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**Broken Time, Continued Evolution:
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Broken Time, Continued Evolution: Anachronies in Contemporary Films¹

In 1983, Brian Henderson published an article that examined various types of narrative structure in film, including flashbacks and flashforwards. 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”.² 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.³ 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 1983.⁴ *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*

1 This research was started in Tartu (Estonia) by a small group of graduate students interested in digital humanities and cultural evolution. Gathering the data was the hardest part, and it was done collectively. Later, Peeter Tinitis, Artjom Shelya, and Oleg Sobchuk analyzed this data. When Oleg left Tartu for a semester-long visit to the Literary Lab, the work continued at Stanford, and it benefited from the discussions with many members of the Lab.

2 Brian Henderson, “Tense, Mood, and Voice in Film (Notes after Genette)”, *Film Quarterly* 36.4 (1986), p. 8.

3 See: Allan Cameron, *Modular Narratives in Contemporary Cinema*, Palgrave Macmillan, 2008; Warren Buckland, ed., *Puzzle Films: Complex Storytelling in Contemporary Cinema*, Blackwell, 2009; Warren Buckland, ed. *Hollywood Puzzle Films*, Routledge, 2014.

4 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” (Gerald Prince, *A Dictionary of Narratology*, University of Nebraska Press, 2003, p. 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.

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”.⁵ 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 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”.⁶ 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?⁷

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

5 David Bordwell, “Intensified Continuity. Visual Style in Contemporary American Film”, *Film Quarterly* 55.3 (2002), p. 16 (Bordwell’s emphasis).

6 Franco Moretti, “The Novel: History and Theory”, in *Distant Reading*, Verso, 2013, p. 169 (Moretti’s emphasis).

7 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. For details about cultural evolution see: Alex Mesoudi, *Cultural Evolution*, The University of Chicago Press, 2011.

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.⁸ 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.

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.⁹ This allowed us to construct a sample which includes the *highest rated* films (most “stars”) among the *most popular* films (highest MOVIEmeter score).¹⁰

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 flash-forwards. 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

8 For instance, see: James E. Cutting, Kaitlin L. Brunick, Jordan E. DeLong, Catalina Iricinschi, and Ayse Candan, “Quicker, Faster, Darker: Changes in Hollywood Film Over 75 Years”, *i-Perception* 2 (2011), pp. 569–576; Nick Redfern, “Robust Estimation of the mAR Index of High Grossing Films at the US Box Office, 1935 to 2005”, *Journal of Data Science* 12 (2014), pp. 277–291.

9 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?prowhatisstarmeter).

10 This approach to constructing a sample is very similar to the one used in Mark Algee-Hewitt, Sarah Allison, Marissa Gemma, Ryan Heuser, Franco Moretti, and Hannah Walser, “Canon/Archive. Large-scale Dynamics in the Literary Field”, *Literary Lab Pamphlet* 11, 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.

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.¹¹ 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, with a big mystery at the center of the plot – not necessarily a murder, but often so.¹²

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 MOV-IEmeter.

11 As was shown by Tzvetan Todorov in “The Typology of Detective Fiction”, *The Poetics of Prose*, Cornell UP, 1977, pp. 42–52.

12 The full list of movies is in the filmography section at the end of this article.

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 2.1](#) 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.¹³ The year significantly predicts the frequency of anachronies. Besides, we can see another historical change: there is more variation in the data in the 1990s and 2000s, compared to earlier decades.

That is, films were becoming more and more different from each other, possibly diverging into several groups. In 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 sub-

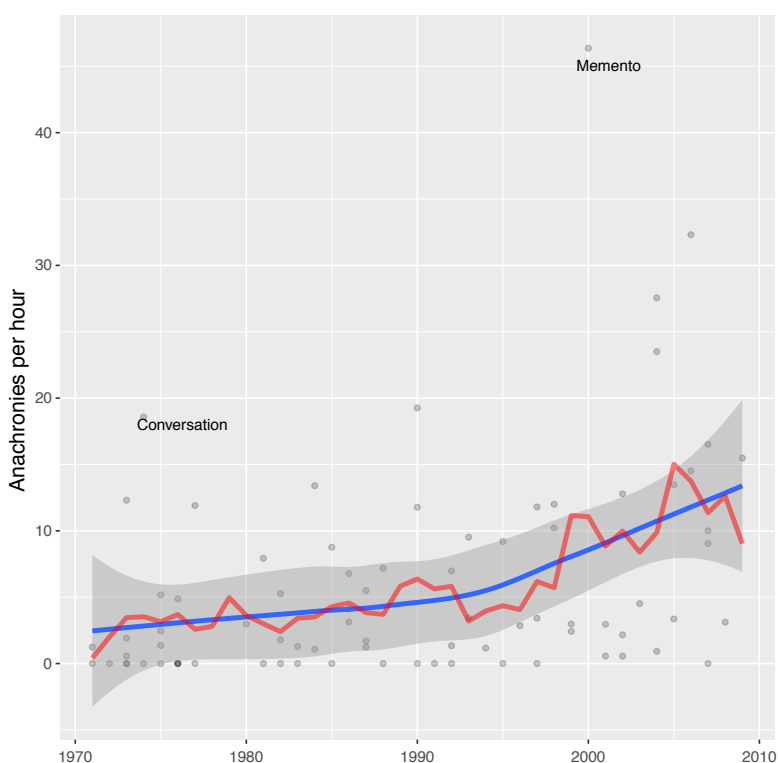


Figure 2.1. The number of anachronies per hour for all the films in our dataset with a rolling average over five years and a loess non-parametric smoothing estimator. Films *Conversation* and *Memento* are marked for visibility.

¹³ 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.

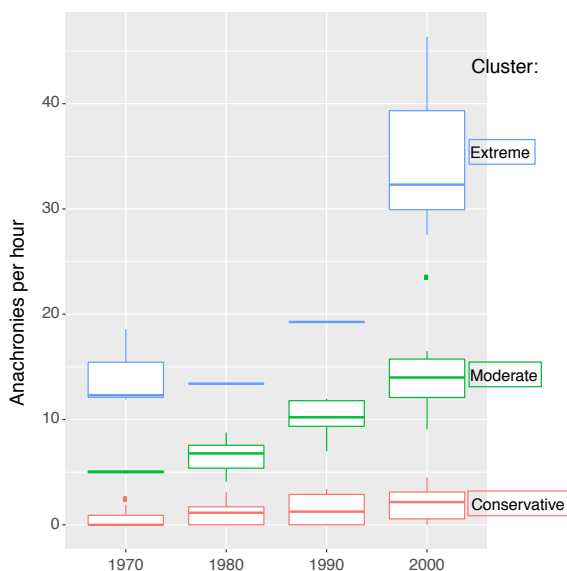


Figure 2.2. Boxplots of automatically formed clusters for each decade.

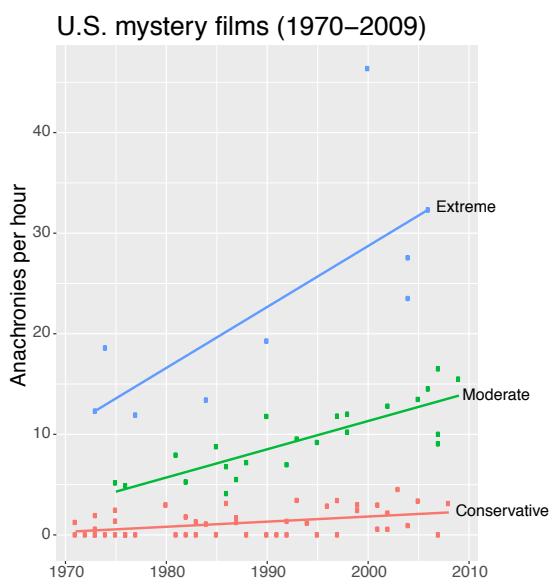


Figure 2.3. Three temporal clusters of films in the dataset with the regression lines of the models for each cluster.

14 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 2.2, the moderate group contained one outlier in the last decade, which we manually reclassified as extreme to establish normality in regression calculations.

15 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.

sets shown on **Figure 2.2**.¹⁴ We then fit a linear regression model on each of the subgroups separately – to assess the association between year of production and the frequency of anachronies (see **Figure 2.3**). 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.¹⁵ 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.

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.¹⁶

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 flashforward occurred. Is it possible that the distribution of anachronies in the plot may vary from group to group?

¹⁶ Stephen Jay Gould, “The Episodic Nature of Evolutionary Change”, in *The Panda's Thumb*, W. W. Norton, 1980, pp. 184–185.

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 3.1](#)). 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.

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

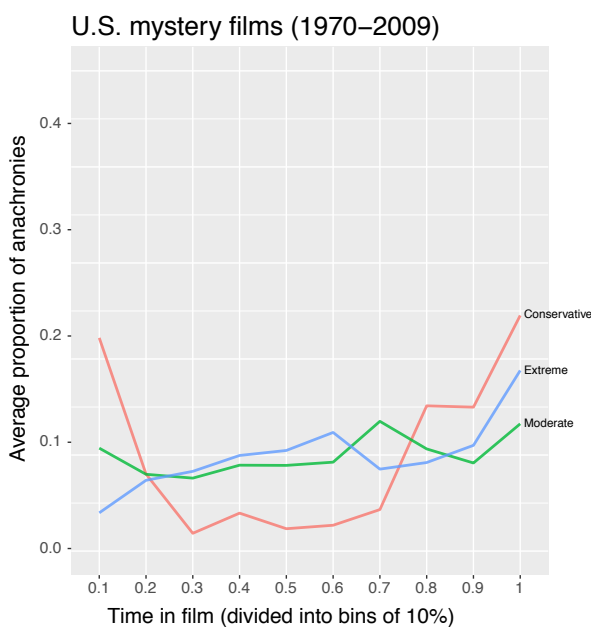


Figure 3.1. The average proportion of anachronies in each 10%-length part of the film within each cluster.

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”¹⁷ – 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.

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”*.¹⁸

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

¹⁷ David Bordwell, *The Way Hollywood Tells It: Story and Style in Modern Movies*, University of California Press, 2006, p. 92.

¹⁸ Gérard Genette, *Narrative Discourse*, Cornell UP, 1980, pp. 49–50 (our emphasis.)

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 narrative theorist, Meir Sternberg, called this approach to presenting information in a story “*delayed exposition*”,¹⁹ 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 4.1). *Watchmen* (2009) provides the clearest example of this distinction. Its central part contains a large number of external flashbacks:

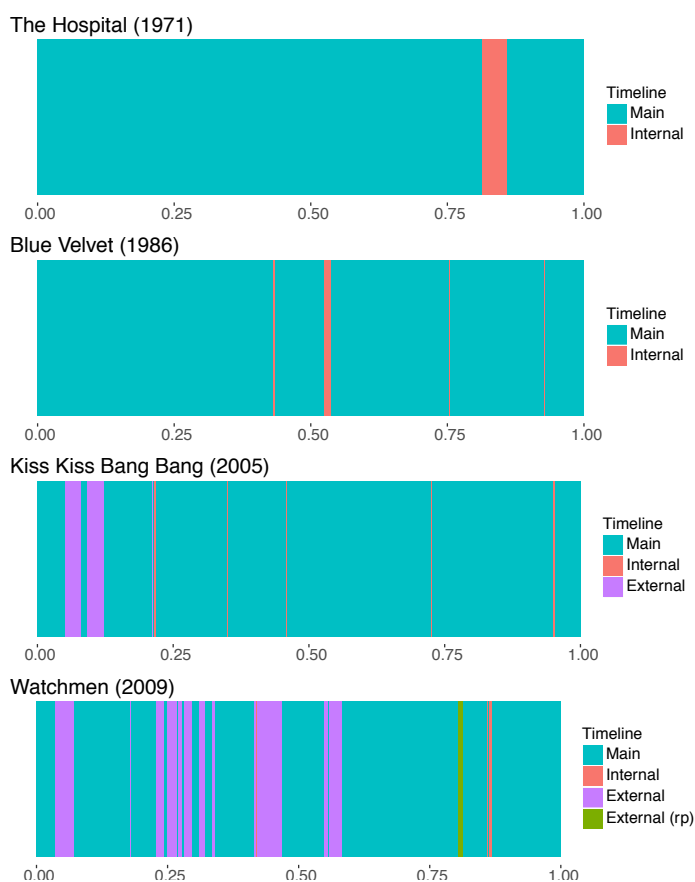


Figure 4.1. The distribution of main, internal, and external timelines in film time for selected films.

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

19 Meir Sternberg, *Expositional Modes and Temporal Ordering in Fiction*, Indiana UP, 1978.

refers.²⁰ 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 dataset²¹ 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 4.2).

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 anachro-

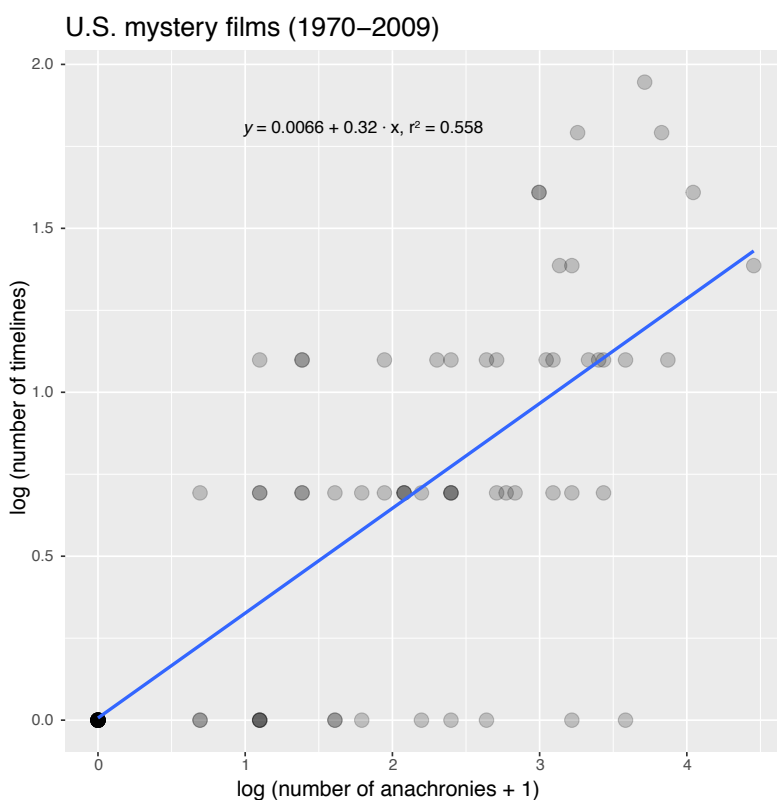


Figure 4.2. Relationship between the number of timelines and the number of anachronies on a log-log scale.

20 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.

21 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.

nies 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 4.3**). *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

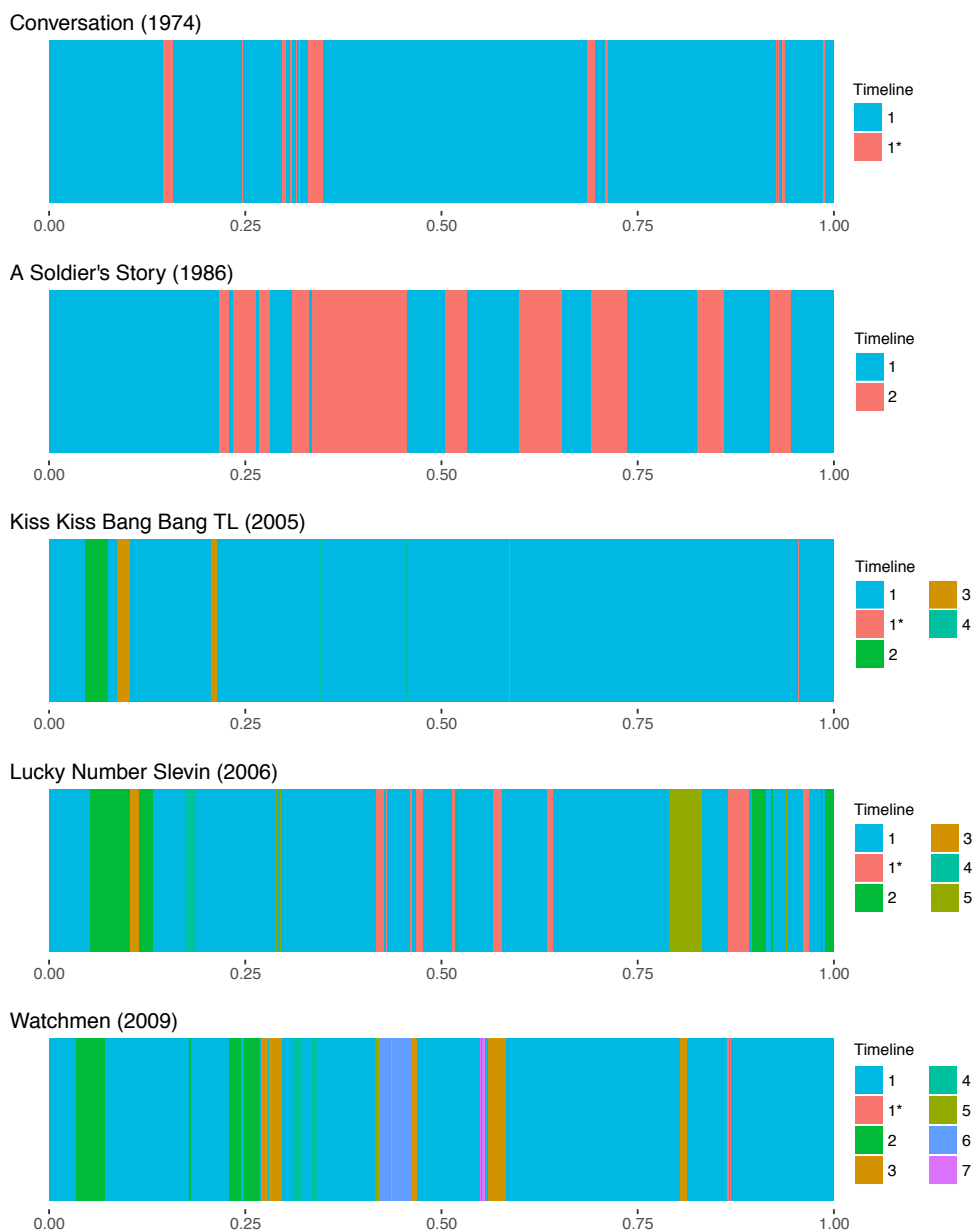


Figure 4.3. The distribution of separate timelines in film time for selected films.

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.

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 interrelationships 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*”.²²

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”.²³ 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.

22 Jurij Tynjanov, “On Literary Evolution”, 1927, in Vassilis Lambropoulos, ed. *Twentieth Century Literary Theory*, State University of New York Press, p. 161 (Tynjanov's emphasis).

23 Stephen Jay Gould and Elisabeth S. Vrba, “Exaptation – a Missing Term in the Science of Form”, *Paleobiology* 8.1 (1982), p. 5.

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 5.1](#)). Which leaves us with one final question: why this connection between anachronies and timelines? Why timelines, instead of something else?

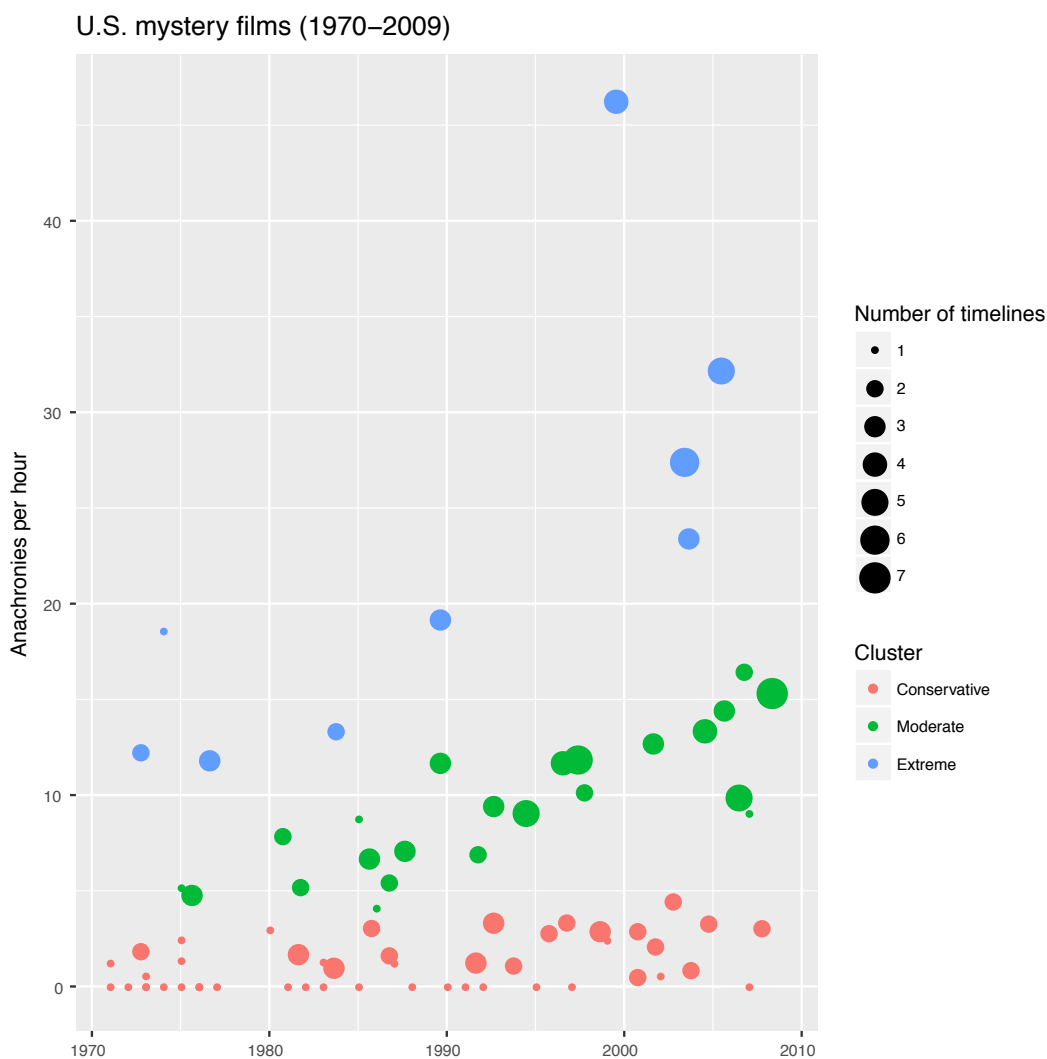


Figure 5.1. A summary plot of the data. The number of anachronies per hour for each film by their year of production, sized according to the number of timelines in the film.

6. 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*.²⁴ 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 6.1** 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.

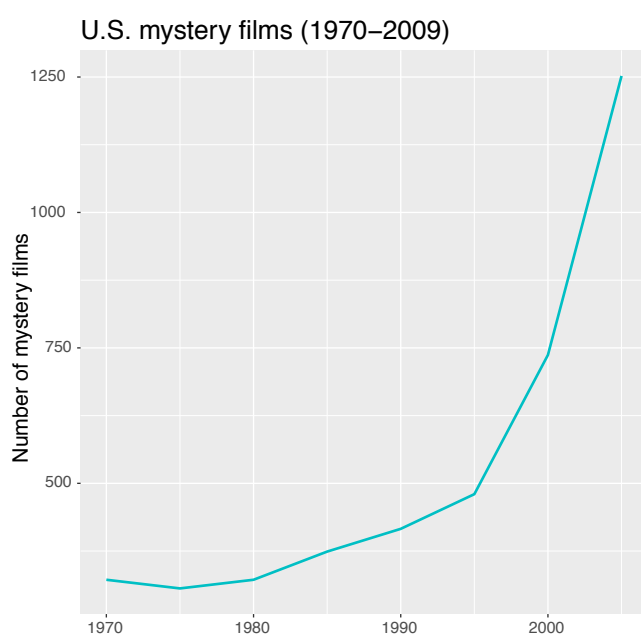


Figure 6.1. The number of mystery films released in each decade.

This may have two explanations. On 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.

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 19th 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

²⁴ At least, in many cases. Sometimes, not selection but drift plays a major role (see R. Alexander Bentley, Matthew W. Hahn and Stephen J. Shennan, "Random Drift and Culture Change", *Proceedings of the Royal Society B* 271 (2004), pp. 1443–1450).

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.²⁵

Shklovsky’s idea about the role of “temporal transpositions” in creating mysteries was expanded by the narratologist Meir Sternberg²⁶, and later developed by psychologists William F. Brewer and Edward H. Lichtenstein into their “structural-affect theory.”²⁷ 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.²⁸

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

25 Viktor Shklovsky, “Sherlock Holmes and the Mystery Story”, in *The Theory of Prose*, transl. by B. Sher, Dalkey Archive Press, 1990, pp. 101, 103 (translation has been modified).

26 Meir Sternberg, *Expositional Modes and Temporal Ordering in Fiction*, Indiana UP, 1978.

27 William F. Brewer and Edward H. Lichtenstein, “Event Schemas, Story Schemas, and Story Grammars”, 1981, in J. Long and A. Baddeley, eds., *Attention and Performance*, vol. 9, Erlbaum, pp. 363–379; William F. Brewer and Edward H. Lichtenstein, “Stories are to Entertain: A Structural-Affect Theory of Stories”, *Journal of Pragmatics* 6 (1982), pp. 473–483; William F. Brewer, “The Story Schema: Universal and Culture-Specific Properties”, 1985, in D. R. Olson, N. Torrance, & A. Hildyard, eds., *Literacy, Language, and Learning: The Nature and Consequences of Reading and Writing*, Cambridge UP, pp. 167–194. Also, see: Hans Hoeken, and Mario van Vliet, “Suspense, Curiosity, and Surprise: How Discourse Structure Influences the Affective and Cognitive Processing of a Story”, *Poetics* 26 (2000), pp. 277–286.

28 William F. Brewer, “The Story Schema: Universal and Culture-Specific Properties”, 1985, in D. R. Olson, N. Torrance, & A. Hildyard, eds., *Literacy, Language, and Learning: The Nature and Consequences of Reading and Writing*, Cambridge UP, p. 170.

that curiosity in general arises when we detect some gaps in our knowledge – information gaps – and seek to fill them in with relevant information²⁹.

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"³⁰. 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 pamphlet.

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

29 George Loewenstein, "The Psychology of Curiosity: A Review and Reinterpretation", *Psychological Bulletin* 116.1 (1994), pp. 75–98.

30 María del Mar Azcona, *The Multi-Protagonist Film*. Wiley-Blackwell, 2010, p. 1.

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, yes³¹, 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.

31 Some examples: Jeffrey Loewenstein and Chip Heath, “The Repetition-Break Plot Structure: A Cognitive Influence on Selection in the Marketplace of Ideas” *Cognitive Science* 33 (2009), pp. 1–19; Ara Norenzayan, Scott Atran, Jason Faulkner, and Mark Schaller. “Memory and Mystery: The Cultural Selection of Minimally Counterintuitive Narratives”, *Cognitive Science* 30 (2006), pp. 531–553; Olivier Morin, “How Portraits Turned Their Eyes upon Us: Visual Preferences and Demographic Change in Cultural Evolution”, *Evolution and Human Behavior* 34 (2013), pp. 222–229.

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

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