	1870s	1880s	1890s	1900s

Figure 8. Chronology of inventions in the detective genre – in Britain, France, and the U.S.A. Each letter combination stands for a formal element invented or used by each author: RC – reverse chronology; RM – detective depicted as “reasoning machine”; LR – locked room mystery; AD – armchair detection; DC – story told by detective’s companion; US – unlikely solution as correct one; C – cryptography; M – map of crime scene; CH – country house crime; MS – evidence exists against multiple suspects; W – victim was about to change the will; DC – (potentially) decodable clues; PD – pure detection: detection is the only main purpose of story.

3.4. The Fabric of Evolution

Cumulative culture grows due to bricolage. The ability to add new parts onto artifacts – for example, to add new elements onto literary forms – allows artifacts to become increasingly complex. This is why the novels of Agatha Christie are much more complex than the novels of Anna K. Green or Fergus Hume (at least, more complex *as* detectives). The cumulative nature of bricolage, typical of culture, has several important consequences. An obvious one is the *speed* of evolution. Which evolves faster: human culture, or human bodies? Of course, the former. However, there is one more consequence, which I will discuss in this section: the very *fabric* of cultural evolution becomes different.

Since Darwin, evolution is traditionally considered to be tree-like. The “tree of life” is a frequent metaphor both in scientific writings and in popular culture. Evolutionary biologists have invented sophisticated methods for building such trees of life – or, more technically, phylogenetic trees. By comparing the genotypes of living beings, biologists can suggest reliable hypotheses about the historical relationships between various species: who could be the common ancestor, where is the possible place of origin for a species, when did a particular branch of the tree appear, and so on.

The scholars of culture started using the metaphor of a tree around the same time as Darwin. The pioneers here were the linguists: interestingly, some of them, like August Schleicher, drew the pictures of tree-like language evolution even before *The Origin of Species* (van Wyhe 2005). Which carries an important message: the idea of tree-like evolution of languages wasn’t an analogy with biology; it was an independent development, which indicates intrinsic similarities between the evolution of biology and culture.

Recently, cultural evolutionists have revived the old tradition of building the trees of culture. One good example is the study of language evolution by Gray and Atkinson (2003): using the methods of glottochronology, they analyzed 87 Indo-European languages, aiming to discover the time of divergence for each language group. They compared the core vocabularies of these languages and then automatically generated a phylogenetic tree that not only showed the times of branching out of various language groups, but also allowed them to estimate the approximate time of origin of the Indo-European language family as a whole: around 7,800–9,800 years ago. Phylogenetic models are used outside of linguistics, too – for example, in archaeology. O’Brien et al. (2001) demonstrated the usefulness of phylogenetic trees in their study of Paleolithic arrowheads found in North America. First, they made a detailed annotation of various parameters of these arrowheads: their length, width, shape, and so on. To each trait, a numeric code was attributed, and so each arrowhead was presented as a sequence of these codes: e.g., 21225212. Then, these quasi-DNA sequences were analyzed as if they were actual DNA: automatically compared to each other to find out phylogenetic relatives. As a result, O’Brien et al. got a tree: a reliable hypothesis about the evolution of arrowheads, consistent with the common archaeological estimates.

In these cases, tree models are particularly convenient for one reason: linguistic evolution, as well as the evolution of ancient material culture, strongly resembles biological evolution (specifically – the evolution of animals). Languages are usually inherited by children from their parents – same as genes. The techniques for making prehistoric tools were learned by the younger from the elder, and the exact copying of arrowheads was more important than creativity and invention. Such direction of learning – from the elder to the younger – is called *vertical* transmission of culture, in contrast to *horizontal* transmission, when culture is learned from members of one generation (Cavalli-Sforza & Feldman 1981). This vertical direction makes the evolution of some types of culture very similar to animal evolution. It is *slow*, and it is *tree-like*.

These – and many other – successful applications of tree models to culture may tempt us into thinking that the tree model is a universal tool for describing cultural evolution. But look at Figure 9, which depicts the connections between the most innovative (and most influential) crime fiction writers: Who borrowed literary forms from whom? We don't see anything resembling a tree there. We see a web, a reticulate fabric. The structure is not a tree because each writer was borrowing literary forms not from a single predecessor but from *multiple* predecessors. For instance, Conan Doyle took many of his ideas from Poe, but also from Anna Green, Gaboriau, and Collins; he wasn't even limiting himself to the English tradition, but was making use of American and French equally – if not more – often.

The fabric of culture is the product of bricolage. Many scholars of evolution consider it a problem: Can cultural evolution actually be studied with tree models? And even more importantly: Can cultural evolution be studied *at all* – if it is a messy network, not a well-structured tree? For example, Tëmkin and Eldredge (2007) built two trees of evolution of musical instruments – cornets and psaltery – and made this disappointing conclusion:

While in biology reticulate evolution is rampant in relatively limited (yet very diverse) domains of the tree of life, recombination in cultural evolution is likely to be a prevalent mechanism of information transfer [...] [Reticulation is] a major obstacle to the application of cladistic methods to questions of cultural evolution. (Tëmkin & Eldredge 2007: 148)

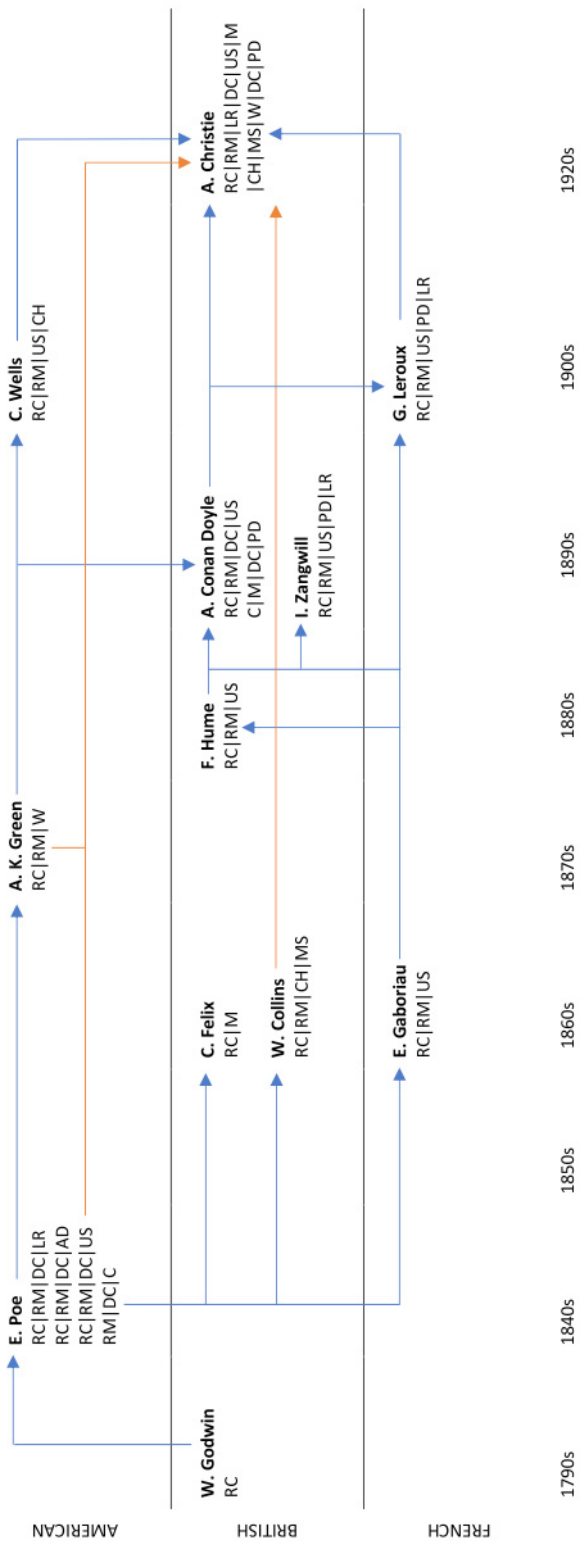


Figure 9. The network of literary borrowings. Sometimes, an author has a single “parent”, but more often – two, three, four... As a result, we don’t see a neat tree of evolution, but a reticulate web.

Reticulate evolution – that is, evolution via bricolage – is a “major obstacle.” One cannot look for trees where there are no trees. A tree is a *structure*; it can be studied, tested, modified; but network – much less so. A network is chaos. So, who is right: Gray and Atkinson, who applied trees for studying the origins of Indo-European languages and found them useful, or Tëmkin and Eldredge, who applied trees for studying musical instruments and found them useless?²³

Both alternatives have strong arguments, so making the choice is hard. Fortunately, we don’t have to. Between these (apparent) alternatives, there is a third way – elegant and simple. It was suggested by the microbiologist Eugene Koonin. Koonin makes two arguments. The first argument goes against Tëmkin and Eldredge, who consider “reticulate evolution... rampant in relatively limited (yet very diverse) domains of the tree of life”:

No one denies that evolution of animals is tree-like. However, this is not a TOL [tree of life], but only a description of the evolution of a single, relatively small, tight group of eukaryotes. The generalization to the entirety of cellular life on Earth fails because of the complex net of extensive HGT [horizontal gene transfer] that is most common among prokaryotes but that also prominently contributed to the evolution of eukaryotes, particularly via endosymbiosis. (Koonin 2011: 165)

Animals – with all their trees – are not a rule, but an exception. An exception that is so visible everywhere around us that it is easy to mistake it for a rule. The rule, however, is different: the living beings that constitute the majority of species on Earth are bacteria and archaea. And evolution in them is nothing like it is in animals: it involves constant and quick exchanges of genetic information, bricolage, networks. There are several ways how microbes can transfer DNA horizontally: transformation, when a cell accidentally breaks, and its DNA can be taken up by another bacteria; transduction, when the pieces of the DNA are carried from one cell to another by a virus; conjugation, when two microbes form a “bridge,” through which pieces of DNA can be transferred (Furuya & Lowy 2006). This is one of the reasons microbes can adapt so quickly to changing conditions and evolve to overcome selective pressures, such as man-made antibiotics. Microbes do not only evolve quickly because of their short life-span (and, thus, much faster change of generations), but also because, in microbes, bricolage is as common as in culture. The same is true for viruses, and so when Richard Dawkins (1993) metaphorically called religious beliefs “viruses of the mind,” this comparison was more than a threatening metaphor; it captured a deep similarity between viruses (with all their bricolage) and culture. Comparing cultural evolution to the evolution of animals – which happens often – seems less adequate than comparing it to the evolution of much smaller, invisible kinds of biology.

²³ If you would like to dive deeper into the debate between those who support trees and those who doubt them, see: Currie et al. 2010; Gray & Watts 2017; but Nunn et al. 2006.

From this, one could reach a disappointing conclusion: trees are useless – not only in culture, but also in biology. But Koonin’s conclusion is different – and much more interesting. According to him, when we look at microbe evolution from a *close* distance, we see a reticulate web, but when we look at it from a *large* distance, we see a tree. Web and tree – at the same time, based on the distance from the object of study. A more complex model; and here is its possible explanation: “the tree-like pattern of evolution actually might be a consequence (one might provocatively say, an artifact) of nonuniform, biased HGT [horizontal gene transfer], whereby organisms that appear ‘close’ in phylogenetic trees actually exchange genes frequently, and organisms that seem ‘distant’ in trees are those between which HGT is rare” (Koonin 2011: 164).

This makes a lot of sense. The authors in Figure 9 belong to roughly the same strand of literature, and that is why there is so much recombination (or horizontal transfer) between them: they “appear ‘close’ in phylogenetic trees.” If you are a detective fiction writer, it is simpler for you to borrow some elements from your colleagues – crime novelists – and harder to borrow from the branches that are “‘distant’ in trees”: science fiction, poetry, or historical novel. Of course, at times, reticulations between distant branches do happen; and if they are successful, they can become masterpieces. In her novel *The Daughter of Time* (1951), Josephine Tey bridged traditional whodunit with historical novel. This is a story about a Scotland Yard inspector who is stuck in a hospital with a broken leg, and so, to fight boredom, he reads scholarly books on English history; one episode – the murder of two princes by King Richard III – seems suspicious, and he starts an investigation. The book became so popular that, in 1990, British crime fiction writers recognized it as the best crime novel of all time (Moody 1990).

Returning to trees: bricolage is powerful, but not almighty. You can easily combine a crime novel with another crime novel; it would take more effort to combine it with a historical novel; and even more effort to combine it with opera. But you cannot mix a crime novel (or any novel, for that matter) with a bicycle. They both are cultural artefacts, but they are situated on very distant branches of the tree of culture. In the places where bricolage is possible – such as in the small part of cultural landscape in Figure 9 – you will find a reticulate fabric. But if you zoom out to see more – more genres, more kinds of art, more neighboring technologies – you will see a pattern: no reticulation. But branches. And trees. Like 150 years ago on the drawings of Schleicher and Darwin.

4. SUCCESS

Previous chapters described how original artistic forms appear. They may appear by chance, when a lucky artist simply stumbles upon a new form, almost by mistake; or, they can appear due to bricolage, when an artist combines several existing forms – resulting in a new, more complex form. This is how they are born. However, not all the newborns survive. We are used to thinking that originality in art is the only thing that actually matters, the main thing that brings success (whatever it means: becoming a bestseller or entering a canon), but I will try to show that this is far from the truth. Originality alone does not guarantee success.

But what does? How do artists, genres, and devices become successful? The success of artforms – this will be the topic of the present chapter. Chapters 2 and 3 were about creativity. This chapter is mostly about its antipode: selection. Creativity increases the formal variation of the artistic field, while selection decreases it. Out of all the stunning diversity of forms available in the marketplace of ideas, selection favors only a few. These few continue to exist: in our memory, on bookshelves, in the works of subsequent authors who copy rhyming patterns or plot formulas – thus prolonging their existence. The rest is wiped off the surface of cultural memory. Usually not beyond retrieve, of course: our global culture rarely forgets anything once and for all; old genres and techniques occasionally pop up again: such as in the case of the black-and-white silent film *The Artist*, which received its Oscar in 2011. But, in general, being *not* selected means being forgotten – the cultural equivalent of death.

In this chapter, I will discuss the mechanisms of selecting art forms. The main question is why do certain art forms become selected? That is, why do they become canonical or bestselling? Surely, the road from an initial spark of an idea to subsequent success is complicated; it involves many factors. However, most of them can be grouped into several distinct categories. In this chapter, I will discuss three such categories: psychology, society, and... luck. I have already stressed the role of luck in the creation of new forms (in Chapter 2), but it plays its part in selection as well. Quite often, success has no explanation: someone gets lucky, and we have to accept it. Fortunately, such random evolution has its distinctive marks, which will help us to uncover it. Unlike luck, the other two agents of selection – psychology and society – are much more predictable. Predictable in the most direct sense of the word: knowing them, we can sometimes foresee the future of art. Of course, we cannot predict the title of the top bestselling novel in 2051, but we can detect the general tendencies, the patterns of future development of literature, film, or music.

So, three different roads to success – psychology, society, and luck – will be discussed in the upcoming pages.

4.1. Cultural Attraction

Usually, paleontologists don't study fictional animals. They study real animals, albeit extinct. But Stephen Jay Gould was no usual paleontologist. He was a scholar of wide interests, ranging from dinosaurs to Victorian literature. An unusual kind of paleontologist who dared to ask: How did Mickey Mouse evolve?

Figure 10 shows the evolution of this fictional character. The first figure in the row shows how the most famous Disney character looked in the early cartoons, such as *Steamboat Willie* (1928). As the popularity of Disney grew, Mickey's appearance changed. Mainly, he became much more juvenile. His last incarnation in the row resembles a small child: large head and eyes, small arms and legs. In biological terms, such baby-like features are called *neotenic*. And they can be found not only in human babies, but also in many other vertebrates: puppies and kittens, ducklings and leverets.

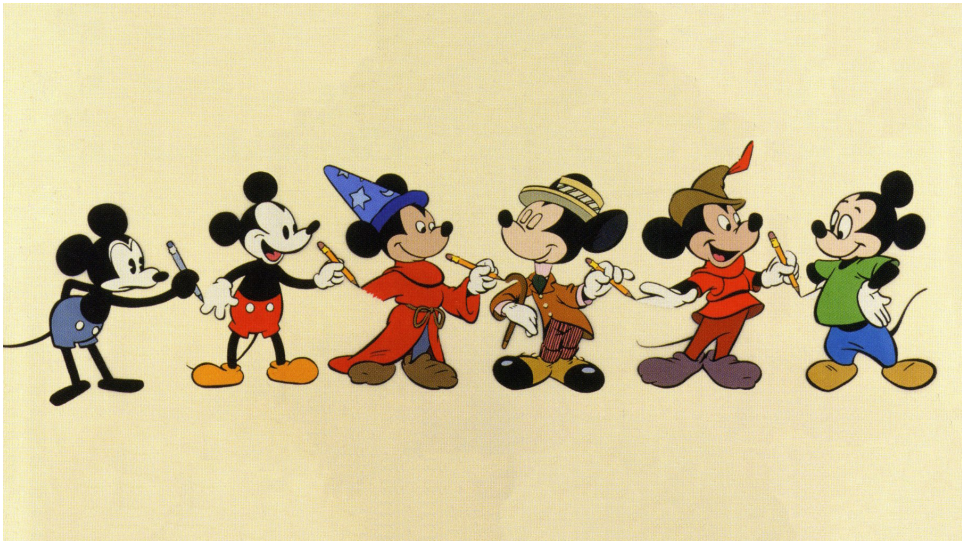


Figure 10. The evolution of Mickey Mouse.

The famed ethologist Konrad Lorenz (1943) suggested an interesting hypothesis: these proportions (he called them *Kindchenschema*) trigger *affection* in parents. In other words, *Kindchenschema* makes babies “cute.” Lorenz’s idea was a guess, based on his vast experience with animals, but contemporary experimental research confirms his intuitions (Kringelbach et al. 2016): the feeling toward cuteness emerges as a response to certain bodily proportions of newborns (as well as to certain sounds and smells).

But how does this apply to Mickey Mouse? Gould makes a guess:

The abstract features of human childhood elicit powerful emotional responses in us, even when they occur in other animals. I submit that Mickey Mouse's evolutionary road [...] reflects the unconscious discovery of this biological principle by Disney and his artists. In fact, the emotional status of most Disney characters rests on the same set of distinctions. To this extent, the magic kingdom trades on a biological illusion. (Gould 1980: 104)

What we see in Figure 10 is the result of a “biological illusion”: we tend to treat fictional creatures with neotenic traits as if they were babies. We think that they are cute simply because they have large heads and big round eyes. And this attachment to *Kindchenschema* works even for the objects that are obviously *not* babies – as long as they have something that remotely resembles a “head” or “eyes”: for example, it was experimentally shown that cars with larger headlights are perceived as cuter than the same kind of cars with smaller “eyes” (Miesler et al. 2011).

Mickey Mouse has evolved to look cuter, to evoke more affection in viewers. And more affection means more viewer interest, more money, more people visiting Disneyland. The Disney empire is the empire of cuteness. And, most probably, this story is not unique, but rather an example of a general tendency.²⁴ Some artistic texts, such as cartoons, have adapted to the cuteness illusion. Just look at virtually any contemporary cartoon for kids: all the positive, likeable characters have neotenic features (in anime, manga, *The Simpsons*, *South Park*, *Rick and Morty* – the list is endless). They all “want” to be popular, and so they all use this feature of our brain for their benefit. Or mutual benefit. In fact, the producers earn money, but the consumers receive pleasant feelings of affection, detached of any real responsibility. Everyone wins.

That's enough about cuteness. Now, to a more general question: What if, besides the cuteness illusion, there were other similar illusions? What if we not only felt affection towards fake babies, but also feared fake dangers or felt anger at fake enemies? What if our cognitive preferences (often unconscious or ill-recognized) play a role in how culture looks and how it evolves, especially in the evolution of the arts, since the arts directly aim at manipulating cognition. The job of the arts is to be cute, attractive, interesting, beautiful, suspenseful... One could even propose a general theory of cultural evolution claiming that psychological preferences are the mechanisms of “psychological selection” of cultural forms: those cultural (art-)forms survive in the marketplace of ideas that best fit these cognitive preferences.

In fact, such a general theory already exists. It is called the theory of *cultural attraction* and was introduced in the 1990s by the anthropologist Dan Sperber. Here he speaks of folklore:

²⁴ For example, a study of teddy bear evolution (from the 1900s to 1980s) showed a trajectory similar to that of Mickey Mouse (Hinde & Barden 1985).

In an oral tradition, all cultural representations [that is, cultural items – *O. S.*] are easily remembered ones; hard-to-remember representations are forgotten, or transformed into more easily remembered ones, before reaching a cultural level of distribution [that is, before becoming widespread – *O. S.*]. This law has immediate application, for instance, to the study of oral narratives. We can take it for granted that tales, myths and so on are optimal objects for human memory, or else they would have been forgotten. (Sperber 1996: 74)

Let's rephrase. In principle, the ingenious human mind can make up many different stories of different length, stuffed with all kinds of complex information. However, not all of them are remembered and retold to further generations. Not all of them survive. Our brain prefers information that is organized in a particular manner: for example, if a story is too long, we won't remember it – unless it's equipped with some mnemonic devices, such as rhyme or rhythm. The limited capacities of our memory thus work as “filtering mechanisms,”²⁵ discarding all oral narratives that do not satisfy some criteria of memorability. Sperber calls the cultural representations that are well-adapted to our brain (e.g., by being memorable) *attractors*. Attractors are the survivors on the cultural battlefield.

Further in this section, we will look at different attractors in art: what they are and how they have influenced art history. But before that, I will briefly continue with examples from folklore, as I haven't yet explained how exactly attractors work. Saying that folkloristic attractors need to be memorable is too general. What *exactly* makes them memorable?

One highly memorable form is the so-called minimally counterintuitive (MCI) narrative, i.e., a narrative containing a limited number of counterintuitive concepts. *Intuitive* concepts are ideas that correspond to our intuitive understanding of how the world works. For example, the phrase “four-legged table” is intuitive: most tables have four legs. The phrase “four-legged student” is *counterintuitive* – when hearing it, we become puzzled and curious: what might such a student look like, after all? Norenzayan et al. (2006) have demonstrated that the majority of memorable folktales have two or three counterintuitive concepts. Take “Little Red Riding Hood” as an example: it has only two such concepts – the talking wolf and the miraculous survival of the girl and her grandmother after they are eaten. The rest of the story doesn't contradict the laws of physics or biology: no flying carpets, no invisibility cloaks, no fire-breathing dragons. Norenzayan et al. have analyzed the success of the Brothers Grimm folktales and which tales from their collection became famous. Their finding confirms the MCI hypothesis: the successful folktales – “Snow White,” “Sleeping Beauty,” “The Musicians of Bremen,” or “Hansel and Gretel” – are MCI narratives. The unsuccessful folktales – “The Girl Without Hands,” “The Golden Children,” “The King of the Golden Mountain,” or “The Jew in the Brambles” – have either no counterintuitive concepts at all or too many of them.

²⁵ Dan Sperber uses this term only once (Sperber 1996: 71), but I find it useful for explaining his theory.

Why are the MCI stories successful? I can suggest this simple explanation. A story with no counterintuitive elements would be boring; a story with too many counterintuitive elements would be a mess. Probably, the minimal number of counterintuitive concepts maintains a balance between boredom and complexity. One way or another, MCI narratives are, using Sperber's terminology, cognitively attractive.

Here is another trait of highly memorable oral narratives: they can trigger strong *emotions*. Such stories are more likely to be selected by and transmitted through society. Heath et al. (2001), as well as other scholars (Eriksson & Coultas 2014; Stubbersfield et al. 2014), showed this in their research on urban legends. An urban legend is a story of an unlikely event (that has probably never happened) presented as if it has actually happened. Sometimes such tales go viral: they are told from person to person thousands of times, surviving for many years. Heath et al. (2001) suggested that urban legends survive because they evoke specific (usually negative) emotions in us. These emotions make us remember the stories, and subsequently make us want to retell them. The virality of urban legends is an integral part of their mechanism of action.

One such emotion, ensuring virality of urban legends, is disgust. For example, read this urban legend used in the experimental study of Eriksson and Coultas (2014: 25):

Many years ago Jasmine visited Stockholm for the first time. She decided to go to a new pizza restaurant near her hotel. After eating her pizza Jasmine found that something was stuck in her teeth. She succeeded in removing the object. She examined the object: it was a tooth from a rat! She realized that the restaurant probably had used rat meat in her pizza. As far as Jasmine could remember she had never felt that sick before.

Eating a rat is one of those things we would like to avoid, and for good reason: for most of us, rats are associated with poor sanitary conditions, dirty streets, and maybe even the Black Death. These are things we should protect ourselves from, and disgust is a natural response to these threats. Disgust is a signal, which has the *survival* function (LeDoux 2012): in humans, as well as many other animals, it helps to unmistakably distinguish between rotten food and fresh food, dirt and cleanliness, rats and hamsters. But disgust contributes not only to *our* survival, but also to the survival of something quite different: disgusting stories.

Stories exist within the elusive and ephemeral (but, nevertheless, very real) space of cultural memory; and disgust, like all other survival emotions, is linked to memory. Disgust is not simply the feeling you have when observing a rotten tomato, it is also a memory "amplifier." It helps our brains remember what to avoid. Disgust helps us not to forget that dangerous things are dangerous. Of course, disgusting *stories* are not dangerous in any way, so their survival is a side effect of this innate emotion: it is a result of a cognitive illusion.

4.2. Hedonic Selection

So, memory is an important “filtering mechanism” for folklore. But not so much for literature or film, since they continue to exist outside our memory: on book pages, film stocks, hard drives. In the contemporary world, almost any information can be preserved on a wide variety of information storage devices, and thus the memory filter is not as important as it used to be several centuries ago. But what are the filters that decide the destinies of contemporary non-oral cultural representations: novels, films, or TV series?

Art is about influencing our cognition. We can consider art as a specific set of techniques that attempts to achieve some (usually “positive”) emotional state. These techniques amaze us, fascinate us, move us, scare us, and so on. The psychologist Ed S. Tan (1996) once called films *emotion machines*, and I think it is only fair to apply this tag to art in general. Novels, films, poetry, and other artistic forms are machines made for pressing the emotional buttons in our brains.

The success of artworks largely depends on whether they achieve this goal. If they manage to evoke a pleasant emotional state, at least some success is guaranteed. And there will be no success if they fail in pressing the intended (or even unintended) emotional buttons. The other two mechanisms of selection – social circumstances and luck – can increase chances of success, but they won’t help much if an emotion machine itself is unable to do what it was designed for. Psychological appeal is the baseline of survival for art.

Thus, our emotions are a filter. One of the pioneers of the quantitative study of art history, Colin Martindale, suggested a good name for such a filtering mechanism: “hedonic selection” (Martindale 1990: 41). Hedonic selection occurs due to the stimulation of certain reward systems of the brain, such as dopaminergic areas or particular “hedonic hotspots.” A song, film, or book can stimulate these reward systems similarly to better studied stimuli: food or sex.²⁶ However, unlike pleasure derived from food or sex, pleasure from art happens as an illusion. We like apples because we have evolved to do so; but we haven’t evolved to like Mickey Mouse. Art exploits the existing pleasure systems of the brain in unexpected ways.

For clarity, let’s review several examples.

The Fear of Music

When listening to music, some of us (roughly every second person) can experience the pleasant feeling of frisson, also called a “chill” or “shivers down the spine.” Usually, it occurs at a specific moment of a song or melody: we hear a

²⁶ The theory of “hedonic hotspots,” suggested by the neuroscientists Morten Kringelbach and Kent Berridge have brought us much closer to understanding pleasure. Different types of pleasure, including that of music and art, are discussed in this comprehensive volume: Kringelbach & Berridge 2010.

combination of sounds, and then two strange things happen. We feel a sudden coldness and our hair stands on end. How is it that the sublime musical experience is linked to such mundane physiological responses?

Musicologist David Huron (2006) suggested a likely explanation. The hair standing on end – piloerection – is a reflex, the primary function of which is thermoregulation. In cold environments, the raised hair of our (hairy) ancestors helped them to thicken the cold-protecting layer of hair (and this is where the connection between piloerection and the experienced “coldness” comes from). However, evolution later discovered another use for piloerection: an aggressive display, which makes an animal look larger and thus more dangerous than it actually is. A frightened cat with a curved back and hair standing on end is a picture we all know. So piloerection is the result of two things: coldness and fear.

When it comes to fear, one thing we are afraid of is loud sounds:

Loudness is known to increase physiological arousal. There are good reasons for this connection: loudness is indicative of events in the environment that entail a large expenditure of physical energy. Whether physical energy is embodied in animate agents (such as a herd of elephants) or in inanimate objects (like boulders rolling down a slope), high levels of physical energy are more likely to pose a danger than low levels of energy. There are good reasons for organisms to be highly aroused by loud sounds. (Huron 2006: 34).

Shivers down the spine are the natural response to *loud* sounds. Or, more precisely: this is a natural response to *unexpected* loud sounds, as unexpected large expenditures of physical energy are even more threatening. And this is exactly how shivers occur when one listens to music: as a response to the unexpected loud transition in a melody. Music exploits this natural defensive mechanism to make our body behave as if it’s frightened. Frightened in the absence of danger. Another cognitive illusion.

But why is this illusion pleasant? Fear is associated with the so-called fight-or-flight response, which leads to raised levels of certain hormones and neurotransmitters, but particularly epinephrine and norepinephrine, commonly known as adrenaline and noradrenaline. Both are released by the “fast-track” reaction system of our brain: an automatic and unconscious response to an alarm. However, if this alarm is false, the “slow-track” reaction system, which is much more conscious, will tell the organism to calm down:

The fast-track brain responds to the combination of loudness and surprise with its usual pessimistic presumption. At the same time, the slower appraising mind concludes that the musical sounds are entirely safe. ... *the magnitude of this contrast amplifies an overall sense of pleasure.* (Huron 2006: 35; my emphasis)

We are afraid, but this is a particular – pleasant – kind of fear.

Obviously, composers of the past did not know much about epinephrine and norepinephrine. However, by experimenting with music, they managed to achieve the same effect on human brains as some natural frightening sounds.

The cognitive architecture of our brain, shaped millions of years ago, now works as a selection mechanism that favors certain sounds. Sounds that make us pleasantly frightened.

Over centuries, this selection resulted in music that was increasingly good at triggering frisson. A recent study (Serrà et al. 2012) has found that during 1955–2010, western popular music became much louder. The evolution of musical instruments followed the same path. Take for example the transition from harpsicord to fortepiano, or from guitar to electric guitar. Composers and engineers were working together to make music more pleasant, which – in some cases – meant: louder.

Don't get me wrong: loudness is of course not the only, and certainly not the main, hero in the history of music. Rather, it is a minor character. However, the evolution of this minor character tells us something important about art as such: it adapts to our brain and exploits it – often in unexpected ways. As a result, we have an interesting symbiosis: the brain, which wants to feel pleasure, is filled with music, which “wants” to become successful. If a musical composition becomes part of this mutually beneficial cohabitation, it survives.

Scary Realism

Frisson is an elegant way of manipulating emotions, as we may not even understand that this pleasant feeling is somehow connected with fear. This is fear that flies under the radar. But in many other cases, art manipulates emotions in much less elegant ways. For example, in horror movies.

A horror film is a powerful tool for extracting pleasure from fear. Film directors have experimented with fear from the very beginning of cinema; later these experiments grew into a lasting tradition of fearful cinema. The first uncertain steps – such as the 16-minute long *Frankenstein* (1910) – paved the way for the later success of the Hollywood monsters of Universal Studios in the 1920s–1950s; and afterwards came the explosion of multiple subgenres: Italian *giallo* movies, supernatural tales of exorcism, Cronenbergian body horror, violent splatter movies, slashers that introduced the now-classical figures of serial killers – the list goes on. A variety of genres, a variety of ways to scare us. Sometimes they went too far, and the fear was not accompanied with any pleasure: many cases have been reported of people fainting at the screenings of horror films, such as *The Exorcist* (1973) or *V/H/S* (2012).²⁷ However, usually people watch them because they can tolerate – and even like – fear. Fear that is much more explicit than music-induced frisson. How is this possible?

A plausible answer to this question was recently suggested by scholar of empirical aesthetics Winfried Menninghaus and his collaborators (Menninghaus et al. 2017). They introduced a cognitive model that explains how art can turn

²⁷ <http://deadline.com/2012/01/moviegoer-faints-in-vhs-midnight-screening-sundance-220225/>

unpleasant emotions – such as fear or disgust – into pleasant ones. We have specific distancing mechanisms in place to reduce our fear of horror movies: the “art schema” (mainly, the understanding that “this is just a movie”), or temporal and spatial distancing (we understand that what we see onscreen is not happening to us here and now). We understand that a serial killer from *Friday the 13th* is a fictional character, and, besides, that there are no serial killers in our apartment (most likely). Nevertheless, despite this conscious distancing, the automatic fast-track response in our brains makes us ready to fight or flee. We get high on adrenaline, and we get it for free – without any real danger involved.

The idea that fear can be pleasant may sound counter-intuitive. Isn’t fear a “negative” emotion? Negative, and yet many filmgoers seek this negative emotion. This puzzle got a name: a paradox of horror, and was clearly formulated by Noël Carroll:

This paradox amounts to the question of how people can be attracted by what is repulsive. That is, the imagery of horror fiction seems to be necessarily repulsive and, yet, the genre has no lack of consumers. Moreover, it does not seem plausible to regard these consumers – given the vast number of them – as abnormal or perverse in any way that does not beg the question. Nevertheless, they appear to seek that which, under certain descriptions, it would seem natural for them to avoid. (Carroll 1990: 160)

Carroll gives a summary of diverse solutions to this “paradox”: from cosmic awe to psychoanalysis. He also suggests his own solution: curiosity. We enjoy fearful monsters because they are unusual – similarly to why some of us go see pickled heads and conjoined twins in museums. “Unusual” means “interesting” means “pleasant.”

I am not sure that this solution is good. Many horror films don’t feature unusual monsters, and some horror films don’t depict direct sources of threat. And yet, they are fearful. Curiosity, the main element of Carroll’s explanation, is a feeling much broader than horror. It is essential for any successful narrative (as I will discuss in the next section) – including scary films – but explaining the essence of horror with it would be a mistake. Instead, how about a different perspective on the “paradox of horror”: what if there is no paradox? The very fact that we call it a “paradox” implies an essential flaw in our thinking, hidden somewhere. And this flaw may be much broader than horror: the whole idea of what emotions are (any emotions) may be worth reconsidering.

The “classical” understanding of emotions implies that specific brain regions are responsible for specific emotions. Say, every time we experience fear, deep in our brain the almonds of amygdala are activated. And the people with dysfunctional amygdala are fearless – or seem to be. However, recently a new view of emotions started emerging in psychology. Instead of the usual idea of brain regions dedicated to specific emotions, another view: our brain actively constructs simulations of emotions for every specific situation. In the case of

fear, multiple neural circuits may be involved, which may differ from person to person, and some of them don't include amygdala. One of the proponents of this approach, Lisa Feldman Barrett:

Fear is not a bodily pattern – just as bread is not flour – but emerges from the interactions of core systems. An instance of fear has irreducible, emergent properties not found in the ingredients alone, such as unpleasantness (as your car skids out of control on a slippery highway) or pleasantness (on an undulating rollercoaster). (Barrett 2017: 37)

In this perspective, there is no paradox of fear. Some instances of fear are unpleasant, but others are pleasant: rollercoaster, bungee jumping, or horror movies.

If horrors are pleasant, we can suggest that this “pleasant fear” in our brains is one more mechanism of cultural attraction: the artworks that trigger it most effectively shall survive, those that are less effective shall die out. Thus, the evolution of horror movies shows us a picture of the intensification of the stimulus. We have seen this intensification already – in the increasingly neotenic Mickey Mouse or the growing loudness of Western music. Do horror films become more “horrible” somehow? And what does it mean to be more horrible?

According to Menninghaus, the audience is protected from taking fictional horror too seriously (e.g., from fainting) by distancing mechanisms. So, can it be that over the years, due to the selection of more intense stimuli, this distance between us and the horrible has shrunk? A monster approaching a protagonist is the classical scene present in virtually every horror movie. The slow approach of zombies in the *Night of the Living Dead* (1968), or the ghost girl crawling out of the TV in the Japanese *Ring* (1998), or, most recently, the nameless entity slowly but constantly walking behind its victim in *It Follows* (2014). This approaching scene may also be a good metaphor of what horror fiction is doing as a genre: to make us afraid, the horrible becomes one step closer to us with every decade. It becomes more *realistic*.

Is it so? Since its dawn, horror fiction has pretended to be reality. Mary Shelley's *Frankenstein* (1818) pretends to be a collection of letters; Bram Stoker's *Dracula* (1897) pretends to consist of letters, diaries, telegrams, and newspaper cuttings; many of H. P. Lovecraft's stories are told as memoirs. When the first horror films were made, they continued this pretense. Although the early films, like the Universal classics – *Dracula* (1931), *Frankenstein* (1931), or *Wolfman* (1941) – were tales about *unrealistic* monsters, quite soon, newer, realer sources of threat were introduced to movie theaters: a friendly-looking serial killer owning a motel (Alfred Hitchcock's *Psycho* [1960]), a driver in a gigantic old truck kicking other cars off the cliff (Steven Spielberg's *Duel* [1971]), or a white shark terrorizing the sunny beaches of New England (Spielberg's *Jaws* [1975]). Today, this pursuit of realism is most evident in the genre of “mockumentaries,” which became popular in the 2000s. These are (fictional) horror films that pretend to be footage of *real* events. Often, this is “found” footage – since its makers have not survived the terrible things they have seen. The most

influential of such films – *The Blair Witch Project* (1999) – went down this road of pretense further than the rest: it was promoted by the producers as a true story of several student filmmakers that have disappeared in the woods while doing their college project about a supernatural legend. The website, launched a year ahead of the film’s release, contained fake interviews and diary entries. At the film festivals, “Missing” posters were hung. So: “real” students, a “real” college project, and a “real” witch that killed them. Fiction becomes reality.

The more realism, the better the horror movie. By the way, this may be the reason why horror films *age* so quickly. Most horror films released several decades ago look today like children’s tales and their “monsters” – like ridiculous puppets. Once the conventionality of fear becomes evident (and this always happens over time), the power of a horror film disappears: its tight grasp over our emotions loosens.

Thus, the evolutionary hypothesis is that horror films become more realistic over time. So far, however, this is only a hypothesis. How can we test it? We can imagine a simple experiment. For it, we can choose a number of classical horror movies from, say, the 1930s, the 1970s, and the 2000s, and show them to a test audience. Then, we ask which films are most realistic and most horrible. There is no need to actually perform this experiment, since the results are very predictable: we would see a more or less linear growth of the “horror-ness” in history. However, the interpretation of this finding will be tricky. What if the results show not the growth of *realism*, but simply the fact that people enjoy films that are *contemporary* to them? So, a counter-hypothesis: the linear growth of realism is not what makes horrors age, but rather the changing *conventions* of realism. That is, in the 1930s it was appropriate for films to look like theatre plays, and now it is appropriate for them to be stuffed with CGI. The conventions are arbitrary.

Are they? To find the answer, we must perform a much more complex experiment. More complex because it requires a time machine. We must travel back in time to the 1930s and run contemporary horror films in movie theatres. If the audience – our great-great-grandparents – scream at *Saw* (2004) less than at *Dracula* (1931), the “conventionality” hypothesis wins. However, I very much doubt so – but I have no means to prove otherwise.

Suspense, Curiosity, and Surprise

As I have tried to show, our sense of fear is a selection mechanism for some types of art, such as music or cinema. But not every film aims to frighten you, and not every song aims to send shivers down your spine. Fear is a specific selection mechanism that is used only in particular genres. At the same time, some affective brain systems are involved in the experience of virtually every artistic narrative. And, thus, virtually every artistic narrative should aim to effectively trigger these systems – or, at least, to trigger them better than their

competitors in the artistic marketplace. I am speaking of the main trio that constitutes narrative interest: suspense, curiosity, and surprise.

The idea that these three emotions are key to making any fictional narrative pleasant was introduced by the literary theorist Meir Sternberg (1978). He even called them “universals” – stressing their abundance in virtually every story. According to Sternberg and his followers (Brewer & Lichtenstein 1982; Hoeken & van Vliet 2000), each of these emotions appears as a response to a specific plot structure:

Suspense arises from rival scenarios about the future: from the discrepancy between what the telling lets us readers know about the happening (e.g., a conflict) at any moment and what still lies ahead, ambiguous because yet unresolved in the world. Its fellow universals rather involve manipulations of the past, which the tale communicates in a sequence discontinuous with the happening. Perceptibly so, for *curiosity*: knowing that we do not know, we go forward with our mind on the gapped antecedents, trying to infer (bridge, compose) them in retrospect. For *surprise*, however, the narrative first unobtrusively gaps or twists its chronology, then unexpectedly discloses to us our misreading and enforces a corrective rereading in late re-cognition. (Sternberg 2001: 117; original emphasis)

So, each of these three emotions is evoked by uncertainty. Suspense is uncertainty about the *future*; curiosity and surprise is uncertainty about the *past*.

Are these definitions exhaustive? Do they give us a sufficient understanding of what constitutes each of these emotions? Most probably not: research in psychology and neuroscience can improve these definitions. For example, now we know that suspense deals not so much with uncertainty, but with one's association with a character: we feel suspense if a character is in danger; though it often works even if there is no uncertainty at all. We care about the life of the brave rock climber N.N. who has just managed not to fall, even if we are watching the movie for a second time – the effect known as the “paradox of suspense” (Yanal 1996; but also see Gerrig 1997).

The same can be said about surprise. In many cases, surprise is evoked not by twists in narrative chronology – that is, flashbacks – as Sternberg assumes. It may simply arise when our expectations are violated (Meyer et al. 1997). *Any* expectation – with a chronological twist or without it.

However, these additions are not so important here. Much more important is that Sternberg realized the crucial role of these three emotions in making narratives pleasant. Switching to Sperber's terms, these human emotions are attractive: they function as “filtering mechanisms” that select narratives which satisfy certain criteria of pleasantness. Uninteresting (not surprising, not suspenseful, not stimulating any curiosity) narratives have little chance of becoming successful.

Interesting narratives, on the contrary, are likely to become more popular over time. In Chapters 5 and 6, I will describe two studies, which focus on the feeling of curiosity. They show the evolution of narrative techniques that evoke this emotion. In accordance with Sperber's prediction, curiosity-triggering tech-

niques become more widespread over time. Here, I will give a brief example of another successful technique – one that evokes surprise.

In an experimental study of folktales, Loewenstein and Heath (2009) examined what they call “surprise-based selection.” Their hypothesis was as follows. Folktales often contain a succession of three events. For example, in the well-known tale *The Three Little Pigs*, the wolf makes three attempts to destroy the houses of each of the pigs: the first and the second attempts are fruitful – the straw house and the stick house cannot resist his huffing and puffing – and the wolf eats both piglets; but the third house, made of brick, withstands the attack. Loewenstein and Heath call such a structure the Repetition-Break plot. In such a plot, several (at least two) similar successive events establish a pattern (for example, two houses fall down), but the last event violates the pattern (the third house does not fall down). The last event is surprising, but the effect of surprise cannot be achieved without the two preceding events: they establish an expectation to be violated.

Surprise can be a highly pleasant emotion, and so Loewenstein and Heath hypothesized that tales containing the Repetition-Break plot would have better chances of survival. They analyzed 88 folktales from the Brothers’ Grimm final collection and found that more than half of them (53%) contained the Repetition-Break plot. Then they compared the popularity of different folktales (estimated according to the number of search results for each title on Google) and found that tales with the Repetition-Break plot were much more popular than the ones without it.²⁸

Apparently, “surprise-based selection” does exist, and the Repetition-Break plot may be an easy way to pass through the filter of selection. At least for folk narratives. But what about more complex stories? Do they contain the same Repetition-Break structure – or is it a simplistic device for tales like *The Three Little Pigs*? At least, in some cases, the plot is still there. Take for example the recent blockbuster *The Dark Knight Rises* (2012) – the third film in Christopher Nolan’s Batman trilogy. At some point during the film, Batman gets captured in a special kind of prison: a deep pit with steep walls. The prisoners can see the sky above them – the freedom, which is so close – but those who have attempted to climb the walls to reach it have fallen. Batman (or, more precisely, his alter ego Bruce Wayne) attempts to climb it, using a rope as a safety measure, but he falls. After some time, he tries again – and is again unsuccessful. Finally, he decides not to use a safety rope and climbs the wall recklessly: falling would mean immediate death. However, on this third attempt (thoughtfully accompanied by emotional music) Bruce Wayne frees himself. A clear example of the Repetition-Break plot.

²⁸ In the same study, Loewenstein and Heath looked at the Repetition-Break structure in a different genre: jokes. But this time, they used another measure of success: not cultural “vitality,” like with the folktales, but likability. It turned out that jokes having the Repetition-Break structure were rated higher than the jokes without it.

Is the Repetition-Break plot the only narrative device made to surprise us? Of course, not – just as loud music is not the only technique for pressing the “fear” button in our brains. One could easily imagine many other techniques of surprise – and not all of them are situated at the level of plot: many have to do with style or characterization. For example, a surprising camera angle, or an unusual metaphor. The Repetition-Break plot is just one of many tools.

However, not many devices have lived such a long life: from folklore until the Batman movie. The Repetition-Break plot truly is an old and successful form. The living fossil of the art world.

Attention

So far, I have mentioned several mechanisms for hedonic selection: fear, suspense, curiosity, and surprise. Each works as a filtering mechanism that can shape artistic forms. New forms emerge that evoke these emotions – scare us, surprise us, and so on. Even more, as time goes on, they get better at their job: music becomes louder, horror films (potentially) become more horrible, mystery films become more mysterious (as I will show in Chapter 6). In other words, an *intensification* of forms occurs from the pressure of our psychological filtering mechanisms. Forms become increasingly pleasant.

However, being pleasant may not be enough. A successful art form must capture our *attention*, make us focus on it. If we read a book or watch a film, we shouldn’t be easily distracted. Of course, the task of capturing our attention is partly performed by the hedonic forms themselves: if we like something, we do not want to put it away. Nevertheless, some forms have no obvious hedonic component, yet they still capture our attention. They don’t make us laugh, or scream, or cry – they simply catch our eye.

Consider Figure 11, made by Cutting & Candan (2015). It shows the mean shot duration of films through the course of the twentieth century. Shots are probably the main structural units of film, the main “building blocks.” The figure shows a striking pattern: over time, mean shot duration has shrunk drastically. Also, note that it happened *twice*. First, in silent cinema: the earliest silent films on average had shots of about 10 seconds; however, by the end of the 1930s – the dusk of the silent film era – this value was compressed to about 4 seconds. The same pattern occurred with the invention of the sound film: initially, shots were long – up to 16 seconds on average – but then, as with silent films, their timeframe decreased to 4 seconds. Naturally, there have always been exceptions: the Oscar-winning *Birdman* (2014) was made to look like a single two-hour long shot, as were its famous predecessors – Hitchcock’s *Rope* (1948) or Alexander Sokurov’s *Russian Ark* (2002). But – on average – the pattern is clear.

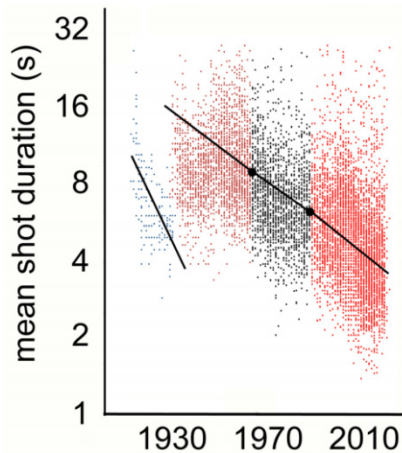


Figure 11. During film history, film shots were becoming increasingly shorter (from Cutting & Candan 2015). Interestingly, this shortening happened twice: first, in the silent movies, and later, in the sound films.

Now, how to explain this pattern? The psychologist James Cutting says: “with these evolved changes, filmmakers are exercising *more control* over a viewer’s *attention*. Moreover, it may be that film has become better adapted to human perceptual and cognitive processes” (Cutting et al. 2011: 574). The quick exchange of shots captures our attention.

And so do other filming techniques. Cutting et al. (2011) have found that, during its century-long history, film became darker – dark colors also help to better capture an audience’s attention. Additionally, the amount of movement on screen (both the movement of actors and the movement of the camera) has increased. Why? Because quick movement functions the same way as a quick exchange of shots: a new picture every few seconds holds our attention.

So, films have evolved to become more attention-capturing. Not news for anyone living in the Internet age, in which each of us is witness to (and, sometimes, a victim of) the aggressive competition for our attention – whether from rivaling YouTube videos or rivaling Facebook ads.²⁹ But, more surprisingly, this competition is not a recent phenomenon. Its origins can be traced back to hundreds of years ago. And the participants of these ancient competitions are quite unexpected.

For example, portraits. The anthropologist Olivier Morin made an interesting study of a particular type of portrait – the direct-gaze portrait (Morin 2013). Direct-gaze portraits appear to look right into the eyes of the viewer. The *Mona Lisa* is one of them, as well as Vermeer’s *Girl with a Pearl Earring*, and many others. Is there anything special about the direct gaze? Psychologists answer affirmatively: in fact, a direct gaze is a strong attractor of attention (Farroni, Massaccesi, Menon & Johnson 2007). Why? The explanation resembles many other psychological mechanisms mentioned in this chapter: it has nothing to do with paintings as such; most probably, the readiness to notice the gaze of

²⁹ See Parr (2015) for an entertaining how-to guide on capturing attention.

another human, directed at you, evolved thousands of years ago because it benefitted us as a highly social species.

Morin has asked if portraits, over centuries, adjusted to this cognitive preference? If the direct gaze attracts attention, and if portraits “want” to attract more attention, then the logical outcome would be to have more direct-gaze portraits. Portraits with a direct gaze would be slightly more attractive than those with an averted gaze, and so people would buy them more often, and then – the well-known story: supply would meet the demand. This is exactly what Morin found. He analyzed a large sample of European portraits from the fifteenth to nineteenth centuries and found that, at the beginning of this period, the proportion of direct-gaze portraits was small: about 25%. But the situation changed quickly: by the sixteenth century, they were the most popular type; about 70% of portraits featured the direct gaze. This domination endured for the next four centuries. It seems that Morin’s hypothesis is correct, and the portraits that had an effective attention-capturing strategy – direct gaze – won in market competition.

Let’s summarize. Our attention and our feelings are important selection mechanisms for art. Art “wants” to grab our attention; it “wants” to be liked; and so, art has to adjust to what our brain considers worth paying attention to and worth liking (often without our conscious awareness). Originally, these psychological criteria had nothing to do with the arts. They were shaped by our previous evolution: recall *Kindchenschema* and Mickey Mouse. However, at present, besides their main functions, they have another use: filtering artistic evolution. Artistic forms that make us pay attention, make us laugh or cry, have higher chances of success. Others usually don’t.

Psychology is an important filtering mechanism, but not the only one. If we want to create a better picture of art evolution, we cannot avoid another filter: social niches.

4.3. Social (and Technical) Selection

Figure 12 shows the rise of a new subgenre of horror film (mentioned above): mockumentaries. Altogether 346 films released between 1962 and 2014.³⁰ This is a picture of almost perfect exponential growth. And “growth” is too modest a word. An explosion, rather. During the five-year period of 2010–2014, more mockumentary horrors were produced than during the whole preceding history of cinema!

³⁰ I don’t know any comprehensive list of mockumentary horrors in the film industry, so I used crowdsourced data that aims at being comprehensive: two lists made by the users of IMDb (Internet Movie Database): (1) “Found footage/ mockumentary horror movies” by klaudia67 (<http://www.imdb.com/list/ls070607652/>); (2) “Every Found Footage Movie” by dimofhorror (<http://www.imdb.com/list/ls063914804/>). I combined these lists and then cleaned the data by removing repeating films and those films which weren’t strictly horrors. As Internet researchers know well, sometimes using data gathered by web enthusiasts can be extremely useful – as in this case. Even if this data fails to be complete, it still shows us the relevant trends.

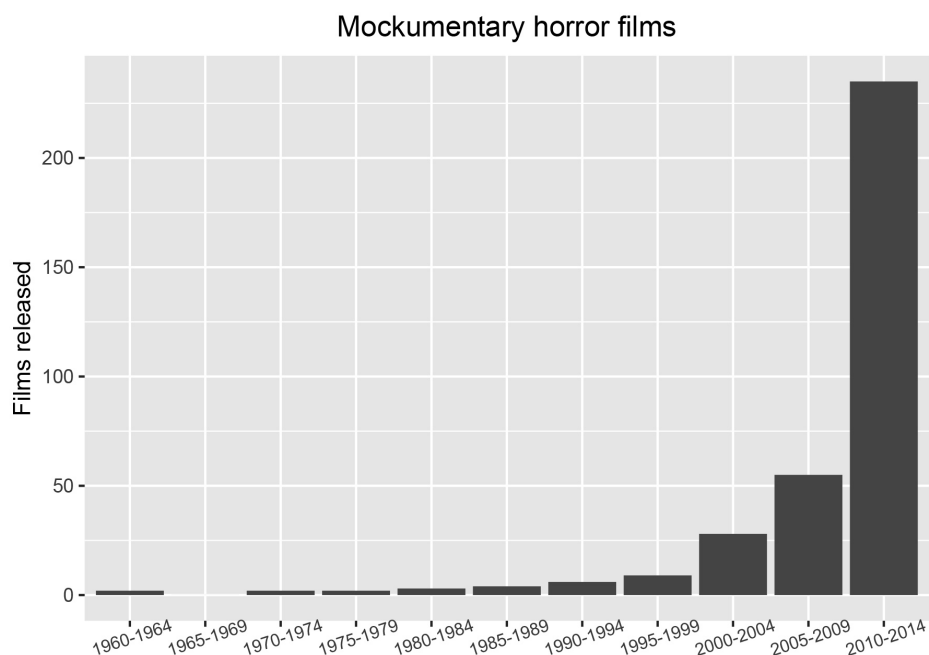


Figure 12. The rise of the genre of mockumentary horror films.

However, the most curious fact is not so much the exponential rise of the genre itself, but the fact that it took *so long* for the genre to rise. Before the explosion in the 2000s, we have four decades of almost nothing. I say “almost” because in every decade several mockumentaries were produced. And some were not bad – for horror standards – such as the Italian *Cannibal Holocaust* (1980). Why didn’t these films initiate the rise earlier? Why did these attempts fail?

The answer is hinted at in Figure 13. Here we have the popularity of each of the 346 mockumentary movies.³¹ Most are complete failures, some are solid mediocrities, and only a few are truly successful. The first huge success was the above-mentioned *The Blair Witch Project*. With a budget of only 60,000 dollars, it earned an impressive 248 million dollars. Its success has yet another measure, probably even more important to us: many stylistic and plot elements of *The Blair Witch Project* became formulaic. A school project, several enthusiastic students, a local legend, a shaky video camera, the threatening end of the film – when the camera either breaks or keeps shooting the video while all the

³¹ On IMDb, each film receives ratings from IMDb users, scored on a scale of 1 to 10 stars. Using these ratings would be one way to measure a film’s popularity. However, ratings can be deceiving as a film may be rated by only a handful of users. So, a much better proxy for popularity would be according to the exact number of people who have voted for a film, irrespective of the number of stars they have given. This is the measure I use in this study.

protagonists are supposedly dead – all these elements became standard pieces in the do-it-yourself kit of the mockumentary horror genre. *The Blair Witch Project* became the model for this formula. A template.

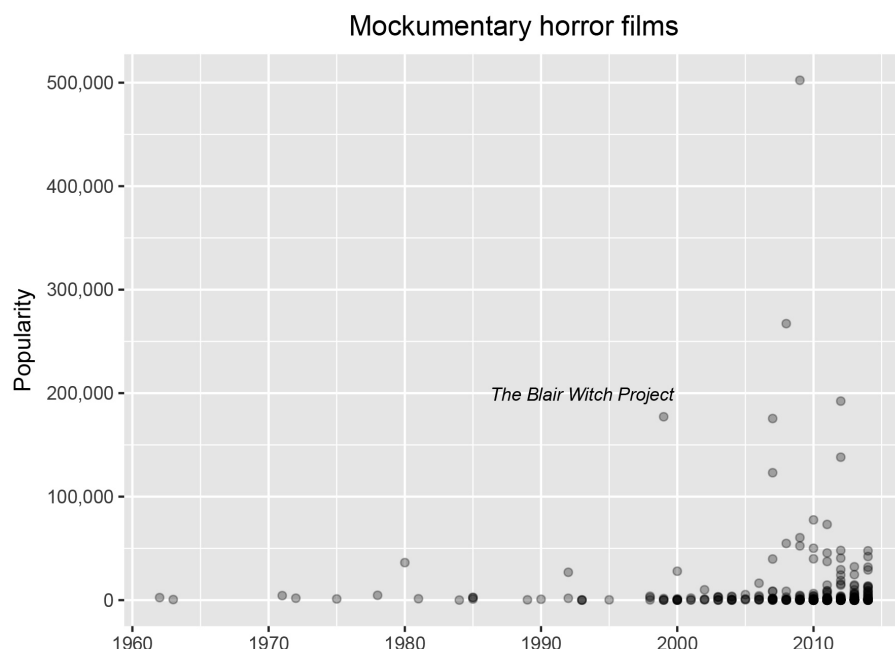


Figure 13. Before mockumentary horrors became popular – in the 2000s – there happened a huge success of *The Blair Witch Project*. It became the blueprint of how such films must be made.

So, why did *The Blair Witch Project* become so successful? Many factors probably contributed, a clever promotional campaign not the least important. However, the main reason may be rooted in something quite different: the sociotechnical context of the late 1990s. Namely, in the spread of a new type of camera.

Before *The Blair Witch Project*, mockumentary movies were filmed with cine-cameras, which used film stock, long strips of shots. And the making of films with cine-cameras had its limitations. For example, cameras were bulky and heavy, so filming itself required several people, which is exactly what we see in *Man Bites Dog*: this pseudo-documentary about a serial killer was made by a team of several filmmakers. Thus, it restricts the plot: now, the movie must include several people, most of whom – truth be told – are useless. The viewer wants to watch the serial killer, not the crowd of nameless (and uninteresting) guys gravitating around him. In *Man Bites Dog*, the pretense of realism comes at a cost to restrictions in the plot.

Digital cameras, which became commonplace in the 90s, made the whole filming process much easier. When a camera can be held in one hand, when it does not require an external microphone or a tripod, using it becomes simple. A team of filmmakers was no longer required. Just one person to press the “On” button at the right moment. And as a result – almost no restrictions in the plot. Such a mockumentary can be made on virtually any topic, in any location, and at any moment. It does not require a complex motivation – as in *Man Bites Dog*. The cost of realism in the pseudo-documentary is much smaller.

The Blair Witch Project benefitted from this decreased cost-benefit ratio. Equipped with a small digital camera, students go into the woods for several days – something that is hard to imagine with a large film camera. Their digital camera is almost invisible. At times, the moviegoers may even forget that they are seeing the woods and the witch’s hut through a movie lens, but instead as if directly through the *eyes* of the students. First-person narration in cinema – this is what *The Blair Witch Project* if not invented, then at least amplified and popularized.

Now, let’s return to the previous question: Why did it take so long for the genre to rise? The psychological selection of more realistic films (and mockumentaries certainly fall into this group) has always existed – in the 60s, 70s, and 80s. However, the absence of the necessary technology – a less bulky video camera – prevented the genre from rising.

But technology isn’t isolated. It never appears alone, and so instead of speaking about “technological selection,” which would be too narrow, we should speak instead about “sociotechnical selection.” Here I share the perspective of science and technology studies and consider technology and society not as antipodes, but as an interwoven whole, a complex unity (Geels 2002). This may be more evident in the following example.

In Figure 14, you can observe a trend similar to the rise of mockumentary films: the rise of cyberpunk science fiction.³² Cyberpunk is quite different from the traditional “hard” science fiction of Isaac Asimov, Stanislaw Lem, and others. Instead of spaceships travelling to Mars, cyberpunk fiction depicts poor cities, large corporations, and lone heroes enhanced with cybernetic technologies. The growth pattern of this genre resembles that of mockumentary horror: a long period of virtually nothing followed by a sudden expansion.

³² Here I used crowdsourced data too – this time from Goodreads. In particular, from two lists: (1) “Best cyberpunk books” (https://www.goodreads.com/list/show/486.Best_cyberpunk_books) and “Best of Cyberpunk” (https://www.goodreads.com/list/show/487.Best_of_Cyberpunk). Unlike IMDb lists, these don’t aim to be comprehensive, which means that many titles are missing – especially the marginal ones, e.g., some precursors to the genre, such as Harlan Ellison’s *I Have No Mouth, and I Must Scream* (1967). Nevertheless, there is no reason to doubt the general trend shown by the data. At least, we see the publication of *important* books – those that remain in the cultural memory. For our purposes, this should be enough.

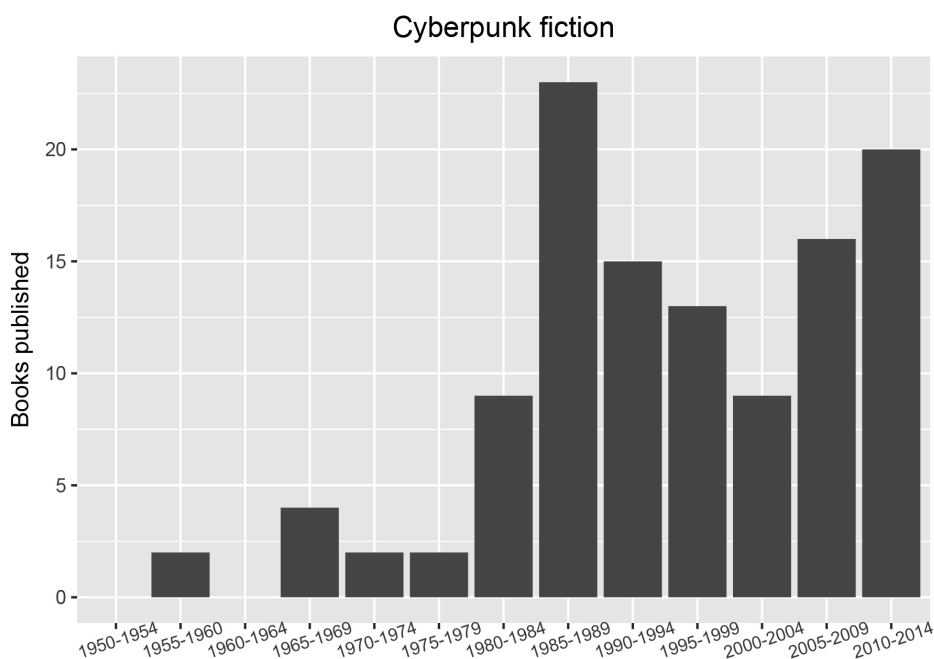


Figure 14. The rise of cyberpunk fiction. Some books, (retrospectively) attributed to the genre, were published in the 1950s-1970s, but the real growth began in the 1980s.

We can see that the growth starts in the 1980s, and if we look at the *popularity* of particular novels (Figure 15), we may find an equivalent to *The Blair Witch Project* – the most successful novel at the start of the rise. In fact, there are three such books: Philip K. Dick’s *Do Androids Dream of Electric Sheep?* (1968), William Gibson’s *Neuromancer* (1984), and Neal Stephenson’s *Snow Crash* (1992). Dick’s book, however, is commonly regarded as a distant precursor to the genre, retrospectively identified as cyberpunk, and so the first successful cyberpunk novel was *Neuromancer*. No surprises so far.

Now we are back to the same question: Why did cyberpunk become popular in the 1980s – not earlier or later? One reason is certainly the personal computer. In the 1980s, computers stopped being an obscure technology taking up (lots of) space in research facilities and started entering homes as appliances. However, they were still obscure and somewhat “alien.” In January 1983 (just a year before Gibson’s *Neuromancer* appeared), *Time* magazine featured a computer on its cover with the caption “Machine of the Year” – instead of its traditional “Person of the Year” annual issue. A machine equated to a person: a telling symptom of how computers were perceived back then – the most “human” of all the technologies. They were entering people’s homes and so were the hopes and fears associated with them. And cyberpunk fed on these hopes and fears: bodies adjusted with microchips (take Gibson’s short story

Johnny Mnemonic [1981]), or humanity enslaved by computers (*The Matrix* [1999]).³³

Both mockumentary horror and cyberpunk fiction owe at least some credit to new technologies. These technologies opened a window of possibility for a new type of literature – in a twofold manner: technological, on the one hand, and social, on the other.

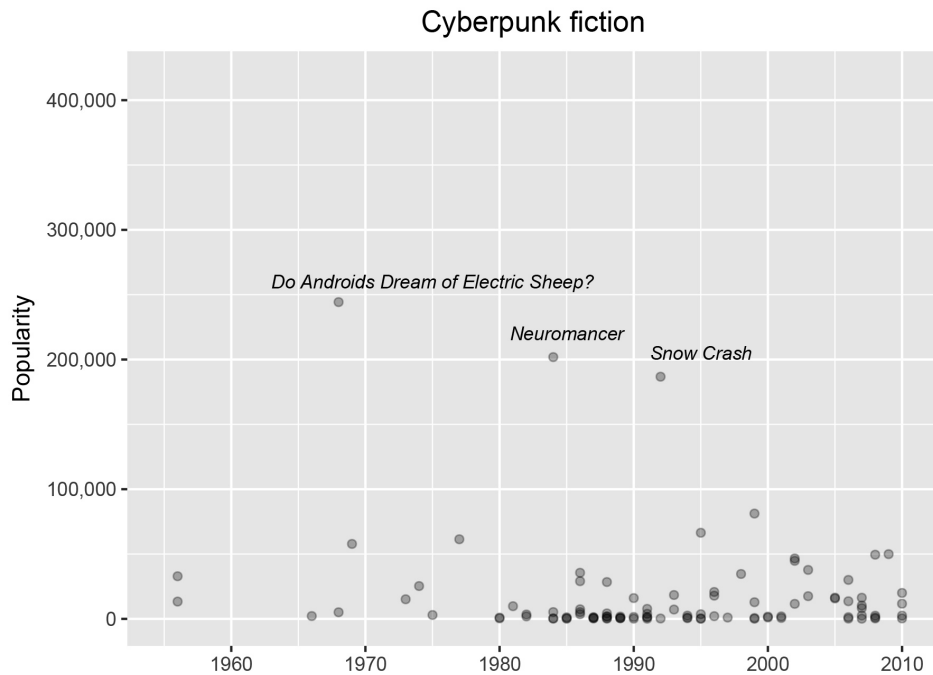


Figure 15. Three books that initiated the rise of cyberpunk. The main one is in the middle: William Gibson’s *Neuromancer*, which played for the cyberpunk fiction the same role as *The Blair Witch* played for the mockumentary horror: it introduced all the main elements of the genre, that could be easily copied and reshuffled by the later authors.

First, new technologies enabled new genres. Cyberpunk fiction relies on computers, and mockumentary horrors rely on digital cameras. These technologies seem to be *necessary* elements of these genres. That is, producing well-made

³³ In principle, computers entered science fiction before the 1980s: recall Stanley Kubrick’s *2001: A Space Odyssey* (1968) with its on-board computer HAL 9000 going insane. But the 1960s were still the time when computers weren’t perceived as a part of the everyday. They were otherworldly, belonging to a futuristic science lab or even to the outer space, like HAL. The transformation of computers into PCs made them much closer to people, and thus massively increased their cultural influence.

cyberpunk novels or mockumentary horrors before these technological changes happened would be extremely complicated. This resembles the evolutionary idea of adjacent possible, suggested for biological evolution by the polymath scholar Stuart Kauffman (2000), and later applied to cultural innovations by Steven Johnson:

The phrase [“adjacent possible”] captures both the limits and the creative potential of change and innovation. In the case of prebiotic chemistry, the adjacent possible defines all those molecular reactions that were directly achievable in the primordial soup. Sunflowers and mosquitoes and brains exist outside that circle of possibility. The adjacent possible is a kind of shadow future, hovering on the edges of the present state of things, a map of all the ways in which the present can reinvent itself. Yet is it not an infinite space, or a totally open playing field. The number of potential first-order reactions is vast, but it is a finite number, and it excludes most of the forms that now populate the biosphere. What the adjacent possible tells us is that at any moment the world is capable of extraordinary change, but only certain changes can happen. (Johnson 2010: 31)

Brains could not appear before the neurons. This change was outside the “circle of possibility”: outside the adjacent possible. The same is true of many technological innovations. When personal computers were introduced, they expanded the possibility for further technological evolution: it became possible to invent laptops, the Internet, or e-commerce. But computers also created new possibilities for the artistic evolution – at times, in rather obvious ways, like computer games or MP3 coding format. But sometimes, in less obvious, like the cyberpunk. Mockumentary horror films are a similar case. They were sometimes produced before the wide use of digital cameras, but it was this technology that enabled the quick explosive evolution of the genre.

The second connection between technology and art is social. When a new technology is introduced, it may cause strong, and often extreme, emotions in the society: from fear to excitement. This is especially true of the early stages of getting used to a technology: the time when we already know its power but aren’t yet certain of its limitations. And uncertainty feeds fears. The early stages of introducing new technologies are also periods when a social resistance may grow. For example, an anxiety disorder named “cyberphobia” was frequently diagnosed in the 1980s: about 20% of the U.S. population were claimed to be in the risk group of becoming cyberphobic (Bauer 1995). On the opposite pole, there was an extreme fascination with the bright cybernetic futures. Both reactions, however polar they are, produce the same strong emotion: interest.

Cyberpunk fiction became *possible* because PCs appeared, but it became *popular* because they triggered public interest. Cyberpunk was propelled by the “cyber-interest,” fueled by the “cyber-fears” and “cyber-excitement.” And this is what distinguishes it from the mockumentary horrors. For mockumentaries, a digital camera was no more than a building brick, a tool that expands the adjacent possible, not associated with strong social interest.

Which selection pressures are more stable – psychological, discussed in sections 4.1 and 4.2, or sociotechnical, discussed here? Usually, the former. Most of us think that babies are cute, and so thought our parents, and grandparents, and so on. This preference is stable and fairly universal. That is why Mickey Mouse will always have good chances to be popular – like it or not. But the sociotechnical preferences – such as the interest in computers – are fluid. They don’t last long; they vary from culture to culture, or even from person to person. In the 1980s and 1990s, computers were a new thing, and so a window of opportunity opened for cyberpunk literature and film. Several decades before that, sociotechnical context was different: rockets and robots were the new big thing, not computers. And so: “hard” science fiction appeared, with brave astronauts investigating the Martian landscapes. Today, we are witness to the great advances in artificial intelligence, and subsequently films and books about how computers become intelligent (often – dangerously intelligent).

So, two kinds of selective environments. One is (relatively) static – psychology; another is (relatively) dynamic – sociotechnical preferences. And whenever we see a pattern, like those in Figures 11–14, we should ask ourselves: Which kind of selective force is responsible for it? Cognitive attraction, or sociotechnical niches? Or the combination of both? Figuring this out can be a very complex task.

And – to complicate things even more – there is a third option: a pattern with no selective force behind it. Drift.

4.4. Drift

I have mentioned the three most popular cyberpunk authors: Dick, Gibson, and Stevenson. They are the recognized “canon” of cyberpunk literature: my data only confirms the common knowledge. Nothing unexpected.

However, Figure 16 shows something that *is* unexpected: the exact numbers – *how* popular each author is.³⁴ It isn’t strange that these three authors hold the top spots; what’s strange is how great their breakaway is from the rest. The combined popularity of the books by just these three authors is higher than the combined popularity of all books by all other authors.³⁵ In statistics, such unequal distribution is called power-law distribution. It’s as if Dick, Gibson, and Sterling are holding a monopoly over cyberpunk. For most readers, the whole genre is limited to these three names. They *are* cyberpunk.

³⁴ Again, as in the case of mockumentary horrors, I use the number of people who gave some rating (*any* rating) to a book as an estimate of its popularity. In this respect, Goodreads and IMDb are similar.

³⁵ Books by Dick, Gibson, and Sterling have 1,212,287 user votes altogether, while the rest of authors combined have only 947,179 votes.

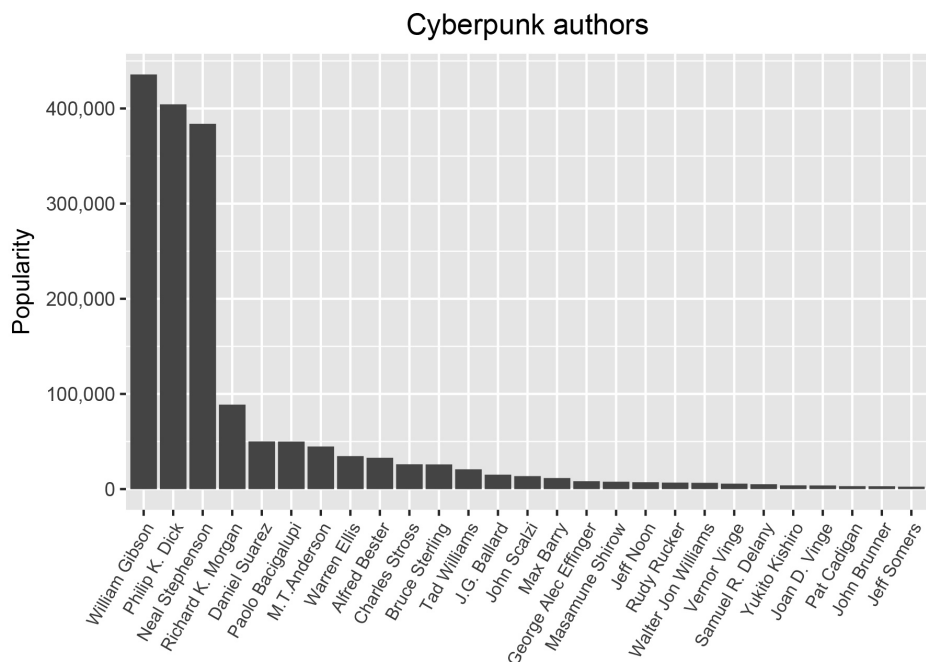


Figure 16. The extreme inequality of the field of cyberpunk literature. The popularity of three main figures combined is larger than the popularity of the rest of writers. The long tail of little-known authors is much longer than shown on this graph.

Now, let's think what this means. If this canonical trio is that much more popular than the remaining hundreds of cyberpunk writers, does it mean that they are much more *fit* to the selective landscape? And “fit” would mean: psychologically more attractive, or more suitable for the social circumstances. Franco Moretti touches upon this drastic inequality of the literary market when discussing early detective fiction:

Readers and markets ... are both causal agents, but in different ways: in the sense that readers *select*, and then markets *magnify*. Did Doyle deserve to sell ten times more than Huan Mee and McDonnell Bodkin? Yes. A hundred times? Doubtful. A thousand—a hundred thousand times? Of course not: this order of magnitude no longer has anything to do with actual morphological differences, but only with the perverse market logic—to those who have, more shall be given—that goes by the name of increasing returns. (Moretti 2013a: 146)

Readers select; markets magnify. I have spoken about selection already, but what about this magnification? Does it fit into the evolutionary framework? Can the drastic distance between Doyle and McDonnell Bodkin (or William Gibson and some Walter Jon Williams) be explained with cultural evolution?

Apparently the evolutionary process of drift seems to be responsible for this inequity. According to Mesoudi: “Cultural drift ... occurs when people copy cultural traits entirely at random in the absence of any ... directional processes” (Mesoudi 2011: 77). For example, take the names given to newborn babies. A name as such does not usually carry any benefits for its bearer – it is just a combination of letters. You may be called Catherine, Laura, or Guinevere, and this will most probably not impact your career, wealth, or social status. That is why we may assume that, in general, names are given to babies quite randomly (Hahn & Bentley 2003). “Random” does not mean “deprived of reason,” though. Every name does have some reason for giving it – and may be a result of long family debate. But these choices are random in another sense: they are almost impossible to predict on a large-scale level.³⁶

So names are given randomly. However, this randomness results not in a mess, but in a *pattern*. A power-law distribution of cultural traits: a few names become extremely popular, the majority become extremely rare. Extremities. John and Mary are widespread; Autry, Trula, and Izora are almost extinct. And the logic behind this polarization is, as Moretti phrases it, “to those who have, more shall be given.” A popular name becomes even more popular because it becomes increasingly more common, and thus more likely to seem a suitable name for your kid. A not so popular name becomes even less popular because it becomes increasingly hard to meet someone with such a name. Such a random process is called drift.

Drift is most likely to happen in *small* populations. The reason behind it is basic statistics:

If many people make a choice, and there is one reliable factor that consistently influences their choice in a given direction, then the more people you observe, the more chances you have that their cumulated decisions will reflect that factor: noisy factors will average out. On the other hand, when people are less numerous, noise (that is to say, unreliable factors weighing in inconsistent directions) is more likely to prevail. (Morin 2011)

Evolution in a small group will be more random than the evolution in a large group because chance plays a larger role when numbers are small. If you roll a dice once, you cannot predict which of the numbers you will get: the probability of rolling 1 is the same as rolling 6. But if you roll it one thousand times, you will be able to accurately predict the distribution.

A practical consequence of this process is the *founder effect*. Imagine a group of monkeys living in an imaginary Unhappy valley. The valley is called Unhappy, because there are too many monkeys and too little food. In the search for more bananas and oranges, a group of four monkeys (who happen to be shorter than the rest of their group – just by chance) takes a risky trip to an unknown land, possibly full of predators. However, they get lucky: they find another valley with lots of bananas and no monkey competitors. So, these four

³⁶ However, it also happens that names become popular because of celebrities: this happened with names such as Elvis, Britney, or Barack (Bentley et al. 2011).

settle in the Happy valley. They give birth to many children, all of which share the genes of this initial small group. As a result, most of the monkeys in the new colony are short – like their four ancestors. And – it is important to stress – they are short not because this trait is adaptive (i.e., it was not selected for), but simply due to chance. It just happened that the founders were short – by chance.

Now, back to the arts – and to our question: Are Gibson, Dick, and Stevenson more fit to the selective environment? Were they chosen because they were better? Most probably, the answer is not so simple. Their huge popularity is not because of their huge artistic advantages over the rest of cyberpunk authors, but because they happened to be the *founders* of a new genre. I say “happened,” as chance played an important role here. Had Gibson gotten the idea of *Neuromancer* a few years later (maybe, even a year later), someone else might have been credited for the invention of the genre, as all the main motifs of cyberpunk – evil corporations, hackers, hi-tech implants – were floating in the air.³⁷ Someone else might have climbed on top of the power-law distribution. So, it makes little sense to look for some aesthetic advantages of Gibson over other cyberpunk writers of the 1980s, 1990s, or today. Obviously, on his road to fame Gibson must have passed some “aesthetic threshold”: his books must have been interesting, clever, and well-written. But so were the books of many other cyberpunk authors. He just happened to be the first.

Gibson, Dick, and Stevenson were the founders of a new genre, and so they became the most important figures in the literary subfield called “cyberpunk.” But what about the field of world literature as a whole? Is it equally centralized?

Figure 17 shows different authors in world literature – from different times, countries, and languages – ranked according to their “prestige” among literary critics.³⁸ And, once again, we see the power-law distribution. Shakespeare is the single most prestigious writer – not unexpectedly. The next in line – Joyce – is almost four times less prestigious. However, his lag behind Shakespeare is nothing compared to other (great) writers in this list: Samuel Taylor Coleridge – 11 times less prestigious than Shakespeare, Walter Scott – 23 times, Washington Irving – 55 times! All of them are canonical, and yet canon too is uneven. Don’t even dare to look at “genre writers,” such as William Gibson: he is 170 times less prestigious than Shakespeare.

³⁷ Contextual reasons made *Neuromancer* particularly popular at that time and place. They were analyzed by Sarah Brouillette, who concludes: “the general championing of Gibson’s text is intimately related to its situation within a particular print environment. Specifically, the initial critical success and continuing interest of *Neuromancer* have much to do with the situation of science-fiction publishing in 1984 [...] the science-fiction community that initially received *Neuromancer* with high praise was particularly ready to embrace the sort of underclass, subcultural challenge to corporate might that it evokes” (Brouillette 2002: 188).

³⁸ This data was shared with me by J.D. Porter, who will analyze it in depth in the forthcoming pamphlet of the Stanford Literary Lab. Prestige is counted here by the number of articles in the MLA International Bibliography for which the writer was tagged as the “Primary Subject Author.” Therefore, it reflects the importance of writers from the point of view of (American) literary critics, not the reading audience at large.

World literature is centralized, and so is the very core of it – the canon. Now, we can try making the same argument as in the case of cyberpunk: centralization is caused by drift. Not by the directional forces of selection (that is, not due to some aesthetic or ideological benefits over the rest), but by a random process. It is a dangerous road: to question the prestige of Shakespeare. But let's look at it from the alternative perspective: it's an attempt to defend those authors who are (much) less prestigious.

The question is: Could the founder effect play a role in the popularity of Shakespeare, as in the case of Gibson – but on a much larger scale? At first glance, this idea seems groundless: unlike Gibson, Shakespeare did not invent a genre. Then what is he the founder of? Of what outset is he standing at? Probably of something much larger than a single genre or a local literary movement, as he is the central figure of the *literary field* as a whole. Is he at the outset of the literary field in its present form?

The contemporary literary field – Modern European literature – began to take shape in the late eighteenth and early nineteenth centuries. The main reason for this was the invention of the modern nation state: a radically new way to organize societies (Hobsbawm 1992). And at the avant-garde of nationalism were Germans. They did not have a united state, and they felt the need to obtain it more than anyone else. A state united by a single nation, a single language, and... a single literature. German intellectuals started thinking about their literary canon earlier than the intellectuals in other countries. They started *inventing* the canon. And they admired Shakespeare:

A new generation, later designated as *Sturm und Drang* (Storm and Stress), comprising Gerstenberg, Klinger, Lenz, Herder, Goethe, and Schiller, worshiped Shakespeare for his evocative power to involve the audience in the action. In their rebellion against the bureaucracy and despotism of German provincialism and political quietism Shakespeare meant for them an intellectual revolution, a liberation of senses, feeling, and imagination. (Grundmann 2005: 51)

An appeal to the senses, feelings, and imagination – this is what Shakespeare's plays could provide for readers tired of the over-formalized and rational classicist drama. In late eighteenth-century Germany, if one was searching for new, non-classicist forms of writing, Shakespeare was an ideal choice. He was selected and put on a pedestal for good reason – for that particular place and time. However, it also happened that this was a *decisive* place and time in the history of European literature. It was the moment when, along with the formation of the modern nation state, modern national literature was formed, having a canon of “geniuses” at its center. Shakespeare was not the founder of modern literature, but he was chosen by the founders.³⁹

Moreover, Shakespeare represented the most powerful country of the age: the British Empire, the center of the world-system in the nineteenth century

³⁹ By the way, another chosen figure – Goethe – holds the third spot in our list: a high ranking, considering the list reflects the preferences of American critics.

(Chase-Dunn & Lero 2014). Britain, where all types of capital – economic, cultural, social – were concentrated. And so, the birth of national literature was combined with economic and cultural domination: and Shakespeare happened to be at the center of it all. Of course, he would become a great author!

Now, let's stop for a moment and consider our feelings. How can this claim – that a coincidence, a random cultural drift, played such a huge role in the popularity of Gibson and in the prestige of Shakespeare – how can this claim possibly be true? Isn't it nonsense that the status of Gibson and Shakespeare is undeserved? That it is a side-effect of cultural processes that are much larger and much more powerful than these two people?

Or, maybe, it is logical? The status of such enormousness *cannot* possibly be a result of the actions of a single human being. Shakespeare holds the top spot of the power-law distribution with a terrific breakaway, which cannot possibly be explained by the actions of an individual – however talented. This is the force of culture that we are observing in Figure 17 – extreme and inhuman.

Why are we so reluctant to accept that chance was what brought Gibson and Shakespeare to their heights? Why don't we agree to admit that some parts of our culture – including famous writers and their writings – are results of random processes? The founder of behavioral economics and Nobel Prize winner Daniel Kahneman coined a name for such reluctance: the bias of confidence over doubt.

We are pattern seekers, believers in a coherent world, in which regularities ... appear not by accident but as a result of mechanical causality or of someone's intention. We do not expect to see regularity produced by a random process, and when we detect what appears to be a rule, we quickly reject the idea that the process is truly random (Kahneman 2011: 115).

Shakespeare being so frequently the object of attention of critics and readers is a regularity. But is this regularity “produced by a random process?”

In the end, I will leave this question open.

5. THE EVOLUTION OF DIALOGUES: A QUANTITATIVE STUDY OF RUSSIAN NOVELS (1830–1900)

5.1. A Problem

While reading contemporary works of fiction (especially those of popular genres), it is hard not to notice the abundance of dialogues.⁴⁰ In some novels conversations virtually dominate, accompanied by rather short descriptive and narrative episodes. For instance, in Ruth Rendell's detective novel *The Vault* (2011), dialogues occupy slightly more than 50 percent of the word space. This omnipresence of dialogues is found not only in popular fiction but also in many "serious" works of literature. A good example is Philip Roth's novel *Deception* (1990), which consists entirely of dialogue. Obviously, there is nothing new in highly dialogic novels: instances of such texts can be found throughout the whole history of literature. For example, the famous knight-errant novel *Amadis de Gaula* (1508) is extremely dialogic, as are much later modernist experiments, like the "dialogue novels" of Ivy Compton-Burnett or Henry Green. However, the spread of such "conversational" literature nowadays seems to be wider than ever before.

This observation, however uncertain it is, poses a problem: is it really the case that during the course of literary history novels have become on average more and more dialogic? Or perhaps there has been no real increase, and works like *The Vault*, *Deception*, and others of their kind are nonillustrative exceptions whose existence really does not indicate anything about the current popularity of the highly dialogic type of novel. And more generally, can we at all speak of any tendency in the development of dialogues in the novel, toward either increase or decrease? If we (being unafraid of stepping on the shaky ground of conditional reasoning) assume an affirmative answer, then what might be the driving force of one tendency or another? The present chapter will not answer these questions with absolute certainty, but it will suggest some possible and apparently quite probable solutions – with the help of quantitative analysis.

5.2. A Method

To answer questions like these, a study should be based not on a couple of more or less random examples but on a much larger sample – not two (or three or ten...) novels but hundreds or even thousands of them. In other words, the main

⁴⁰ The term *dialogue* in the present study is used in its narrow sense, i.e., as "the representation (dramatic in type) of an oral exchange involving two or more characters" (Prince 2003 [1987]: 20), and has little to do with M. Bakhtin's all-embracing conception of dialogism. The words *dialogic* and *dialogicity* used throughout this article are derived from this narrow definition.

strategy of the research should become “distant reading,” which, according to Franco Moretti (2000a: 57), who coined the term, “allows you to focus on units that are much smaller or much larger than the text: devices, themes, tropes – or genres and systems.” In our case, these two extremes meet in the study of dialogues (“much smaller ... than the text”) from the perspective of a “much larger” pattern of their development over decades.⁴¹

However, distant reading is not a *method*. Rather, it is an umbrella term for a set of particular tools of analysis that are yet to be described. Here another notion suggested by Moretti (2013b) becomes useful: “operationalizing.” To achieve the goal posed above we have to convey a series of operations, mainly of two types: (1) operations for the creation of a representative sample of novels; (2) operations for the analysis of this sample.

First, regarding the *sample*. In an ideal case, this should encompass a large number of novels from several European literatures published over the span of several decades. Unfortunately, this ideal case is unrealizable due to the lack of prepared literary corpora and unresolved complications with the automatic extraction of dialogues in many national literatures. Therefore, I decided to choose one national literature in which the history of the novel is rather short (the smaller the population, the smaller our sample can be) which, at the same time, has produced excellent works of fiction highly valued among the world’s literature. The Russian novel of the nineteenth century seems to be a good match. During the short period from 1830 to 1900 the Russian novel underwent a marvelous transformation. Before 1830 there were virtually no Russian novels (let alone *good* Russian novels), but in the span of seventy years Russian literature produced such writers as Ivan Turgenev, Fyodor Dostoevsky, and Lev Tolstoy – authors no less prominent than their British or French contemporaries. I collected a sample of four hundred Russian novels based on the free access electronic library Lib.ru, which includes almost all available online electronic copies of novels and larger *povesti* (a typically Russian genre of narrative fiction the length of which can vary significantly, at times being close to a short story and sometimes the length of a novel).⁴² This corpus includes texts published either in journals or as books from 1830 to 1900. I decided not to include earlier texts, as their number would not be enough to make the sample representative.

Is this corpus representative? For obvious reasons, the authors who are considered a part of the Russian canon of nineteenth-century literature are represented better than the majority of lesser-known writers (e.g., Turgenev is represented by twelve texts, Tolstoy by thirteen, and Dostoevsky by sixteen, while Grigory Kugushev, Vasily Vonliarliarsky, Yakov Butkov, and many others are

⁴¹ This study is far from being the first attempt to investigate characters’ speech using quantitative methods (cf. Conroy 2014; Hoover et al. 2014; Katsma 2014). However, the objectives of those studies were quite different.

⁴² A more detailed discussion of the genre of *povest*’ and its ambiguities is in Di Salvo 2006.

represented just by one novel each). At the same time, many noncanonical but popular authors of their time are also well represented (the corpus contains thirteen novels by Daniil Mordovtsev, nine by Konstantin Leontjev, nine by Dmitry Grigorovich, etc.). Therefore, even if canonical authors are indeed better represented, this does not seem to be an overwhelming problem.⁴³

Now the operations for the *analysis* of the sample. In the case of Rendell's *The Vault*, mentioned above, I have determined the word space of dialogue, that is, the relative number of words in *répliques* (dialogue segments). However, this may not be the most interesting way to deal with the problem. Years ago Boris Yarkho (2006: 425–429), that half-forgotten forerunner of “distant reading,” suggested a method of analysis that seems more promising in the essay “Komedii i tragedii Kornel’a: Et’ud po teorii zhanra” (“Comedies and Tragedies of Corneille: A Study on Genre Theory”) in his fundamental volume *Metodologija tochnogo literaturovedenija* (*The Methodology of Precise Literary Study*). Written in the 1930s, this volume was not published until very recently. Yarkho started his career doing formal analysis along the lines of the Russian formalists but then became their severe critic and made a heroic (because solitary) attempt to develop a method that would be more scientific than the “formal method” of Victor Shklovsky, Boris Eikhenbaum, and their colleagues. In his excellent analysis of Pierre Corneille’s plays, Yarkho introduced the notion of *dialogic liveliness* (Russian, *живость диалога*), calculated with the help of the coefficient of liveliness, represented by the following equation:⁴⁴

$$\text{coefficient of dialogic liveliness} = \frac{\text{number of utterances}}{\text{number of lines in a play}}$$

This equation should be regarded as a *mathematical* definition of “liveliness.” However, Yarkho does not provide an explicit *psychological* definition of liveliness; that is, he does not answer the question, what does more or less lively dialogue *do* to a reader? The attempt to introduce a psychological perspective here would not be a strained interpretation. Yarkho himself was an advocate of a psychological approach to literature, and no doubt his definition of liveliness was an inherently psychological one. In another article Yarkho (1927: 7–8) writes: “The form of a literary work is a sum of those elements of the work that can evoke an aesthetic feeling ... it is the sum of stimuli.” So what is the aesthetic feeling evoked by such a formal feature as liveliness?

The absence of this explanation in Yarkho’s text is understandable: he never completed his *Methodology*, which exists today in the form of a very concise

⁴³ It should be noted that clear criteria for the construction of representative literary corpora have yet to be developed, which is a much larger problem that cannot be solved by our study.

⁴⁴ Here and going forward the term *utterance* indicates the direct speech of a single character. An utterance begins when a character starts speaking and ends when this speech is interrupted by the direct speech of another character or by a narrative or descriptive fragment of text. *Dialogue* is considered to be a composite whole consisting of units – *utterances*.

manuscript. To fill in this gap, I will suggest my own psychological interpretation of dialogic liveliness later in this chapter. However, for now the mathematical definition is more important. A slightly modified version of the equation Yarkho used to analyze plays seems useful for identifying liveliness in novels. Yarkho was interested in *verse* plays, but novels are a prosaic genre. So instead of counting the number of lines in a play, we have to use some other measure – for instance, the total number of words. Now the equation will be

$$\text{coefficient of dialogic liveliness} = \frac{\text{number of utterances}}{\text{number of words in a novel}}$$

If a novel has many characters' utterances, then the coefficient is high, which should indicate high dialogic liveliness. If a novel has very few dialogues, the coefficient should be low.

Having established these initial methodological premises, another operation had to be undertaken: calculation of the coefficient of dialogic liveliness for each of the novels in the selected corpus. Fortunately, Russian literature has very stable conventions for indicating dialogues in the novels. In the vast majority of cases, every new utterance begins with a new line and a dash. So it was not complicated to write a simple computer program in Python that would automatically count utterances. However, in rare cases this method did not work. Some novels of the first half of the 1830s (usually those containing very few dialogues) did not follow any coherent convention for representing direct speech, and for that reason they had to be counted manually.

5.3. A Graph

The graph in Figure 18 shows the results of calculating the coefficient of dialogic liveliness for each of the novels in the corpus and then finding mean values of liveliness for five-year periods. This graph confirms my main assumption: during the nineteenth century Russian novels became more dialogic. Overall, the mean dialogic liveliness increased from about 0.01 in the 1830s to almost 0.02 in the 1890s. Roughly speaking, it doubled. At the same time, there are a couple of unexpected findings. First, I had expected that the graph would show a linear increase in the coefficient. Instead, we can observe a quick jump during 1830–40 and after that a period of relative stability, during which dialogic liveliness remained steady. Second, my assumption was that at the beginning of the century there would be no highly dialogic novels, that is, that there would be no novels much different from the mean value. However, there were some significant early outliers – highly dialogic novels published in the early 1830s. (Actually, they have distorted the position of the mean dialogic liveliness of the 1830–34 period, which otherwise would be lower.) Their coefficients are not smaller than those of the highly conversational novels of the

end of the century. In some sense, they were “ahead of their time,” which makes one wonder about the cause of such miraculous precocity.

These three findings of our quantitative analysis pose three questions:

1. Why did the number of dialogues increase?
2. Why was the increase not linear?
3. Why were there highly dialogic novels as early as the 1830s?



Figure 18. The dynamics of change of mean dialogic liveliness in Russian novels of the nineteenth century. Error bars represent the standard error of the mean.

5.4. Why the Number of Dialogues Increased

In literary studies dialogue is often regarded as a means of realistic depiction of the fictional world (e.g., see Thomas 2007; Leech and Short 2007), and it is hard to disagree.⁴⁵ Conversations are an integral part of our everyday experience, so it is little wonder that a work of fiction that aims to be realistic will most probably contain some dialogue. To a certain extent, the role of dialogue is similar to the role of description, as analyzed by Roland Barthes (1989 [1968]:

⁴⁵ I will not proceed to an analysis of the long-standing debate about the role of mimesis in dialogue and, more generally, speech representation. It is simply worth stressing that a huge part of the research on dialogues concerns the problem of the faithfulness of their reproduction (e.g., see Fludernik 1993; Page 1988; Sternberg 1982), while much less work has been done on the problem of the structural function of dialogue in a narrative text (e.g., see Phelan 2012; Thomas 2012; Toolan 1987). For instance, claims that “representing the voices of characters in a story is an effective way of enlivening a narrative” (Thomas 2007: 80) are quite commonplace, but there is little research on why it may be so.

146) in his famous essay “The Reality Effect”: to “denote what is ordinarily called ‘concrete reality,’” to be “the pure and simple ‘representation’ of the ‘real.’” Yet highly dialogic novels like Roth’s *Deception* make it obvious that there is much more to dialogues than simple realism. Does an author really have to fill so many pages with characters’ chatting just to make his or her text more mimetic? Obviously, no.

According to Barthes’s (1989 [1968]: 142, 143) interpretation, those realistic parts of a text are “insignificant notations,” “useless details” that play no other role than merely pointing at their referents. But what about the rest of the textual elements? These other elements are structural; that is, they fulfill a certain function, and their aim is to influence the reader in a certain way. Switching from structuralist terminology to its kindred spirit in Russian formalist scholarly language, we can say that these structural elements are the form of the text, or its devices. If dialogue occupies such a large part of a text’s space, then is it perhaps a device? No doubt it fulfills a role similar in importance to those functions fulfilled by other formal elements. Assuming that this is correct, then the growth of the number of dialogues clearly indicates that it was a very successful device: at the beginning of the nineteenth century it was almost never used, but in the course of some forty years it became quite common. Does this reflect the growth of realism? Or is it, more likely, evidence for the evolutionary success of this literary form? Moretti (2000b: 209) claims that the success of certain texts and forms depends in many cases on a factor as simple as readers’ interest. If a literary form is interesting, it undergoes the process of readers’ “selection” and continues to exist, and if not, it becomes “extinct.” Such a growth of the coefficient of dialogic liveliness makes me think that this highly dialogic kind of novel must have been very successful in evoking readers’ interest. But what makes it so effective?

In his book *Expositional Modes and Temporal Ordering in Fiction* (1978) Meir Sternberg does not pay much attention to fictional conversations. However, his theory of narrative interest seems to be very helpful for one looking for the answer to why dialogues may be so compelling. Particularly, Sternberg (ibid.: 50) proposes the idea that the main device triggering narrative interest is a textual “gap”:

The literary text may be conceived of as a dynamic system of gaps. A reader who wishes to actualize the field of reality that is represented in a work, to construct (or rather reconstruct) the fictive world and action it projects, is necessarily compelled to pose and answer, throughout the reading-process, such questions as, What is happening or has happened, and why? What is the connection between this event and the previous ones? What is the motivation of this or that character? To what extent does the logic of cause and effect correspond to that of everyday life? and so on. Most of the answers to these questions, however, are not provided explicitly, fully and authoritatively (let alone immediately) by the text, but must be worked out by the reader himself on the basis of the implicit guidance it affords. In fact, every literary work opens a number of gaps that have to be filled in by the reader through the construction of hypotheses, in the light of

which the various components of the work are accounted for, linked, and brought into pattern.⁴⁶

Sternberg's ideas about the important role of gaps as the triggers for narrative interest⁴⁷ are compatible with psychological theories of interest, most obviously with the "information-gap theory" of George Loewenstein (1994: 87), which "views curiosity as arising when attention becomes focused on a gap in one's knowledge. Such information gaps produce the feeling of deprivation labeled *curiosity*. The curious individual is motivated to obtain the missing information to reduce or eliminate the feeling of deprivation." Loewenstein's theory is suitable for the study of literary material and is compatible with Sternberg's. If, due to the similarity of terminology, it is the most conspicuous of the psychological investigations that confirm the importance of gap filling and the subsequent resolution of uncertainty, it is hardly the only one (see also Berlyne 1954, 1957; Pisula et al. 2013; Silvia 2006). Moreover, in neuroscience a tight connection has been demonstrated between the resolution of uncertainty and the activation of dopamine neurons – one of the reward systems of the brain – particularly responsible for the pleasant feeling of "being interested" (see Fiorillo et al. 2003; Schultz 2001; Spanagel and Weiss 1999).

These psychological studies did not use literary texts as the stimuli in their experimental research on gaps, uncertainty, and interest. However, a smaller number of empirical investigations of this problematic are based on literary material. For instance, Richard J. Gerrig and his colleagues have studied what they call "small mysteries," defined as "a gap between what the author and characters know and what a reader is allowed to know" (Love et al. 2010: 790). In a series of publications (Gerrig et al. 2009; Gerrig 2010) the researchers provided evidence for the assumption that, while reading, people are involved in the process of detecting small gaps/mysteries that can evoke curiosity. David Miall (2004) obtained similar results, though he does not use the word *gap*. He regards a narrative as consisting of short episodes, each of which ends with a "twist" that stimulates readers' interest. Twists make readers ask the question, what will happen next? From this viewpoint the whole reading process may be

⁴⁶ Sternberg himself stresses that his concept of "gap" has not much to do with Roman Ingarden's and Wolfgang Iser's. For a discussion of the differences between these two conceptions, see Sternberg 1978: 311.

⁴⁷ Throughout this article the terms *interest* and *curiosity* are used as synonyms. However, there exists an influential scholarly tradition of treating curiosity as a particular example of interest being opposed to suspense (e.g., Brewer and Lichtenstein 1982; Hoeken and van Vliet 2000; Sternberg 1978, 2003a, 2003b). Within this theoretical framework, curiosity is defined as the desire to obtain missing information about events that happened in the narrative past observed from the position of the narrative present, while suspense is the desire to know about future events. At the same time, many psychologists do not employ this distinction, using interest and curiosity interchangeably (together with *exploratory behavior*, *information seeking*, and other terms). For simplicity, I also use them as synonyms; however, I avoid the word suspense.

regarded as the reader looking for the answers to this question in following episodes, passing from one intriguing twist to another.

To sum up, there is enough evidence to assume that one of the triggers of reader interest in narrative is this “dynamic system of gaps” scattered here and there on the pages of texts. It should be stressed that I am talking here not about intriguing large-scale puzzles – like “Who murdered Roger Ackroyd?” – but about the enormous number of “small mysteries” that abound in narratives. To return to Sternberg’s (1978: 51) terminology, these should actually be categorized as “temporary gaps”:

A temporary gap ... is one that the work opens at some point upon the continuum of the text only to fill it in explicitly and satisfactorily itself – or at least to enable the reader to do so with ease – at a subsequent stage. Who are Tom Jones’s parents? Why does Chichikov buy dead souls? ... Each of these questions indicates a gap that is kept open only temporarily, so as to arouse the reader’s curiosity or surprise and encourage inferential activity; such a gap ... always serves the dynamics of expectation.⁴⁸

How does this discussion of temporary gaps and narrative interest relate to dialogue? In fact, the connection seems to be very tight. Dialogue is a perfect mechanism for enlarging the number of small mysteries in a text. Every utterance of a character usually opens several possibilities for the development of the conversation – it gives several options for another interlocutor’s answer. Every utterance in a dialogue can create a gap, pose a question that may be answered in the following utterance, which in its turn can open another gap, and so on. The typical form of a dialogue is “question-answer-question-answer” and so forth or, to put it otherwise, “gap opens – gap closes – gap opens – gap closes” and so forth. Thus, dialogue seems to be an explicit form of the representation of this gap mechanism of interest, which can also be present in other, more implicit forms.

For an illustration, consider a (randomly chosen) fragment of conversation from Dostoevsky’s *Crime and Punishment*. There is even something slightly uncanny in how unexpectedly closely this dialogue between Raskolnikov and Sonia Marmeldova follows the “question-answer” pattern.

There was a book lying on the chest of drawers. He had noticed it every time he paced up and down the room. Now he took it up and looked at it. It was the New Testament in the Russian translation. It was bound in leather, old and worn.

⁴⁸ Sternberg (1978: 51) also states that “permanent gaps are located both in the *fabula* and the *sujet*, whereas temporary gaps belong to the *sujet* alone – being ‘artificially’ created and sustained through temporal manipulations of some perfectly straightforward and coherent segment or segments of the *fabula*.” It may seem that in light of this claim dialogue cannot be categorized as a device for constructing temporary gaps, because it obviously belongs to the level of *fabula*. However, there is no contradiction: fictional conversations are embedded narratives, and thus they are located in the *fabula* of the primary, intradiegetic level but in the *sujet* of the secondary, metadiegetic level.

Q “Where did you get that?” he called to her across the room.

She was still standing in the same place, three steps from the table.

A “It was brought me,” she answered, as it were unwillingly, not looking at him.

Q “Who brought it?”

A “Lizaveta, I asked her for it.”

“Lizaveta! strange!” he thought.

Everything about Sonia seemed to him stranger and more wonderful every moment. He carried the book to the candle and began to turn over the pages.

Q “Where is the story of Lazarus?” he asked suddenly.

Sonia looked obstinately at the ground and would not answer. She was standing sideways to the table.

Q “Where is the raising of Lazarus? Find it for me, Sonia.”

She stole a glance at him.

A “You are not looking in the right place... . It’s in the fourth gospel,” she whispered sternly, without looking at him.

Q “Find it and read it to me,” he said. He sat down with his elbow on the table, leaned his head on his hand and looked away sullenly, prepared to listen.

A “In three weeks’ time they’ll welcome me in the madhouse! I shall be there if I am not in a worse place,” he muttered to himself.

Sonia heard Raskolnikov’s request distrustfully and moved hesitatingly to the table. She took the book however.

Q “Haven’t you read it?” she asked, looking up at him across the table.

Her voice became sterner and sterner.

A “Long ago... . When I was at school. Read!”

Q “And haven’t you heard it in church?”

A / Q “I ... haven’t been. Do you often go?”

A “N-no,” whispered Sonia.

Raskolnikov smiled.

Q “I understand... . And you won’t go to your father’s funeral to-morrow?”

A “Yes, I shall. I was at church last week, too ... I had a requiem service.”

Q “For whom?”

A “For Lizaveta. She was killed with an axe.” (Dostoevsky 2000 [1866]: 276–77)

The question-answer structure dominates in this conversation between Raskolnikov and Sonia and in the rest of the dialogues throughout the novel. Of course, this does not mean that the organization of fictional conversations should necessarily be simple: a regular exchange of questions and answers that go in turn. It also happens that an utterance of a character resolves one “small mystery” but, at the same time, opens another one. In other cases, instead of a logically expected answer, there may be a question in response and so on. Anyway, in most cases we can find this interchange of questions and answers of

one or another kind. And this pattern seems to recur in other Russian novels analyzed in the present study.⁴⁹

So dialogue is a simple way of enlarging the number of intriguing gaps in a narrative. These may be not as intriguing as the question “Who murdered Roger Ackroyd?”, but they constitute small “portions” of intrigue, which, manipulated properly, can evoke steady curiosity in the reader. Other textual structures – for instance, descriptions – can also be used to create a number of small mysteries; however, dialogue seems to be a much more convenient device for this purpose. In dialogue the writer has at his or her disposal a clear and simple structure, which in some sense may not even require very much creative thought. From the reader’s point of view, dialogue has a different advantage: it makes the reader’s task of identifying gaps in a narrative easier, because now they are explicitly marked. This may also explain why dialogue is even more widespread in popular fiction than it is in “literary” fiction. Spy stories, romances, and detective novels have to be read “smoothly,” without much effort, and a dialogue, with its clear-cut distinction between gaps/questions and the answers to them, is one of the devices that facilitate such reading.

5.5. Why the Increase Was Not Linear

So dialogue seems to be an effective way of enlarging the number of “gaps” in a text and thus making it more interesting and simpler to read. It should follow logically from this that the quantity of dialogues in the Russian novels of the nineteenth century should gradually increase. However, this is not exactly so. We do observe growth, but it is not linear. There is a relatively fast increase during the first half of the century but afterward virtually no change. Why did that happen?

The first explanation that comes to mind is that a novel cannot consist of a limitless quantity of dialogue. The increment of fictional conversations between characters happens at the price of a decrease in the size of the other elements of novelistic structure, such as its narrative and descriptive parts. If there were too many dialogues, then at some point the novel would simply cease to be a novel and become a play. And most likely, such a transformation might eventually have occurred if dialogue were the only source of a novel’s appeal. However, this obviously is not true. Despite the fact that dialogues seem very widespread in contemporary fiction, many other, nondialogic devices provide readers with curiosity gaps. The frequency of dialogue in novels grew only until their substitution for the novel’s other parts ceased to be advantageous. In the 1850s the Russian novel reached a certain compromise between its dialogic and nondialogic parts, which appeared to be optimal and thus remained virtually unchanged at least until the end of the century.

⁴⁹ According to Itamar Even-Zohar (1990: 137), this “question-and-answer” pattern is typical of nineteenth-century Russian novels, making their dialogues “tightly concentrated.”

It is interesting that such a situation – the (relatively) quick growth of a certain trait and a subsequent period of stasis – is the observable tendency of biological evolution. For example, Ernst Mayr (2001: 196–97) writes:

[A] drastic difference between the rates of evolutionary change ... is virtually the rule. Bats originated from an insectivorelike ancestor within a few million years, but have hardly changed in basic body plan in the ensuing 40 million years. The origin of whales happened very rapidly, in terms of geological time, compared to the subsequent essential stasis of the new structural type. In all of these cases the lineage had shifted into a new adaptive zone and was for a while exposed to very strong selection pressure to become optimally adapted to the new environment. As soon as the appropriate level of adaptedness had been acquired, the rate of change was reduced drastically.

Here we can draw some parallels between biological and cultural evolution. Like a biological species or a trait, this new literary form – “dialogue as gap-constructing device” – developed rather quickly to a certain point and then subsequently did not change much. Surely, the speed of change must be treated differently in the context of natural as distinct from literary evolution. In nature the time scale is millions of years; in literature, it is only dozens of years. Nevertheless, this difference should not undermine the parallel: numerous studies have demonstrated that one of the distinctive features of cultural evolution is its much greater speed – which, by the way, is the reason cultural evolution is so effective.

5.6. Highly Dialogic Novels in the 1830s

Another strange thing that requires explanation is that already in the first half of the nineteenth century, there existed novels with a high coefficient of dialogic liveliness (around 0.025) comparable to that of some novels from the end of the century. Does this mean that these authors were “ahead of their time” – that they had somehow foreseen the further evolution of the novel and made their move earlier than their rivals in the literary field?

This is a possible explanation but highly improbable. In literary evolution (as is true for cultural evolution in general) the invention of completely new formal devices is quite rare. More often, though, one can observe the borrowing and subsequent recombination of borrowed materials, either formal or thematic. So it may be worthwhile to look for some common “ancestor” from which this high dialogicity might have been “inherited.” What makes this path of inquiry more plausible is the fact that the majority of these outliers share one common feature, one which will help us trace the roots of their dialogic “richness.”

First, let us have a look at the titles of these atypical novels: *Roslavlev, or, Russians in 1812* (1831), *Askold's Grave* (1833), and other works by Mikhail Zagoskin; *A Mysterious Monk, or, Some Traits from the Life of Peter I* (1834) by Rafail Zotov; and *The Strelets* (1832) and *Biron's Regency* (1834) by

Konstantin Masalsky. These are all *historical* novels. The Russian historical novel, as Mark Al'tshuller (1996) demonstrates, was strongly influenced by European historical novels, particularly those of Walter Scott. Aristocratic Russian readers, most of whom spoke several foreign languages, quickly acquainted themselves with these texts in the original or through French translations. Russian translations also appeared, though somewhat later, in the middle of the 1820s, that is, almost ten years after the publication of Scott's first novel, *Waverley*, in 1814. Historical novels became hugely successful and could compete in popularity with another highly popular genre of the time – gothic novels (Nedzvetsky 2011). This foreign influence is so evident that it would be logical to assume that the high dialogic liveliness of early Russian historical novels was copied directly from Scott together with many other formal elements. However, this hypothesis at first sight is contested by simple numbers from the quantitative analysis of Scott's novels. To my surprise, the coefficients of these texts are relatively low: 0.0072 in *Waverley*, 0.0138 in *Ivanhoe*, 0.0114 in *Quentin Durward*.

Does this mean that Scott's novels made no impact on the high dialogicity of early Russian historical novels? The situation is bound to be a bit more complicated. For instance, Al'tshuller (1996: 167) claims that the dialogic form of narrative in Masalsky's historical novel *The Strelets* "is derived from Scott, who liked larding his novels with direct speech of characters and long dialogues. Though, he kept this within limits and never turned his novels into drama. Nevertheless, this way of dramatizing narration comes from Scott and was regarded by the contemporary readers as Scott's." This perception of Scott's novels as highly dramatized can be explained by the fact that in his novels the density of fictional conversations might have been greater than in the novels of his Russian contemporaries, to whom he was inevitably compared.

At the same time, there might have been other sources from which Russian historical writers could have copied the highly dialogic model of novel. No doubt Scott was very popular and influential, but he was not the only popular and influential historical novelist of that time (see Ungurianu 2007: 34–39). For instance, another historical text widely read in Russia was *Cinq-Mars, ou, Une conjuration sous Louis XIII* (1826) by the French writer Alfred de Vigny. Interestingly, the quantity of dialogues there is much higher than in Scott (around 0.019). Russian authors could have borrowed this dialogic pattern from Vigny, an assumption that receives additional support from the observations of literary historians who have expressed the opinion that Vigny, not Scott, had the greatest influence on the first Russian historical novelist Zagoskin and other authors of that time (Kuprejanova and Nazarova 1962: 99).

It may be that only one of these factors played a role, or perhaps they supplemented each other in making early Russian historical novels so unusually "dialogic." Either way, evidence suggests that the outliers on the graph are not accidental but form an explicable pattern and that this pattern may be a result of literary borrowing.

Dialogue is so widespread in contemporary novels that one may get the impression that this has always been typical of fiction. The present chapter aimed to demonstrate that conversation between fictional characters is a specific device for producing narrative interest, which has developed over the course of literary evolution. This development has a certain pattern that can be detected using quantitative methods of analysis.

However, the findings of this research may trigger further questions. My hypothesis seems to work in the case of Russian literature, but what about other national literatures: British, French, German? Was their development of dialogue similar? To answer this question with certainty, additional studies are required. The results may be quite different, at least with respect to dating. As mentioned above, the Russian novel came into being much later than novels in many other parts of Europe, and its development seems to have been faster than the norm elsewhere. However, I expect the main thesis to be applicable to other European novels as well: we may expect a rise in dialogues, though the dynamics of this rise may differ.

One more question: this study ends in 1900, but what happened after that? What was the course of the development of dialogue in Russian novels of the twentieth century? The similarity, mentioned above, between biological and cultural evolution leads me to think that in the twentieth century Russian literature did not become significantly more “dialogic.” However, this is just speculation. A literary system, like any other cultural system, is subject to various influences, some of which may be quite unexpected. Also, despite the similarities between natural and cultural (or, in this particular case, literary) evolution, there may be even more significant differences. These various principles specific to literary evolution require careful examination, and this study is one small step in this direction.

6. BROKEN TIME, CONTINUED EVOLUTION: ANACHRONIES IN CONTEMPORARY FILMS

In 1983, Brian Henderson published an article that examined various types of narrative structure in film, including flashbacks and flashforwards.⁵⁰ After analyzing a whole spectrum of techniques capable of effecting a transition between past and present – blurs, fades, dissolves, and so on – he concluded: “Our discussions indicate that cinema has not (yet) developed the complexity of tense structures found in literary works” (Henderson 1983: 8). His “yet” (in parentheses) was an instance of laudable caution, as very soon – in some ten–fifteen years – the situation would change drastically, and temporal twists would become a trademark of a new genre that has not (yet) acquired a standardized name: “modular narratives”, “puzzle films”, and “complex films” are among the labels used (see Cameron 2008; Buckland 2009, 2014). Here is an example: Christopher Nolan’s *Memento* (2000) contains 85 anachronies (i.e. flashbacks or flashforwards) – something that would have been hard to imagine in 1983.⁵¹ *Memento* is probably an extreme case – the most puzzlingly complex of all complex films – but the tendency towards using more anachronies has become widespread, although in less extreme forms. From romantic comedies (*500 Days of Summer* [2009]) to psychological dramas (*Blue Valentine* [2010]) and science fiction (*Primer* [2004]), transition between past and present is now *the* narrative device.

So, what actually happened in the 1980s–1990s? Some change in narrative form, obviously: but what, exactly? In an article written soon after the end of this period, David Bordwell made this observation about American films: “there have been some significant stylistic changes over the last 40 years. The crucial technical devices aren’t brand new – many go back to the silent cinema – but recently they’ve become very salient, and they’ve been blended into a fairly distinct style [that] amounts to an *intensification* of established techniques” (Bordwell 2002: 16; original emphasis). By “intensification” Bordwell means, among other things, the marked shortening of the average shot length, or the framing of characters’ conversation, which became much closer than ever before. The same thing, we would argue, applies to anachronies: their history can be traced back to *The Cabinet of Dr. Caligari* (1920) and *The Phantom*

⁵⁰ The study presented in this chapter is a collaboration with several colleagues from Tartu: Maria Kanatova, Alexandra Milyakina, Tatyana Pilipovec, Artjom Shelya, and Peeter Tinitis. They helped to collect data and took important part in the analysis. I suggested the research question, directed the project, partly collected the data, partly did the analysis, and wrote the text in its entirety.

⁵¹ Here is Prince’s standard definition of anachrony: “a discordance between the order in which events (are said to) occur and the order in which they are recounted” (Prince 2003: 5). In this study, we have slightly modified Prince’s definition: by anachrony we mean *any* break in the chronological order of narrative, similarly to what in film criticism is meant by cut.

Carriage (1921), but sometime around 1990 their numbers increased manifold, giving rise to a new and distinct style.

In the present study, we want to address several questions related to this (hypothetical) intensification of anachronies. First, and most basic: has there *actually* been an intensification? To our knowledge, so far no one has actually tried to go beyond the anecdotal, and provide quantitative evidence of this process. (In other words: what if *Memento* were just an exception?) Second, we strongly suspect that such a dramatic increase cannot be merely quantitative. As Franco Moretti put it, following J.B.S. Haldane: “size is seldom *just* size – a story with a thousand characters is not like a story with fifty characters, only twenty times bigger: it’s a different story” (Moretti 2013a: 169). This may also be true in our case: in evolutionary terms, we may be in front of a different film “species”, distinct from previous ones not only because of the *number* of anachronies, but because of their *qualitative* function. Which leads to the third, and most interesting, question: what could be the driving force for the emergence of this new species?⁵²

6.1. Initial Steps

To answer questions about size, one obviously has to collect some quantitative data; in our case – counting anachronies in movies. But where to begin? If we want to know how exceptional *Memento* is, we could check other films released in the year 2000; but which ones, exactly? The Internet Movie Database (IMDb), the largest existing information source about films, contains 4,719 films for that year. Obviously, this is too much. So, it makes sense to limit ourselves to culturally significant, widely appreciated ones. In cinematics, a new discipline that advocates a quantitative approach to movies, the usual way to construct a sample of “important” movies consists in taking films with the highest box-office gross (for instance, see Cutting et al. 2011; Redfern 2014). However, we doubt whether box-office data tell the whole story about the cultural impact of a film. Among recent highest-grossing films we find *Minions* (2015), which gathered a fortune, but has mediocre user ranking on IMDb – 6.4 stars out of 10. Another summer hit, *Transformers: Age of Extinction* (2014), is an even better (or worse) example: only 5.7 stars. Commercial success can tell us *something* about the quality of a movie – but we need additional indicators.

⁵² From here on, we will sometimes use biological terminology instead of more common words: “species” instead of “genre”, “mutation” instead of “novelty”, and so on. This needs a brief explanation. We believe that the theory of evolution (and, in particular, the theory of cultural evolution) provides the best ground for studying long-term trends in human history, including the history of film. This theory necessarily comes with new concepts, many of which, unlike the ones just mentioned, have no analogs in the humanities: exaptation, selection, branching (cladogenesis), and others. And even though “species” and “mutation” may seem as a stretch, we still prefer using them – to remind about the evolutionary framework.

IMDb gives us better metrics for constructing a sample of significant films – better for our purposes, at least. One of these are the IMDb rankings: that is to say, the evaluations of how “good” is a movie given by IMDb users. By themselves, the rankings can however be biased if the number of voters is small: the horror movie *The Black Tape* (2014), for instance, has an average rank of 7.7 – which leaves behind almost any classical horror film – for the very simple reason that so far, only 93 users have evaluated it. So, in addition to the IMDb “stars” we need another measure, which would reflect how widespread the attention from the audience has been. Luckily, IMDbPro – an extended version of IMDb – contains exactly such a measure, called MOVIEmeter.⁵³ This allowed us to construct a sample which includes the *highest rated* films (most “stars”) among the *most popular* films (highest MOVIEmeter score).⁵⁴

A further question had to do with film genre. Should we look at *any* type of films, or restrict ourselves to a specific genre – say, comedies, or action films? And would it actually matter? We assume that it does: if the trend towards the increase of anachronies is real, it may be easier to detect in those genres that seem more inclined to the use of flashbacks and flashforwards. Anachrony is a plot-level device – and not every genre makes a complex use of its plot. A conventional action movie, for instance, does not: explosions and gunfire usually provide enough entertainment, and there is no need for multiple storylines to intertwine past and present. If we want to investigate the device that breaks the linear temporal order, then, it makes sense to look at movies where plot is used *as device to structure temporality*, and not just as a container for a succession of fights or car crashes. Metaphorically speaking, if you are interested in the evolution of beaks, you should study species that actually *have* them – birds, not mammals. And our choice of “birds” fell on detective stories, where the interplay between the past (the crime) and the present (the investigation) is a defining characteristic of the genre.⁵⁵ So, we selected for our analysis a series of films that have a “mystery” tag on IMDb: films like Roman Polanski’s *Chinatown* (1974), David Lynch’s *Blue Velvet* (1986), or David Fincher’s *The Game* (1997). Basically, they are all variations of the traditional detective formula,

⁵³ On IMDbPro, there is no direct way to access the statistics on the number of votes for the whole corpus of films, so MOVIEmeter is the closest measure we have to reflect popularity. IMDb team does not reveal the exact algorithm of calculating this score, it only states: “Users vote through their actions, every time someone visits an IMDb page about one of the over 3 million titles and over 6 million people in the database, we record that “pageview”. It is the sum total of these pageviews that form the foundation of the STARMeter, MOVIEmeter, and COMPANYmeter rankings” (http://www.imdb.com/help/show_leaf?prowhatistarmeter).

⁵⁴ This approach to constructing a sample is very similar to the one used in Algee-Hewitt et al. 2016. However, instead of combining the popularity and prestige metrics, we combined two different measures of popularity. That is, we rely here exclusively on user-generated data, with all its flaws – strong contemporary bias being the main one. At the same time, this approach to sampling, in our view, makes sense for this particular case. Mystery is a popular genre, and so we are taking a “popular” perspective on it.

⁵⁵ As was shown in Todorov 1977.

with a big mystery at the center of the plot – not necessarily a murder, but often so.⁵⁶

Having decided the parameters for the sample, two more questions remained: what time period to include, and what national cinema? As anachronies in Korean films may be used in a completely different way from their French or British equivalents, we decided not to mix different cultures, and limited ourselves to films produced in the U.S.A. As for the time frame, given that the 1980s and 1990s were what interested us most, we decided to add the adjacent decades (1970s and 2000s), to have a larger picture. In conclusion: we will analyze 80 American mystery films released between 1970 and 2009 (10 films per every 5 years), combining the highest scores for the two IMDb measures of user rankings (“stars”) and MOVIEmeter.

6.2. Branching

The first things we did was to include all flashbacks and flashforwards in a general dataset of anachronies, and then make some initial calculations. Did the increase in anachronies actually take place – and *how large* it was?

In Figure 19 we have plotted the number of anachronies per minute in all the films from our dataset. Apparently, the average frequency of anachronies per film indeed grows, gaining momentum in mid-1990s. We fit a linear regression model to assess the relation between the frequency of anachronies and the year of their production.⁵⁷ The year significantly predicts the frequency of anachronies. However, the model explains only a small amount of variation in the data ($F(1,79)=16.65$, $p<0.01$, $R^2=0.17$). This is not all that surprising since the plot shows, in addition to the increase in average values, also an increased range of variation.

That is, films were becoming more and more different from each other, possibly diverging into several groups. In the 1990s and later, there remain many films with almost no anachronies, while, at the same time, in another group anachronies are rising, sometimes becoming extremely high. To better understand these trends, we allocated the data into the subsets shown on Figure 20.⁵⁸ We then fit a linear regression model on each of the subgroups separately – to

⁵⁶ The full list of movies is in the filmography section at the end of this chapter.

⁵⁷ In order to establish the statistical assumptions of normality of the data needed for a linear regression we log-transformed the frequency data. A log-transformed measure describes an increase in anachronies not in absolute terms but in ratios: a difference of one in log-transformed data stands for a difference of 100% for absolute data.

⁵⁸ We allocated the subsets in the following fashion. (1) We divided the data into decade-length periods to allow us to consider temporal trends while at the same time allowing each period some breadth to decrease the influence of any particular film in our small sample. (2) We used the *k*-means algorithm to divide the films in each decade into three clusters based on their frequency of anachronies. (3) We formed them into three cross-temporal groups based on their rank in each decade. These could accordingly be seen as films with low, moderate and high frequencies of discontinuities, that we characterized as “conservative”, “moderate”, and “extreme”. As can be seen in Figure 20, the moderate group contained one

assess the association between year of production and the frequency of anachronies (see Figure 21). The year of production is a significant predictor in each case, however the trend size, as well as the amount of variation explained by the year of production, was different.⁵⁹ While there is a minor trend towards more anachronies in the group that can be called “conservative” in its use of anachronies, the main increase can be found in the “moderate” and “extreme” clusters. Instead of one general tendency, then, we see something that resembles divergence. And the evolutionary hypothesis that occurs to us is the following: what if this graph represented an instance of *cultural branching*? Metaphorically speaking, this is an image of a small part of the invisible “tree of culture”. In the seventies, there used to be only one “species” of mystery films (at least, as far as anachronies were concerned); but in the 1980s something like a mutation happened, which turned out to be successful (for reasons that need to be explained), and thus another “film species” appeared, with plenty of flashbacks and flashforwards.

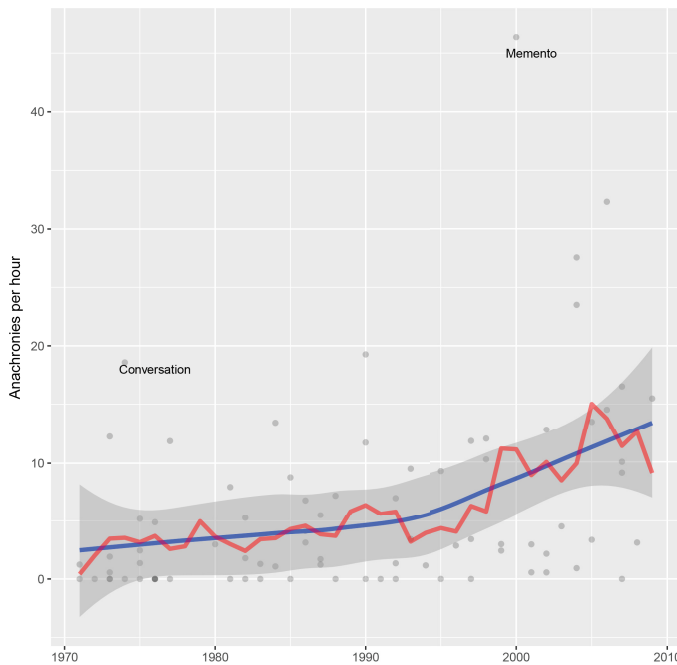


Figure 19. The number of anachronies per hour for all the films in our dataset with a rolling average over five years and a loess non-parametric smoothing estimator.

outlier in the last decade, which we manually reclassified as extreme to establish normality in regression calculations.

⁵⁹ For the conservative group the trend was 0.05 anachronies per hour per year, for the moderate group it was 0.28 per year, and for the extreme group 0.60 per year. For the conservatives, the model ($F(1,46)=11.04$, $p<0.01$, $R^2=0.20$) explained 20% of the variance, for the moderate group, ($F(1,21)=44.68$, $p<0.001$, $R^2=0.67$) it explained 67% of the variance, while for the extreme group ($F(1,7)=8.27$, $p<0.05$, $R^2=0.48$), it explained 48% of the variance.

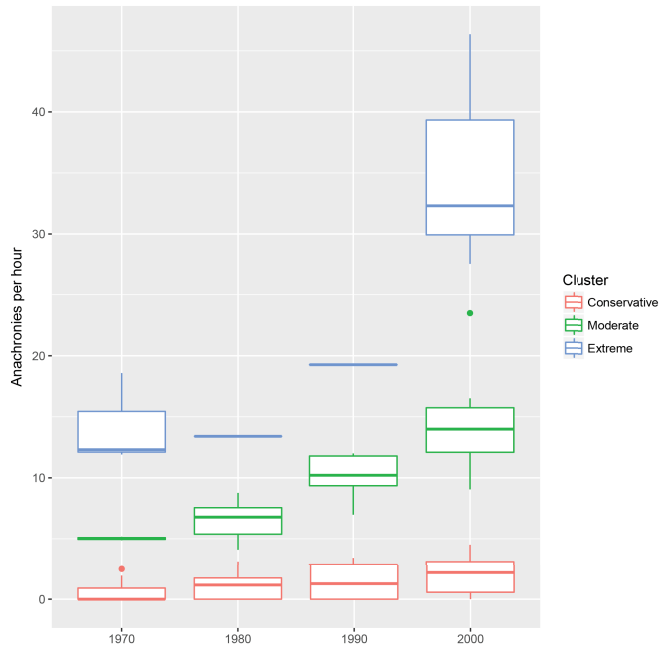


Figure 20. Boxplots of automatically formed clusters for each decade.

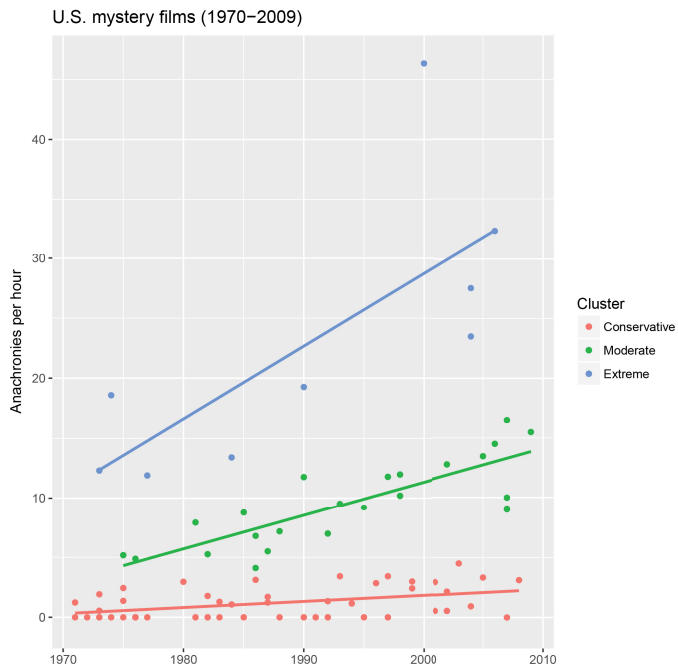


Figure 21. Three temporal clusters of films in the dataset with the regression lines of the models for each cluster.

Not a single group of films, but three groups, three branches – this was the hypothesis. How could we test it? To begin with, it seemed reasonable to assume that – if these were really different “film species” – there would be more difference between them than the mere quantity of anachronies. Stephen J. Gould once wrote this Hegelian passage:

The dialectical laws are explicitly punctuational. [Soviet paleontologists] speak, for example, of the “transformation of quantity into quality.” This may sound like mumbo jumbo, but it suggests that change occurs in large leaps following a slow accumulation of stress that a system resists until it reaches the breaking point. Heat water and it eventually boils. Oppress the workers more and more and bring on the revolution. (Gould 1980: 184–185)

Increase the number of anachronies and the result will be a different formal structure... Size is seldom just size. It often accompanies qualitative changes. Is there a qualitative difference between the three branches, then – and can we find it in our dataset? Apart from the information about the number of anachronies in each film, we had also notated the exact time at which a flashback or flash-forward occurred. Is it possible that the distribution of anachronies in the plot vary from group to group?

6.3. Beginning, Middle, and Ending

To check this, we can plot the location of every anachrony in each film from our three groups (see Figure 22). The difference between the groups is striking. The “conservative” films have more anachronies at the beginning or the end, and almost nothing in the middle. On average, 84.8% of the anachronies happen in the first 20% or the last 30% of the films from this group. In “moderate” and “extreme” movies, the anachronies are distributed quite evenly with a slight peak at the end. In these films, respectively 51.6% and 50.9% of anachronies are situated at the beginning or end, which is almost an even distribution of anachronies between the mid-film and the edges, as we measured it. So, probably we have two groups, at the end, two branches. On branch A, anachronies are concentrated mostly at the beginning and the end; on branch B, they are distributed quite evenly.

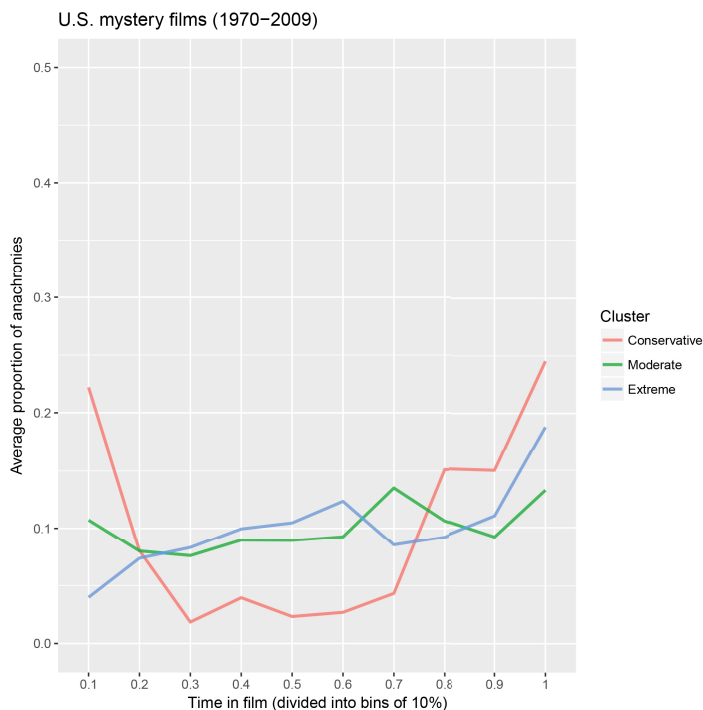


Figure 22. The average proportion of anachronies in each 10%-length part of the film within each cluster

Why are anachronies placed at the beginning and end in the first case? One reason lies in the “framing” role played by anachronies. Take, for example, the case of *Farewell, My Lovely* (1975), based on the Raymond Chandler novel, which is structured as one long story embedded into another story. At the beginning of the film, private detective Phillip Marlowe enters a hotel room, trying to flee from the police. However, policemen quickly find him, and a conversation begins, which quickly turns into Marlowe’s monologue – the story of how he met his client, and of the mysterious events that followed. At the end of this long flashback we are brought back to the hotel room. So, two “cuts” intervene in the chronological order: one at the beginning and one at the end.

Framing is a frequent technique in noir and neo-noir films. More widespread is the use of anachronies which may be called “explanatory flashback”. In David Lynch’s *Blue Velvet* (1986), we have a story of a young man, Jeffrey, who conducts an amateur investigation, in the course of which he encounters suspicious characters like the sadomasochistic gangster Frank, and his two unnamed associates – the “Yellow Man” and the “Well-Dressed Man”. At the very end of the movie Jeffrey realizes that the Well-Dressed Man and Frank are one and the same person, and his insight is shown in a flashback of the first time he met the Well-Dressed Man. The flashback is used here as a device that provides an answer to a mystery (in this case, the central mystery of the plot).

Whenever we have a puzzle (“who is the murderer?” or some equivalent), the answer will probably include some sort of flashback – making viewers recall important, but previously unnoticed, details. “Plots revolving around a secret”, writes Bordwell, “have always encouraged flashbacks” (Bordwell 2006: 92) – and as the explanation of the secret is withheld till the end, the explanatory flashback is necessarily also placed at the end of the film.

At this point it is clear why these two common functions of anachronies – as frames and as solutions of a mystery – should be associated to the beginning and the end of the plot. But why are there anachronies *in the middle* of the “moderate-extreme” group of films? The likeliest reason is that, in addition to those two functions, there is a third role anachronies can play – a role for which the middle of the plot is the most convenient position.

6.4. Timelines

Here, we need a brief narratological digression. So far, when speaking of anachronies, we were simplifying a complex issue. A narratologist like Gérard Genette, however, would not simply say “anachrony” or “flashback” to describe Jeffrey’s recollection of his first encounter with the Well-Dressed Man; a narratologist would say: “internal homodiegetic repeating analepsis”. Most of these terms don’t concern us, but the distinction between “internal” and “external” flashbacks (or analepses) is important. External analepses refer to events that occur *before* the beginning of the main story (or “first narrative”, in Genette’s terms), whereas internal analepses refer to events that happen *after* the beginning of the main story. Jeffrey’s recollection of the Well-Dressed Man is clearly internal: their first encounter happens after the beginning of his amateur investigation (which is the “first”, or main, narrative). On the other hand, a recollection of Jeffrey’s childhood memories would be an external flashback, because it would concern something that had happened long before the investigation started. Here is Genette on external and internal flashbacks (or analepses):

This distinction is not as useless as it might seem at first sight. In effect, external analepses and internal analepses [...] function for purposes of narrative analysis in totally different ways, at least on one point that seems to me essential. External analepses, by the very fact that they are external, never at any moment risk interfering with the first narrative, for their only function is to fill out the first narrative by *enlightening the reader on one or another “antecedent”*. (Genette 1980: 49–50; my emphasis)

In other words, while internal flashbacks may actively intervene in the main narrative, contributing to the solution of puzzles and mysteries, external flashbacks shed light on the background of the main narrative, thus making it more comprehensible. External flashbacks often convey important information about the characters’ past – something that might have been told at the very beginning, but for some reason was withheld until a suitable moment. Another narra-

tive theorist, Meir Sternberg, called this approach to presenting information in a story “*delayed exposition*” (Sternberg 1978), contrasting it to the “natural order,” in which all childhood traumas are told first.

Returning to our problem: what if the flashbacks situated around the middle of films were usually external – and those near the end internal? Unfortunately, we had not expected that our investigation would take this turn, and had not collected the data on internality/externality for every movie; however, several examples for which we *had* gathered this information seem to support the hypothesis (Figure 23). *Watchmen* (2009) provides the clearest example of this distinction. Its central part contains a large number of external flashbacks: the sub-plots of how Dr. Manhattan became a god-like creature, of the watchmen’s participation in the Vietnam war, of Rorschach’s tough childhood – as many examples of “delayed exposition” that allow us to get a better understanding of particular characters. The flashbacks situated at the end have a completely different role: they provide an answer to the main mystery of the narrative – who killed The Comedian? – allowing the movie, which started with the scene of The Comedian’s murder, to end with an internal flashback unmasking the murderer.

Ideally, this observation should be supported by quantitative, not just anecdotal evidence. Though we do not have data on externality/internality, we have something that may serve as a substitute: information about the different “timelines” to which each flashback or flashforward refers.⁶⁰ Assuming that one of these timelines is the main narrative, then any reference to other timelines would result in an external anachrony. The number of timelines can thus be a proxy for the number of external flashbacks in a film. If movies with a large number of anachronies are a new type of film, then they should contain more external flashbacks and, quite probably, more timelines. To test the existence of such a relationship between the number of timelines and the number of anachronies, we fitted a linear regression model on the log-transformed dataset⁶¹ and found that the number of anachronies predicts the number of timelines in the film with a good model fit ($R^2 = .56$). The model predicts that, for every 100% increase in the number of anachronies, the number of timelines will on average increase by 32%, thus demonstrating a clear dependency (Figure 24).

⁶⁰ Timelines are defined as (more or less) distinct narratives, temporally separated from one another. For example, *The Green Mile* (1999) consists of three timelines: (1) the story of Paul Edgecomb as an old man living in a retirement home; (2) the story of young Paul Edgecomb serving as a prison officer, and one of the prisoners, John Coffey; (3) a brief story of the crime that was supposedly committed by Coffey. The three timelines are connected by a series of flashbacks.

⁶¹ Statistical tests like linear regression depend heavily on the assumed distributions in the data, and therefore require the data to be transformed if these assumptions are not met. In order to fulfill these criteria we log-transformed both variables (and added a constant of 1 to number of anachronies, to avoid mathematical issues that occur when the value is less than 1). The log transformation of a variable decreases large distances and increases small distances, practically allowing the relationships to be monitored in percentages instead of unit changes.

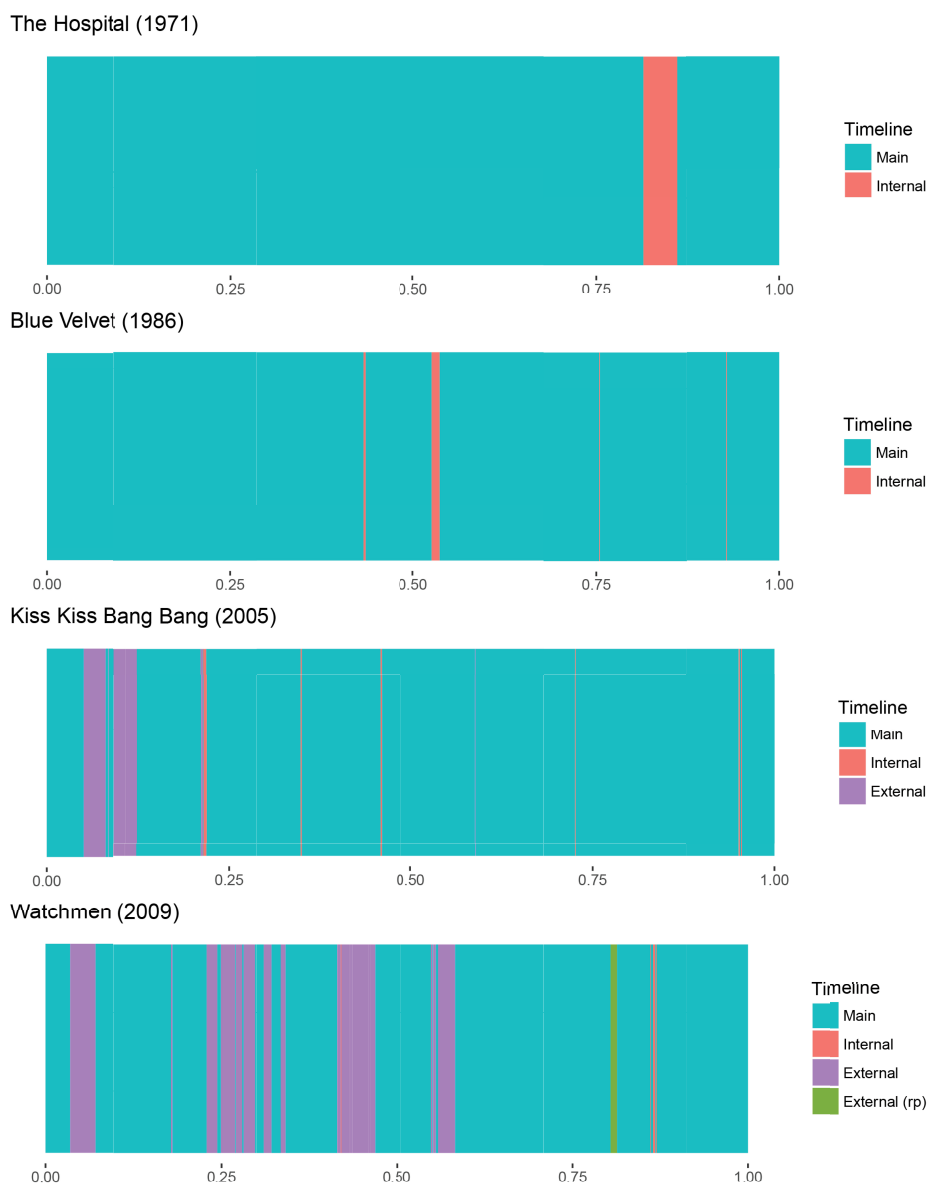


Figure 23. The distribution of separate timelines in film time for selected films.

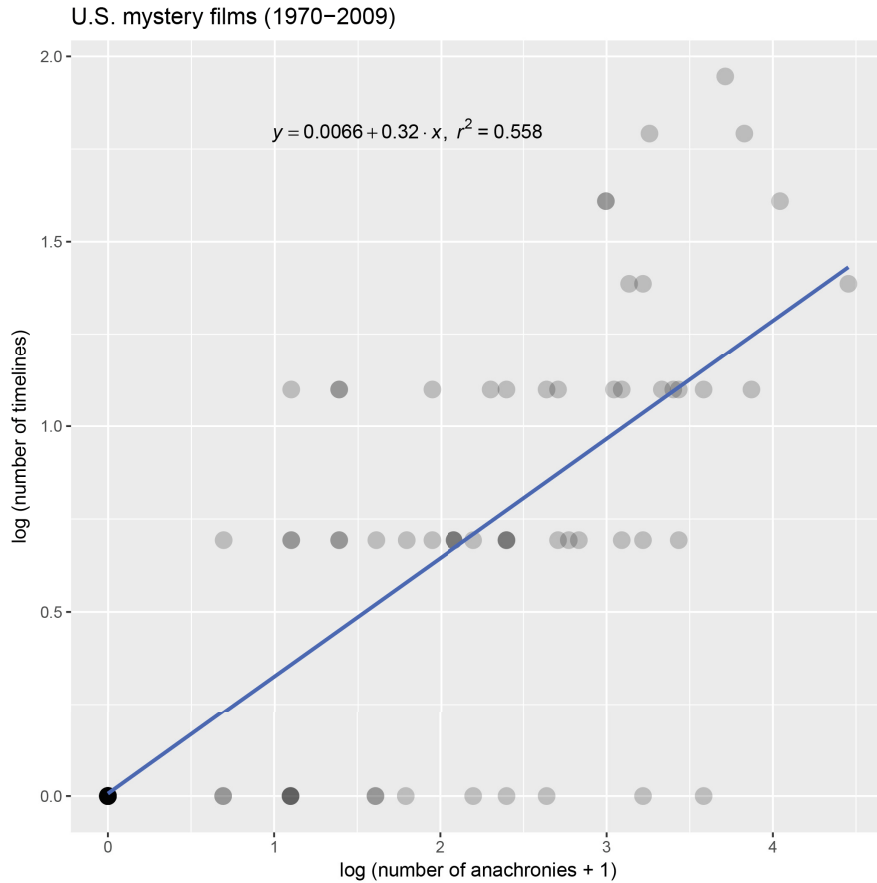


Figure 24. Relationship between the number of timelines and the number of anachronies on a log-log scale.

One could say that this is self-evident: obviously, a film with only one flashback cannot contain more than two timelines. However, this does not explain why films with ten anachronies also tend to have just two timelines. Large number of timelines seems to be a particular feature of the 1990s–2000s’ films with high anachrony-per-minute ratio: this can be easily noticed even if we simply compare them with some of the highly scoring films of the previous decades (Figure 25). *The Conversation* (1974), which has more anachronies than any other film of the 1970s, contains only one timeline. *A Soldier’s Story* (1984), the leader of the following decade, only two (and organized in a classical detective schema: the story of the crime, then the story of the investigation). This contrasts sharply with the temporal diversity of the 2000s; *Kiss Kiss Bang Bang* (2005), for instance, has a *smaller* number of anachronies than *The Conversation* (0.22 against 0.3 per minute), but their *function* is completely different. Now, they glue together different timelines.

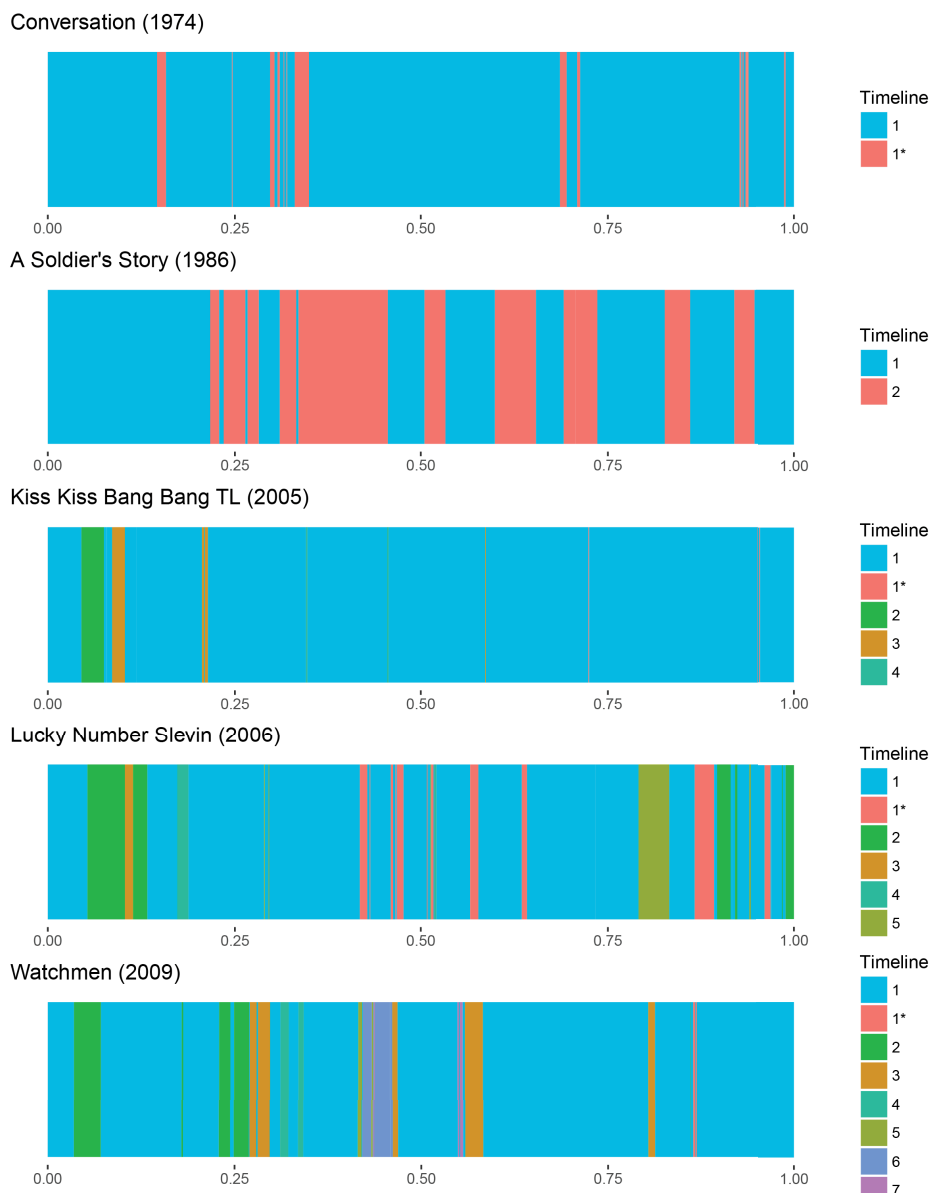


Figure 25. The distribution of main, internal, and external timelines in film time for selected films.

6.5. Exaptation

What was it, that made possible the tremendous increase of anachronies of the 1990s? Having collected the quantitative evidence, we now think we know the answer: a new function was found for an old device. In literary history, this actually occurs quite often. “If we agree that evolution is the change in inter-relationships between the elements of a system”, writes Jurij Tynjanov in his classical paper on literary evolution, “then evolution may be seen as the “mutations” of systems. [...] They do not entail the sudden and complete renovation or the replacement of formal elements, but rather the *new function of these formal elements*” (Tynjanov 1987: 161; Tynjanov’s emphasis).

A similar idea was expressed in evolutionary biology. In a famous article, Gould and Vrba also discuss a feature’s change of function, calling it exaptation (in contrast to adaptation). Exaptation occurs when “a character, previously shaped by natural selection for a particular function (an adaptation), is coopted for a new use” (Gould & Vrba 1982: 5). One of the examples they give is particularly striking: feathers. At first, feathers were used for insulation, and, besides, as a “net” for catching insects; to this day, there are birds that use their feathers and wings to catch fish in shallow water. Then, after a series of quantitative changes (say, the lengthening of feathers) bird-like creatures such as *Archaeopteryx* suddenly discovered that feathers and wings could be used as a means of transportation – at first, of course, imperfect, but later more and more apt for this new function. What is particularly interesting about exaptation is that it always comes as a surprise. Nobody plans it (neither Mother Nature in the case of biological evolution, nor a sagacious human mind in that of cultural evolution); it simply happens. A slow accumulation of minor changes leads to a leap. An organ adapted for catching insects turns into something way more striking. A narrative device adapted for functions A and B becomes also suited for function C, which is so productive that it gives birth to a whole new subgenre.

So, a new function for anachronies was discovered – *and it came in a form of an exaptation*. The increase in the number of anachronies led to a qualitative change: a new function. Quantity turned into quality. Or, just as likely, the other way around: the sudden discovery of a new function led to a dramatic quantitative increase. However, one thing can be said with certainty: this new function was closely related to the increase in the number of anachronies *and* of timelines in contemporary films (Figure 26). Which leaves us with one final question: why this connection between anachronies and timelines? Why timelines, instead of something else?

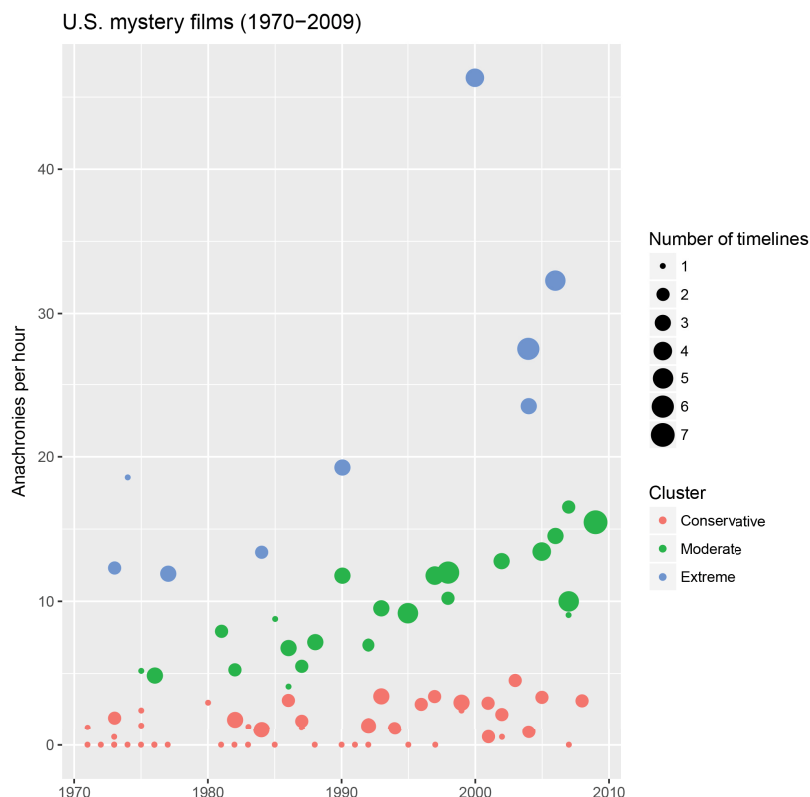


Figure 26. A summary plot of the data. The number of anachronies per hour for each film by their year of production, sized according to the number of timelines in the film.

6.6. Scaffolding

Exaptation explains *how* the formal invention was made. But this is not enough to understand the quick rise of anachronies. Making a lucky invention is only a part of the story; for spreading widely, this invention also needs to be *selected for*.⁶² What were the factors that might have played a role in the selection of highly-anachronic mystery films? The following discussion contains, for the most part, speculations, but they are not groundless. Several solutions that we suggest are based on empirical research, and the only (unanswered) problem is: which one is correct?

Here is the first factor that could make anachronies grow. Figure 27 shows the number of mystery films released in each decade. About the time when the new type of high-anachrony mysteries branched out, there also was a quick rise in the overall number of mystery movies. This may have two explanations. On

⁶² At least, in many cases. Sometimes, not selection but drift plays a major role (see Bentley et al. 2004).

the one hand, this quick rise in popularity may simply be a result of the formal innovation: a new interesting genre appeared, and everybody liked it. But, more interestingly, this rise may be seen as a *precondition* for the emergence of the new genre of highly anachronic mysteries. This makes perfect sense in the light of evolution theory too: inventions, such as a new narrative form, usually emerge on the margins of large populations. The larger the population, the higher are chances that somewhere on the periphery a new interesting phenomenon will appear. Probably, this is what happened to anachronies: a new function for them was found because there were more mystery films made, enabling more experiments, and one of these experimental forms proved to be successful.

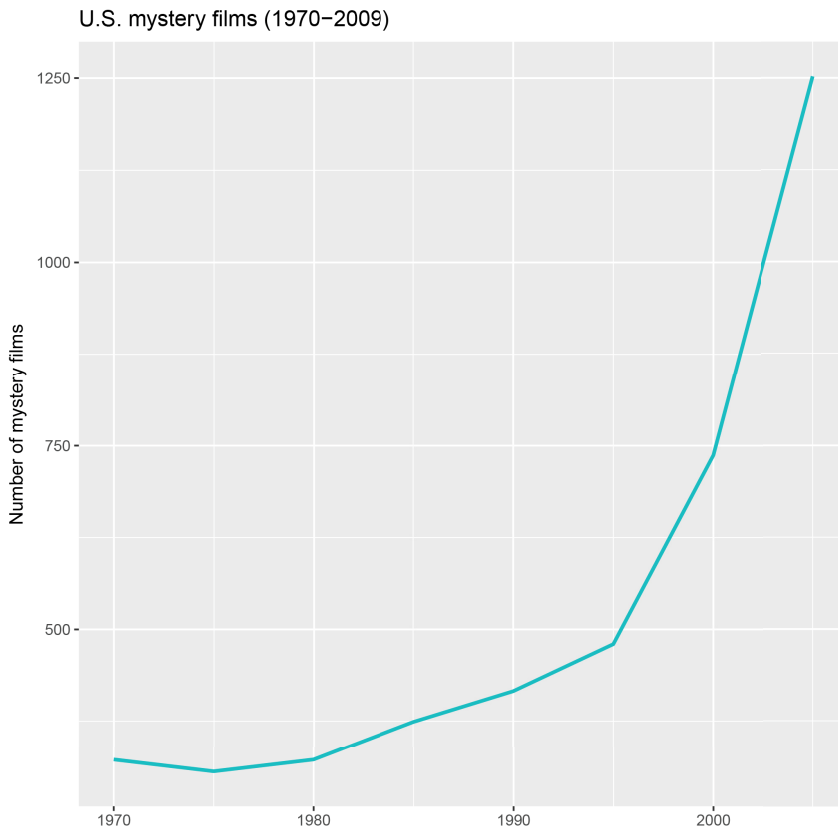


Figure 27. The number of mystery films released in each decade.

Another factor that could influence the selection of anachronies, rests on the intersection of composition and psychology. Let's consider a similar situation from the end of the nineteenth century: two literary genres that were competing for readers' attention, both heavily relying on mysteries as one of their central devices. Two branches, one of which would lose much of its popularity, while

the other would proliferate. Adventure novels, filled with robbers and pirates, versus crime novels, with a detective as the main figure. A hundred year ago, Viktor Shklovsky briefly discussed the relationship between mystery, anachronies, and the evolution of genres:

As a matter of fact, a single temporal transposition such as the omission of a particular incident and its appearance after the consequences of this incident have already been revealed is often quite sufficient to create ... a mystery.

And then:

Detective novels, a subspecies of the “crime novel”, have come to overshadow the “robbers novel” in importance. This is due, most probably, to the very convenience afforded by the mystery motivation. At first, the crime is presented as a riddle. Then, a detective appears on the scene as a professional riddle-solver. (Shklovsky 1990: 101, 103; translation has been changed)

Shklovsky’s idea about the role of “temporal transpositions” in creating mysteries was expanded by the narratologist Meir Sternberg (1978), and later developed by psychologists William F. Brewer and Edward H. Lichtenstein into their “structural-affect theory” (Brewer & Lichtenstein 1981; Brewer & Lichtenstein 1982; Brewer 1985; also, see Hoeken & van Vliet 2000). According to them, the order in which events are presented in a narrative can influence the emotions of the perceivers (be it readers, viewers, or listeners): in particular, manipulating the temporal order of events in a narrative can trigger such emotions as suspense, curiosity, and surprise. For us, curiosity is most interesting here:

In a curiosity discourse structure [a] significant event is withheld from the discourse, but [...] it provides enough information about the earlier event to let the reader know that the information is missing. This discourse structure leads the reader to become curious about the withheld information. The curiosity is resolved by providing enough information in the later parts of the discourse for the reader to reconstruct the omitted significant event. The classic mystery story is a good example of the curiosity discourse structure. (Brewer 1985: 170)

For example, curiosity may be evoked by changing the event sequence E1E2E3E4 into E1...E3E4(E2), where E2 is presented as a flashback. The structural-affect theory is also supported by the “information-gap theory” of George Loewenstein, who came to the conclusion that curiosity in general arises when we detect some gaps in our knowledge – information gaps – and seek to fill them in with relevant information (Loewenstein 1994).

Now, let’s return to Shklovsky’s hypothesis in the light of these cognitivist theories: detective novels became more prominent than other adventure genres because they had a good motivation to increase the amount of information gaps in a text, thus stimulating the pleasant feeling of curiosity in readers. So: what if the same thing happened to films a century later?

Our hypothesis is that – in highly-anachronic movies – multiple timelines function as a motivation, as a *scaffolding* that makes it possible to insert more information gaps in a text. Having several sub-plots allows to create mysteries not only *within* each of them, but also on the boundaries *between* them. In Paul McGuigan’s *Lucky Number Slevin* (2006), for instance, the behavior of the protagonist in the main narrative raises many questions, the answers to which are given in other timelines: his recent past, his more distant past, even the story of his childhood. (In addition, each of these stories is presented in a non-linear manner, and some of them are linked to even smaller sub-plots). In general, the multiple-timeline structure allows to make some timelines “gappy”, fill them with mysteries, and use other timelines to solve these mysteries. The powerful technique of multiple timelines allows this new kind of films to contain many more information gaps than was typical before, thus increasing their appeal for many viewers. Multiple timelines make mystery movies much more mysterious than their predecessors.

Interestingly, the rise of highly-anachronic, multi-timeline movies in the early 1990s coincided with the parallel rise of so-called “multi-protagonist films”: stories that “abandon the single-protagonist structure on which most film narratives have traditionally relied and replace it by a wider assortment of characters with more or less independent narrative lines” (Azcona 2010: 1). Films like Robert Altman’s *Short Cuts* (1993), Quentin Tarantino’s *Pulp Fiction* (1994), Steven Soderbergh’s *Traffic* (2000), or Alejandro González Iñárritu’s *21 Grams* (2003) are good examples of this tendency. The advantages provided by multi-protagonist films are similar to those of highly-anachronic movies: having several character lines allows to switch between them, and in leaving line A for line B, the former necessarily generates an “information gap”: there is something that isn’t being shown and thus potentially triggers our curiosity.

Multiple timelines and multiple protagonists are thus two distinct auxiliary devices, with the same fundamental goal: placing more information gaps in a film, to make it more intriguing. One task, two solutions.

Let’s return to the three questions we posed at the beginning of this chapter.

First, has there actually been an intensification in the use of flashbacks and flashforwards in films? Undoubtedly – at least, in our sample of American mystery movies. However, this intensification only occurs in one subgroup of the films, allowing us to distinguish two “branches” in the evolution of film: one in which the intensification doesn’t occur – and the other, in which it occurs in the years around 1990, and has been increasing since then.

Second, was the increase only quantitative? No, it wasn’t. It went hand in hand with a qualitative shift – the change in the function of anachronies. In the “conservative” branch, anachronies were used mostly at the beginning or ending of movies, and their function consisted in providing an answer to the main mystery of the plot, or in establishing a “frame” for the narrative. In the branch

of highly-anachronic films, a new function emerges: anachronies connect together different timelines of the plot.

Third, what was the force driving the emergence of the new kind of highly-anachronic, multiple-timeline films? Humans tend to like curiosity-triggering stimuli, which may be understood as one of the constant pressures on the evolution of fictional narratives. Different artistic forms compete for our attention, and being able to stimulate curiosity – by intensifying the mystery element of a story – plays a large role in this competition. In evolutionary terms, our brain’s ability to be curious could be called a selection bias: it is a force that gives a *direction* to cultural evolution, like the one demonstrated in this study.

Do we know what other influences this “curiosity bias” had on the evolution of film? Not really. Do we know what other psychological biases have shaped the evolution of various art forms? In some cases, yes,⁶³ but we are still far from understanding how art evolves and what are the forces driving this evolution. The study of the cultural evolution of art has a long journey ahead of it.

Filmography

1970s

- 1971, *Klute*, Alan J. Pacula
- 1971, *The Hospital*, Arthur Hiller
- 1972, *Sleuth*, Joseph L. Mankiewicz
- 1973, *Electra Glide in Blue*, James William Guercio
- 1973, *Magnum Force*, Ted Post
- 1973, *Soylent Green*, Richard Fleischer
- 1973, *The Last of Sheila*, Herbert Ross
- 1973, *The Long Goodbye*, Robert Altman
- 1974, *Chinatown*, Roman Polanski
- 1974, *The Conversation*, Francis Ford Coppola
- 1975, *Farewell, My Lovely*, Dick Richards
- 1975, *Night Moves*, Arthur Penn
- 1975, *The Stepford Wives*, Bryan Forbes
- 1975, *Three Days of the Condor*, Sydney Pollack
- 1976, *All the President’s Men*, Alan J. Pakula
- 1976, *The Omen*, Richard Donner
- 1976, *Marathon Man*, John Schlesinger
- 1976, *Murder by Death*, Robert Moore
- 1977, *Equus*, Sidney Lumet
- 1977, *Eraserhead*, David Lynch

⁶³ Some examples: Loewenstein & Heath 2009; Norenzayan et al. 2006; Morin 2013.

1980s

1980, *Dressed to Kill*, Brian De Palma
1981, *Blow Out*, Brian De Palma
1981, *Cutter's Way*, Ivan Passer
1982, *Deathtrap*, Sidney Lumet
1982, *Missing*, Costa-Gavras
1982, *The Thing*, John Carpenter
1983, *Something Wicked This Way Comes*, Jack Clayton
1983, *Without a Trace*, Stanley R. Jaffe
1984, *2010: The Year We Make Contact*, Peter Hyams
1984, *A Soldier's Story*, Norman Jewison
1985, *Clue*, Jonathan Lynn
1985, *Fletch*, Michael Ritchie
1986, *Blue Velvet*, David Lynch
1986, *Crossroads*, Walter Hill
1986, *Manhunter*, Michael Mann
1987, *Angel Heart*, Alan Parker
1987, *House of Games*, David Mamet
1987, *No Way Out*, Roger Donaldson
1988, *Frantic*, Roman Polanski
1988, *Mississippi Burning*, Alan Parker

1990s

1990, *Jacob's Ladder*, Adrian Lyne
1990, *Mountains of the Moon*, Bob Rafelson
1990, *Reversal of Fortune*, Barbet Schroeder
1991, *Barton Fink*, Joel Coen, Ethan Coen
1992, *A Few Good Men*, Rob Reiner
1992, *Twin Peaks: Fire Walk With Me*, David Lynch
1992, *The Player*, Robert Altman
1993, *Manhattan Murder Mystery*, Woody Allen
1993, *The Fugitive*, Andrew Davis
1994, *Death and the Maiden*, Roman Polanski
1995, *Se7en*, David Fincher
1995, *Twelve Monkeys*, Terry Gilliam
1996, *Primal Fear*, Gregory Hoblit
1997, *L.A. Confidential*, Curtis Hanson
1997, *Lost Highway*, David Lynch
1997, *The Game*, David Fincher
1998, *Dark City*, Alex Proyas
1998, *The Red Violin*, François Girard
1999, *The Green Mile*, Frank Darabont
1999, *The Sixth Sense*, M. Night Shyamalan

2000s

- 2000, *Memento*, Christopher Nolan
2001, *Donnie Darko*, Richard Kelly
2001, *Interstate 60*, Bob Gale
2001, *Mulholland Drive*, David Lynch
2002, *Minority Report*, Steven Spielberg
2002, *The Bourne Identity*, Doug Liman
2003, *Mystic River*, Clint Eastwood
2004, *Harry Potter and the Prisoner of Azkaban*, Alfonso Cuarón
2004, *Saw*, James Wan
2004, *A Very Long Engagement*, Jean-Pierre Jeunet
2005, *Harry Potter and the Goblet of Fire*, Mike Newell
2005, *Kiss Kiss Bang Bang*, Shane Black
2006, *Lucky Number Slevin*, Paul McGuigan
2006, *The Prestige*, Christopher Nolan
2007, *Atonement*, Joe Wright
2007, *Eastern Promises*, David Cronenberg
2007, *Gone Baby Gone*, Ben Affleck
2007, *Zodiac*, David Fincher
2008, *Changeling*, Clint Eastwood
2009, *Watchmen*, Zack Snyder

CONCLUSIONS

THINGS NOT DONE, THINGS TO BE DONE

This dissertation is the end product of several years of work. End products, however, often deviate from the original plan. Reasons may vary: better ideas, new methods, or a lack of time, disillusionment, failure to prove the hypotheses... In my case, a lack of time was an important reason: I did not manage to complete as much as I wanted (the way I wanted). My initial plan was longer and more detailed, but this thesis turned out to be shorter and somewhat uneven: some of the initial topics were developed at length, others – which I also planned to develop at length – are mentioned in passing. But I have not discarded the initial plan – I am keeping it in mind, as I would like to develop this dissertation into a longer book in the near future. The task of these concluding remarks is to sketch out the differences between what was planned initially – and what is still to be done.

Exaptation. In Chapters 2 and 3, I have listed two main mechanisms of invention: random chance (equivalent to mutation in biology) and bricolage (equivalent to genetic recombination) – but there is a third mechanism, exaptation. Exaptation is the change of function of an organ or an artefact: a dramatic qualitative shift, which usually happens after a less dramatic quantitative change. I discuss exaptation in passing in Chapter 6, as it seems to be responsible for the emergence of a new type of mystery film in the 1990s–2000s. But initially I planned to dedicate a separate section to exaptation – and I still think this would be a good idea.

Geography. Another important topic left undiscovered is the geography of evolution. Where are innovative artforms born? How do they spread? How does adaptation work across cultures and nations? (A genre adapted to Country A may turn out to be ill-adapted to Country B). Are artforms usually invented at the core of the cultural world-system, or are they equally frequent at the periphery? How does the population size of an area, or population density, influence the emergence of new cultural items? What is the speed at which artworks “travel” across the globe? All these questions deserve a separate chapter, or even several chapters.

Stability. It happened so that artistic change became the main hero of this thesis. Change is more noticeable than stability, and so I focused on the components of change: variation and selection. The evolutionary mechanism providing stability – retention, or restabilization (as Niklas Luhmann [2012] called it) – was always implied as a force acting on the background. And yet, it fully deserves a chapter or two for itself.

Avant-guard vs. popular art. How exactly do some traditional concepts in art studies match evolution theory? Take the traditional divide between avant-garde art and popular culture. I would hypothesize that popular art (as indicated by its

title) is mainly driven by selection. That is, there are very good reasons why a popular Genre A is popular: it is perfectly engineered to manipulate our emotional system. But what about avant-garde art? It is usually praised by a small group of insiders – artistic “peer-review.” And from evolution theory we know that, in small groups, changes are much more random – and so success can be random too. So, is avant-garde art more prone to random evolution?

Death of artforms. I spoke at length about how artforms are born and selected, but I did not speak about how they die. The death of art is an interesting topic in itself. Everything dies, sooner or later, and artworks and artforms die too. For example, what is the average “lifespan” of a novel or a film? With contemporary databases like IMDb or Goodreads, we can estimate the amount of attention that a movie or a book receives over many years. A book that was a bestseller a year ago sells now with a 50% discount, as nobody buys it: it no longer interests potential readers. How long does this “interesting” phase last? And, more generally, what does it mean for an artwork to “die?”

Red Queen. Speaking of death: some genres simply refuse to die – they are unusually long-lasting. In Chapter 3, I demonstrated the crystallization of the detective genre over the nineteenth century. One hundred years later, detectives are still popular. Why so, if many other genres cannot outlive a decade? My hypothesis: detectives had a large potential for reinventing themselves. Detectives today are different from what they were in the early twentieth century. One example: a century ago, the literary criminal would be a practical nephew killing his aunt for the inheritance – or, an equally practical criminal mastermind, such as Professor Moriarty (a Professor!). Today, most criminals are impractical serial killers, who don’t care about their aunts but kill complete strangers for no practical benefit. This process of reinventing yourself for survival has a parallel in biology – it is called the Red Queen hypothesis. Does Red Queen’s explain not only biology but culture too?

Speculations. I made several speculative claims throughout my dissertation. For example, in Chapter 3, I hypothesize that literature is driven by two pressures – the pressure for novelty and conservative pressure; but my evidence is anecdotal. In Chapter 4, I claim that cartoons may adapt to the neoteny bias (they become cuter over time), while horror films evolve more towards realism. Again, I rely on anecdotal evidence. I did not discard these speculations, as they are interesting, but I fully understand that simply being interesting is not enough. So I am planning a large-scale study of cuteness in cartoons: to test if neoteny bias played any role in their evolution. It may be possible to find empirical ways of testing my other speculative hypotheses too.

I decided to postpone investigating these ideas until a better time. Are these the only themes that would improve this thesis? Of course not. The space for improvement and adjustment is endless – particularly due to the open-ended nature of my enterprise. I am not attempting to build an ultimate diachronic theory of art, nor am I trying to prove a specific hypothesis within cultural evolution. Instead, my main goal is to show that diachronic theories for art may be useful and can fill some of the gaps in art history.

A diachronic theory based on cultural evolution opens a whole spectrum of new questions for art history. The patterns and principles described in this thesis are a tiny fraction of patterns and principles yet to be discovered. And so, at the end, I would like to repeat what I said at the very beginning: let's collectively investigate the longitudinal cut of art – its patterns and mechanisms.

Because there are plenty.

REFERENCES

- Algee-Hewitt, M., S. Allison, M. Gemma, R. Heuser, F. Moretti, and H. Walser. 2016. Canon/archive. Large-scale dynamics in the literary field, *Stanford Literary Lab*, Pamphlet 11. <https://litlab.stanford.edu/LiteraryLabPamphlet11.pdf>
- Al'tshuller, M. 1996. *Epokha Val'tera Skotta v Rossii: Istoricheskii roman 1830-h godov* [*The Walter Scott era in Russia: The Historical Novel of the 1830s*]. St. Petersburg: Akademicheskii proekt.
- Atkinson, Q. D., A. Meade, C. Venditti, S. J. Greenhill, and M. Pagel. 2008. Language evolves in punctuational bursts. *Science* 319: 588.
- Ayres, R. U. 1992. CIM: a challenge to technology management. *International Journal of Technology Management* 7: 17–39.
- Azcona, M. 2010. *The Multi-Protagonist Film*. Oxford: Wiley-Blackwell.
- Barrett, L. F. 2017. *How Emotions Are Made*. Boston and New York: Houghton Mifflin Harcourt.
- Barthes, R. 1964. *Elements of Semiology*. New York: Hill and Wang.
- Barthes, R. 1989 [1968]. The reality effect. In *The Rustle of Language*, 141–148. Berkeley: University of California Press.
- Basalla, G. 1988. *The Evolution of Technology*. Cambridge: Cambridge University Press.
- Bauer, M. 1995. “Technophobia”: A misleading conception of resistance to new technology. In *Resistance to New Technology*, edited by M. Bauer, 1–41. Cambridge: Cambridge University Press.
- Belknap, R. L. 1997. Survey of Russian journals, 1840–1880. In *Literary Journals in Imperial Russia*, edited by D. A. Martinsen, 91–116. Cambridge: Cambridge University Press.
- Bentley, A., M. Earls, and M. J. O'Brien. 2011. *I'll Have What She's Having: Mapping Social Behavior*. Cambridge, MA: The MIT Press.
- Bentley, A., M. W. Hahn and S. J. Shennan. 2004. Random drift and culture change. *Proceedings of the Royal Society B* 271: 1443–1450.
- Berlyne, D. 1954. A theory of human curiosity. *British Journal of Psychology* 45(3): 180–191.
- Berlyne, D. 1957. Uncertainty and conflict: A point of contact between information-theory and behavior-theory concepts. *Psychological Review* 64(6): 329–339.
- Bhattacharyya, S., and S. Ohlsson. 2010. Social creativity as a function of agent cognition and network properties: A computer model. *Social Networks* 32: 263–278.
- Bloom, H. 1973. *Anxiety of Influence: A Theory of Poetry*. Oxford: Oxford University Press.
- Bohm, I. C., U. Altmann, O. Lubrich, W. Menninghaus, and A. M. Jacobs. 2012. Old proverbs in new skins – an fMRI study on defamiliarization. *Frontiers in Psychology* 3: 204.
- Bordwell, D. 2002. Intensified Continuity. Visual Style in Contemporary American Film, *Film Quarterly* 55(3): 16–28.
- Bordwell, D. 2006. *The Way Hollywood Tells It: Story and Style in Modern Movies*. Berkeley, CA: University of California Press.
- Borges, J. L. 1981[1936]. Modes of G. K. Chesterton. In *Borges: A Reader*, edited by E. R. Monegal and A. Reid, 87–91. New York: Dutton.
- Boyd, R., and P. Richerson. 1985. *Culture and the Evolutionary Process*. Chicago, IL: University of Chicago Press.

- Brewer, W. F. 1985. The story schema: Universal and culture-specific properties. In *Literacy, Language, and Learning: The Nature and Consequences of Reading and Writing*, edited by D. R. Olson, N. Torrance, and A. Hildyard, 167–194. Cambridge: Cambridge University Press.
- Brewer, W. F., and E. H. Lichtenstein. 1981. Event schemas, story schemas, and story grammars. In *Attention and Performance*, vol. 9, edited by J. Long and A. Baddeley, 363–379. Erlbaum.
- Brewer, W. F., and E. H. Lichtenstein. 1982. Stories are to entertain: A structural-affect theory of stories. *Journal of Pragmatics* 6: 473–483.
- Brouillette, S. 2002. Corporate publishing and canonization: *Neuromancer* and science-fiction publishing in the 1970s and early 1980s. *Book History* 5: 187–208.
- Brunetière, F. 1890. *L'évolution des genres dans l'histoire de la littérature*. Paris: Hachette.
- Brunetière, F. 1905. *L'évolution de la poésie lyrique en France au dix-neuvième siècle*. Paris: Hachette.
- Buckland, W., ed. 2009. *Puzzle Films: Complex Storytelling in Contemporary Cinema*. Oxford: Wiley-Blackwell.
- Buckland, W., ed. 2014. *Hollywood Puzzle Films*. New York: Routledge.
- Buckley, C. D., and E. Boudot. 2017. The evolution of an ancient technology. *Royal Society Open Science* 4: 170208.
- Caldwell, C. A., and A. E. Millen. 2008. Studying cumulative cultural evolution in the laboratory. *Philosophical Transactions of the Royal Society B* 369: 3529–3539.
- Cameron, A. 2008. *Modular Narratives in Contemporary Cinema*. New York: Palgrave Macmillan.
- Campbell, D. T. 1960. Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review* 67(6): 380–400.
- Carroll, J. 2011. *Reading Human Nature: Literary Darwinism in Theory and Practice*. Albany, N.Y.: SUNY Press.
- Carroll, N. 1990. *The Philosophy of Horror*. New York and London: Routledge.
- Cavalli-Sforza, L. L., and M. Feldman. 1981. *Cultural Transmission and Evolution: A Quantitative Approach*. Princeton, N.J.: Princeton University Press.
- Cawelti, J. G. 1976. *Adventure, Mystery, and Romance: Formula Stories as Art and Popular Culture*. Chicago and London: The University of Chicago Press.
- Chanda, M. L., and D. J. Levitin. 2013. The neurochemistry of music. *Trends in Cognitive Sciences* 17(4): 179–193.
- Chase-Dunn, C., and B. Lero. 2014. *Social Change: Globalization from the Stone Age to the Present*. New York: Routledge.
- Collins, R. 1998. *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge, MA; London: The Belknap Press.
- Collins, R. 2005. Sociology and philosophy. In *The Sage Handbook of Sociology*, edited by C. Calhoun, C. Rojek, and B. Turner, 61–78. London: Sage.
- Conroy, M. 2014. Before the 'inward turn': Tracing represented thought in the French novel (1800–1929). *Poetics Today* 35(1–2): 117–171.
- Cook, M. 2011. *Narratives of Enclosure in Detective Fiction: The Locked Room Mystery*. New York: Palgrave.
- Currie, T. E., S. J. Greenhill, and R. Mace. 2010. Is horizontal transmission really a problem for phylogenetic comparative methods? A simulation study using continuous cultural traits. *Philosophical Transactions of the Royal Society B* 365: 3903–3912.

- Cutting, J. E., K. L. Brunick, J. E. DeLong, C. Iricinschi, and A. Candan. 2011. Quicker, faster, darker: Changes in Hollywood film over 75 years. *i-Perception* 2: 569–576.
- Cutting, J. E., and A. Candan. 2015. Shot durations, shot classes, and the increased pace of popular movies. *Projections* 9(2): 40–62.
- Cutting, J. E., J. E. DeLong, and C. E. Nothelfer. 2010. Attention and the evolution of Hollywood film. *Psychological Science* 21(3): 432–439.
- da Silva, S. G., and J. J. Tehrani. 2016. Comparative phylogenetic analyses uncover the ancient roots of Indo-European folktales. *Royal Society Open Science* 3: 150645.
- Darwin, C. 1871. *The Descent of Man, and Selection in Relation to Sex*, <http://www.gutenberg.org/ebooks/2300>
- Davies, S. 2012. *The Artful Species: Aesthetics, Art, and Evolution*. Oxford: Oxford University Press.
- Dawkins, R. 1993. Viruses of the mind. In *Dennett and His Critics: Demystifying Mind*, edited by B. Dahlboom, 13–27. Cambridge, MA: Blackwell.
- de Saussure, F. 2011 [1916]. *Course in General Linguistics*, translated by W. Baskin. New York: Columbia University Press.
- Dean, L. G., G. L. Vale, K. N. Laland, E. Flynn, and R. L. Kendal. 2014. Human cumulative culture: A comparative perspective. *Biological Reviews* 89: 284–301.
- Debreczeni, P. 1996. *Bludnaja doch': Analiz khudozhestvennoj prozy Pushkina* [*Prodigal Daughter: The Analysis of Pushkin's Prose*]. St. Petersburg: Akademicheskii proekt.
- Di Salvo, M. 2006. Povest'. In *The Novel*, vol. 1, edited by F. Moretti, 283–288. Princeton, NJ: Princeton University Press.
- Dostoevsky, F. 2000 [1866]. *Crime and Punishment*, translated by C. Garnett. Ware, UK: Wordsworth.
- Dunbar, K. N., and J. A. Fugelsang. 2005. Causal thinking in science: how scientists and students interpret the unexpected. In *Scientific and Technological Thinking*, edited by M. E. Gorman, R. D. Tweney, D. C. Gooding, and A. P. Kincannon, 57–79. Mahwah, N.J.; London: Lawrence Erlbaum.
- Eldredge, N. and S. J. Gould. 1972. Punctuated equilibria: an alternative to phyletic gradualism. In *Models in Paleobiology*, edited by T. J. M. Schopf, 82–115. San Francisco: Freeman, Cooper & Co.
- English, J. 2016. Now, not now: Counting time in contemporary fiction studies. *Modern Language Quarterly* 77(3): 395–418.
- Eriksson, K., and J. C. Coultas. 2014. Corpses, maggots, poodles and rats: Emotional selection operating in three phases of cultural transmission of urban legends. *Journal of Cognition and Culture* 14(1–2): 1–26.
- Evans, A. B. 2009. Nineteenth century sf. In *The Routledge Companion to Science Fiction*, edited by M. Bould, A. M. Butler, A. Roberts, and S. Vint, 13–22. London and New York: Routledge.
- Even-Zohar, I. 1990. Gnessin's dialogue and its Russian models. *Poetics Today* 11(1): 131–153.
- Farroni, T, S. Massaccesi, E. Menon, and M. H. Johnson. 2007. Direct gaze modulates face recognition in young infants. *Cognition* 102: 396–404.
- Fiorillo, C. D., P. N. Tobler, and W. Schultz. 2003. Discrete coding of reward probability and uncertainty by dopamine neurons. *Science* 299(5614): 1898–1902.
- Fludernik, M. 1993. *The Fictions of Language and the Languages of Fiction: The Linguistic Representation of Speech and Consciousness*. London: Routledge.

- Fowler, A. 1971. The life and death of literary forms. *New Literary History* 2(2): 199–216.
- Fowler, A. 1982. *Kinds of Literature: An Introduction to the Theory of Genres and Modes*. Oxford: Oxford University Press.
- Furuya, E. Y., and D. Lowy. 2006. Antimicrobial-resistant bacteria in the community setting. *Nature Reviews Microbiology* 4: 36–45.
- Gasparov, M. 1996 [1989]. *A History of European Versification*, translated by G. S. Smith and M. Tarlinskaja. Oxford: Clarendon Press.
- Geels, F. 2002. Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Research Policy* 31: 1257–1274.
- Genette, G. 1980. *Narrative Discourse: An Essay in Method*, translated by J. E. Lewin. Ithaca, N.Y.: Cornell University Press.
- Gerrig, R. J. 1997. Is there a paradox of suspense? A reply to Yanal. *British Journal of Aesthetics* 37: 168–174.
- Gerrig, R. J. 2010. Readers' experiences of narrative gaps. *StoryWorlds* 2: 19–37.
- Gerrig, R. J., J. Love, and G. McKoon. 2009. Waiting for Brandon: How readers respond to small mysteries. *Journal of Memory and Language* 60 (1): 144–153.
- Godfrey-Smith, P. 2009. *Darwinian Populations and Natural Selection*. Oxford: Oxford University Press.
- Gottschall, J. 2008. *Literature, Science, and a New Humanities*. New York: Palgrave.
- Gould, S. J. 1980. *The Panda's Thumb: More Reflections in Natural History*. New York and London: W. W. Norton & Company.
- Gould, S. J., and E. S. Vrba. 1982. Exaptation – a missing term in the science of form. *Paleobiology* 8(1): 4–15.
- Gray, R. D., A. J. Drummond, S. J. Greenhill. 2009. Language phylogenies reveal expansion pulses and pauses in Pacific settlement. *Science* 323: 479–483.
- Gray, R. D., and J. Watts. 2017. Cultural macroevolution matters. *Proceedings of the National Academy of Sciences* 114: 7846–7852.
- Gray, R. D., and Q. Atkinson. 2003. Language-tree divergence times support the Anatolian theory of Indo-European origin. *Nature* 426(27): 435–439.
- Greenhill, S. J., T. E. Currie, and R. D. Gray. 2009. Does horizontal transmission invalidate cultural phylogenies? *Proceedings of the Royal Society B* 276: 2299–2306.
- Greenhill, S. J., C.-H. Wu, X. Hua, M. Dunn, S. C. Levinson, and R. D. Gray. 2017. Evolutionary dynamics of language systems. *PNAS* 114(42): E8822–E8829.
- Gruber, H. E. and K. Bödeker, eds. 2005. *Creativity, Psychology and the History of Science*. Springer.
- Grundmann, H. 2005. Shakespeare and European Romanticism. In *A Companion to European Romanticism*, edited by M. Ferber, 29–48. Oxford: Blackwell.
- Guillon, M., and R. Mace. 2016. A phylogenetic comparative study of Bantu kinship terminology finds limited support for its co-evolution with social organization. *PLoS ONE* 11(5): e0155170.
- Hahn, M. W., and A. Bentley. 2003. Drift as a mechanism for cultural change: An example from baby names. *Proceedings of the Royal Society B* 270: S120–S123.
- Heath, C., C. Bell, and E. Sternberg. 2001. Emotional selection in memes: The case of urban legends. *Journal of Personality and Social Psychology* 81(6): 1028–1041.
- Henderson, B. 1983. Tense, mood, and voice in film (notes after Genette). *Film Quarterly* 36(4): 4–17.

- Henrich, J. 2004. Demography and cultural evolution: How adaptive cultural processes can produce maladaptive losses – the Tasmanian case. *American Antiquity* 69(2): 197–214.
- Heuser, R., and L. Le-Khac. 2012. A quantitative literary history of 2,958 nineteenth-century British novels: The semantic cohort method, *Stanford Literary Lab*, Pamphlet 4. <https://litlab.stanford.edu/LiteraryLabPamphlet4.pdf>
- Hinde, R. A., and L. A. Barden. 1985. The evolution of the teddy bear. *Animal Behaviour* 33: 1371–1373.
- Hjelmslev, L. 1953. *Prolegomena to a Theory of Language*, translated by F. J. Whitfield. Baltimore: Waverly Press.
- Hobsbawm, E. 1992. *Nations and Nationalism since 1780: Programme, Myth, Reality*. Cambridge: Cambridge University Press.
- Hoeken, H., and M. van Vliet. 2000. Suspense, curiosity, and surprise: How discourse structure influences the affective and cognitive processing of a story. *Poetics* 26: 277–286.
- Hoover, D. L., J. Culpeper, and K. O'Halloran, eds. 2014. *Digital Literary Studies: Corpus Approaches to Poetry, Prose, and Drama*. New York: Routledge.
- Huron, D. 2006. *Sweet Anticipation: Music and the Psychology of Expectation*. Cambridge, MA; London: The MIT Press.
- Jacob, F. 1977. Evolution and tinkering. *Science* 196(4295): 1161–1166.
- Johnson, S. 2010. *Where Good Ideas Come From: The Natural History of Innovation*. New York: Riverhead Books.
- Johnson, S. 2014. *How We Got to Now: Six Innovations That Made the Modern World*. New York: Penguin.
- Kahneman, D. 2011. *Thinking, Fast and Slow*. New York: Penguin.
- Katsma, H. 2014. Loudness in the novel, *Stanford Literary Lab*, Pamphlet 7. <https://litlab.stanford.edu/LiteraryLabPamphlet7.pdf>
- Kauffman, S. A. 2000. *Investigations*. Oxford and New York: Oxford University Press.
- Kaufman, S. B. 2011. Intelligence and the cognitive unconscious. In *The Cambridge Handbook of Intelligence*, edited by R. J. Sternberg and S. B. Kaufman, 442–467. New York, NY: Cambridge University Press.
- Kimura, M. 1983. *The Neutral Theory of Molecular Evolution*. Cambridge: Cambridge University Press.
- Kliger, I., and B. Maslov, eds. 2016. *Persistent Forms: Explorations in Historical Poetics*. New York: Fordham University Press.
- Knight, S. 2010. *Crime Fiction since 1800*. 2nd ed. New York: Palgrave.
- Kobayashi, Y., H. Ohtsuki, and J. Y. Wakano. 2016. Population size vs. social connectedness – A gene-culture coevolutionary approach to cumulative cultural evolution. *Theoretical Population Biology* 111: 87–95.
- Koonin, E. V. 2011. *The Logic of Chance: The Nature and Origin of Biological Evolution*. Upper Saddle River, N.J.: Pearson Education.
- Kringelbach, M. L., and K. C. Berridge, eds. 2010. *Pleasures of the Brain*. Oxford: Oxford University Press.
- Kringelbach, M. L., E. A. Stark, C. Alexander, M. H. Bornstein, and A. Stein. 2016. On cuteness: Unlocking the parental brain and beyond. *Trends in Cognitive Sciences* 20(7): 545–558.
- Kuprejanova, E. N., and L. N. Nazarova. 1962. Russkij roman pervoj chetverti XIX veka: Ot sentimental'noj povesti k romanu" [Russian novel of the first quarter of the nineteenth century: From sentimental povest' to a novel]. In *Istorija russkogo*

- romana [*The history of the Russian novel*], vol. 1, edited by G. M. Fridlender, 66–99. Moscow: Izdatelstvo Akademii nauk SSSR.
- LeDoux, J. 2012. Rethinking the emotional brain. *Neuron* 73(4): 653–676.
- Lee, M. S. 2010. Edgar Allan Poe (1809–1849). In *A Companion to Crime Fiction*, edited by Ch. J. Rzepka and L. Horsley, 369–380. Oxford: Wiley-Blackwell.
- Leech, G., and M. Short. 2007. *Style in Fiction*. Harlow, UK: Pearson Longman.
- Loewenstein, G. 1994. The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin* 116 (1): 75–98.
- Loewenstein, J., and C. Heath. 2009. The Repetition-Break plot structure: A cognitive influence on selection in the marketplace of ideas. *Cognitive Science* 33: 1–19.
- Loiperdinger, M. 2004. Lumiere's *Arrival of the Train*: Cinema's founding myth. *The Moving Image* 4(1): 89–118.
- Lorenz, K. 1943. Die angeborenen Formen möglicher Erfahrung. *Zeitschrift für Tierpsychologie* 5: 235–409.
- Lotman, J. 2009 [1992] *Culture and Explosion*, translated by W. Clark. Berlin and New York: Mouton de Gruyter.
- Lotman, J. 2013. *The Unpredictable Workings of Culture*. Tallinn: Tallinn University Press.
- Lotman, Y. 2002 [1989]. O roli sluchajnyh faktorov v literaturnoi evolutsii. In: Lotman Y. *Istoriia i tipologiiia russkoi kul'tury*, 128–135. St. Petersburg: Iskustvo–SPB.
- Love, J., G. McKoon, and R. J. Gerrig. 2010. Searching for Judy: How small mysteries affect narrative processes and memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 36 (3): 790–796.
- Luhmann, N. 2012. *Theory of Society*. Vol. 1, translated by R. Barrett. Stanford, CA: Stanford University Press.
- Madison, G., and G. Schiölde. 2017. Repeated listening increases the liking for music regardless of its complexity: Implications for the appreciation and aesthetics of music. *Frontiers in Neuroscience* 11: 147.
- Maguire, R. A. 1997. Introduction. In *Literary Journals in Imperial Russia*, edited by D. A. Martinsen, 1–8. Cambridge: Cambridge University Press.
- Martindale, C. 1990. *The Clockwork Muse: The Predictability of Artistic Change*. New York: Basic Books.
- Mauch, M., R. M. MacCallum, M. Levy, and A. M. Leroi. 2015. The evolution of popular music: USA 1960–2010. *Royal Society Open Science* 2: 150081.
- Mayr, E. 2001. *What Evolution Is*. New York: Basic Books.
- McShea, D. W., and R. N. Brandon. 2010. *Biology's First Law: The Tendency for Diversity and Complexity to Increase in Evolutionary Systems*. Chicago and London: The University of Chicago Press.
- Menninghaus, W., V. Wagner, J. Hanich, E. Wassiliwizky, T. Jacobsen, and S. Koelsch. 2017. The Distancing–Embracing model of the enjoyment of negative emotions in art reception. *Behavioral and Brain Sciences* [epub ahead of print]
- Mesoudi, A. 2011. *Cultural Evolution: How Darwinian Theory Can Explain Human Culture and Synthesize the Social Sciences*. Chicago and London: The University of Chicago Press.
- Mesoudi, A. 2017. Pursuing Darwin's curious parallel: Prospects for a science of cultural evolution. *PNAS* 114(30): 7853–7860.
- Meyer, W.-U., R. Reisenzein, and A. Schützwohl. 1997. Toward a process analysis of emotions: The case of surprise. *Motivation and Emotion* 21(3): 251–274.

- Miall, D. 2004. Episode structures in literary narratives. *Journal of Literary Semantics* 33 (2): 111–29.
- Miesler, L., H. Leder, and A. Herrmann. 2011. Isn't it cute: An evolutionary perspective of baby-schema effects in visual product designs. *International Journal of Design* 5(3): 17–30.
- Mokyr, J. 1990. *The Lever of Riches: Technological Creativity and Economic Progress*. New York and Oxford: Oxford University Press.
- Mokyr, J. 1996. Evolution and technological change: a new metaphor for economic history? In *Technological Change*, edited by R. Fox, 63–83. London: Harwood.
- Mokyr, J. 2004. *The Gifts of Athena: Historical Origins of the Knowledge Economy*. Princeton and Oxford: Princeton University Press.
- Mokyr, J. 2017. *A Culture of Growth: The Origins of the Modern Economy*. Princeton, N.J.: Princeton University Press.
- Moody, S., ed. 1990. *The Hatchards Crime Companion: 100 Top Crime Novels Selected by the Crime Writers' Association*. London: Hatchards.
- Moretti, F. 1998. *Atlas of the European Novel 1800–1900*. London and New York: Verso.
- Moretti, F. 2000a. Conjectures on world literature. *New Left Review* 1: 54–68.
- Moretti, F. 2000b. The slaughterhouse of literature. *Modern Language Quarterly* 61(1): 207–227.
- Moretti, F. 2005. *Graphs, Maps, Trees: Abstract Models for Literary History*. London and New York: Verso.
- Moretti, F. 2013a. *Distant Reading*. London and New York: Verso.
- Moretti, F. 2013b. Operationalizing, or, The function of measurement in literary study. *New Left Review* 84: 103–119.
- Morin, O. 2011. When does psychology drive culture? In *Creating Consilience: Integrating Science and the Humanities*, edited by E. Slingerland and M. Collard, 179–193. Cambridge: Oxford University Press.
- Morin, O. 2013. How portraits turned their eyes upon us: Visual preferences and demographic change in cultural evolution. *Evolution and Human Behavior* 34: 222–229.
- Morin, O., and A. Acerbi. 2017. Birth of the cool: A two-centuries decline in emotional expression in Anglophone fiction. *Cognition and Emotion* 8: 1663–1675.
- Munro, T. 1955. Do the arts progress? *The Journal of Aesthetics and Art Criticism* 14(2): 175–190.
- Munro, T. 1960. Evolution and progress in the arts: A reappraisal of Herbert Spencer's theory. *The Journal of Aesthetics and Art Criticism* 18(3): 294–315.
- Muthukrishna, M., and J. Henrich. 2016. Innovation in the collective brain. *Philosophical Transactions of the Royal Society B* 371: 20150192.
- Nedzvetzky, V. 2011. *Istorija russkogo romana XIX veka: Neklassicheskie formy* [The history of the Russian novel of the nineteenth century: Nonclassical forms]. Moscow: Izdatelstvo Moskovskogo universiteta.
- Norenzayan, A., S. Atran, J. Faulkner, and M. Schaller. 2006. Memory and mystery: The cultural selection of minimally counterintuitive narratives. *Cognitive Science* 30: 531–553.
- Nunn, Ch. L., M. B. Mulder, and S. Langley. 2006. Comparative methods for studying cultural trait evolution: a simulation study. *Cross-Cultural Research* 40(2): 177–209.

- O'Brien, M. J., J. Darwent, and R. L. Lyman. 2001. Cladistics is useful for reconstructing archaeological phylogenies: Palaeoindian points from the Southeastern United States. *Journal of Archaeological Science* 28: 1115–1136.
- Ogburn, W. F., and D. Thomas. 1922. Are inventions inevitable? A note on social evolution. *Political Science Quarterly* 37(1): 83–98.
- Page, N. 1988. *Speech in the English Novel*. Basingstoke, UK: Macmillan.
- Paige, N. 2017. Examples, samples, signs: An artifactual view of fictionality in the French novel, 1681–1830. *New Literary History* 48: 503–530.
- Parr, B. 2015. *Captivology: The Science of Capturing People's Attention*. New York: Harper One.
- Petroski, H. 1992. *The Evolution of Useful Things*. New York: Vintage Books.
- Phelan, J. 2012. Conversational and authorial disclosure in the dialogue novel: The case of *The Friends of Eddie Coyle*. In *Narrative, Interrupted: The Plotless, the Disturbing, and the Trivial in Literature*, edited by M. Lehtimäki, L. Karttunen, and M. Mäkelä, 3–23. Amsterdam: De Gruyter.
- Pisula, W., K. Turlejski, and E. P. Charles. 2013. Comparative psychology as unified psychology: The case of curiosity and other novelty-related behavior. *Review of General Psychology* 17 (2): 224–229.
- Poe, E. 1846. The philosophy of composition.
<http://xroads.virginia.edu/~HYPER/poe/composition.html>
- Põldmäe, J. 1971. *Eesti värsisüsteemid ja silbilis-rõhulise värsisüsteemi arengujooni XX sajandil: väitekirj filoloogiakandidaadi teadusliku kraadi taotlemiseks*. Tartu.
- Popper, K. 1979. *Objective Knowledge: An Evolutionary Approach*. Revised ed. Oxford: Clarendon Press.
- Porter, J. D. 2018. Popularity/prestige. *Stanford Literary Lab*, Pamphlet 17. <https://litlab.stanford.edu/LiteraryLabPamphlet17.pdf>
- Prince, G. 2003 [1987]. *A Dictionary of Narratology*. Lincoln: University of Nebraska Press.
- Propp, V. 1946. *Istoricheskie korni volshebnoi skazki [Historical Roots of the Wonder Tale]*. Leningrad: Leningrad University Press.
- Propp, V. 1968 [1928]. *Morphology of the Folktale*. 2nd ed., translated by L. Scott. Austin: University of Texas Press.
- Pykett, L. 2005. *Wilkie Collins*. Oxford: Oxford University Press.
- Ravignani, A., T. Delgado, and S. Kirby. 2016. Musical evolution in the lab exhibits rhythmic universals. *Nature Human Behaviour* 1: 0007.
- Redfern, N. 2014. Robust Estimation of the mAR Index of High Grossing Films at the US Box Office, 1935 to 2005. *Journal of Data Science* 12: 277–291.
- Reitblat, A. I. 2009. *Ot Bovy k Bal'montu i drugie raboty po istoricheskoi sotsiologii russkoi literatury*. Moscow: Novoe literaturnoe obozrenie.
- Roberts, R. M. 1989. *Serendipity: Accidental Discoveries in Science*. New York: Wiley.
- Savage, P. E., S. Brown, E. Sakai, and T. E. Currie. 2015. Statistical universals reveal the structures and functions of human music. *PNAS* 112(29): 8987–8992.
- Schultz, W. 2001. Reward signaling by dopamine neurons. *Neuroscientist* 7(4): 293–302.
- Scott, W. 2008 [1820]. *Ivanhoe*. Project Gutenberg:
http://www.gutenberg.org/files/82/82-h/82-h.htm#link2H_INTR
- Segal, E. 2010. Closure in detective fiction. *Poetics Today* 31(2): 153–215.
- Serrà, J., Á. Corral, M. Bogaña, M. Haro, and J. Arcos. 2012. Measuring the evolution of contemporary western popular music. *Scientific Reports* 2: 521.

- Shklovsky, V. 1914. *Voskreshenie slova*. St. Petersburg.
- Shklovsky, V. 1990 [1925]. *Theory of Prose*, translated by B. Sher. Elmwood Park, IL: Dalkey Archive Press.
- Silvia, P. 2006. *Exploring the Psychology of Interest*. Oxford: Oxford University Press.
- Simonton, D. K. 1999a. *Origins of Genius: Darwinian Perspectives on Creativity*. Oxford: Oxford University Press.
- Simonton, D. K. 1999b. Creativity as blind variation and selective retention: is the creative process Darwinian? *Psychological Inquiry* 10(4): 309–328.
- Skov, M. 2010. The pleasure of art. In *Pleasures of the Brain*, edited by M. L. Kringelbach and K. C. Berridge, 270–283. Oxford: Oxford University Press.
- Sorokin, P. 1937. *Social and Cultural Dynamics. Vol. 1. Fluctuation of Forms of Art*. New York: American Book Company.
- Spanagel, R., and F. Weiss. 1999. The dopamine hypothesis of reward: Past and current status. *Trends in Neurosciences* 22 (11): 521–527.
- Sperber, D. 1996. *Explaining Culture: A Naturalistic Approach*. Oxford: Blackwell.
- Staber, U. 2008. Network evolution in cultural industries. *Industry and Innovation* 15(5): 569–578.
- Stableford, B. 2003. Science fiction before the genre. In *The Cambridge Companion to Science Fiction*, edited by E. James and F. Mendlesohn, 15–31. Cambridge: Cambridge University Press.
- Sternberg, M. 1978. *Expositional Modes and Temporal Ordering in Fiction*. Bloomington: Indiana University Press.
- Sternberg, M. 1982. Proteus in quotation-land: Mimesis and the forms of reported discourse. *Poetics Today* 3(2): 107–156.
- Sternberg, M. 2001. Why narrativity makes a difference. *Narrative* 9: 115–122.
- Sternberg, M. 2003a. Universals of narrative and their cognitivist fortunes (I). *Poetics Today* 24(2): 297–395.
- Sternberg, M. 2003b. Universals of narrative and their cognitivist fortunes (II). *Poetics Today* 24(3): 517–638.
- Stubbersfield, J. M., J. J. Tehrani, and E. G. Flynn. 2014. Serial killers, spiders and cybersex: Social and survival information bias in the transmission of urban legends. *British Journal of Psychology* 106(2): 288–307.
- Symons, J. 1972. *Bloody Murder. From the Detective Story to the Crime Novel: A History*. London: Faber and Faber.
- Tan, E. S. 1996. *Emotion and the Structure of Narrative Film: Film as an Emotion Machine*. Mahwah, N.J.: Lawrence Erlbaum.
- Tehrani, J. J. 2013. The phylogeny of *Little Red Riding Hood*. *PLoS ONE* 8 (11): e78871.
- Tëmkin, I. 2004. The evolution of the Baltic psaltery: A case for phyloorganology. *The Galpin Society Journal* 57: 219–230.
- Tëmkin, I., and N. Eldredge. 2007. Phylogenetics and material cultural evolution. *Current Anthropology* 48(1): 146–153.
- Thomas, B. 2007. Dialogue. In *The Cambridge Companion to Narrative*, edited by D. Herman, 80–93. Cambridge: Cambridge University Press.
- Thomas, B. 2012. *Fictional Dialogue: Speech and Conversation in the Modern and Postmodern Novel*. Lincoln: University of Nebraska Press.
- Tihanov, G. 2017. On the significance of historical poetics: In lieu of a foreword. *Poetics Today* 38(3): 417–428.

- Todorov, T. 1977. The typology of detective fiction. In *The Poetics of Prose*, 42–52. Ithaca, NY: Cornell University Press, 1977.
- Tomasello, M. 2006. Uniquely human cognition is a product of human culture. In *Evolution and Culture*, edited by S. C. Levinson and P. Jaisson, 203–217. Cambridge, MA: MIT Press.
- Tomasello, M., A. C. Kruger, and H. H. Ratner. 1993. Cultural learning. *Behavioral and Brain Sciences* 16: 495–552.
- Toolan, M. 1987. Analysing conversation in fiction: The Christmas dinner scene in Joyce's *Portrait of the Artist as a Young Man*. *Poetics Today* 8(2): 393–416.
- Tynjanov, J. 1987 [1927]. On literary evolution. In *Twentieth Century Literary Theory*, edited by V. Lambropoulos, 152–162. State University of New York Press.
- Tynyanov, Y. 2000 [1924]. The literary fact. In *Modern Genre Theory*, edited by D. Duff, 29–49. London and New York: Routledge.
- Underwood, T. 2016. The life cycles of genres. *Journal of Cultural Analytics*, May 23. <http://culturalanalytics.org/2016/05/the-life-cycles-of-genres/>
- Ungurianu, D. 2007. *Plotting History: The Russian Historical Novel in the Imperial Age*. Madison: University of Wisconsin Press.
- Uspensky, B. 1973. *A Poetics of Composition*, translated by V. Zavarin and S. Wittig. Berkeley, CA: University of California Press.
- van Nierop, O. A., A. C. M. Blankendaal, and C. J. Overbeeke. 1997. The evolution of the bicycle: A dynamic systems approach. *Journal of Design History* 10(3): 253–267.
- van Wyhe, J. 2005. The descent of words: Evolutionary thinking 1780–1880. *Endeavour* 29(3): 94–100.
- Veselovsky, A. 1940. *Istoricheskaja poetika [Historical Poetics]*. Leningrad: Khudozhestvennaja literatura.
- Ward, T. B., R. A. Finke, and S. M. Smith. 1995. *Creativity and the Mind*. New York: Plenum.
- Ward, T. B., S. M. Smith, and R. A. Finke. 1999. Creative cognition. In *Handbook of Creativity*, edited by R. J. Sternberg, 189–212. Cambridge: Cambridge University Press.
- Watts, J., S. J. Greenhill, Q. D. Atkinson, T. E. Currie, J. Bulbulia, and R. D. Gray. 2015. Broad supernatural punishment but not moralizing high gods precede the evolution of political complexity in Austronesia. *Proceedings of the Royal Society B* 282: 20142556.
- Wiele, H. V. 2016. The loss of poetic effects: From indeterminate to conventionalised meaning. *Language and Literature* 25(1): 54–71.
- Yanal, R. 1996. The paradox of suspense. *British Journal of Aesthetics* 36: 146–158.
- Yarkho, B. 1927. Prostejshye osnovanija formal'nogo analiza [The basics of formal analysis]. In *Ars Poetica I*, edited by M. A. Petrovsky, 7–28. Moscow: Gosudarstvennaja akademija khudozhestvennyh nauk.
- Yarkho, B. 2006. *Metodologija tochnogo literaturovedenija [A Methodology of Precise Literary Study]*, edited by M. Akimova, I. Pilshchikov, and M. Shapir. Moscow: Jazyki slavianskiv kultur.

SUMMARY

Contemporary humanities do not seem to be interested in answering questions that begin with *why*. Why, before 1900, paintings were mostly mimetic, but, after 1900, mostly abstract? Why did the Russian novel reach its height in the second half of the nineteenth century – not earlier or later? Why does *vers libre* prevail in contemporary lyrical poetry? We hardly know. Probably these questions are not impossible to answer, but there has been little effort made to address them. Humanities have tended to ask adjacent questions instead, those beginning with *when*, *how*, or *who*. So why is *why* underappreciated? I think that this lack of interest is rooted in a much larger, fundamental problem: we do not yet have a theory of art that would let us answer (or even pose) the *why* questions – a diachronic theory of art.

Charting Artistic Evolution: An Essay in Theory presents a project of precisely that. It argues that the ideographic approach practiced in the humanities would benefit from accompaniment by a different, nomothetic approach, common in the sciences. We should look not only for the particular – a book, an author, a stylistic device – but also for the general: large historical trends, macro-patterns, tectonic shifts in the artistic field. The new discipline of digital humanities moves in this direction; it detects broad patterns and trends in the data. However, this growing stack of information, collected through sophisticated methods – from sentiment analysis to topic modeling – needs to be explained. How can we make sense of the diachronic changes?

Our best solution may be to look for answers in a scholarly domain that already has a theory of diachronic change: cultural evolution. This biology-inspired discipline was initiated in the 1980s but did not start to gain strength until the 2000s. Today, it is a quickly growing, powerful framework in anthropology, linguistics, and other social sciences. Cultural evolutionists use quantitative methods (statistics, experimentation, or agent-based modeling) and the Darwinian framework to uncover the origins of new cultural items, the reasons for their success or failure, and the cultural mechanisms of their diffusion in society. Most interestingly, the evolutionists are concerned with the *why* questions: Why are certain tools or languages preferred over others? Why do some technologies become increasingly complex? Why do some societies collapse while others flourish?

In my dissertation, I have employed the cultural evolution theory to understand artistic history. Art forms – devices, plot formulas, genres – get invented (through a random serendipity or intentional bricolage); they gain or lose their popularity depending on how successfully they press the buttons of the “emotion keyboard” in our brains; successful art forms are reproduced by the subsequent generations of writers or film directors who keep them “alive” for decades, or even centuries. I present these and many other general principles of artistic evolution and use them to explain various cases in art history. Why did Hollywood film crews become larger over time? Why do mystery movies

obtain more complex temporal structure? Why is the literary field so unequal: a handful of famous authors and a majority of forgotten ones? Why do certain social environments boost artistic creativity? I demonstrate that all these *why* questions can be answered with suitable methods: quantitative and qualitative – and a suitable theory: cultural evolution.

The dissertation has six chapters. *Chapter 1* (“A Theory of History”) sets the task: to create a persuasive theory of artistic evolution. In the chapter, I identify three major obstacles that prevented existing diachronic theories from obtaining a more prominent place in art history: (1) lack of quantitative evidence due to the absence of databases and computational analytical tools, (2) lack of falsifiable hypotheses, (3) pursuit of overly harmonic theories. I claim that using the theory of cultural evolution would enable the historians of literature, film, and other arts to re-address this old idea of a diachronic theory of art at a more sophisticated level. In the following chapters, I provide the skeleton of a new theory of art based on cultural evolution.

Chapter 2 (“Chance”) introduces the idea of a random, serendipitous invention as one of the key actors in an artistic field. I combine the elements of evolutionary epistemology, creativity studies, and psychology to suggest that many new forms of literature, such as the genre of science fiction or omniscient narration, appeared via the process of “blind variation and selective retention”. Some environments – networked social structures – can make this process faster and more efficient, as they enable a quick and easy exchange of ideas. To support these arguments, I use the Russian novel as an example: it reached prominence in the 1850s and 1860s because its evolution was stimulated by a unique creative environment – a tight network of “thick” journals, which had no equivalents in contemporary Europe.

Chapter 3 (“Bricolage”) analyzes another mechanism of artistic innovation: a recombination of forms. I argue that art balances in between two contradictory pressures: a pressure for novelty and a “conservative” pressure. That is, each work of art tries to be innovative, and yet it should not cross the boundaries of reader comfort. This double pressure makes art evolve faster than most other cultural domains. Another aspect, discussed in this chapter, is cumulative cultural evolution: the gradual increase in complexity of art forms. An indirect proof of this process is the accelerated growth of film crew size throughout the twentieth century, which is supported by data for the 20,000 most popular Hollywood films, gathered by myself. Another, more direct, proof is found in my analysis of innovations in detective genre history. I demonstrate that the genre was not invented by Edgar Allen Poe, as commonly assumed, but through a process of gradual accumulation of small inventions made by multiple authors, resulting in increased complexity of the genre. Finally, I touch upon the problem of the shape of the evolutionary process in art: is it a tree-like shape or a web? The suggested solution, inspired by the recent account of evolutionary microbiology, is that this process can be shaped both as a tree *and* as a web – depending on the scale at which we are observing it.

While Chapters 2 and 3 discuss innovations in art, *Chapter 4* (“Success”) focuses on an opposite, creativity-limiting process: selection. The main question is why certain art forms become successful (bestselling or canonical) while others do not. I argue that successful art forms should be either (a) psychologically satisfying, or (b) important for societal reasons. I use Dan Sperber’s theory of cultural attraction to demonstrate how various psychological biases influence the audience’s selection of art forms. For example, “neoteny” bias makes cartoon characters, over the twentieth century, increasingly cute; our psychological mechanisms of fear push horror fiction towards increased realism; our attention mechanisms make film shots much shorter, and so on. But psychology is not the only selective force; social context has an important role too. I explain how technological inventions can open temporary niches for artistic products. For example, the wide spread of digital video cameras opened the niche for the genre of pseudo-documentary horror films. The spread of personal computers had a similar effect on the popularity of cyberpunk literary fiction. Finally, besides psychological and social selection, there is a third option: cultural drift, or neutral evolution. I explain the mechanisms of drift from the example of literary canon formation.

The Chapters 1 through 4 are not purely theoretical. They also include many examples from the history of literature, film, painting, or music, which illustrate my theoretical claims. Importantly, most of these claims are also supported by empirical data, which either I myself collected or took from the studies of other researchers. Nevertheless, Chapters 5 and 6 of the dissertation are more focused on examples and less on theory. They demonstrate how the framework of cultural evolution can illuminate the particular problems in studying the arts. *Chapter 5* begins with the question: why are there so many dialogues in contemporary novels? To answer, I look at the history of nineteenth-century Russian novels and detect a significant increase in the amount of dialogues during this period. This increase can be explained by the fact that the dialogic text is for some reason more psychologically attractive than authorial narration, and so it was selected by readers. I find support for this intuition in experimental psychology – particularly, in the empirical studies of curiosity. *Chapter 6* has the psychology of curiosity as its background theme, too. It suggests that the “curiosity bias” of our brains is the driving force behind the gradual increase in temporal complexity of films. As expected, the study detects a significant growing trend towards more complexity.

The dissertation has investigated several major aspects of the evolutionary approach to art history. However, the evolutionary perspective allows to address many more interesting questions. But this is the task for the future.

SUMMARY IN ESTONIAN

Kunstilise evolutsiooni kaardistamine: essee teooriast

Tundub, et tänapäeva humanitaariteadusi huvitab vähe vastata küsimustele, mis algavad sõnaga *miks*. Miks olid maalid enne 1900. aastat peamiselt mimeetilis-
sed, kuid pärast 1900. aastat pigem abstraktsed? Miks saavutas vene romaan
oma kõrgpunkti 19. sajandi teisel poolel, mitte varem ega hiljem? Miks on kaas-
aegses lüürilises luules ülekaalus vabavärss? Me õigupoolest ei tea. Tõenäoliselt
ei ole neile küsimustele vastamine võimatu, kuid nendega tegelemiseks pole
suuri pingutusi tehtud. Humanitaarteadustes on selle asemel kaldutud esitama
lähedasi küsimusi, mis algavad sõnadega *millal*, *kuidas* või *kes*. Nii et miks
miksi ei hinnata? Leian, et selle huvipuuduse juured on palju laiemas fundamen-
taalses probleemis: meil ei ole veel kunstiteooriat, mis võimaldaks meil vastata
miks-küsimustele (või isegi neid esitada) – puudub diakrooniline kunstiteooria.

„Kunstilise evolutsiooni kaardistamine: essee teooriast“ pakub välja just ni-
melt sellise katselise projekti. Töös väidetakse, et oleks kasulik, kui humanitaar-
teadustes viljeldava ideograafilise lähenemisega kaasneks teistsugune, täppis-
teadustes tavaline nomoteetiline lähenemine. Peaksime otsima mitte üksnes
konkreetsed – raamatut, autorit, stiilivõtet – vaid ka üldist: laiemaid ajaloolisi
suundumusi, makromustreid, tektoonilisi nihkeid kunstiväljal. Uus distsipliin
digihumanitaaria liigub selles suunas; selle abil tuvastatakse andmetes avara-
maid mustreid ja suundumusi. Ent seda kasvavat informatsioonihulka, mis on
kogutud keerukate meetodite abil, mis ulatuvad sentimendianalüüsist teema
modelleerimiseni, on vaja ka seletada. Kuidas saame diakroonilisi muutusi
mõtestada?

Parimaks lahenduseks võib osutuda vastute otsimine uurimisvaldkonnast,
milles on juba omaks võetud diakroonilise muutumise teooria: kultuurievolut-
sioonist. See bioloogiast inspireeritud distsipliin sai alguse 1980. aastatel, kuid
ei kogunud jõudu enne 2000. aastaid. Praeguseks on tegu kiiresti kasvava
võimsa raamistusega nii antropoloogias, lingvistikas kui ka teistes sotsiaal-
teadustes. Kultuurievolutsionistid kasutavad kvantitatiivsed meetodeid (statisti-
kat, eksperimente või toimijapõhist modelleerimist) ning darwinlikku raami, et
avastada uute kultuurinähtuste päritolu, nende edukuse või luhtumise põhjuseid
ja ühiskonnas levimise kultuurilisi mehhanisme. Enim huvi pakub see, et evo-
lutsionistid tegelevad just *miks*-küsimustega: miks eelistatakse teatud tööriistu
või keeli teistele? Miks muutuvad mõned tehnoloogiad järjest kompleksse-
maks? Miks varisevad mõned ühiskonnad kokku, samas kui teised löövad
õitsele?

Olen väitekirjas rakendanud kultuurievolutsiooni teooriat, et mõista kunsti
ajalugu. Kunstivormid – võtted, süžeevalemid, žanrid – leiutatakse (kas suvalise
juhuslikkuse või sihipärase brikolaaži kaudu); nad koguvad ja kaotavad popu-
laarsust olenevalt sellest, kui edukalt nad meie ajus vajutavad „emotsioonide kla-
viatuuri“ klahvidele; edukaid kunstivorme reprodutseerivad hilisemad kirjanike

või filmirežissööride põlvkonnad, kes hoiavad neid „elus“ aastakümneid või isegi sajandeid. Tutvustan kunstilise evolutsiooni neid ja mitmeid teisi üldpõhimõtteid ning kasutan neid, selgitamaks mitmesuguseid näiteid kunstiajaloost. Miks kasvasid Hollywoodi filmimeeskonnad aja jooksul suuremaks? Miks muutus detektiivifilmide ajaline struktuur keerukamaks? Miks on kirjandusväli nii ebavõrdne: käputäis kuulsaid kirjanike ning unustusse vajunud enamus? Miks ergutavad mõned sotsiaalsed keskkonnad kunstiloomet? Näitan, et kõiki neid *miks*-küsimusi on võimalik seletada sobivate meetodite – kvantitatiivsete eksperimentide – ning sobiva teooria – kultuurievolutsiooni – abil.

Väitekirjal on kuus peatükki. 1. peatükis „Ajalooteooria“ püstitatakse ülesanne: luua veenev kunstilise evolutsiooni teooria. Selles peatükis tuvastasin kolm olulist takistust, mis tõkestasid olemasolevatel diakroonilistel teooriatel kunstiajaloos väljapaistvama koha omandamist: (1) kvantitatiivse tõendusmaterjali puudus andmebaaside ning analüütiliste arvutustööriistade puudumise tõttu; (2) falsifitseeritavate hüpoteeside puudumine; (3) liialt harmooniliste teooriate poole pürgimine. Väidan, et kultuurievolutsiooni teooria kasutamine võimaldaks kirjandus-, filmi- ja teiste kunstide ajaloolastel pöörduda diakroonilise kunstiteooria poole tagasi senisest palju keerukamal tasandil. Järgnevates peatükkides pakkusin välja kultuurievolutsioonil põhineva uue kunstiteooria kondikava.

2. Peatükis „Juhus“ tutvustatakse juhusliku, suvalise leiutamise ideed kui üht põhilist toimijat kunstiväljal. Kombineerisin evolutsioonilise epistemoloogia, loomingulisuse uuringute ja psühholoogia elemente, pakkumaks välja, et paljud uued kirjandusvormid, nagu näiteks ulmežanr või kõiketeadev jutustamine, tekkisid „pimedas varieerumises ning valikulises säilitamises“ protsessis. Mõned keskkonnad – võrgustunud sotsiaalsed struktuurid – võivad selle protsesse kiiremaks ja tõhusamaks muuta, sest võimaldavad kiiret ning hõlpsat ideede vahetust. Nende argumentide toetuseks kasutan näitena vene romaani: see saavutas väljapaistvuse 1850. ja 1860. aastatel, sest selle evolutsiooni stimuleeris unikaalne loominguline keskkond – „paksude“ ajakirjade tihe võrgustik, millel puudus ekvivalent tolleaegses Euroopas.

3. peatükis „Brikolaaž“ analüüsitakse veel üht kunstilise innovatsiooni mehhanismi: vormide rekombineerimist. Väidan, et kunst hoiab tasakaalu kahe vastukäiva surve vahel: on surve uudsuse suunas ning „konservatiivne“ surve. See tähendab, et iga kunstiteos üritab olla uuenduslik, ent ei tohiks liialt ületada lugeja mugavuspiire. See kahekordne surve paneb kunsti enamikust teistest kultuurivaldkondadest kiiremini arenema. Veel üks aspekt, mida selles peatükis käsitletakse, on kumulatiivne kultuurievolutsioon: kunstivormide keerukuse järk-järguline suurenemine. Selle protsessi kaudseks tõendiks on filmimeeskondade suuruse kiirendatud kasv 20. sajandi vältel, mida toetavad andmed 20 000 kõige populaarsema Hollywoodi filmi kohta, mille olen ise kogunud. Teise, otsesema tõendi pakub mu analüüs uuendustest detektiivjutu žanri ajaloos. Näitan, et žanrit ei mõelnud välja Edgar Allan Poe, nagu üldiselt arvatakse, vaid see leiutati arvukate autorite poolt tehtud väikeste leiutiste järk-järgulise akumulatsiooni protsessis, mille tulemuseks oli žanri suurenenud keerukus. Lõpuks

käsitlen mudelit, mille evolutsiooniprotsess kunstis võtab: kas see on puu või võrgu kujuline? Vastuseks pakun, saades inspiratsiooni hiljutistest tulemustest evolutsioonilises mikrobioloogias, et see protsess võib olla nii puu kui ka võrgu kujuline – olenevalt mõõtkavast, milles me seda vaatleme.

Kui 2. ja 3. peatükk käsitlevad uuendusi kunstis, keskendub 4. peatükk „Edu“ sellele vastanduvale, loomingulisust piiravale protsessile: valikule. Peamine küsimus on, miks teatud kunstivormid kujunevad edukaks (bestselleriteks või kanoonilisteks) ja teised mitte. Väidan, et edukad kunstivormid peavad olema kas (a) psühholoogilist rahuldust pakkuvad või (b) ühiskondlikel põhjustel olulised. Kasutan Dan Sperberi kultuurilise köitvuse teooriat, näitamaks, kuidas erinevad psühholoogilised kalduvused mõjutavad kunstivormide valimist publiku poolt. Näiteks muudab „neoteeniakalduvus“ multifilmitegelased 20. sajandi vältel järjest armsamateks; meie psühholoogilised hirmumehhanismid tõukavad õuduskirjandust aga kasvava realismi suunas; meie tähelepanumehhanismid muudavad filmikaadreid palju lühemateks jne. Kuid psühholoogia ei ole ainuke selektiivne jõud; oluline osa on ka sotsiaalsel kontekstil. Seletan, kuidas tehnoloogilised leiutised võivad avada kunstitoodangu jaoks ajutisi nišše. Näiteks avas digitaalse videokaamera lai levik pseudodokumentaalsete õudusfilmide niši. Personaalarvutite levimisel oli samasugune mõju küberpunkkirjanduse populaarsusele. Lõpuks on peale psühholoogilise ja sotsiaalse selektsiooni ka kolmas võimalus: kultuuritriiv ehk neutraalne evolutsioon. Selgitan triivimehhanisme kirjanduskaanoni kujunemise näitel.

1. ja 4. peatükk ei ole üksnes teoreetilised. Neisse kuulub ka arvukalt näiteid kirjanduse, filmi, maalikunsti või muusika ajaloost, mis illustreerivad mu teoreetilise väiteid. On oluline, et enamikku neist väidetest toetavad ka empiirilised andmed, mille olen kogunud ise või leidnud teiste teadlaste uurimustest. Ent 5. ja 6. peatükk keskenduvad enam näidetele ja vähem teooriale. Neis näidatakse, kuidas kultuurievolutsiooni raamistus võib valgustada konkreetseid probleeme kunstide uurimisel. 5. peatükk algab küsimusega: miks on kaasaegsetes romaanides nii palju dialooge? Vastamiseks vaatasin 19. sajandi vene romaani ajalugu ning tuvastasin dialoogimahu olulise suurenemise sellel perioodil. Seda suurenemist võib seletada tõigaga, et dialoogiline tekst on mingil põhjusel psühholoogiliselt köitvam kui autorijutustus ning seega tegid lugejad selle valiku. Sellele intuiitivsele vastusele leian tuge eksperimentaalsest psühholoogiast – eriti empiirilistest uudishimu-uuringutest. Ka 6. peatüki taustteemaks on uudishimu psühholoogia. Peatükis pakutakse välja, et meie ajude „uudishimukalduvus“ on liikumapanevaks jõuks filmide ajalise kompleksuse järk-järgulises suurenemises. Ootuspäraselt tehakse uurimuses kindlaks oluline kasvutendents suurema keerukuse suunas.

Väitekirjuri uuris kunstiajaloo evolutsioonilise käsitlemise mitmeid olulisi aspekte. Kuid lisaks sellele lubab evolutsiooniline perspektiiv vaadelda veel mitmeid teisi huvitavaid küsimusi. Aga jäägu see ülesanne tulevikuks.

CURRICULUM VITAE

Name: Oleg Sobchuk
Date of birth: May 23, 1990
Citizenship: Ukrainian
E-mail: sobchuk@ut.ee

Education:
2013–2018 University of Tartu, PhD studies in Literature and Cultural Research
2015 Study visit to Stanford Literary Lab, Stanford University (March–June, 2015)
2011–2013 University of Tartu, MA studies in Semiotics
2007–2011 Kyiv-Mohyla Academy, BA studies in Philology

Employment:
2017–2018 University of Tartu, Institute of Cultural Research, Junior research fellow

Publications on the topic of dissertation:

Peer-reviewed research papers

- Sobchuk, O. and P. Tinitis. 2018. Cultural attraction in film evolution: Curiosity can drive cinematic story structure, *Journal of Cognition and Culture* [accepted, forthcoming].
- Sobchuk, O., and A. Shelya. 2018. (Дальнее) чтение и (культурная) эволюция [(Distant) reading and (cultural) evolution]. *New Literary Observer* 150, 88–93.
- Shelya, A., and O. Sobchuk. 2017. The shortest species: How the length of Russian poetry changed (1750–1921). *Studia Metrica et Poetica*, 4, 66–84.
- Kanatova, M., A. Milyakina, T. Pilipovec, A. Shelya, O. Sobchuk*, and P. Tinitis. 2017. Broken time, continued evolution: Anachronies in contemporary films. *Stanford Literary Lab*, Pamphlet 14 <https://litlab.stanford.edu/LiteraryLabPamphlet14.pdf> (*primary author).
- Sobchuk, O. 2016. The evolution of dialogues: A quantitative study of Russian novels (1830–1900). *Poetics Today* 37, 137–154.
- Sobchuk, O. 2015. Номотетическое литературоведение: пунктирный набросок [Nomothetic literary criticism: A rough sketch]. *New Literary Observer* 132, 102–114.

Review papers in academic journals (selected)

- Sobchuk, O. 2014. Interweaving narratology and experimental psychology [Review of: Sanford, A. J. and C. Emmott. 2012. *Mind, Brain and Narrative*. Cambridge: Cambridge University Press]. *Cognitive Semiotics* 7, 138–143.

- Sobchuk, O. 2014. Увидеть за деревьями лес: Эволюция, миросистемный анализ, статистика [To see the forest for the trees: Evolution, world-systems analysis, statistics. Review of: Moretti, F. 2013. *Distant Reading*. London and New York: Verso]. *New Literary Observer* 125, 320–324.
- Sobchuk, O. 2013. Yuri Lotman's semiotic theory for beginners [Review of: Semenenko, A. 2012. *The Texture of Culture: An Introduction to Yuri Lotman's Semiotic Theory*. New York: Palgrave]. *Poetics Today* 34, 611–613.
- Sobchuk, O. 2013. Количественные методы и эволюционная теория в литературоведении [Quantitative methods and evolution theory in literary studies. Review of: Gottschall, J. 2008. *Literature, Science, and a New Humanities*. New York: Palgrave]. *New Literary Observer* 122, 354–358.
- Sobchuk, O. 2013. У затінку філогенетичних дерев [In the shadow of phylogenetic trees. Review of: Mesoudi, A. 2011. *Cultural Evolution: How Darwinian Theory Can Explain Human Culture and Synthesize the Social Sciences*. Chicago: University of Chicago Press]. *Ukrainian Humanities Review* 18, 51–61.

Presentations:

- 2018 [*invited*] – “Cultural evolution of literature” (École polytechnique fédérale de Lausanne)
- 2017 – “Cumulative cultural evolution in film production crews” [with P. Tinitis] (Inaugural Cultural Evolution Society Conference, Max Planck Institute for the Science of Human History, Jena)
- 2017 – “Cumulative cultural evolution of films: The case of anachronies” (Annual conference of European Human Behaviour and Evolution Association, École Normale Supérieure, Paris).
- 2017 – “What are dialogues in (Russian) novels for?” (Conference of young philologists, University of Tartu).
- 2016 [*invited*] – “Cultural evolution and distant reading: A new theory for new methods” (Summer School in Digital Humanities, Higher School of Economics, Moscow).
- 2015 – “Evolution within cinematics: A quantitative study of American mystery films” [with P. Tinitis and A. Shelya] (“Digital Humanities in Estonia” conference, Tartu).
- 2014 – “Multilevel accentuation and its role in the memorization of narrative texts” (Narrative conference, MIT).
- 2014 – “Multilevel accentuation and its role in the memorization of narrative” [awarded *Best student paper prize* from the Cognitive Science Society] (Computational Models of Narrative workshop, Quebec City).
- 2013 – “The passivity of the reader: the role of accentuation in the process of apprehending narrative” (European Narratology Network conference, Paris).

Academic events organized:

- The conference *Applications in Cultural Evolution: Arts, Languages, Technologies* (June 6–8, 2018) at the University of Tartu (<https://cultevol.ut.ee/>).
- The *Cultural Evolution Seminar* at the University of Tartu (<https://evocultures.wordpress.com/>): a series of seminars on cultural evolution and digital humanities, running from autumn 2015 to spring 2017, when it developed into a university course.

ELULOOKIRJELDUS

Nimi: Oleg Sobchuk
Sünniaeg: 23.05.1990
Kodakondsus: Ukraina
E-post: sobchuk@ut.ee

Haridus:
2013–2018 Tartu Ülikool, doktoriõpingud, kirjandus- ja kultuuriteadused
2015 Külalisdoktorant Stanfordi Ülikoolis, Stanfordi kirjanduslaboris (*Stanford Literary Lab*) (märts–juuni, 2015)
2011–2013 Tartu Ülikool, magistriõpe, semiootika
2007–2011 Kiev-Mohyla akadeemia, bakalaureuseõpe, filoloogia

Töö:
2017–2018 Tartu Ülikool, Kultuuriteaduste Instituut, nooremteadur

Teadusartiklid doktoritöö teemal:

Eelretsenseeritud teadusartiklid

- Sobchuk, O., ja P. Tinitis. 2018. Cultural attraction in film evolution: Curiosity can drive cinematic story structure [Kultuuriline külgetõmme filmi evolutsioonis: Uudishimu võib kujundada filmiloo struktuuri]. *Journal of Cognition and Culture* [vastuõetud, ilmumas].
- Sobchuk, O., ja A. Shelya. 2018. (Дальнее) чтение и (культурная) эволюция [(Kaug-)lugemine ja (kultuuri) evolutsioon]. *New Literary Observer* 150, 88–93.
- Shelya, A., ja O. Sobchuk. 2017. The shortest species: How the length of Russian poetry changed (1750–1921) [Lühim liik: kuidas vene luule pikkus muutus (1750–1921)]. *Studia Metrica et Poetica*, 4, 66–84.
- Kanatova, M., A. Milyakina, T. Pilipovec, A. Shelya, O. Sobchuk*, ja P. Tinitis. 2017. Broken time, continued evolution: Anachronies in contemporary films [Murtud aeg, jätkuv evolutsioon: anakrooniad kaasaegses filmis]. *Stanford Literary Lab*, Pamphlet 14 <https://litlab.stanford.edu/LiteraryLabPamphlet14.pdf> (*peamine autor).
- Sobchuk, O. 2016. The evolution of dialogues: A quantitative study of Russian novels (1830–1900) [Dialoogide evolutsioon: kvantitatiivne uurimus vene romaanidest (1830–1900)]. *Poetics Today* 37, 137–154.
- Sobchuk, O. 2015. Номотетическое литературоведение: пунктирный набросок [Nomoteetiline kirjanduskriitika: esialgne kavand]. *New Literary Observer* 132, 102–114.

Arvustused teadusajakirjades (validud)

- Sobchuk, O. 2014. Interweaving narratology and experimental psychology [Sidudes narratoloogiat ja eksperimentaalpsühholoogiat. Arvustus teosest: Sanford, A. J. and C. Emmott. 2012. *Mind, Brain and Narrative*. Cambridge: Cambridge University Press]. *Cognitive Semiotics* 7, 138–143.
- Sobchuk, O. 2014. Увидеть за деревьями лес: Эволюция, миросистемный анализ, статистика [Et näha puude asemel metsa: evolutsioon, maailmaspsteemide analüüs, statistika. Arvustus teosest: Moretti, F. 2013. *Distant Reading*. London and New York: Verso]. *New Literary Observer* 125, 320–324.
- Sobchuk, O. 2013. Yuri Lotman's semiotic theory for beginners [Juri Lotmani semiootiline teooria algajatele. Arvustus teosest: Semenenko, A. 2012. *The Texture of Culture: An Introduction to Yuri Lotman's Semiotic Theory*. New York: Palgrave]. *Poetics Today* 34, 611–613.
- Sobchuk, O. 2013. Количественные методы и эволюционная теория в литературоведении [Kvantitatiivsed meetodid ja evolutsiooniteooria kirjandusteaduses. Arvustus teosest: Gottschall, J. 2008. *Literature, Science, and a New Humanities*. New York: Palgrave]. *New Literary Observer* 122, 354–358.
- Sobchuk, O. 2013. У затінку філогенетичних дерев [Fülogeneetiliste puude varjus. Arvustus teosest: Mesoudi, A. 2011. *Cultural Evolution: How Darwinian Theory Can Explain Human Culture and Synthesize the Social Sciences*. Chicago: University of Chicago Press]. *Ukrainian Humanities Review* 18, 51–61.

Ettekanded:

- 2018 [kutsutud] – “Kultuurievolutsioon kirjanduses” (*Cultural evolution of literature*), École polytechnique fédérale de Lausanne.
- 2017 – “Kumulatiivne kultuurievolutsioon filmi tootmismeeskondade juures” (*Cumulative cultural evolution in film production crews*) [kaasautor P. Tinits], Inaugural Cultural Evolution Society Conference, Max Planck Institute for the Science of Human History, Jena.
- 2017 – “Kumulatiivne kultuurievolutsioon filmides: anakrooniate juhtum” (*Cumulative cultural evolution of films: The case of anachronies*), Annual conference of European Human Behaviour and Evolution Association, École Normale Supérieure, Paris.
- 2017 – “Mille jaoks on dialoogid (vene) romaanides?” (*What are dialogues in (Russian) novels for?*), Conference of young philologists, University of Tartu.
- 2016 [kutsutud] – “Kultuurievolutsioon ja kauglugemine: uus teooria uutele meetoditele” (*Cultural evolution and distant reading: A new theory for new methods*), Summer School in Digital Humanities, Higher School of Economics, Moscow.
- 2015 – “Evolutsioon kinemeetrias: kvantitatiivne uurimus Ameerika põnevusfilmides” (*Evolution within cinematics: A quantitative study of American*

- mystery films*) [kaasautorid P. Tinitis ja A. Shelya], “Digital Humanities in Estonia” conference, Tartu.
- 2014 – “Mitmetasandiline rõhutamise ja selle roll jutustavate tekstide meelde jätmisel” (*Multilevel accentuation and its role in the memorization of narrative texts*), Narrative conference, MIT.
- 2014 – “Mitmetasandiline rõhutamise ja selle roll narratiivi meelde jätmisel” (*Multilevel accentuation and its role in the memorization of narrative*) [autasu *Parim tudengiartikkel* Kognitiivteaduse Seltsilt (*Cognitive Science Society*)], Computational Models of Narrative workshop, Quebec City.
- 2013 – “Lugeja passiivsus: rõhutamise roll narratiivi mõistmisel” (*The passivity of the reader: the role of accentuation in the process of apprehending narrative*), European Narratology Network conference, Paris.

Ürituste korraldamine:

- Konverentsi *Rakendused kultuurievolutsioonis: kunstid, keeled, tehnoloogiad* (*Applications in Cultural Evolution: Arts, Languages, Technologies*) (6.–8. juuni 2018) korraldamine Tartu Ülikoolis (<https://cultevol.ut.ee/>).
- Seminari *Kultuurievolutsiooni seminar* (*Cultural Evolution Seminar*) korraldamine Tartu Ülikoolis (<https://evocultures.wordpress.com/>): seminariseeria kultuurievolutsioonis ja digitaalthumanitaarias, sügisest 2015 kevadeni 2017 kuni sellest sai loengukursus.

**DISSERTATIONES LITTERARUM
ET CONTEMPLATIONIS COMPARATIVAE
UNIVERSITATIS TARTUENSIS**

1. **Indrek Tart.** Eestikeelne luuleraamat 1638–2000. Tartu, 2002.
2. **Anneli Saro.** Madis Kõivu näidendite teatritseptsioon. Tartu, 2004.
3. **Eve Annuk.** Biograafilise lähenemisviisi võimalusi nõukogude aja uurimise konteksti. Tartu, 2006.
4. **Piret Viires.** Postmodernism eesti kirjanduskultuuris. Tartu, 2006.
5. **Marin Laak.** Kirjandusajaloo mittelineaarsed mudelid: teksti ja konteksti probleeme digitaalses keskkonnas. Tartu, 2006.
6. **Leena Kurvet-Käosaar.** Embodied subjectivity in the diaries of Virginia Woolf, Aino Kallas and Anaïs Nin. Tartu, 2006.
7. **Jaak Tomberg.** Kirjanduse lepitav otstarve. Tartu, 2009.
8. **Katrin Puik.** Iroonia Heiti Talviku ja Betti Alveri luules. Tartu, 2009.
9. **Eneken Laanes.** Lepitamatud dialoogid: subjekt ja mälu nõukogudejärgses eesti romaanis. Tartu, 2009.
10. **Mirjam Hinrikus.** Dekadentlik modernsuskogemus A. H. Tammsaare ja nooreestlaste loomingus. Tartu, 2011.
11. **Kairit Kaur.** Dichtende Frauen in Est-, Liv- und Kurland, 1654–1800. Von den ersten Gelegenheitsgedichten bis zu den ersten Gedichtbänden. Tartu, 2013, 424 S.
12. **Mart Velsker.** Lõunaeesti kirjandusloo kirjutamise võimalusi. Tartu, 2014, 203 lk.
13. **Aija Sakova-Merivee.** Ausgraben und Erinnern. Denkbilder des Erinnerns und der moralischen Zeugenschaft im Werk von Ene Mihkelson und Christa Wolf. Tartu, 2014, 172 S.
14. **Maarja Hollo.** Romantiline subjekt, mälu ja trauma Bernard Kangro sõjajärgses loomingus. Tartu, 2016, 194 lk.
15. **Brita Melts.** Kirjanduslikud omailmad ja nende autobiograafilised lätted. Tartu, 2016, 223 lk.
16. **Andrus Org.** Eesti ulmekirjanduse žanrid ja nende poeetika. Tartu, 2017, 362 lk.
17. **Johanna Ross.** Aira Kaalust Mari Saadini. Nõukogude eesti naisarengu-romaan ja selle lugemisviisid. Tartu, 2018, 307 lk.