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Abbreviations

Primary literature

<i>AYZ</i>	<i>_All You Zombies_</i>
<i>BhBSt</i>	<i>By His Bootstraps</i>
<i>BP</i>	<i>Brooklyn Project</i>
<i>BttF1</i>	<i>Back to the Future I</i>
<i>BttF2</i>	<i>Back to the Future II</i>
<i>SoTh</i>	<i>A Sound of Thunder</i>
<i>TM</i>	<i>The Time Machine</i>
<i>TTW</i>	<i>The Time Traveler's Wife</i>

Technical terms

CTC	Closed Timelike Curve
PVC	Principle of V-Correlation
TM	time machine

Breaking the Time Barrier: Time Travel Paradoxes

“For many years I have been tormented by the certainty that the most extraordinary discoveries await us in the sphere of Time. We know less about Time than about anything else.”

(Tarkovsky 53)

Should any time traveller ever come across this thesis, would they please be so kind as to deposit it under the old cherry tree in my garden, after sunrise, on the morning of Friday, December 3rd 2010.

The author would be much obliged.

Oh my God, it was really there!

(Entry from the author's diary, dated Friday evening, December 3rd 2010)

Introduction

Time travel has been fascinating us human beings for centuries: maybe, because its consequences are both intriguing and perplexing; maybe, because we are stuck on our linear path through time. I sincerely doubt that there is a single person on the planet who has never ogled the idea of sneaking a peek of the future or of experiencing history first hand. However, since only very few of us get the chance of travelling with a Time Lord, we take to the second best possibility we have: time travel stories. Robert Silverberg remarked in his introduction to the anthology *Trips in Time* ("Introduction", n.p.), that "[t]he only workable time-machine ever invented is the science-fiction story". The last century has seen a change in the world of theoretical physics as time travel has become an acceptable topic of research, but, although discoveries have been made that fuel the hope of time travellers *in spe*, there is not much hope for having dinner with Shakespeare anytime soon.

However, for the purposes of this thesis, it is important to draw a distinction between the discussion of the world of physics and science, i.e. whether time travel is physically possible, and the world of science fiction – for as the name clearly states, science fiction is fiction: a fancy flight of the mind, if one wanted to call it that. In this sense a discussion about the possibility, and even more so about any specific features of time travel, must necessarily be restricted to the realms of 'what if'; it is logical possibilities we are talking about and what we have to be interested in is whether a text is narrated in a logically sound way, conclusive in itself, in the world it creates. While there certainly is an interdependence between science and science fiction, this relationship seems to be mostly one-sided – which is not to say that science fiction never spurs any scientific developments; *Star Trek's* (the series) communicators have been fascinating to many and behold, forty years later almost everybody has one. Both Wells and Jules Verne had people fly to the moon... So, while at the moment there seem to be stronger tendencies of science influencing science fiction (mostly by supplying new facts and insights to make any stories more plausible from a scientific point of view), this does not mean that it might not, one day, be the other way around again. Maybe one day there will be time machines –

after all, two hundred years ago it was physically ‘proven’ that flying is impossible, save for birds.

My research questions focus on how time travel occurs in the text and whether this, as well as the manner of travelling, influences the story. Would there be, for instance, a difference between travelling with and without a time machine? If so, does this also relate in any way to time travel paradoxes, and if yes, to which? Which raises the next point, namely what time travel paradoxes are there in the text and how are they dealt with – do they take a prominent place, or are they simply ornaments to make the story more interesting? Also, how are they illustrated, and are they connected to an epiphany? Lastly, can there be any solutions to time travel paradoxes and if yes, what are they? The answers to all these questions can be found in my conclusion.

The body of this thesis consists of two major parts. The first one deals with theoretical aspects of time, time travel and time travel paradoxes, while the second one analyses how time travel and time travel paradoxes occur and are dealt with in texts. Time seems to defy any straightforward definition, and talking about time is not without problems either, as will be shown in chapter 1.1.2. Different aspects of time, as well as the concept of internal and external time, will be dealt with in chapter 1.1.1. I then go on to talk in length about time travel – firstly, what it is and why it has been argued to be impossible – and what the laws of physics have to say about it, especially regarding time machines and the much-discussed issue of backwards causation. After giving a short overview of fictional means of time travel, both pre- and post-Wells, I will also address a number of puzzling moral dilemmas related to time travel. A last point in this chapter on time travel will be a short discussion of determinism and free will, concepts that are hard to pin down at the best of times, but which become even more slippery and elusive in the context of time travel.

My last theory point will then be to talk about time travel paradoxes. I first give a definition of what a normal paradox is and then go on to put this into connection with time travel, presenting a number of types and characteristics of time travel paradoxes. I will follow this up by a discussion of whether it is possible to change the past or merely to influence it, which also involves taking a closer look at the so called second-time-around fallacy. Before talking about the theoretical concepts behind the paradoxes that will be analysed later in my thesis, I also explore in how far banana peels might keep history safe and why time travel might upset the principle of V-

correlation, short PVC. I feel that I should add at this point that talking about causal interdependence, self-consistency and the laws of physics usually results in slicing a given problem up into “convenient conceptual bits” (Riggs 64). It has to be kept in mind that these concepts are only separable for the purpose of analysis, but that, in truth, they are all linked and intertwined. This means, of course, that an answer for one aspect might have to be re-evaluated if seen in a bigger picture.

In the second part of my thesis I analyse my primary texts as to how they use and deal with time travel and time travel paradoxes. Keeping in mind what has been said about time machines, I first analyse the differences between travelling with and without a time machine and how this can influence the story. I do this by identifying six key aspects of time travel, namely the occurrence of time travel, the temporal and spatial aspects of time travel as well as the when and where visited, the event horizon, travelling through time itself and the direct effects of time travel on the human body, and by comparing how a time traveller with and one without a time machine would fare. This is especially interesting with regards to *TTW* and Wells’s *The Time Machine*, which will also be my primary contestants here.

Foreshadowing, planting and payoff form an integral part of telling a story (the terms themselves come from the field of screenwriting). They are basically a clever way to give a story coherence and the audience information about the story, without making the exposition of the necessary information too obvious. In the context of time travel and time travel paradoxes I will be seeing them as devices that help to illustrate the paradox, giving the right hint, the right piece of information, at the right time, so that an effective epiphany can be constructed (on which I shall also elaborate in this chapter). I then go on to analyse how the sub- and metastructure of the texts themselves mirror and reinforce the paradox or time travel situation that they narrate. Before going on to the analysis of the paradoxes in 2.3, I shall also explore what linguistic and visual means are used to illustrate time travel and the time travel paradoxes in the text.

The final part of my analysis investigates causal loops, the grandfather paradox and the butterfly-effect in the context of a particular text. For this purpose, I use a number of primary sources, the most important ones being, in no particular order, the movies *Back to the Future* 1 and 2, some episodes from the BBC series *Doctor Who*, *The Time Traveler’s Wife* by Audrey Niffenegger, “Brooklyn Project” by William Tenn,

“_All You Zombies_” and “By His Bootstraps” by Robert A. Heinlein and “The Sound of Thunder” by Ray Bradbury. *Back to the Future 1* tells the story of how Marty McFly travels into the past, messes up the moment in which his parents would have been supposed to fall in love and how he has to struggle to bring his parents ‘back’ together in order to avoid fading out of existence. In *Back to the Future 2* the past is changed and Marty has to try to change it back. Both movies address a number of time travel related issues, among them most prominently the grandfather paradox and, in the second one, alternate dimensions.

Doctor Who, a science-fiction/fantasy series by the BBC, relating the stories and adventures of an alien time traveller whose name is unknown and who is therefore simply called The Doctor, has been around for quite a number of years now. Having been cancelled in the early nineties of the last century, the series was revived in 2005 and a successful five new seasons have been added to the canon of *Doctor Who* since then. This paper will only look at this new version of *Doctor Who* – firstly, because there would be far too much material to deal with otherwise, and secondly because the newer series do not only present a relatively coherent and relevant body of work, but also a modern and up-to-date take on the well-known TV-series.

The Time Traveler’s Wife (TTW for short) uses time travel as the background for a very uncommon love story – the protagonists meet for the first time when Clare is seven and Henry is thirty-six, although Henry is only eight years older than Clare. This text differs from my other primary texts in that time travel and its paradoxes are only of secondary importance. (There are also episodes in *Doctor Who* in which time travel is not the most important theme; however, for this thesis I have selected the episodes that contain the most references to time, time travel and time travel paradoxes.) Like any setting, time travel can shape a story in a certain way; as I will show in chapter 2.1, the story of TTW would not be the same without time travel. “Brooklyn Project”, “_All You Zombies_”, “By His Bootstraps” and “The Sound of Thunder” are all traditional science fiction stories and focus on different paradoxes associated with time travel, mainly the grandfather paradox, causal loops and the butterfly-effect. It should be noted that in this context I am assuming, if not indicated differently, that there are no parallel universes and only one temporal dimension – otherwise time travel paradoxes like the grandfather paradox would “lose their bite” (Smith, *Bananas* 366).

Last but not least I would like to make a short comment on the title of my thesis: “Breaking the Time Barrier: Time Travel Paradoxes”. In “Brooklyn Project” (240) the government official announces proudly that the last possible frontier, the Fourth Dimension, has been broken. In my title, breaking the time barrier refers to breaking out of the constraints that time imposes on us and on our perception of the world. However, if the stream of time as it forms part of our everyday life is broken, then there is the possibility that very strange things could happen: time travel paradoxes. These, as well as their origin, are the matter of this thesis. So let us step behind the final frontier and see what mind-boggling adventures may await us there.

PART 1: Theoretical Aspects

1.1 Time

Calvin and Hobbes

by Bill Watterson

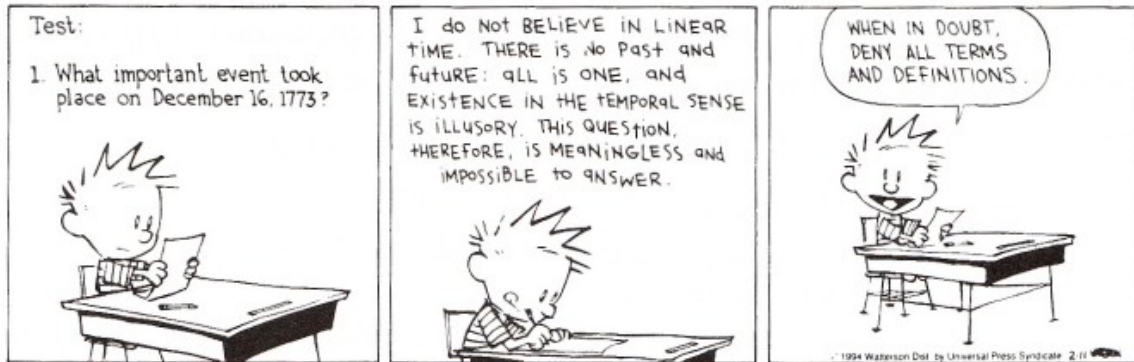


Illustration 1: Linear Time

1.1.1 “Wibbely-wobbely, timey-wimey... stuff”: What is time?

I know well enough what [time] is, provided that nobody asks me. But if I am asked what it is and try to explain, I am baffled.
(St. Augustine 264)

There are many questions surrounding time – from the rather existential one whether there actually is time or whether time is real, to the philosophical one whether time has a beginning or an end. Then one has to stretch one’s mind to (try and) take in all that is/was/will/could be eternity – presumably to end up with a sound headache, if nothing else – only to arrive at Einstein’s mind-boggling realisation that time is relative. According to Pickover, scientists have not found any satisfactory answers to any of these questions. So, when he states that “[t]oday, physicists would agree that time is one of the strangest properties of our universe” (xiii), I, at least, can only agree most whole-heartedly.

In order to bring some light into what time actually is – or rather, what scientists and philosophers think time to be at the moment – this chapter will shortly look at the physical, philosophical and psychological aspects of time. It is astonishingly difficult to keep these different aspects apart, which might lead to some overlapping; however, I shall try my best to establish them as clearly and accessibly as possible. And if all else fails, there is still The Doctor's highly scientific and precise explanation that "time is, if seen from a non-linear, non-subjective point of view, a big ball of wibbely-wobbely, timey-wimey... stuff" (*Dr. Who – Blink* (3.11), 00:16:15).

1.1.1.1 Physical time

After Newton, Einstein is certainly one of the most important persons in physics and his idea that time is relative has basically turned the world as we know it – as we perceive it – upside down. A result of this shift of perception¹ is that the "constant linearity" of 'Newtonian time' is nowadays usually contrasted with experienced time (Shiner 317). In contemporary physics, time is, of course, relative, which means that an objective measurement can only be made within a fixed system of reference. This frame of reference needs to be defined somehow, but how can the flow of time, if it actually is flowing, be measured? Toomey (36) asks "[...] at what rate does the moment from the future move through the present into the past?", but gives himself the answer that the

[...] obvious answer – one day every day, one hour each hour, one second per second – is unsatisfactory. If we define both "days" of "one day every day" as measure of the same time, then the answer is tautologous and meaningless.
(Toomey 36)

How, then, is time to be measured? A clock obviously is no help here, as it only indicates the passage of time, but not time itself or its rate of passing... Since time itself apparently cannot be measured, we have to do with counting how many regular periods have elapsed – these regular periods could be, for instance, the resonance

¹ This refers, of course, to the theory of time; our perception of time itself has, as such, not really changed.

of a caesium atom (Toomey 315). If physics talks about time passing more or less slowly, what is really meant is that the periods measured are more or less numerous, which is an implicit indication of a difference in speed with which time is progressing.

Shiner (317) makes a fair point of mentioning that in daily life we are not only dealing with these physical measures of time, but indeed with a true “multiplicity of times”: there is the temporality of human existence, the physiological rhythms of plants and animals, which could be summarized under “biological time”, “social time”, e.g. different cultural calendars, and “sacred time”, i.e. the cycles of ritual (Shiner 317).

Based on all that, it is then safe to say that time is both relative and objective (Shiner 317), and, in the words of Whitrow (313), that “time is universal but not absolute”. In how far time is relative should not require any further explanation; it might be helpful though to say that Shiner understands ‘objective time’ in the sense that it is not the product of a single human subject, but “corresponds to rhythms of experience”. While everything in the universe is governed by time, this does not mean that time is absolute – Thorne (72) quotes Einstein on that matter when he says that each person who is travelling must experience a “different time flow than others” who are travelling differently: “[...] if you and I move relative to each other, what I call space must be a mixture of your space and your time, and what you call space must be a mixture of my space and my time” (Thorne 73).²

In the last statement by Thorne, a strong relationship between time and space becomes apparent and points towards the concept that is nowadays called space-time. Minkowski elaborated on space-time based on the concept of relativity as established by Einstein (Special Theory of Relativity) and came to the conclusion that the universe is made up of space-time, which he defined as four-dimensional and absolute (Thorne 87). Three of these four dimensions would be the traditional spatial ones, the fourth being time. In his now famous Cologne-lecture, Minkowski introduced his topic in the following, somewhat lyrical way: “Henceforth space by itself, and time by itself, are doomed to fade into mere shadows, and only a kind of union of the two will preserve an independent reality.” (Minkowski 75)

² Thorne (73) makes an interesting note, namely that all reference frames are pulled by gravity. This fact is especially tantalizing in the context of time travel as it raises the question whether any gravitational pull would also affect the travelling time machine. Since Harry in *TTW* tends to end up at emotionally charged points of his life, one could argue that these incidents exert something like a gravitational pull as well.

While this description of space-time is certainly rather poetic, a more hands-on definition of time is needed – or rather, a working definition of what we perceive as past, present and future. A well-known quote by Einstein runs along the lines that any distinction between these three, i.e. past, present and future, would be nothing more than a stubborn illusion, but since we will be talking about time travel later, a short discussion of how these three aspects of time could be distinguished still has its merits.

Ryan (144) lists three possible ways to do so; she mentions that from a basic, physicist's point of view most processes would be time-symmetric, meaning that the direction of time does not influence how these processes would unfold. There is, however, one exception to this: the second law of thermodynamics, which states that entropy in a closed system steadily increases, so that, quite logically, the future would be defined by a higher state of entropy. An example for increasing entropy would be a cup that falls down and smashes: the broken cup is in a higher state of entropy. If time ran backwards, the cup would have to reassemble itself and thereby, impossibly, return to a lower state of entropy. Another way to keep past and future apart is to work with causation, i.e. that causes have to precede the effects; this would then be called a causal arrow. The third possibility to distinguish between past and future would be a so-called cognitive arrow: as we move through time, knowledge and memories are created at the expense of the unknown that is the future. Related to the cognitive arrow would be the intentional arrow, which sees the past as a series of realised events and the future as the realm of non-actualised possibilities: when a possibility of the future is actualized in the present, it cannot be changed anymore and thus becomes the past (Ryan 145). Prior (57) says in this context that "the future has an openness to alternatives that the past does not have"; a notion that shall be severely questioned in a number of chapters in this thesis.

In 1927, the British astronomer Arthur Eddington coined the term 'time's arrow' or 'the arrow of time'; a mental construct that could also be called 'chronological arrow'. Its main purpose is to make it possible to distinguish the directions of time on a four-dimensional relativistic map. Clearly, however, any reference that is gained from this chronological arrow does not provide absolute values, but merely information on how the different 'marks' on the arrow are related to each other. In connection with these arrows Grey (68) notes that time reversal, i.e. time running in reverse, only makes sense as long as time is identified with one of these arrows of time.

1.1.1.2 Philosophical time

I have already touched a little on the philosophical aspects of time towards the end of the preceding chapter; I shall now deal with them in more detail.

Van de Vate (153) states that “[t]ime is an individual: there is only one time.” This can be interpreted from a number of angles – there is only one absolute space-time (this might be opposed by physicists), everything comes around only once (this interpretation ties in with what will be discussed later in respect to the possibility of changing the past) or maybe even that everybody can only experience time from their own subjective point of view. Van de Vate also tries his hand with a second, more specific definition of time:

Time in its obviousness is that which has duration, or is divided into hours, minutes, and seconds; it is that which is divided into past, present, and future. But this description is incomplete. It describes the form of what is already temporal, namely, sequences of events.
(Van de Vate 154)

He also adds that “units of time are arbitrary divisions imposed upon time for our collective convenience” (157), which is an important point indeed.

Since we lack the knowledge of what time really is and since we do not have any proper language to talk about and describe time, there is a huge body of metaphors. One of the most popular ones seems to be the comparison of time to a river, as for instance in the *Metamorphoses*:

Time itself, also, glides, in its continual motion, no differently than a river. For neither the river, nor the swift hour can stop: but as ways impels wave, and as the prior wave is chased by the coming wave, and chases the one before, so time flees equally, and, equally, follows, and is always new.
(Ovid bk. xv: 176-198)

Toomey (35) quotes Marc Aurelius, who describes time as “a violent torrent” that carries things with it and sweeps them away again without stopping, and reflects upon the similarities between time and rivers: “Time and rivers have much in common – among them a hidden source and an end in a vast unknown” (Toomey 36).

Putting these different concepts of time now into context with time travel and the polarised views on it, it is helpful to look at the conceptions of the world in terms of

time by Heraclitus and Parmenides. These two ideas about time and the world are fundamentally opposed to each other: while Heraclitus postulates that the world is in a perpetual flux, Parmenides sees truth and reality as eternal and stable. Grey (55) explains that time travel would only be possible in the world of Parmenides, because in his understanding the past and the future are as real as the present. This is a necessary precondition for time travel, since there needs to be a destination, a somewhere (or, as Grey quite attentively notes, a *somewhen* [my emphasis]) to go to (Grey 55).

In contrast, the future in Heraclitus's world is open and not determinate. In such a world there would be no destination. Grey (55) argues that it could be assumed that the time traveller would arrive at a time when that particular time was real, however, the problem that arises here is that if the time traveller indeed finds him- or herself at a point when the past is still the present, that this could make it appear as if the past could be changed. This last remark does not apply to the Parmenidean view with the same stringency as to the Heraclitean: since everything is fixed in Parmenides's world, people run no risk of changing anything; something that appears as a possible option in Heraclitus. Since the issue of changing the past will be dealt with rather comprehensively in the chapter about time travel paradoxes, I shall not go into much detail here; at this point I would only like to bring Aristotle into the discussion, who says that "nothing that is past is an object of choice" and that "no one deliberates about the past, but about what is future and capable of being otherwise, while what is past is not capable of not having taken place" – changing the past is something that is even beyond the power of God (n.p. bk6, part 2).

Since, as in the Heraclitean view, the future is not determinate, it might be tempting to claim that the future, in fact, is not real. Grey (59) rebuffs this idea by arguing that denying the existence or reality of past and future events would be the same as denying the reality of distant places, as these are not objective features of reality, but different perspectives of the experiencing subject. Thus the changing of events from future to present and past would not be a changing of facts, but merely a change of the chronological perspective, much in the same way as a change in spatial location would result in a change in spatial perspective. Grey might well have a point here: as we can only perceive three dimensions with our senses, it might be feasible to assume that time for us only appears to be so puzzling, because we only see a part of the bigger picture; a situation probably comparable to the Allegory of the Cave by

Platon. The Doctor, on the other hand, claims to be able to see all of time, all that was, is and could be (*The Parting of the Ways* 1.12, 39:50:00), so his perception of time differs rather substantially from ours.³

With regard to the reality of the future, Hanley (147) proposes that an asymmetry between past and future, i.e. that the “future *seems* [original emphasis] to be causally accessible while the past is not” (Grey 59), is mainly one of degree – “there is a lot we know about the future, and a lot we don’t know about the past” (Hanley 147). Smart (*Future*, 141) claims that the future is real, and does so on logical grounds: as reality is not a property that can be acquired – for in order to become real, something would have to lack reality first; however, to be able to lack a property presupposes existence: there would be a manifest contradiction (Smart, *Future*, 142) – future has to be real or it could never exist at all. As a result, talking about changing the future is as futile as talking about changing the past – and if there are no alternative futures, then it follows that there can be no alternative pasts either (Smart, *Future*, 149).⁴ In light of all these discussions, it is understandable why Clarke (xiii) felt compelled to say that “the idea of the future is one of the more obsessive preoccupations of modern times”.

As a last point in this chapter I would like to address the understanding of time as it seems to prevail in most parts of the world. As far as orientation towards the future is concerned, there are certain tendencies that could be described in terms of action; since future is mostly regarded as open to at least human influence if not control, hope or apprehension are what usually dominates temporal experience (Shiner 318, 329). History itself is perceived as “an immanent continuous process in linear or chronological time which on its part is thought of as a flow in an irreversible direction, a homogenous medium indiscriminately comprising all events imaginable” (Kracauer 139). According to Gale (237), this irreversibility of time can be annulled if time is seen as cyclical, which would then lead to a denial of time in general. Gale calls this “the myth of the eternal return”, a concept that can be found in the novel *The Stone Gods*, by Jeannette Winterson.

³ Let me offer here a nice titbit of information and intertextual reference: there is a quote by William Blake: “I see the Past, Present, and Future, existing all at once before me.”

⁴ It could be argued that an alternative past would be the alternative future of the original, non-altered past.

1.1.1.3 Internal and external time

CALVIN AND HOBBS

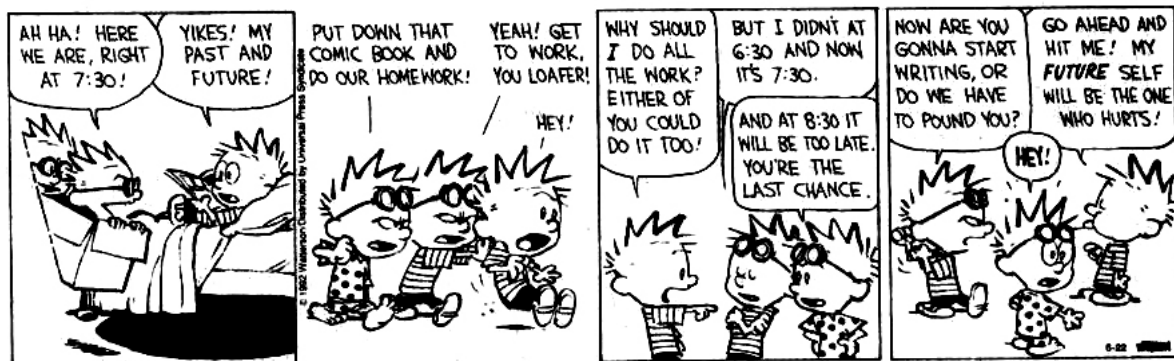


Illustration 2: Meeting Oneself

Time travel brings with it the puzzling problem that a time traveller might be able to meet their younger or older self, as Marty in *BttF2*, or, the same way as Henry in *TTW*, even multiple 'copies' of themselves. While this qualifies as a paradox for some people, it does not for others; Reichenbach (37), for instance, does not see any logical inconsistency in self-encounters at all. He basically classifies a self-encounter as a closed causal chain (cf. the chapter on causal loops). The problem of self-encounters, as well as the apparent disorder of cause and effect that can occur within time travel, can be solved by the introduction of the concepts of internal and external time. This is also true for a third issue, one which is addressed by Harrison (*Dr. Who*, 9), namely how it can be possible to remember something that has not yet happened to the person in question. Internal time refers to the time as it passes for the time traveller; if we take up Lewis's (146) example of the wristwatch, then the wristwatch would show the time as it passes for the time traveller while the clock on the wall would show the 'real time' (Ryan 152), i.e. the external time, as it is true for everyone else. Internal time, which Harrison (*Dr. Who*, 9) calls subjective time as opposed to objective time (i.e. external time), thus designates "a time scale that is relative to a specific system" (MacBeath 410). Physicists also call external time 'proper time' (Nahin 26, MacBeath 410); another term for internal time would also be "personal time" (Lewis 146) or "particular time" (MacBeath 406). MacBeath (410) notes that ageing and maturing can, in fact, only be accurately measured with respect to particular time.

Drawing a distinction between internal and external time makes explaining the above-mentioned problems somewhat less complicated: even if cause and effect become juggled up in external time, they still are in order for the time traveller. If I, for example, ventured to punch the time traveller's face and then were to send him or her off to the eighteenth century, for all the world it would seem as if the poor chronoviator's eye was blackening without reason, or rather, as if the effect of a blackening eye preceded its cause, i.e. my manhandling the time traveller. Tooley (76) quite rightly states that this would be causal chains converging to the cause instead to the effect. However, if we consider the matter from the point of view of the time traveller's personal timeline, there would be nothing askew at all: first he or she has to take a punch, and the eye subsequently blackens.

Distinguishing between these two temporal viewpoints also answers Grey's (62) demand that there be more than one chronological separation between two events, i.e. the temporal difference as perceived by the world and the one as experienced by the time traveller. This is echoed by Lewis (147) when he claims that one single event may occur more than once for a time traveller: since a time traveller would be able to go back to points in space-time that they have already visited, in the eyes of the world there would exist two versions of the same time traveller at the same time. However, as far as the time traveller is concerned, there could be many years between them experiencing an event for the first and then for the second time – a clear difference between perceptions, but, from the point of view of internal and external time, a difference that can be explained easily enough. This brings us already into close vicinity of the problems entailed in the second-time-around fallacy (cf. the chapter on time travel paradoxes), which basically refers to the mistake of believing that an event may occur twice. The important point then is to keep in mind that events happen only once in objective time: they may come around twice in the time traveller's experience and be thus assigned two values on their personal time scale, but on the external time scale they can only occupy one point in space-time and one point only.

Before the notion of internal and external time became widely accepted (mostly due to Lewis in the seventies), this apparent paradox caused a lot of confusion (or at least more confusion than it still causes today – after all, the concepts cannot be proven beyond doubt, even if the Special Theory of Relativity does make a strong

point in their favour), as can be seen by Capek's worries, who rejects the logical possibility of time travel, because

[t]here would be some events which, beside being simultaneous with themselves would also be simultaneous with other instants in time! In other words, a certain event corresponding to a single point in which the corresponding world line⁵ recrosses itself would be simultaneous with a remote future instant."

(Capek 448)

With the concepts of subjective and objective time, clearly, this does not constitute a problem, as there simply is no second meeting at a 'remote future instant' – there is just one, with as many world lines as one pleases crossing this single point in time. Dwyer (*Changing*, 348) solidifies this point when he says that although the time traveller, of course, remembers two versions of the encounter (if they do not forget anything, that is), the event may exist two times in their memory, but still only once in the real world.

It is hard to decide whether Parry's (14) statement that one cannot exist in two space-times actually supports the claim that it would be possible to meet oneself in the past. Parry says that "[y]ou only exist at the place that you have moved to. You do not continue to exist at the place in space that you have come from." According to Parry, her statement opposes the idea of meeting oneself, however, I feel it could be argued that if events only occur once, then, at a particular point in space-time, there could well be two different temporal versions of a single person. This has got nothing to do with "smearing" oneself across time (Parry 14), since that moment at that point is the present, and there can always only be one present moment. For me this raises the question where or when people exist at all – if it were possible to see time 'from outside', then it stands to reason that it could appear as a homogenous continuum: if that were the case then all the specific, single moments of the present would appear as one continuous body of time, and as a result there would not be one present moment which then can be occupied by everyone.

Meeting oneself is a popular theme in time travel stories and as the Doctor claims that "[his] relationship with time is not quite as linear as [that of normal people]"

⁵ In order to better explain space-time and movement through it, Minkowski used a normal, two-dimensional diagram, in which he reduced the three dimensions of space to one, which, in the diagram would be e.g. the y-axis, and used time in the place of a second dimension, e.g. the x-axis. He could then draw up diagrams of anything's movement through space-time by simply treating space as one dimension and time as the other. The resulting graph would then be called a worldline, i.e. "a path traced by an object in space-time" (Toomey 352).

(Abnett 1:33:10), one is not surprised when he runs into an earlier version of himself, e.g. in *Time Crash*⁶. Niffenegger, too, plays with the idea in *TTW*, e.g. in the museum, when an older Henry teaches his younger self how to pick pockets (*TTW* 50). These two instants also involve causal loops; a time travel paradox that will be dealt with at a later point in this thesis.

1.1.1.4 Psychological time

When a man sits with a pretty girl for an hour, it seems like a minute. But let him sit on a hot stove for a minute and it's longer than an hour. That's relativity.
(Einstein, quoted in Zimbardo 13)

What becomes obvious from this famous quote by Einstein, is that time is not only subject to the effects caused by different frames of reference and to the objective laws of physics that have been identified by Newton and Einstein. According to Zimbardo (12), time is also subject to an individual's psychological processes – depending on e.g. a person's emotional state or their personal time perspective, time will be experienced very differently. Consequently, it can be said that time is just as relative psychologically speaking as it is in physics.

However, there would be a difference between physical laws and psychological principles, as obviously, physical laws are the same for everyone and unchanging, while, psychologically speaking, everybody understands and explains the world a little differently (Zimbardo 13). This notion is complemented by Charles Lamb (quoted in Zimbardo 13), who, almost a hundred years before Einstein, already proclaimed that “[y]our ‘now’ is not my ‘now’”. This does not only apply to psychology, but also to the physical understanding of time. Robert Ornstein (quoted in Zimbardo 14) explains

⁶ In this episode, the Tenth Doctor, played by David Tennant, forgets to raise the shields of his TARDIS, which leads to his TARDIS merging with the TARDIS of the Fifth Doctor, his younger self, played by Peter Davison. The answer to the problem is ‘found’ when the Tennant-Doctor remembers what he has seen the Tennant-Doctor doing when he was still the Davison-Doctor. In Lewis's words (148): “His older self knew how because his younger self had been told and the information had been preserved by the causal processes that constitute recording, storage, and retrieval of memory traces.”

the subjective relative perception of time as a cognitive process, which is therefore subject to cognitive illusions. This becomes clear when we consider that time seems shorter the more engaged and engrossed one is in an activity – the more cognitive processes are executed, the shorter the time seems/ the faster it seems to pass. This ties in with St. Augustine's notion that time exists only in the mind (263ff). An experiment at Rice University has shown that sound is judged to be longer if the pitch changes – the more pronounced the change, the longer it is perceived to be (Zimbardo 14).

Le Poidevin (n.p.) remarks that we do not have any sense to discern time as such; the only thing that we seem to be able to observe are changes and events in time and temporal relations. However, whatever we perceive, we experience as present, i.e. as going on right now – this is true for both the present and, paradoxically, also the past. The future is excluded from our perception, as perception is a causal process – “to perceive something is to be causally affected by it” – and since a cause has to precede its effect, the future is off-limits to us. For Gale (228) memory and anticipation play an important part in our perception of time; an idea that he voices in rather lyrical words indeed: “...what else but memory and anticipation could enable the past and future to get an arm or leg onto the tiny liferaft of presentness?”

1.1.2 Nowhere, nowhen and distimement: no words for time?

There is a curious thing that happens in time travel stories, discussions about time travel and sometimes also in daily-life when people are talking about time. Not as long as it is the every-day usage of time – ‘What’s the time?’, ‘See you later!’ and their siblings are all not only perfectly fine speech acts, they are also rather easy to pin down as far as time is concerned. However, similar to the Vashta Nerada in *Dr. Who – Silence in the Library*, there are certain ‘monsters’ lurking in the shadows of speech. Nahin (180) sees part of the difficulties that we seem to have with the concepts related to time travel as well as its relationship of cause and effect in our language. In his opinion “distinct and separate concepts of the temporal ordering of events, and of causality, have become merged in everyday thought”. This is certainly true, however, I see a much bigger problem in our apparent lack of appropriate

vocabulary to deal with time and its related issues. Nahin (181) asserts that we are sometimes able to work our way around if not solve the difficulties in understanding that are created with inadequate language, but this is only possible through common agreement. For instance, if we look closely at the sentences ‘The meeting will take place now.’ or ‘We will meet again next month, same time.’⁷ it becomes clear that there are contradictions – ‘the meeting will start’ indicates the future, however, ‘now’ is the ultimate specifier for the present. Also, it should be clear to anybody that it is not possible to meet again the following month and yet at exactly the same time as today. We do understand these sentences, but only by applying the knowledge that we have about time and which forms part of our cultural heritage. If we were to decode the meaning simply by applying logic, we would have a much harder time coming to a correct conclusion – if it is possible at all without invoking any knowledge about how our world functions and what conventions there are to make sense of it (cf. Nahin 181).

As we have seen, problems with time and how to refer to it/ describe it start very much at an everyday level and they get much more complex as soon as we start talking about time travel and displacement in time. In this last sentence there are already two problems. The complications start with time travel: ‘travel’ as such usually implies a change of space in respect to the passing of a certain amount of time (Smart, *Time Travel*, 241). What do we then do with *time* travel? A change of what with respect to what? A change of time with respect to space? This seems to be a good first guess, but as with traditional travel, travelling through time also implies duration, be it now very long, short or even immediate, so would it then be change of time in respect to both space and time? Then we have a doubling of time, which would be bringing something to the system which is already there and thus apparently does not add up either: “time is already represented within the model and cannot be introduced again from outside” (Schlick 43). Smart sums the issue up rather well:

Bodies that do not move relative to one another [...] are represented by parallel world lines in the space-time diagram, whereas relative motion is represented by the relative inclinations of world lines. It is clear therefore that we cannot represent motion through space-time. To do so would be illegitimately to treat space-time as if it were a space in the continuant

⁷ Examples taken from Nahin (181).

sense. Motion is rate of change of space with respect to time, and so we cannot have motion through time or through space-time.
(Smart, *Time Travel* 238)

The second problem that came up in my sentence above, is 'displacement in time'. 'Dis-PLACE-ment'. 'Temporal re-LOCATION', 'temporal DISTANCE', 'backwards in time', 'forwards in time', 'to go to the past/ the future' (is the future or the past a place?), 'to travel into the future/ past'. Place clearly belongs to the semantic field of space, and not to time. Logically speaking, it would have to be 'dis-TIME-ment', and other creations would have to include such coinings as 'no-WHEN' (Grey 57) or 'any-WHEN' (to be fair, there is 'any time'). However, checking any dictionary of any consequence, except maybe those dedicated to the explanation of science-fiction terms, will promptly reveal that there usually is no such word in the English language. In fact, as soon as we start talking about time, we start using spatial metaphors – language abounds with them (Gale 229), and not just the English language. The same happens also in German, and I feel safe enough to venture to say that it happens in any language whose speakers are not inherently familiar with the four-dimensional concept of space-time and who do not possess any means of directly sensing time. As such, time travel seems then to be clearly grounded in the spatial metaphor of travel (Grey 57).

The interesting question, however, is how spatial metaphors came to be thus employed. Wells describes time as being basically the same as space, as just another dimension to it (*TM* 2); Minkowski and Einstein talk about time in spatial metaphors as well (cf. their respective essays in Lorentz et al.). Our situation here is probably comparable to the inhabitants of Abbott's *Flatland*⁸ (especially to the spheres): how should we have any chance of imagining or even comprehending a fourth dimension if our perception is limited to three? Our musings about time might be very amusing indeed to four-dimensional beings. In the end the transfer from words relating to concepts of space to concepts of time might simply have been made because of the vacuum of terms for time – and when talking *about* time

⁸ The auto-diegetic narrator of this novel is a square – his country is called Flatland, because it has only two dimensions. One day, a sphere from the world of three dimensions comes to visit the square and tells it about the third dimension. At first the square does not believe the sphere and has difficulties imagining three dimensions, but when the sphere takes it to its world, the square is exhilarated. It does not only believe in three dimensions now, but even asks the sphere to also introduce it to the fourth one – which annoys the sphere tremendously, for clearly, there is no fourth one...

became an issue, i.e. not simply stating the time, the vacuum of appropriate terms was filled with the terms for the concept that was perceived to be closest to it. I would also like to suggest the idea that maybe the process might have been similar in a way to the borrowings that happen between languages – in the course of contact between different cultures, certain cultural concepts of one group might be adopted by the other, taking the words to talk about these concepts with them. I realise, of course, that this hypothesis does have its pitfalls, but I believe it would be a valid idea which might merit further research.

Considering how closely time and space are linked and interrelated according to modern physics, the way Wells described time seems to be rather prophetic (even if he was not correct in all points). In the context of paradoxes Horwich actually sees language as the primary problem why we think that there are paradoxes in the first place:

Thus if we suppose that simple objects can time-travel, and there is no reason why we shouldn't, then we must suppose that more complicated systems, e.g., human beings, can also time-travel. Therefore we can conclude that those alleged paradoxes which tend against this view are mere artifacts [sic] of the psychological language in which they are stated. The nonscientific [sic] language of 'free will', 'action', 'belief', and 'decide' is shaped to fit ordinary situations. So it is hardly surprising that things break down in the bizarre context of time travel.
(Horwich, *Paradoxes*, 438)

1.2 Time Travel

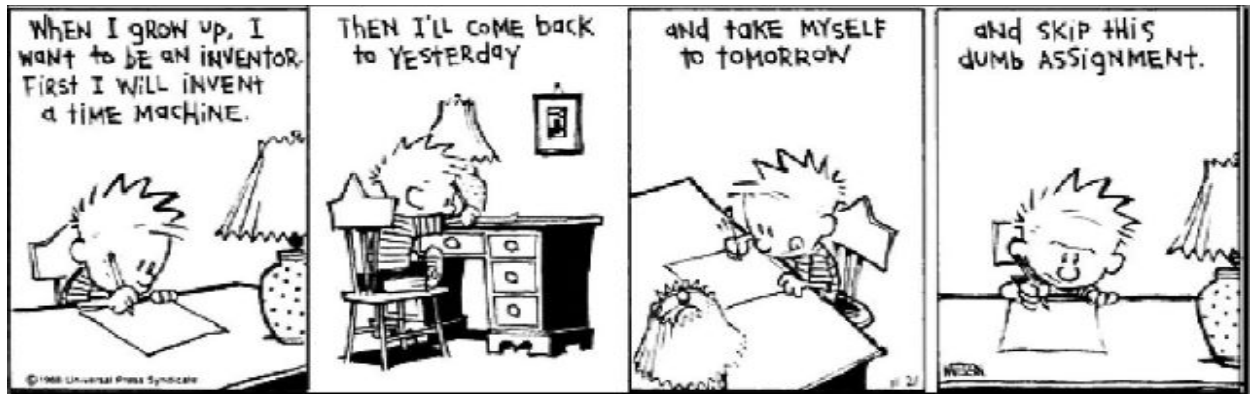


Illustration 3: Time Travel

1.2.1 Defining time travel

As I have discussed in the previous chapters, time is rather difficult to describe, and 'travelling' in the context of time only 'makes sense' to a certain degree. As Riggs (48) remarks, "most notions of time travel seem counter-intuitive or at least somewhat bizarre" – and this is putting it mildly. Not only is the concept of time travel in itself something that does rather go against anything that we (can) experience in everyday life; also its consequences can be unsettling to the mind, as will become clear in the subsequent chapters.

According to Grey (68), from a Heraclitean metaphysical point of view the very idea of time travel seems strange and it does not come as a surprise that time travel itself is sometimes considered to be a paradox.⁹ As can be imagined, there are many disputes about whether time travel is possible, with both physicists and philosophers offering their – sometimes rather conflicting – ideas. While one camp seems to be

⁹ In the Parmenidean world it would technically be possible, as everything is extended in time just as in space (the precondition for this would of course be a world that is a four-dimensional manifold of events), which would make a time traveller an "aggregate of stages" or "streaks" extended in space-time (Grey 60).

firmly set on out-ruling time machines, time travel and any ensuing paradoxes to keep the universe and history safe from such reality-twisting notions, the other side is just equally determined to prove that all of that and much more is possible. In this battle of opinions arguments can be found reaching from banana peels over time protection conjunctures to wormholes and particle beams¹⁰, throwing in notions about free will and determinism for good measure. However, as the technology for time travel simply does not (yet?) exist, these discussions are either based on logical arguments (that would mostly be the philosophers) or any preliminary results that quantum mechanics, the Special Theory of Relativity and other theories have yielded so far. It appears that, at the time of this writing, time travel cannot be ruled out on any firm physical grounds – whether any traversable wormhole or a functioning time machine can actually be built is of course an entirely different question. As we shall see presently, there are a number of logical arguments against time travel, but before dealing with these, I feel that a definition of what time travel actually is, is necessary.

1.2.1.1 What is time travel?

Horwich (*Paradoxes* 433) summarises time travel very concisely: “To travel in time is to travel some temporal in a time less than the duration of that interval.” What I appreciate in this quote is Horwich’s use of ‘temporal’¹¹, however, it should be noted – and this is also true for the definition given by Lewis – that it is necessary to keep in mind that there is no absolute time and that we are always talking about relative time, i.e. that the measured values are to be seen in context of their frame of reference. Grey’s (59) definition is basically the same as Horwich’s, namely that in time travel two events would have to be separated by unequal amounts of time. Lewis’s explanation (*Paradoxes*, 145) is a little more detailed. Like Horwich and Grey, Lewis says that time travel involves the discrepancy between two periods of time which in a

¹⁰ According to Thorne (521) vacuum fluctuations would destroy any time machine in the making, i.e. shortly before the wormhole became a time machine.

¹¹ Horwich uses ‘temporal’ here as a noun and in doing so creates an alternative to the much more fuzzy spatial metaphor. Personally, I feel that ‘to travel a temporal in time’ is much more evocative than ‘to travel a (temporal) distance in time’.

world without time travel would be the same: the time traveller departs and arrives, the time elapsed being the duration of the journey. This period of time can be positive or zero. If the periods of time measured by the traveller and the observer do not equal each other, there is a case of time travel. If the traveller arrives 'earlier', i.e. in less time than has been measured outside the time machine, he or she has travelled into the past. This past lies in the future of the present from which they set out, that is certainly true, but since the external time has moved further into the future than the personal time of our time traveller, they still have, relatively spoken, travelled into the past. If the time traveller travels far into the past, they arrive even before their departure: this is what we usually call travelling backwards in time. If, however, the time traveller finds that between their departure and their arrival more than the amount of time that they have measured in the time machine has elapsed, they have travelled into the future. An interesting question would be whether the amount of time measured by the time traveller could also be negative – and where that would take them¹².

Riggs (49) compares time travel to normal, spatial displacement as departure, arrival and travel time all have direct parallels, so that time travel, in the same way as 'normal' travel, would be from one space-time point to another. As Riggs quite rightly notices, there can be no time travel without spatial displacement, which is sometimes seen as a problem as far as Wells's time machine is concerned (a topic to which we will return later). Well's idea of comparing time travel to movement in space is also in so far defective as his metaphor would also include other spatial assumptions (Ney 312), such as travelling sideways or up and down (which to my mind does not work out in the context of time travel – but then, wobbley-wobbly...).

While we have now established what time travel is in respect to travel time, it merits also to spare a thought on how this travel time passes, i.e. the travelling itself. A popular method, often found in time travel stories and also employed by Wells, is the idea of having time literally run backwards, much like a film played in reverse. This enchanting idea has some fundamental itches physically speaking; among others, but most importantly, the second law of thermodynamics would be going awry or in

¹² This would, however, require the existence of negative time. As far as I understand it, negative time in physics might already refer to time running in the opposite direction, i.e. the past; so if the time traveller would indeed measure a negative amount of time while travelling backwards in time, this would then probably add up to them travelling forward after all.

fact even have to cease to exist. Nevertheless, many authors use this technique and an expanded idea of time reversal has even formed the basis for whole novels, most prominently in Martin Amis's *Time's Arrow* (although, strictly speaking, reversed time would not be a form of time travel as it is dealt with in this thesis). J. Smith sums this concept up as follows:

For time travel to occur, a token event of some type must be a cause of a token event of another type which would normally affect and precede it, instead of being affected by, and succeeding it. Thus plants must grow back into seeds, high entropy systems spontaneously lose entropy and the expansion of the universe is reversed. If the whole world is but one of God's films, then time reversal is the 'film of the world' played in reverse.
(J. Smith 63)

In terms of physics, time travel is called 'a closed time-like curve', CTC for short (which, in essence, allows scientists to write about the topic without marking them as science fiction aficionados). Another more scientific term for time travel would be 'movement into the backward light cone', a light cone being one way of describing the relationship of any event to space-time (Ney 312) – basically a more recent version of the Minkowski diagram.

An interesting aspect of time travel, which will also become important in our discussion of time travel paradoxes, is that time travel into the past requires "the temporal relocation of information, by any method, into the causal past relative to the moment of departure" (Ney 312). Since in Ney's definition information requires to be identifiable as being from the future, the method of sending any information into the causal past is limited: on the one hand, the causal history of the past needs to be preserved, while at the same time the interaction of the sent information with other agents in the past needs to be possible – otherwise nothing has arrived in the past. In my understanding this interaction could be anything, even if it just were the appearance of the time machine or a probe: this interaction could be "as minimal as the displacement of air, or as significant as the death of some individual by the hands of the traveller"¹³ (Ney 314). In *BP* by William Tenn, this is exactly what leads to a butterfly-effect (which goes unnoticed by the characters in the story). Ney (315) realises this potential for paradoxes and changing the past as well and classifies

¹³ Which, of course, brings us to the so-called grandfather- or auto-infanticide-paradox (see chapter 1.3 for the discussion of time travel paradoxes).

interaction with the past into active and passive interaction – passive interaction would be observation, active interaction would be changing or fulfilling the past. (As we shall see in the chapter on time travel paradoxes, there is a whole slew of ramifications connected to changing the past.)

I suppose that the attentive reader has noticed that on these last three pages there has been a lot of talk especially about time travel into the past and not so much into the future. This is partly due to what has already been discussed before, namely that time travel into the future, from a philosophical standpoint, is the same as time travel into the past, while from a physics point of view, time travel into the future is nothing that far out of the extraordinary. In J. Smith's (58) words: "forward time travel I regard to be [...] not an especially remarkable phenomenon and I shall not discuss it here."

1.2.1.2 Arguments against time travel

Apparently, several of the issues of time travel that have plagued the world for years have been laid to rest by Lewis in his text *Paradoxes* (Hanley 123). This might or might not be true; or at least it does not appear as if the majority of the scientific community was sharing Hanley's view, as becomes obvious when one sifts through the number of publications that appear every year on this topic. As no side has any possibility of finally, definitely proving their point and laying all controversy to rest, it can be expected that the battle of the worlds – the ones that allow for the possibility of time travel and the ones that do not – is going to continue.¹⁴ While I, for the sake of the argument in this paper, will assume that time travel is possible – that is, at least in the fictive worlds of texts narrating stories that involve time travel – I shall, nevertheless, list some of the most popular arguments against time travel, mostly because time travel paradoxes tend to touch upon these issues.

One popular argument runs along the lines that since we have not seen any time travellers, there simply are none. This is a rather naïve point of view, but voiced and

¹⁴ According to Visser (557-8), these discussions about the possibility of time travel illustrate people's fears about time travel being something like a "Pandora's box" and the paradoxes the illnesses emerging from it (which ties in nicely with the *Doctor Who*-episode *Father's Day* (1.8)).

defended by such giants as Stephen Hawking (who we shall meet again in chapter 1.3 on time travel paradoxes with his notion of a time-protection-conjecture – basically a cosmic chaperone, making sure that “history is safe for historians”¹⁵). This argument is ridiculously easy to rebut, the easiest cause against it being that maybe our times just are not interesting enough to be visited or even avoided for being a contamination zone (environmental problems, leaky atomic reactors, oil spilt everywhere,...). Also, with all the problems of changing the past, it would not be too far fetched that maybe time travel is possible, but subject to severe safety restrictions, if not forbidden at all. N. Smith (*Problems*, 158) offers the idea that time travel might be prohibitively expensive and also brings up the fact that maybe we simply would not recognize a time traveller, even if we saw one – much like a tribe in the jungle who is discussing whether men can fly. If they saw a jumbo flying past above their heads, would they necessarily know that it is flying humans?

Another argument against time travel that is often cited is inferring the impossibility of time travel by arguing that time travel brings with it a host of counterintuitive difficulties, such as entity multiplication, purposive behaviour or backwards causation. The most popular clearly is that time travel involves changing the past, which is logically impossible, thus also making time travel logically impossible. Dwyer argues, however, that this last argument cannot hold as the first premise is false – time travel does not necessarily – if at all – involve changing the past (Dwyer, *Changing* 341; cf. Goldstein¹⁶). N. Smith (*Bananas* 364) also agrees that arguments including changes of the past, such as the auto-infanticide objection, should be dropped for good, as it can play no useful role in any discussions of time travel – N. Smith goes even one step further than Dwyer by directing his answer at scholars objecting to time travel “merely on grounds of logical reasons of thought experiments”, which is basically my own opinion as well, as has been outlined above. Ney (311), however, seems to disagree here, as he clearly states that “logical limitations must take priority over apparent physical possibility”. Since this statement is, to say the least, mind-boggling in its tunnel vision-like perception of the universe, I cannot help but hope that I have somehow missed Ney’s point. If something is apparently possible, denying it on “grounds of logical reasons” seems a bit like denying electricity: there also was one

¹⁵ Taken from the title of Woodward’s article.

¹⁶ If there is a single contradiction in a system, the logical consistency of the entire system is compromised – if p and $\sim p$ are true, it would be possible to infer anything.

point in history when people could by no means logically explain a lightning bolt and consequently ascribed it to the powers of Zeus.

1.2.2 ...but what about the laws of physics?

It appears that right now the known laws of physics do not forbid time travel, which of course spurs physicists on to look for new physics which they believe will finally forbid time machines (Nahin xv). If there are no laws explicitly forbidding anything, this is, at least in physics, practically as much as saying that something is allowed: Kaku (xv) even goes so far as to quote T. H. White's *The Once and Future King* and says that "[a]nything that is not forbidden is mandatory". Another way scientists approach the possibility of time travel is to assign it, if it absolutely cannot be forbidden at all, a very low probability, e.g. as Earman, Smeenk and Wüthrich do: "...any theory allowing CTCs and bizarre constraints on initial conditions should be assigned a low probability" (100). Today, it is taken as a fact that below a certain (extremely small) scale time and space, in the form as we know them, break down, which means that below that length/ duration – Planck length and Planck-Wheeler time¹⁷ – the laws of physics most probably do not apply anymore. It could even be that there wormholes pop into and out of existence on a regular basis (Nahin 498).

This is interesting for physicists, since wormholes are seen as the most likely means for time travel (Kaku 222-224).¹⁸ The problem is that opening a wormhole would probably require more energy than is available in the whole universe, which makes it a rather futile endeavour. However, if there really were natural wormholes on the quantum-foam level (or below), then blowing these up (in the sense of expanding them) might be a possible solution to getting a traversable wormhole. The key-point is to have a stable and traversable wormhole, as wormholes tend to break down

¹⁷ For an exact definition see Toomey (349).

¹⁸ ...but also for long spatial distance travel across the universe – much in the way as it is proposed in the science-fiction series *Stargate*, where it is possible to travel across vast distances of space in almost zero time by traversing a wormhole.

easily, which would not be a good thing to happen to a time traveller trying to get through.

Gödel's solution to his field equations does not require a wormhole; Gödel's idea of the universe consists of an enormous revolving cylinder, along which all worldlines run. This would basically indicate that it would be possible to travel in time by either moving faster than the cylinder revolves or by stepping to the side, waiting until the moment in the past or future appears and then jumping back in:

[B]y making a round trip on a rocket ship it is possible in these worlds [worlds in which Gödel's field equations describe the structure of space-time] to travel into any region of the past, present, and future and back again, exactly as it is possible in other worlds to travel to distant parts of space.
(Gödel 560)

This kind of world would be one of eternal returns – everything would, at some point, come around again; in a way much like in the novel *The Stone Gods* by Jeanette Winterson. What is, however, noteworthy, is that in time travel stories that centre on paradoxes, the method of time travel as such does not seem to be the primarily important point; the aim is rather to set up a paradoxical situation (Riggs 50).

Riggs (58) ponders the connection between the laws of physics and the paradoxical consequences of time travel, especially the problem of changing the past and free will. In his opinion, there really is no such question of whether there is free will; it simply is a fact universally acknowledged that the laws of physics cannot be violated by anyone – and this, clearly, has nothing to do with free will. It might be my choice to fly off into the night sky, but no amount of violently flailing and flipping my arms is going to take me up there, as the laws of physics clearly forbid flying humans (outside an airplane and contra the gravitational pull of anything). So, as long as I am not hit by a lightning bolt while standing next to Superman, all my free will is not going to help me to break the laws of physics, much like it might be my will to make the sides of a right triangle add up to a length shorter than the hypotenuse or add seven to four and get seventeen. It simply is not possible – I can try however much I like, I am never going to achieve it. Riggs says that what constitutes the laws of physics is that they govern the causal interactions between events, so, according to him, I could try and shoot my grandfather (what I would never wish to do, he is a very sweet old man), even wound him – I might even believe he is dead – but when it

comes down to it, he would not die of anything I inflicted on him (for a further discussion of time travel related problems of free will see chapter 1.2.5).

1.2.2.1 Time machines

According to Earman, Smeenk and Wüthrich (91), a time machine is a device that is able to create closed time-like curves, i.e. time travel. This would entail the manipulation of matter and energy. Also, no matter how the time machine operates, its effects would have to be “confined to a finite region of space and operate a finite amount of time” (102). However, they also say that it would be very trying to come up with a widely accepted definition.

From the early nineties of the last century onwards, a lot of attention has been devoted to discovering whether CTCs can be built in a universe that does not already contain them (N. Smith, *Problems* 156). Basically the same question is posed by Earman, Smeenk and Wüthrich (91), although they ask whether the laws of physics would allow for the operation of a time machine. Many ideas, concepts and machines have been proposed, and all have been met with objections for one reason or another. No one has yet produced a practicable scheme for backward time travel in our universe, but neither has it been established that such a scheme cannot be produced: consequently, this is an open and exciting question in physics, now that the topic has gained academic acceptability. At times it even seems as if science fiction writers and physicists seem to be set on outdoing each other in coming up with new fantastic ideas, with the physicists usually being hard critics on the stories. While they seem to love pointing out the various deficiencies and impossibilities of the time machines proposed by the writers, physicists do seem to harbour certain affections for the genre and not seldom do also write stories themselves using a pseudonym (cf. Nahin, Thorne). In this sense the genre of science fiction truly manages to blend – and even transcend – science and fiction.

As I have mentioned above, possible candidates for a time machine could be wormholes, traversable wormholes, rotating cylinders or could even, as Gott

proposed, involve gigantic cosmic strings¹⁹ (Kaku 222-224). Earman, Smeenk and Wüthrich (100) allow for the possibility that time travel might be physically possible if there are physically possible worlds that contain CTCs in either the weak or the strong sense, but they also point out that even if this was possible, then this would still not necessarily imply that it would also be possible to physically operate a time machine. Another interesting problem which does not only refer to time machines but also to time travel as such is put forth by Earman, Smeenk and Wüthrich (94): even if it was possible for a time traveller to hop into a functioning time machine and be off, he or she could never return due to the amount of energy that would be necessary to overcome the slope of entropy – in fact, it would be impossible within the confines of normal time to travel backwards.

Another issue is that many people make the wrong assumption that a time machine does not have to move; most prominently among them H.G. Wells, who kept his time machine stationary, which, according to Smart (*Time Travel* 238) would be a conceptual impossibility, as they would be travelling up and down the Earth's worldline. Toomey (51-2) cites Minkowski's famous line: "Nobody has ever noticed a place except at a time, or a time except at a place" and concludes with him that, therefore, there can be no travel through only time or space on their own: both would be necessary (see also my discussion of the problematic 'travel' in 1.1.2). Nahin (23) claims that a real time machine must move in space as well as in time, but the question is whether that refers to the frame of reference in which the time machine departs and arrives, or to 'absolute space'. The first problem would be that if the time machine was really spatially fixed in relation to 'absolute' space, it might not only be unable to return to the same place from which it started as the Earth is continuously moving²⁰ – it could even be torn off the planet as soon as it was switched on (even if

¹⁹ Remnants of the Big Bang that would probably, if my understanding of the physical principles involved is correct, be much like the strings proposed to be the smallest building blocks of our cosmos, only much, much bigger.

²⁰ The Earth rotates around its axis and orbits the sun. The whole solar system is moving inside the bigger structure of our galaxy, the Milky Way, which is racing through space itself, for that matter. Therefore, the past is not only a certain number years away, but also a tremendous amount of kilometres (in some cases it could even be light-years, but one would have to do the maths for a definite number). So, if a time machine aspires to jumping between places that far apart in both time *and* space, with the Earth orbiting the sun at a speed of 31 kilometres per second, the sun revolving around the centre of the galaxy at a speed of 200 kilometres per second and the galaxy hurtling towards a galactic super cluster at a speed of 600 kilometres per second (Vaas 214), it should also be capable of moving space-wise.

it was only 'on standby'), because it would remain fixed in the space time where it was first activated (it could only be transported when being switched off).

Another reason why a time machine would have to move in space as well as in time is to prevent a collision between two temporally different time machines (relative to the personal time frame) (Ney 317). Something a little similar to this happens in *Time Crash*, where the Tennant-Doctor forgets to put up the shields of his TARDIS, which then leads to his TARDIS merging with the Davison-Doctor's TARDIS. The problem addressed by Ney also appears in Macbeath (426-7), who argues that the problem would not so much be the time machine simply jumping to another point in space-time, but sliding into the past or future, as this would imply that the machine has to seamlessly occupy all the stages between arrival and departure. This, however, would lead to the double occupancy problem (Grey 60), which arises out of the question how time travel into the past can start: if the time machine is set to depart at noon, what happens immediately before noon? Two machines would be occupying – or at least attempting to do so – the exact same space-time position. The time machine would most likely cease to exist in the one or other more or less spectacular way (in *Time Crash* (4.0) the continued merging of the two Tradises would lead to an explosion that would tear a hole of the exact size of Belgium into the fabric of the universe). Which, of course, brings us to an interesting problem: if the time machine travels back and explodes exactly the moment before I pull the lever, how do I ever get to pull the lever? Consequently, the time machine blows up if and only if it does not blow up... a paradox (Nahin 23). Disconcertingly enough, invoking external and internal time to solve this problem does not entirely solve the problem as it usually does – it stands to reason that all versions and stages of the machine might be blown up simultaneously (which is basically what happens in *The Big Bang* (5.13)).

1.2.2.2 Backwards causation

Backwards causation is the puzzling thing that happens when an effect temporally precedes its cause. Fitzgerald also calls the phenomenon ‘retrocausality’; Grey refers to it as ‘reverse causation’. The daunting difficulty about the problem that “the latter does not follow the former” (Ben-Yami 444) is making sense of how what has not yet happened could affect what is happening now (Grey 62). Dummett and Flew (48) argue that the “crucial difference between causes and effects is that causes bring about their effects”, ergo it would be logically impossible for the effect to come before the cause; Brier (361) agrees to this as well.

Ryan (154) on the other hand proposes to distinguish between two different ways in which backwards causation can be understood. If backwards is seen in a purely pragmatic sense, then the nature of cause and effect becomes inverted with respect to the real world: “In the pragmatic version of backward causation, it is the nature of the forces that lead from cause to effect that changes, not the direction of the process of causation.” If it is really the order of cause and effect that is inverted, one would be seeing backwards causation in a strictly temporal sense. This would, for example, include a tree that already exists, then the seed, out of which the original tree had grown, would germinate and the original tree would grow²¹. This happens to some extent in time travel stories when the time travel leads into the past and results in a changed world. It is important, however, to distinguish between backwards causation and time simply running backwards – the difference depends on whether time running backwards is seen as the main forward time line or whether it is merely understood as a device to illustrate travel into the past, i.e. as a movie that is being rewound. In any case, for Grey (68) the whole process makes sense “as long as time is identified with one of the ‘arrows’ of time”, as they are thought to provide time with direction – whether this arrow is thermodynamic, cosmological or psychological does not make a difference for Grey.

²¹ The terribly awkward syntax of this sentence shows how hard it is to write about time and time travel – especially when it is time running backwards.

1.2.3 Fictional means of time travel

1.2.3.1 Pre-Wells

Nowadays the ways by which (fictional) time travel is achieved are multitudinous (e.g. falling through a black hole – *Star Trek*, special space-time geometries such as Gödel's cylindrical universe – *The Stone Gods* (to a certain degree) or traversable wormholes – the Time Gate in *BhBst* might be something like that), at least in science-fiction and fantasy stories. It is almost unbelievable for us today, however, that the time machine, which most of us perceive as the most 'common' and 'natural' means of trans-temporal transport, is actually only a rather recent invention. Until a little more than a hundred years ago, time travel was usually an element of dreams or drug-induced visions; even the more 'real' journeys were often not physical trips to another time but something that could be called 'mind-travelling', i.e. the thoughts, the brain or the persona of the traveller would be sent to another time, where they would then find themselves in the body of a local person. Harrison (*Dr. Who* 4), in 1971, tries to find possible explanations to time travel and offers, among others, also hallucinations as well as being transported to a solar system that is absolutely identical to ours, only that everything is exactly as it was, let us say, a hundred years ago, with all actions, events and processes being the same (within the system everything would be spatially related, however, the system as a whole would have to be isolated).

In any case, 'mind-travelling' and hallucinations is not where things stopped: if the author bothered at all to explain why their character ended up in another time than the character's own, it was common to draw upon the supernatural. Alkon (19) mentions in his *Origins of Futuristic Fiction* that the first time traveller in English literature appeared in a story by Samuel Madden, an Irish-Anglican clergyman, in 1733. In this story, *Memories of the Twentieth Century*, a guardian angel travels to 1998 and brings back state documents to the year 1728. In Johan Wessel's *Anno 7603* (1781) – which, by the way, Toomey lists as first time travel story ever (25) – and in the play *The Blue Bird* (1908) by Maurice Maeterlinck it is a fairy that instigates the time travel. Toomey (25) also lists Dicken's *A Christmas Carol* as a

story containing time travel, the cause of which are ghosts. It should also be mentioned that fairy tales often involve time distortion, i.e. the time in the realm of the fairies tends to pass either more slowly or much faster than in the real world. Technically speaking, this would also be time travel, with the home of the fairies functioning as time machine. Other things that have been known to trigger time travel are violent bumps on the head (e.g. Mark Twain, *A Connecticut Yankee in King Arthur's Court*), emotional trauma (e.g. Sauvy, *Time Reversal*; *TTW*) and natural phenomena like extremely violent lightning or the Bermuda triangle, as well as suspended animation and hibernation (although, strictly speaking, these do not fit the category of actual time travel in the truest sense of the word). It seems that especially towards the end of the nineteenth century, when a scientific approach became more and more important, a connection was made between time and clocks on the one side and time travel on the other. Since mechanical clocks obviously can be rewound without any apparent loss of energy due to thermodynamics (contrary to hourglasses or candles), thus seemingly defying these essential laws of physics (a flawed thought, but accepted at the time, at least as far as writers were concerned), clocks seemed to be the ideal means for controlling time or travelling through it. Edward Page Mitchell was the first to employ this idea in 1881, in his story *The Clock that Went Backwards*. Eight years later Lewis Carroll picked up the idea in *Sylvie and Bruno*, where it is said that the watch determines time: "instead of its going with the time, time goes with it" (both qtd. in Toomey 26).

It is also thought-provoking to have a look at when the different kinds of time travel stories first appeared. While the first time travel story to the future was written in 1733 (if we go with Alkon), the first time travel story into the past only appeared in 1891 (*Tourmalin's Time Cheques* by F. Anstey). This is echoed by Suerbaum, Broich and Borgmeier (66). H.G. Wells obviously was not the first to write a time travel story; there have been at least twenty others before his *TM*. However, as we shall see in the next chapter, Wells revolutionised the way time travel is handled in science-fiction.

1.2.3.2 Post-Wells

As I have just said, *TM* is not the first time travel story, but it is the first that uses a proper time machine to travel and thus “pioneered time travel as we usually think of it today” (Nahin 143). What is therefore so extraordinary about Wells’s work is that he, for the first time, “provided an up-to-date, technologically and scientifically grounded rationale for doing something that had hitherto been justified as occurring either by means of magic or through some sort of dream vision” (Firchow 123). The audience of that time expected “its fictions to be at least as technologically sophisticated as the articles on technology and science in its newspapers” (Firchow 124) and Suerbaum, Broich and Borgmeier (66) note that Wells’s time travel is a result of scientific inventions – it is therefore no wonder that the novel was rather a success. As I have already shown above, ironically, modern physics claims that Wells’s time machine would not work, since it does not move space-wise. It would therefore occupy every instant of the time in between the start and the endpoint, which would mean that a) it would crash into itself at the moment immediately before the lever is pulled, and b) it would be ‘sitting’ in the same place all those years (Nahin 23).

Nevertheless, it is safe to argue that Wells was the “most original and inventive writer in the history of futuristic fiction” (Clarke xvi). According to Clarke, he developed his own astonishing variations on the already established forms, e.g. he writes his story about a dystopia, which as such is nothing new, but takes it to the far future and even points out to where the whole thing might be headed, namely the end of the world. In Slusser and Chatelain’s opinion (*Communication* 175) Wells headed a fusion of travel and historical narratives, resulting in ‘future histories’. This genre has already existed to some extent before Wells, however, it is the time machine that allows a controlled physical displacement first to the future and then, more significantly, to the past – up to then there had always been a significant mismatch between the narrator’s time and the audience’s, which for Slusser and Chatelain raised the difficulty of getting the narrated story back to the audience. In short, Wells’s time machine changes narratives of the historical past forever (Slusser and Chatelain, *Communication* 176).

1.2.4 Moral dilemmas

Time travel cannot only give rise to purely logical paradoxes; it is also a wonderful source for moral dilemmas. As an example story to work with, I shall paraphrase a story put forth by Harrison (*Problem 65*): A woman named Jocasta Jones finds something that looks very much like a deep freeze in the wood. Inside there is a man, frozen solid. Jocasta helps the man Dum to thaw out. Dum has a book which explains how to build a time machine and a deep freeze. Jocasta and Dum have a baby, which they call Dee as it is the spitting image of his father. Dee grows up and finds his father's book. He builds the time machine and sets out with his father, taking the book with him. However, the journey takes longer than anticipated and in order to survive, Dee eats up his father Dum. Upon his arrival, Dee has a psychological breakdown and out of guilt starts calling himself Dum. In order to escape his fear that the people of the past, where he is now living, discover his unnatural actions, Dum formerly Dee builds a deep freeze, gets inside and takes the book with him. The next thing Dum remembers, is being rescued by Jocasta.

Apart from the obvious causal loop – the information in the book – there is a much graver problem here: did Dee kill his father or did he commit suicide? Did he eat himself? Is he guilty of cannibalism? And being his own father, is he to be committed for incest with his own mother? In *AYZ* by Heinlein the case is even more extreme: one person is their own father, mother and child – a man travels into the past, seduces a girl and has a child with her, only to discover that the woman is himself from the past, before he has had to change his sex due to complications when giving birth to his daughter, who was kidnapped right after her birth by a strange bartender from the future, who sent him back to meet the girl in the first place (in the end it turns out that all major characters in the story are the same person, at different stages of their personal timeline). Biologically speaking such a thing would be exorbitantly improbable – “the likelihood of this is the sort of probability that a kettle has of freezing on a hot stove” (Grey 68) – but not entirely impossible (some scholars, however, claim that it is impossible, e.g. Macbeath, Godfrey-Smith, Harrison, Nahin 319-323): a child gets half of his or her chromosomes from their father and the other half from their mother; if mother and father are the same person, then their chromosomes are exactly the same. In the event of father, mother and child being the same person, the chromosomes given from the mother would have to

be the exact other half than those given from the father, so that in the end they could add up to form the original pattern again. This would then mean that the offspring would be a clone of its parent. Hanley recognizes the same necessary coincidence that he detects with all causal loops and therefore promptly comes to the conclusion that in the case of such a genetic paradox the whole person would be an information loop (Hanley 139-41; cf. chapter 1.3.5.1). As has already been said above, this is extremely unlikely to happen, but technically speaking it would not be impossible either – and in *The Doctor's Daughter* (4.6) it actually does happen.²²

What about if I were to kill somebody in the present and then flee into the past: ought I to be hanged in 1890 for committing a crime more than a hundred years later – which, at this point in 1890, have not even committed yet? In fact, I had not even been born in 1890. Another example would be a married man travelling back in time and then marrying another woman: would he be a bigamist? And if he indeed be prosecuted for bigamy, with which woman is he bigamously married? The wife in the past will be dead before the other might even be borne – and the law allows for re-marriage after the first spouse is deceased (Harrison, *Dr. Who* 21). Is that then a valid defence? Kaku and Dwyer also raise this point. The main question is whether the personal timeline of the offender, or the objective timeline of the community is to be used as a baseline.

Another rub is here to be found in the question whether it is appropriate to consort to pre-punishment, i.e. the punishment of crimes before they have occurred. This idea is elaborated at great length in the movie *Minority Report*, where people are charged and detained purely on the basis of visions of three oracles. Robinson (589-90), quoting Smilansky, identifies the fact that pre-punishment involves the punishing of innocents as the most obvious objection to pre-punishment. He then goes on to say that, if compatibilism is true, then it would already be determined that somebody was going to commit a crime and the fact that it has not happened yet would bear no moral significance as it would only be a mere matter of time. There does not seem to be any answer ready to this problem; but since it is not yet possible to predict the future yet, there still is some time left to find a solution – if there actually is one.

²² A genetical-restructuring machine scraps off a little of The Doctor's skin, apparently rearranges the chromosomes to some extent and creates a girl – The Doctor's daughter.

1.2.5 Determinism and free will

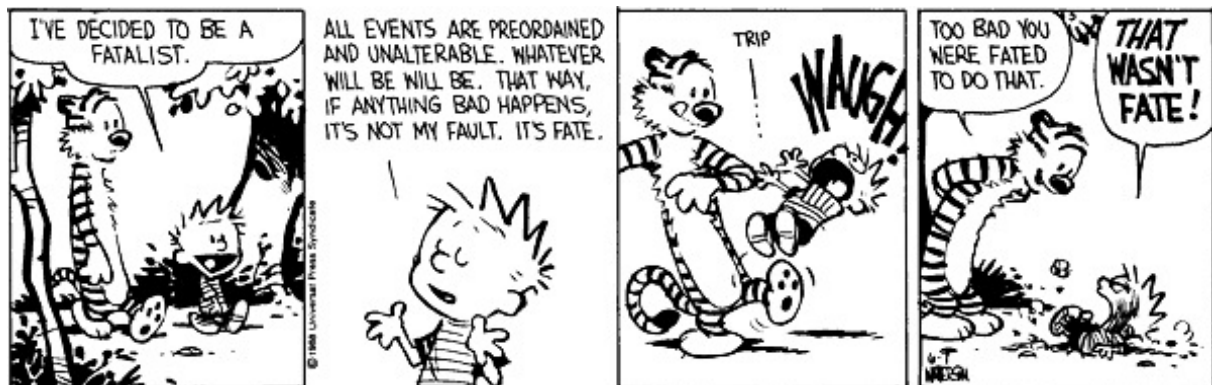


Illustration 4: Fatalism and Predeterminism

McKenna (n.p.) defines free will as "the unique ability of persons to exercise control over their conduct in the fullest manner necessary for moral responsibility". He adds that free will is accountable for any morally significant conduct. Determinism is, according to McKenna, that "the facts of the past, in conjunction with the laws of nature, contain every truth about the future" (cf. also Toomey 344). In determinism every event is the necessary result by the events preceding it, which means that at any moment of time there is only one possible future. This of course treads loose the avalanche of all difficulties, complexities and paradoxes involving free will. In the context of time travel this would put forth the question whether I am free to kill my younger self or whether I will be prevented by whatever fanciful means the universe might come up with. As this is a somewhat absurd notion, it is often dragged forward as an argument against the possibility of time travel. However, Riggs (57) rebuffs that argument as he claims that the absence of free will is not a requirement for the possibility of time travel: as I have already mentioned above in my chapter on the laws of physics, it is impossible to execute impossible actions, no matter whether time travel is involved or not or whether one has free will or not. Just because I want to fly does not mean I can – on the other hand, just because the laws of physics

forbid me to fly just as I am on my own, it is perfectly possible to fly provided one has the right equipment to do so. Accordingly, Riggs argues, people in a universe containing CTCs cannot be denied free will either, simply on the basis that they, too, are incapable of doing the impossible. In my opinion, this implies that there have to be some laws of physics then that directly or indirectly (the latter being the more likely candidate) prevent either time travel, or at least alteration (this would, however, be falling victim to the second-time-around fallacy which says that things happen once and only once and ergo cannot be altered). In a certain way, this would come down to the same ideas put forth by Hawking in his time protection conjecture.

In time travel, the main problem about determinism and free will basically arises out of the notion about changing or influencing the past. While it is usually believed that, even if it is impossible to change the past, it is possible to change or influence the future. Smart (*Reality* 149), however, sees that differently: in his opinion it does not make any more sense to talk about altering the future than it does to talk about altering the past. Grey seconds this idea:

On the one hand we believe that if something has not happened yet then maybe it will not. [...] But if what has not yet happened is necessary for what has already happened then happen it must. We are all fatalists about the past, but reverse causation extends the same considerations to the future.
(Grey 62)

In this sense, the past is just what has already happened, and the future is merely what is going to happen; both cannot be changed: “Future possibility is just present ignorance” and “[t]he fatalism which everyone accepts about the past applies equally to the future”. It should, however, also be noted that “the absence of real alternatives in no way entails the existence of coercion or inexorable compulsion to act in a particular way” (all quotes taken from Grey 65). Hanley’s (147) point of view in this matter is rather close to Grey when he asserts that any asymmetry that we might perceive between past and future is, at best, only one of degree: “there is a lot we know about the future, and a lot we don’t know about the past.” For Gale (231) a universe in which all events involving human choice are already determined would leave no place for human creativity or, as already implied, choice, thus resulting in there being no significance to human existence.

1.3 “Is it ok if I get a headache?”²³: Time travel paradoxes

1.3.1 What are paradoxes and how do they work?

We have now come to the most beguiling effect of time travel: paradoxes. The unnerving thing about paradoxes is that they do not appear to have any solution. Falletta (9) says about paradoxes that they are not only very hard to comprehend, but also that they could be seen as “a truth, standing on its head in order to receive attention”. The term paradox originally comes from Old Greek, from ‘para’ and ‘doxos’, which could be translated as ‘beyond belief’. Paradoxes today can have a number of different meanings. Falletta mentions three forms of paradoxes: firstly, a statement that appears to be contradictory, but is not; secondly, a statement that appears to be true, but is not, and thirdly, a chain of proof that leads to contradictory deductions and implications. In the context of writing fiction Gale (226) sees paradoxes as a dramatic technique which can be used to shock the audience and make the world appear in a different light. Ryan has found a wonderful way to sum up paradoxes and the way we relate to and deal with them:

Whether temporal or not, paradoxes are the unimaginable at the heart of an imaginable world. We deal with them logically by putting them in quarantine, so that they will not infect the entire fictional world; we deal with them philosophically, by regarding them as thought experiments aimed at destabilizing common-sense conceptions of time; and we deal with them imaginatively, by putting ourselves in the skin of the characters whose life is being invaded by the irrational.
(Ryan 160)

On a different note, there is a famous illustration for the workings of the Special Theory of Relativity, which calls upon the so-called ‘Twin Paradox’. This runs as follows: one twin, let us call him John, leaves Earth on a fast rocket ship and carries with him a watch, while his brother, Joseph, stays at home, clinging to his own watch, counting the minutes until John’s return. Since John is moving much faster than Joseph, time for him passes much more slowly, thus resulting in John being much

²³ Lois on time travel and different dimensions (*Lois and Clark: The New Adventures of Superman: Tempus Anyone?*, 00:06:32).

younger than Joseph upon John's return to Earth. However, this specific, so-called paradox is not a paradox at all, since the effects of time dilution – time progressing more slowly from the point of view of somebody in motion – are a simple consequence of the Special Theory of Relativity.²⁴ This illustration for the effects of the Special Theory of Relativity therefore does not classify as a 'real' paradox in the same way as the other paradoxes in this thesis do.

1.3.2 Types and characteristics of time travel paradoxes

The main problem that time travel brings with it is the possibility of influencing or changing the past. This appears to be a rather upsetting notion for our human psychology, considering that everybody seems to be trying to find ways around or solutions to the paradoxes that might be the result of changing the past. There are those who suggest multiple universes, deliberately (by cosmic chaperones) and/or accidentally (by chance) placed banana peels and perfectly maintained guns that develop a tendency to get stuck just when that obnoxious grandfather finally is in perfect reach. Others simply decide that the past is fixed anyway, and as it happened only once, the outcome of whatever I try and do is what has already happened (second-time-around fallacy). The main purpose of paradoxes, at least in discussions on a logical or philosophical level, appears to be to "highlight the contrast between the analysis of physical possibility in a spacetime with tame global structure and in a setting with CTCs" (Earman, Smeenk and Wüthrich 99). There are plenty of examples of and proposed solutions for paradoxes, as shall become obvious in a moment.

Horwich (*Paradoxes* 433) lists a number of alleged paradoxes of time travel, most of which can be dispelled with rather quickly. As I have mentioned before, sometimes the process of time travelling itself is considered a paradox, as the time necessary for traversing a certain temporal distance may be more or less than the actual duration

²⁴ However, as there are accelerating frames involved – for John's ship has to accelerate to reach his very, very high travel speed and consequently also to decelerate when returning to Earth – cases like this cannot really be handled by the Special Theory of Relativity (cf. Horwich, *Time Travel* 432).

of that interval as measured by an observer. This can be dealt with easily indeed, as it is merely necessary to give up the notion of absolute time and instead relativise time to different frames of reference. This is one of the basic concepts explained by the Special Theory of Relativity and should not lead to any confusion with ‘real’ time travel paradoxes.²⁵

The next paradox that Horwich presents is connected to Leibnitz’s Law, which states that “the principle that if one thing is identical with another then any property possessed by the one is also possessed by the other” (N. Smith, *Problems* 157). The problem is perceived in an incompatibility of unrestricted time travel with this law. Allow me to give an example from Horwich (434-5): a beardless John from 2010 travels back to the 70ties where (or rather when...) he then marvels at his former self, who is displaying a most lavish amount of facial hair. According to Leibnitz’s Law, beardless John₂₀₁₀ is the same person as bearded John₁₉₇₀, ergo the two Johns should have the same properties – what is then to be made of the difference of the beard? The proverbial rub can be found in the attention paid to tenses: as long as the property of having a beard is employed timelessly, i.e. in the sense of having a beard at some time or other, this can be true of both John₂₀₁₀ and John₁₉₇₀. There can only be argued to be a problem if a temporal index were to be built into the property of ‘having a beard’, as this would then be, for instance, ‘having a beard in 1970’. Any John who shares this property – and if they are the same, then, according to Leibnitz’s Law, they would be bound to share this property – would have to have a beard in 1970. However, even this problem can be taken care of by simply taking into consideration the different personal times (Horwich calls personal time ‘proper time’) of the two versions of John: at some proper time t John₂₀₁₀ displays a beard in 1970, while John₁₉₇₀ has a beard in 1970 at some different proper time t' (cf. Horwich, *Paradoxes* 434-5).

Differentiating between proper time and absolute time also helps to solve a paradox reported by N. Smith (*Problems* 156), which combines the problems considered in

²⁵ Smith (*Problems*, 156) sums up this aspect of the Special Theory of Relativity in a very concise and accessible way: “The fundamental principle of Einstein’s Special Theory of Relativity is that all observers measure the same value for the speed of light in a vacuum – and from this it follows that observers moving relative to one another measure different temporal intervals between the same events. In particular, a clock carried aboard a fast rocket runs slow relative to a similar clock on earth – and the faster the rocket travels, the slower the clock runs. This *time dilation effect* [original emphasis] implies that any traveller can, simply by travelling fast enough, become a time traveller.”

the first two examples by Horwich. In N. Smith's version a time traveller departs, let us say, in the year 1980 when he or she is twenty years old. The journey lasts one year and our traveller arrives happily, if maybe a little hungry and in need of a bath, in 2010. Our chrononaut has thus traversed thirty years in just one year and is, fifty years after his or her birth, only twenty-one years old. As already mentioned, taking into consideration the different frames of references of absolute and personal time, the alleged paradoxes in this examples can, along the same lines as in the two examples before, be soundly rebuffed as well.

The third paradox Horwich lists is already much more in the direction of the paradoxes that I am exploring in this thesis:

Whatever has already happened cannot now be undone. But if someone could return to some time in the past he would be able to bring about some state of affairs which as a matter of historical fact did not occur at that time.

(Horwich, *Paradoxes* 435)

According to Horwich this would clearly be a contradiction, and it is subsequently possible to infer either the impossibility of time travel or the existence of "mysterious forces which conspire to prevent [time travellers] from bringing about such contradictions" (Horwich, *Paradoxes* 435). This problem²⁶ brings with it determinism and special constraints, which have also already been dealt with in the chapters on determinism and time travel and the laws of physics and which will also be discussed in more detail in the following chapter, in which I will look at the so-called 'banana-peel-mechanism' and its implications. In order to avoid redundancies, I shall keep the discussion of this problem at this point to a minimum. Let it only be said that Horwich (*Paradoxes* 434ff) works his way around the problem by claiming that in fact, there is not even a question of changing the past and, consequently, neither are there any special, bizarre constraints or other infringements of free will that are bordering on determinism: John, who is a committed patriot and who harbours a deep dislike of all things French, might have been able to travel back to the Battle of Hastings with the firm intention of preventing the French from invading Britain; the fact that history remains unchanged (something I will come back to in a minute) and the fact that there is not even a record of John's visit to the battle field do not imply that John has

²⁶ Cf. the standard argument for fatalism (cf. also Horwich, *Time Travel* 435).

been prevented from fulfilling his dream of a French-free English language by some bizarre constraints working their almost magical ways. John could have simply abandoned his original plan, without there being any outside events forcing him to do so. As Horwich (*Paradoxes* 435) puts it, “[f]rom the fact that someone did not do something it does not follow that he was not free to do it”. According to Riggs (51), Lewis (*Paradoxes* 150) states the obvious explanation that sometimes people simply fail to do something that they are normally able to do. It has to be noted, though, that this, in Lewis’s context only seems to appear to a single event – to which Riggs (52) answers that only because they were unable to achieve something one time, it cannot be inferred that they will also fail on other occasions, so Lewis’s argument does not work as a general explanation for a general lack of success (Riggs 51).

Horwich’s fourth paradox (*Paradoxes* 437) addresses the issue of beliefs and decisions: “How can I feel so sure that I am in the presence of my earlier self and that I have never been punched on the nose, when I also know that I have not yet decided whether to punch this person on the nose?” In this sense “unrestricted time travel would force the time traveller to hold inconsistent beliefs”. The difficulty with decisions is that they require a transition from a state in which a decision has *not yet* been made to a state in which the decision *has* been made: “Before he has made the decision, he does not know what he is going to do, afterwards he does know.” If I accept this definition of a decision, however, then it can happen to me that I feel that I will eventually decide to do something which I have not yet actively decided to do: I can feel sure that I will not punch my earlier self and at the same time know that I have not yet decided not to do so (all quotes from Horwich, *Paradoxes* 438).

The last paradox that Horwich (*Paradoxes* 439) introduces is originally taken from Earman (231). In this paradox Earman tries to create a paradoxical situation that is not dependent on human agency, so that free will cannot complicate the matter:

Consider a rocket ship which at some space-time point x can fire a probe which will travel into the past lobe of the null cone at x . Suppose that the rocket is programmed to fire the probe unless a safety switch is on and that the safety switch is turned on if and only if the ‘return’ of the probe is detected by a sensing device with which that rocket is equipped. Is the probe fired? We find that the answer is that it is fired if and only if it is not fired, which is a contradiction if standard logic holds. (Earman 231)

The auto-infanticide paradox has much in common with Earman's above paradox: for auto-infanticide would appear as impossible as failure is a necessary condition for success. This is Horwich's explanation for the parallels between the two paradoxes:

Each case concerns a type a [sic] causal chain which, when located along an ordinary open timelike curve [i.e. a timeline involving no time travel], creates no difficulties. The problems arise when one imagines the same type of causal chain, but laid along a closed timelike curve. This is because what would normally be the end of the causal chain may be incompatible with what would normally be its beginning. Thus common or garden causal chains may be self-defeating in the context of a closed timelike curve.
(Horwich, *Paradoxes* 442)

What possibilities are there then to resolve such matters? Kaku (225) offers fulfilling the past, changing the past within limits and splitting universes. We shall see what might be possible – and why it might, in fact, be not – in the next chapter.

1.3.3 The second-time-around fallacy and changing the past

“What's been done cannot be undone.”
Lady Macbeth (*Macbeth* 5.1.65)

“The time is out of joint: O, cursèd spite
That ever I was born to set it right!”²⁷
Hamlet (*Hamlet* 1.5.189-90)

The greatest wish of human beings seems to be able to change the past – and rightly so, for would it not be wonderful to not do something that in hindsight was a really stupid or unfortunate thing to do? Or, take today's lottery numbers back to last week

²⁷ This quote has a little amusing quirk to it: David Tennant, who starred as Hamlet in the 2009 production of *Hamlet* by the RSC, also played The Tenth Doctor in the BBC Series *Doctor Who*.

and pick up a million pounds upon returning to the present? Lamentably, this does not seem to be within the realm of the possible – and I am not talking about the rather obvious lack of a functioning time machine: apparently, changing the past is impossible and influencing it would only result in the actual present. Slusser and Chatelain state quite offhandedly that there would only be one way to go: ever into the future (*Communication* 177), which renders thinking about changing the past rather superfluous. While this view can of course be challenged to one's heart's content – and there are enough scholars who do so – I shall concentrate on two aspects that both accept time travel into the past as possible, but which challenge the assumption that the past can be changed: firstly, the second-time-around fallacy, i.e. the idea that the past would happen more than once, and secondly, the difference between changing and affecting the past.

1.3.3.1 *The second-time around fallacy*

The main hurdle in time travel stories and changing the past seems to be the misunderstanding that an event can come around twice. As N. Smith (*Problems* 156; *Bananas* 365) notes, “there can be no first time around of a set of events, with the time traveller absent, followed by a second time around of the *very same events*, with the time traveller playing a role” – otherwise it would be multiple universes or time dimensions (Simon Hawkes proposes a splitting of the time stream in *The Nautilus Sanction*). The first and second part of *BttF* also play with this phenomenon. In *Problems* (156) N. Smith further explains the complexity of the situation like this: “If a time traveller is going to travel to some past time, then they *have already been there*; if they are going to save a life when they get there, then they *have already done so*.” This principle is followed to the letter by *TTW*, where Henry is faced with the death of his mother, the death of a child at an ice-hockey match and even his own death. Failing to see that the past cannot be changed would mean to succumb to the second-time-around fallacy, i.e. to imagine that backward time travel would give one a second go at the very same events that constitute one's past. Dwyer (*Changing* 344) sees much of the confusion about the logical possibility of time travel stemming from thinking of a first time and a second time (or even more times). Dwyer's point of

view is basically the same as N. Smiths: no time traveller can travel back (as opposed to forward) to a time he has not already visited.

Hanley (125) even goes so far as to claim that there are in fact two fallacies, namely that change is possible and that everything is repeating endlessly (which is, however, the concept in *The Stone Gods* by Jeanette Winterson) – although, in Hanley's case, this refers also more specifically to causal loops: it is "apparently very tempting to think that each event in a causal loop occurs *more than once*". The primary point is to realise that "[e]ach event is an individual, uniquely located in space-time." Macbeath (410) tries to further throw light onto this Gordian knot of entangled time-lines, world-lines and recurring events by bringing internal and external time to the matter – every event can only happen once; they may, however, come around twice in the time traveller's experience: an event may have two values on the time traveller's time scale, but only one on the external time scale (Macbeath 410).

Smart (*Future* 149) applies the same concept also to the future: in the same sense that changing the past is impossible, it is also impossible to alter the future. If I try to change the future by doing A rather than B, then the events brought about by A just were the future. As there are no alternative pasts, neither can there be any alternative futures (which brings us, again, back to the issues of determinism and free will).

1.3.3.2 Affecting vs. changing the past

Closely related to the second-time-around fallacy – the assumption that things happen more than once – is the controversy of whether it is possible to change the past, i.e. bring about an event that as such did not occur. N. Smith (*Bananas* 365) proposes that time travellers can affect the past, but questions whether it would be really possible to change it. Horwich (*Paradoxes*) touches on the same problem, but what N. Smith calls 'affecting the past', he calls 'influencing the past'. Horwich (*Paradoxes* 435) remarks that while time travel allows for influencing, changing the

past would be logically impossible²⁸. This would also be true for the future: “We can bring about future events, but we cannot bring about an event that will not occur.”

Where then is the difference between changing and affecting? N. Smith (*Bananas* 366) offers as an explanation for the impossibility of changing the past that nobody can do something contradictory, such as proving that $17=7$. This as such is a good example, but it does not help much to illustrate the difference between changing and affecting the past. Vranas (*Milk* 4) also offers the idea of replacing the past and that this would also count as changing it, e.g. replacing the past of a horrible death by committing suicide beforehand. Referring to standard theories of change, the conception of changing the past by replacing it can be objected to – Lewis (*Paradoxes*) argues that a replacement would not be ‘genuine’ or ‘literal’ change. Changing the past would have to include a qualitative change of the past (Vranas, *Milk* 2).

Affecting the past would involve something that Ney calls ‘fulfilment activities’ (315). According to Hanley (147), an “informed time traveller would see the fact that a past event occurred as reason to bring it about if necessary”, which basically means that a time traveller might attempt to bring about something that has already happened (Harrison, *Dr. Who* 18). Ney (315) takes the Kennedy-shooting as an example to illustrate how the actions of the time traveller influence the events of the past to bring about the past as we know it. In fact, he identifies four different possibilities how this influence could be exerted: in the first case, the time traveller commits the murder “in a state of ignorance regarding the inevitability of his actions”; in this case the time traveller would be nothing more than a “gunman with a grudge”. In the second case, the time traveller is fully aware of what he or she is doing and what the consequences are, but accepts it and sees him- or herself as a maybe “reluctant but submissive puppet in the hands of fate” (all quotes from Ney 315-6). Thirdly, the time traveller could actively try to prevent Kennedy’s murder, but despite everything he or she does, the murder happens anyway. In this context Ney (316) also mentions that it could even be the precise actions, which the time traveller takes to prevent the murder, that bring the murder about in the first place – the time traveller would change the past from the unactualized way it would have been without him to the one

²⁸ As we do not as of now have any experiences with changing the past, any proof that something is ‘impossible’ can in this sense only be made within the realm of philosophy by means of logical deduction and implication.

and only way it actually is; simply being there would be enough, however unobtrusively the time traveller acted (Lewis, *Paradoxes* 149). This twist of events is also a popular theme in time travel stories (e.g. *BP*). The last point would be the time traveller being a “psycho” (Ney 316), who knows what he is going to do, embraces and even relishes in it.

Apart from the already mentioned theme of the time traveller causing the events they were trying to avoid, there is another popular one: the necessity for the time traveller “to secure some significant fact about the present, such as the time traveller’s own existence. It may be that the traveller [...] is one of his or her own ancestors” (Grey 67). *Kindred*, *BttF1*, *AYZ*, and Harrison (*Problem*) all use this theme; some (e.g. *AYZ*) in a more extreme form than others (e.g. *Kindred*). In any case, the time traveller still would not change the past: if he managed to succeed in his mission, he exists and is therefore able to bring about the events in the past that secure his existence – “[t]he time traveller does not undo what has been done or do what had not been done, since his visit to an earlier time does not change the truth values of any proposition concerning the events of that period” (Dwyer, *Affect* 384). This point of view seems to be the most widely accepted one today.

If we take this as a starting point for an analysis of how time and changing it is handled in the science-fiction world, we are in for a surprise. While some stories go with the concepts outlined above on purpose, some other stories simply ignore them. In the case of *Doctor Who*, something even more interesting happens: up to and including series four, time could not be changed or messed with; only minor events were allowed to be modified, but big, key-moments needed to stay unaltered. However, if I have read all – sometimes slightly contradictory clues – correctly, then in series five something remarkable happened: seeing as time could be un-written by cracks in space-time brought about by an exploding TARDIS, time could then, all of a sudden, be re-written as well. It is far from me to insinuate anything, but one cannot help but notice certain similarities with *Star Trek*. In 2009 the franchise has been, mildly speaking, rebooted, chiefly by having Spock and some Romulan villains travel into the past – through a black hole – which consequently undoes whatever has happened before and therefore leads to new fates and destinies for all: anything that had happened ‘before’, i.e. in the past as it would have been without an old Spock showing up, the whole canon of TV-series and movies basically could be thrown out of the window:

Kirk: But you say he's from the future, knows what's gonna happen?
 Then the logical thing is to be unpredictable!
 Spock: You're assuming that Nero knows how events are predicted to unfold. The contrary, Nero's very presence has altered the flow of history, beginning with the attack on the *U.S.S. Kelvin*, culminating in the events of today, thereby creating an entire new chain of incidents that cannot be anticipated by either party.
 Uhura: An alternate reality.
 Spock: Precisely. Whatever our lives might have been, if the time continuum was disrupted, our destinies have changed.
 (*Star Trek*, 1:07:38)

Apart from the characters explaining these new circumstances in the movie, doubtless for the benefit of the audience, the point is driven home rather bluntly by collapsing Vulcan into a black hole and by dreaming up a relationship between Lieutenant Uhura and Commander Spock (which, for *Star Trek* fans, is probably even more radical than turning Vulcan into a singularity).

1.3.4 Why time travel could lead to a shortage in banana peels and upset PVC

1.3.4.1 Of banana-peel-mechanisms and chronology protection conjectures

By travelling in a space ship on one of these [CTCs], one could travel into one's past. This would seem to give rise to all sorts of logical problems, if you were able to change history. For example, what would happen if you killed your parents before you were born. It might be that one could avoid such paradoxes by some modifications of the concept of free will. But this will not be necessary if what I call the *chronology protection conjecture* is correct: *The laws of physics prevent closed timelike curves from appearing* [original emphasis].
 (Hawking 604)

In this quote Hawking addresses the main problems of time travel – time travel paradoxes and issues involving free will and changing the past – and proposes that the laws of physics will prevent any CTCs from occurring. Hawking calls this the chronology protection conjecture. N. Smith (*Problems* 156) denies that there could be anything such as changing the past; as has been shown above, only affecting the past is possible. Everett (124023-2) explains that, since the laws of physics cannot

accommodate any self-contradictory predictions, certain constraints need to apply when CTCs are formed (i.e. when time travel is or becomes possible). Everett chooses the grandfather-paradox as an example to explain what consistency constraints could entail:

For example, in the case of the grandfather paradox we might insist that the initial conditions just before the prospective murder include the presence of a strategically placed banana peel on which the prospective murderer slips as he pulls the trigger, thus spoiling his aim. One might refer to this approach as the 'banana peel mechanism' [...]. (Everett 124023-2)

This 'banana peel mechanism' has naturally triggered a certain opposition as it seems rather contrived indeed (cf. Earman, Smeenk and Wüthrich 98). Earman, Smeenk and Wüthrich argue that no 'Cosmic Chaperone' is required to make sure that any necessary constraints or banana peels are present – any constraints would be entailed by "the conjunction of the local laws governing the fields and the global structure of the spacetime on which the fields are propagating", by which these constraints would gain a law-like status (Earman, Smeenk and Wüthrich 98). Some science fiction writers respond to the auto-infanticide objection (i.e. the grandfather paradox) by saying that backward time travel *is* possible, as long as any time travellers are accompanied by chaperones who prevent them from changing the past (cf. N. Smith, *Problems* 157). From Lewis's (*Paradoxes* 148) point of view, such chaperones are unnecessary as well: if the time traveller fails, they fail for some "commonplace reason". However, in TTW Henry is sometimes unable to move or even speak if he wants to intervene in the sense of changing something, which raises the question whether Niffenegger might be using some sort of implicit cosmic chaperone²⁹.

In any case, if we rule out any semi-mystical chaperones, this still leaves the question why the time traveller cannot fire the gun or, if the gun can be fired, why only in certain directions. Gorovitz (367) singles out two possibilities of how this could be explained: "Either the gun is not behaving as the normal physical object we take it

²⁹ When Henry wants to do something in the past of which he knows that he has not done it, or when he wants to prevent something from happening, he suddenly cannot move or even say something, e.g. when the two boys are in Henry's room and his father comes in (57) or when Henry cannot stop the puck from killing the girl at the ice hockey game (57, 58). There is no explanation as to why he suddenly seems to be frozen, which could be taken as an indication for some other force that is stopping him, i.e. some sort of cosmic chaperone (this chaperone does not necessarily have to be a person).

to be or the notion of voluntary action does not apply in the usual way.” Another approach would be to say that for whatever reason it is that the gun cannot be fired, it would be, in any case, because of a coincidence, which takes us back to the ‘banana peel mechanism’. While Horwich (*Asymmetries* 97) admonishes that such a run of coincidences would be extremely improbable (for if the time traveller was persistent and launched one attack after the other, the whole place would have to be littered with metaphorical banana peels), N. Smith (*Bananas* 363) does not appear to see any major problems with that: time travel and coincidences go hand in hand. Riggs (55) adds that not all failed attempts must necessarily have to be attributed to events and objects in the ‘local’ past, i.e. the past as if there was no time traveller; some plan-thwarting-mishaps could have been induced by the time traveller himself, e.g. standing himself in the way. Last but not least, N. Smith (*Problems* 157) raises the very good question why anyone should go through all the trouble of trying to kill their younger selves if the person in question clearly remembers that all attempts have been unsuccessful. An answer to that question could be that the time traveller suffers from amnesia, or if that is not the case, that they might be truly determined to change the past after all – in the sense of maybe getting things right this time. Another, maybe less sophisticated, answer might be that they simply enjoy seeing all their attempts being somewhat miraculously thwarted.

1.3.4.2 The principle of V-correlation: PVC

PVCs are another cause for time travel induced headaches. In this context PVC would not refer to polyvinyl chloride, but rather to the principle of V-correlation (N. Smith, *Bananas* 367-8; Horwich, *Asymmetries* 97-8). The gist of this principle is, put simply, that the connection between different events can normally be graphically depicted with in upside-down letter ‘v’: each event being the cause of the next one, to the end that a chain of events would be branching out as time commences, having less and less to do with each other, apart from one common origin. An inverse fork, i.e. a graphical representation looking like the letter ‘v’, would then be the opposite, namely unrelated events being only connected by an event in the future, to which all chains of events converge:

[I]f events of type A and B are associated with one another, then either there is always a chain of events between them [...] or else we find an earlier event of type C that links up with A and B by two such chains of events. What we do not see is [...] an inverse fork – in which A and B are connected only with a characteristic subsequent event, but no preceding one.

(Horwich, *Asymmetries* 97-8)

Clearly, seen from this point of view, inverse forks would be highly improbable. As N. Smith (*Bananas* 368), however, notes – and I have to agree with him here – that Horwich has got things back to front. PVCs concern what has been observed – they are a *de facto* principle, not a modal force. I was only born because my parents met. My parents met quite by accident; there was a whole string of coincidences that resulted in my parents ending up in the same little pub that none of them had ever been to before at the same time. It was entirely by coincidence that my father spotted my mother and decided to ask her to dance. If I were to start with my birth as a fixed event in time and work my way backwards through all the coincidences that were necessary conditions for my birth to occur, then I would end up with an impressive list indeed – exactly what Horwich would call an inverse fork, i.e. a violation of the PVC. However, it is perfectly clear that these coincidences were not required to bring about my birth; because they just happened to occur, my birth took place, making them purely *de facto*. (cf. N. Smith, *Bananas* 376)

Along the same lines there is something that N. Smith (*Bananas* 386) calls ‘forcing coincidences’: if my older self tells me that I will get into a time machine, take a trip through time and upon my arrival tell my younger self that I will get into a time machine, take a trip through time and upon arrival tell my younger self about the trip and so forth, then this is what I will end up doing: the tale conforms to my actions – the tale is as it is because of what I did (however I got to do it or for whatever reasons I did it), but my actions were not forced to conform to the tale, e.g. by any mystical powers; they were the result of choices made out of free will.

1.3.5 The paradoxes that will be dealt with in this thesis

It can be said that all paradoxes are related to some degree; however, causal loops and the grandfather paradox are usually being agreed upon as being the two major types of time travel paradoxes (Toomey 343). In this thesis I shall deal with these two, but I shall also address the butterfly-effect, i.e. that some small event may have large-scale consequences and unforeseeable repercussions at a later point in time. While it might be argued that the butterfly-effect is as such not a true time travel paradox, it is still a device often and effectively employed in time travel stories, which is why I feel it deserves to be also looked at in the context of this thesis. While causal loops and the auto-infanticide or grandfather paradox mostly assume a past that cannot be changed, the butterfly-effect incorporates per definitionem changing the past – however, sometimes it is only the reader who is aware that history in the story changes (e.g. *BP*); sometimes only the time traveller in the story realises the changes upon their return from the past (e.g. *SoTh*). I will talk in greater detail about this special instrument in the tool box of science-fiction writers presently, but first I shall look at causal loops and auto-infanticide.

1.3.5.1 Causal loops and self-creation

It was a simple pattern – as simple as ever was.
Must we think only in terms of a beginning and an
end? Cannot a thing – even a person – exist in a
closed cycle without beginning or end?

As Never Was, Shuyler Miller (cited in Hanley 142)

Ryan (151) says about causal loops that they are logical monstrosities, and there really is not much to add to that, at least not to describe the effect they seem to have on a human brain. As Tempus puts it in the episode of *Lois and Clark: The New*

Adventures of Superman: Tempus Anyone? (00:02:20): “I suppose time travel can be a real brain-drain.”³⁰

Toomey (343) defines the bootstrap paradox as “[a]ny of a variety of conditions that, by way of futureward and pastward time travel, in effect become their own cause and may produce a jinn.” A jinn would be “a hypothetical entity that seems to have been created from nothing and whose world-line traces a CTC”, i.e. something that exists without ever having been created and whose worldline in a space-time diagram would appear as closed. I also call this concept ‘self-creation’, as its existence is entirely self-dependent (cf. Ney 316). Auto-infanticide would be a self-defeating causal loop.

Lewis (*Paradoxes* 148) describes a causal loops as every event on the loop being causally explicable in so far as it is caused by other events elsewhere on the loop. While every single event can thus be explained, the entire loop may, however, be well beyond explanation: “The parts of the loop are explicable, the whole of it is not.” Hanley (138) objects here: since any events on the loop would involve both internal and external causes, the loop could be explained by explaining all its parts. Hanley (123) holds the view that causal loops are neither logically nor physically impossible; the only objectionable feature would be the coincidences needed to explain them. He further adds that “if causation is transitive, then every event on the loop is both a cause and effect of every event on the loop, including itself” (125). As has already been suggested above, fulfilment activities can also be closed causal loops – e.g. Kennedy’s murder makes a time traveller go back in time with the wish to save him, but with his actions brings about Kennedy’s murder in the first place (cf. Ney 316).

While Lewis sees causal loops more in isolation, Hanley (125) argues that causal loops need not be ‘detached’ from the rest of the world as it is essential for the existential equilibrium of the events comprising the chain to be compatible with

³⁰ A statement which is soon followed by one of the characters asking whether it would be ok to get a headache (00:06:32) and H.G. Wells building a device to trace down his time machine (which the bad guy Tempus has stolen to abduct Lois and create a world without Superman in a parallel dimension) – by relying on the radiation emitted by the flux capacitor (00:10:10). In defence of the series it should be said that it is from the nineties and that the flux capacitor was probably (hopefully) intended as a joke and/or an inter-textual reference to *Back to the Future*. Since H.G. Wells shows up whenever time travel is necessary, much like a means to an end, I am not sure whether the same can be said about him as about the flux capacitor.

nearby events, so that any influences can balance out. This is also pointed out by Riggs (63).

In *Retro-Suicide* (2) Vranas points out that there can be causal and information loops. An information loop would be, for example, the transfer of information in *Time Crash* (4.0; see above). Hanley, following Macbeath, differentiates certain types of loops as well, namely object loops and information loops. An object loop would be a tangible object that exists on a closed worldline, e.g. the notebook in *BhBst* (131). Object loops can involve restoration problems: no object can go from young to old and then mysteriously, against all laws of thermodynamics, back again to young; however, within an object loop any change has to be changed back, e.g. pages reattaching themselves to the notebook, pages becoming not worn again, any atoms lost must be returned and any atoms gained must be lost (Macbeath 417). Normally, causal relations between stages only have to be counterfactually supporting in one direction, but within a causal loop this counterfactual dependence goes both ways (Hanley 131-3).

As mentioned above, an information loop encompasses the transmission of information; there is, however, no origin of that information. As Lewis asks quite pointedly in *Paradoxes* (74): “But where did the information come from in the first place?” This kind of paradox can often be found in time travel stories; in *TTW* Henry learns the dates in Clare’s diary by heart only to be the one to tell her to write them down; in *The Shakespeare Code* The Doctor quotes some of Shakespeare’s most famous lines, which are then used by Shakespeare, in *Blink* (3.11) a whole dialogue generates itself and in *BttF1* Marty’s mother decides to name her son Marty because of a nice boy she once knew – who is nobody else but Marty himself. What makes information loops slightly less problematic is that the restoration problem does not arise. Naturally, there is still the problem where the information originated in the first place, but it has been argued that this issue can be solved by assuming that everything encodes everything else. All information would then exist in an either decoded or undecoded form, which would imply that if I had the means to decode the information around me, I could get any information about everything. (Hanley 131-3) The already mentioned genetic paradox would also count as an information loop; in this case an entire person would form an information loop (Hanley 141). As with all causal loops, coincidence is a vital prerequisite for them to obtain (Hanley 144).

1.3.5.2 The auto-infanticide paradox

Another, probably better known name for the auto-infanticide paradox is grandfather paradox. Thorne (508) decides to call it matricide paradox, based on his musings that “[p]resumably, the chivalrous men who dominate the science fiction writing profession feel more comfortable pushing the murder back a generation and onto a male.” For Riggs (50) retro-suicide (Vranas, *Retro-Suicide 2*) is the principal paradox of time travel, and Vranas classifies it as a consistency paradox, i.e. a paradox that involves the possibility of creating an inconsistency (*Retro-Suicide 2*). Toomey (346) defines the auto-infanticide paradox as “any variety of conditions that, by way of postward time travel, become self-contradictory”. What basically happens is that a time traveller could travel into the past and kill an earlier version of themselves or one of their ancestors before these were able to procreate, thus ceasing to exist, consequently not being able to travel into the past, meaning gramps will not be (have been?) killed, resulting in the time traveller being alive and on their way into the past.

N. Smith (*Problems* 157) calls the whole process a vicious circle. The fact that the time traveller was there to attempt the murder would entail that he or she had not died young – this logic works, however, only, if any sort of intermittent existence of a person is impossible (*Bananas* 363). Intermittent existence would mean that a person could pop in and out of existence, i.e. that the person’s existence is not continuous or steady (cf. Oxford dictionary). If intermittent existence is possible, there would be no contradiction – the time traveller could show up, kill whoever is on the list and disappear again without any problems – and hence neither a paradox nor an objection to time travel (the contradictions involved in the grandfather paradox are often used as an argument against time travel as such, cf. Hawking, chronological protection conjecture). Thom (212) says that it is logically impossible for a person to go out of and, at a different point, come back into existence again³¹. Riggs (53) believes the same and argues that every being is a continuant entity in space-time and that the very existence of the time traveller already is a sufficient condition to ensure that all necessary ancestors exist and that the time traveller did not die

³¹ Intermittent existence is different from ‘normal’ time travel – when the time traveller traverses space-time in a time machine or jumps from space-time-point to space-time-point, the traveller does not cease to exist, but merely cannot be perceived by us any longer. Thom (212) distinguishes here between existence and circulation – when time travelling the traveller would just not be in circulation.

young. While this explanation is sound enough for most logicians, true time travel sceptics feel that it still leaves something to be desired.

Vranas (*Retro-Suicide* 4,5) tries to bring a little more light to the paradox by dividing it into two different types, namely ability and exertion paradoxes. Ability paradoxes refer simply to what can or cannot be done; exertion paradoxes imply that there will always come up something to prevent me from executing the murder, no matter how hard I might try. The question that is raised in any case is why the attempts are always bound to fail – which brings us partly back to the infamous banana-peel-mechanism mentioned before. In the end it could be that everything only depends on one's point of view: it is only because the murder attempts fail that the child who the time traveller is desperate to eliminate is in fact the time traveller's younger self in the first place, and not some look-alike or a version from another dimension (N. Smith, *Bananas* 373). Speaking in terms of PVCs, the question is not what must occur if the time traveller is to kill his or her younger self, but what did occur – whatever the time traveller is going to do has already been done. So if the time traveller's younger self survived, then *only because* the time traveller failed. Basically, he or she was simply very lucky: the coincidences that kept him or her alive were not entailed by the time traveller's quest to annihilate him or her, but because they *just happened* to occur – as is sometimes the case with coincidences, unbelievable as they may seem – the mission failed (cf. also the movie *Twelve Monkeys*; N. Smith, *Bananas* 374).

Vranas (*Retro-Suicide* 6) raises also another problem, this time more closely connected to the ability paradox. Of course it would be physically possible for me to shoot my younger self – the gun is freshly cleaned, tested and ready, the distance is perfect and there is no chance at all that I might miss. Vranas admits that killing the child before me would be possible if speaking on purely physical grounds – what would be physically impossible is to kill her if she is an earlier stage of mine. The question of what it is, then, that stills my hand or makes me miss is one that nobody seems to be able to answer and which brings us back to Hawking's cosmic chaperones. Jasper Fforde in *The Eyre Affair* at least makes good use of this concept by inventing something that he calls 'chrono-guards'. An interesting question would be what would happen if I indeed did manage to kill my younger self. Would she somehow be resurrected, a bit like Captain Jack in *Doctor Who*, or would I start to vanish, like Marty's siblings in *BttF1*? Macbeath (411) brings another twist to the grandfather paradox: what if the grandfather is a time traveller himself? It would be

possible for him to sire the time traveller's father in the future, travel back to the past and then be killed by the time traveller without any complications or ensuing paradoxes... This is basically how Clare and Henry conceive their daughter: a Henry from the past, before he had gotten a vasectomy, travels into the future and sleeps with Clare, who then gets pregnant. Taking this to a more extreme level, it would even be possible to be one's own parent, as has already been discussed in length.

1.3.5.3 *The butterfly-effect*

While causal loops and self-creation are more concerned with the cause preceding the action, the creation of contradictions and inconsistencies and the absence of any proper, finite explanations, the butterfly-effect focuses more on how small changes in history can amount to having severe repercussions at a later point in time. Causal loops and the grandfather paradox tend to play more with the idea of an epiphany at the end, when the characters realize that it was their own actions that brought about the past as it is and which they wanted to change in the first place. The butterfly-effect requires a changeable past, i.e. that time can be re-written, with the effects of the change in the past rippling through all of space-time, restructuring it according to the new parameters (a bit like the domino-effect); however, it does not seem to be vital for the characters to realise that they are experiencing the results of a butterfly-effect and that things were different before – both characters comprehending that things have changed and characters being oblivious to change can yield interesting results in a story. In *BP*, for instance, nobody realises that there have been any changes; in *SoTh* only the time travellers themselves notice what has happened when they leave the time machine.

A butterfly-effect can be triggered by as little as crushing a butterfly (*SoTh*), or even only germs released by the time traveller breathing; in *BP* it is the mere appearing of the probe in the past that causes a chain reaction – some molecules cannot form, at another point something else – minimal things – goes wrong, and in the end the species sending the probe back in time is not human anymore. According to Ney (319), there would be no difference between the extreme act of detonating an atomic bomb and crushing some beetle: a seemingly significant act could have no long-term consequences at all while a seemingly insignificant act could have far reaching ramifications.

PART 2: Analysis

2.1 The six parameters of time travel

I have determined six different parameters that allow me to analyse different aspects of time travel; in short, in how far different aspects of time travel have influence on the story. Since this becomes clearest when shown in the form of a comparison between time travelling with and without a time machine, I shall illustrate my point in the following by mostly comparing H.G. Wells's *TM* to Niffenegger's *TTW*.

2.1.1 Occurrence

Probably one of the most striking – and disconcerting – aspects of time travel in *The Time Traveler's Wife* is the fact that Henry has almost no control over when he disappears and where and when he is going; Mieszkowski (394) therefore compares his involuntary temporal shifting to epileptic fits. Diametrically opposed to this is time travelling with a time machine, where these three points are determined: the time traveller decides when to switch on the time machine and programmes both the where and the when they want to visit. Comparing the two possibilities, one could call the first one a random form of time travelling and the second a determined one.

Although time travelling as such is an entirely random experience for Henry, there are some things that particularly seem to trigger his shifts, e.g. flickering TV-pictures, loud noises or a heightened level of stress (*TTW* 3). Henry is aware of these and tries to avoid them, which is the reason why he does not have a TV (*TTW* 184) – it might also be one of the reasons for working at the library. On the one hand, Henry absolutely loves books, so working in a library certainly is something of a dream-job for him, but on the other hand, this work provides a calmness that other jobs might not be able to offer. Taking this into consideration, it is surprising that Henry disappears quite often while sorting books or working in the stacks. He seems to be

able to cover up most of these instances, which is certainly due to the fact that he has a fair amount of freedom in his job concerning what he is doing when, but naturally his occasionally not wearing clothes has not gone unnoticed by his colleagues, who think he has some strange fetish involving books and nudity.

While there are some circumstances that seem to trigger time travel, there are also some things that help Henry stay in the present. Henry goes running everyday; it clears his mind and gives him a feeling of having at least some control over his body. At one point when Clare and Henry talk about the frequency of them sleeping together, Henry explains to her that having intercourse makes him feel very connected to her: "Being physically connected the way we are, it's kind of rewiring my brain", which, for him, apparently facilitates staying in the present (*TTW* 225). Since he tells Kimmy that he has barely travelled in the first months of knowing Clare, this might well be true (*TTW* 213). In addition to all this, he also has a profound knowledge of antipsychotic drugs, which he is known to take every so often.

2.1.2 Time

When travelling with a time machine, the chrononaut, e.g. Wells's Time Traveller or the bartender in *AYZ*, can determine what time he wants to visit, the only exception being a malfunction of the time machine (e.g. the story might require the time traveller to strand somewhere (-when) or to arrive at a specific, if unplanned, point in space-time). Henry, on the other hand, has no control to when and where he is going. Ryan describes Henry's time travelling like this:

He seems to have some degree of control over the temporal target of his displacements, for he chooses to visit Clare, his future wife, during her childhood, so as to get to know her over the entire course of her life.
(Ryan 152)

I feel what Ryan says here is problematic, as she ventures to say that Henry *chooses* to visit Clare. As I have already pointed out in my literature review, I fully support Ryan's (152) rather than Mieszkowski's (394-5) view as far as the question of *The Time Traveler's Wife* containing time travel-induced paradoxes is concerned; however, I have to side with Mieszkowski when it comes to this matter here. Henry

does not have any control at all over when he time travels and when and where he is going; this is in fact one of the, if not *the* main pillar supporting the plot of the whole novel. If Henry could decide on these three points – when to leave, where to go and when to go; thus giving him the same control as one enjoys with a time machine – there would be no story, or at least a different one. If the story were to stay the same as far as possible, Henry would have to actively and consciously decide on going back to visit Clare in her past, so that she would then recognize him in the library and thus instigate their relationship. This way the relationship would still be a causal loop³²; the difference would be that Henry consciously chooses to do so rather than being involuntarily dragged off to important points in his past by his subconscious.³³ However, while this way the story could be kept at least roughly the same, the underlying themes of memory (Kermode, BBC5 podcast) and waiting would still change drastically – Henry could not only inform Clare to where and when he will be going at what time and return to her just a second after having left, he would also be able to avoid such things as being stranded in the winter without any clothes (through which he loses his feet) or in the meadow during a deer hunt (which leads to his death).

Another point that should not be forgotten is the fact that one of the strongest drives of any living being is to stay exactly that: alive. It is a drive that is deeply rooted in the subconscious. If it is Henry's subconscious, that is choosing where and when to go, how could it decide to travel to potentially disastrous places and times? Would he not always at least end up in a place that his subconscious considers safe? Even if the subconscious were drawn to revisiting traumatic experiences, it probably would not venture to threaten Henry's life. This would support my original argument that Henry has no control whatsoever over his travelling – the travelling is described as gravitating towards important events and persons in his life, which is in fact a very apt description: just in the same way as the proverbial apple did not choose to fall onto Newton's head, but was pulled towards the gravitational centre of the Earth, Henry does not choose to visit anything, but is pulled towards the events without him being

³² Clare recognizes him in the library and starts a relationship with him because she has fallen in love with him years ago; Henry consequently visits Clare in the past during her childhood because she has become one of the emotionally most important persons in his life, thus again allowing her to get to know him while she is still a child and then, in her teenage years, to develop the relationship that will cause her to start a relationship with him in his real-time.

³³ That is to say, if it actually is his subconscious that elicits the time travelling, but more to this later.

able to do anything for or against it. Depending on how much “emotional mass” these events comprise, he is pulled to them more or less strongly, i.e. more or less often – the “heavier” an event is, the deeper it dents space-time, the more visits it gets.

I suspect that Ryan might have arrived at the opinion that Henry is able to choose by lumping together the possibilities of conscious and unconscious choice, but as I have shown above, a story based on Henry being able to choose where to go and thus to consciously control time travelling would diverge too much from the original story as written by Niffenegger than to render a distinction between conscious and unconscious choice unnecessary – again, if it even is his subconscious, that is responsible for the time travelling. Interestingly enough, Ryan comments in a foot note on exactly the point that I have made above: if Henry could choose the “destination of his episodes of chronological displacement [...]” – let us forget the issue of conscious and unconscious choice for the moment; if my explanation above is valid, then this question has become superfluous anyway – “[...] why would he end up naked in a parking lot in the middle of winter, and needing to have his feet amputated? Why does he die on return from a later expedition?” (Ryan, 162). Ryan considers that to be a plot hole; I, however, see it more as a misconception on Ryan’s side of the arbitrariness of time travel as it is true for Henry.

2.1.3 Space

Just as time, space cannot be determined by Henry, while a functioning time machine certainly could. A question true for both Henry and a time machine would concern not so much the place of destination, but what exactly happens with the space that the time traveller occupies. When the time machine or the chrononaut takes off to another time and space, do they leave behind a perfect vacuum (Vaas 213)?

In *TTW* Henry’s disappearance is often accompanied by a strange ‘noiselessness’ that is described as if every sound were sucked from the room. Sometimes there also appears some kind of ‘popping’ noise, which, if we go along with the idea that Henry’s disappearance leaves a vacuum, could be the air rushing into the vacuum to

fill it up (much like opening a vacuum-sealed glass of jam). The Time Traveller also hears a “sound like the clap of thunder” (Wells 22) when he jerks the time machine to a stop. The other side of the coin would then necessarily be the question of what happens when Henry (or the time machine) reappears? Do they displace the matter occupying the time and space at which they arrive? Or do they actually rematerialize *inside* of whatever happens to be at that place? As long as there is only gas, there does not seem to be any problem; it could be that the nausea and the dizziness have something to do with the body suddenly having to deal with unnecessary molecules strewn all over the place. In Butler’s *Kindred* (1979) the main character Dana comes back from a trip into the past, but rematerializes with her arm stuck in the concrete wall of her apartment.³⁴ In this respect Henry is lucky; although he slams into objects quite regularly when reappearing, he never actually rematerializes inside of something (other than thin air, if we want to count that and not go along the line that he simply displaces the molecules). In *TTW* the matter is never addressed; it is, however, in *The Time Machine*. The Time Traveller fears that, should he reintegrate in an already occupied space, there would be a big explosion (Wells 22). Apparently, air is not something to worry about; it does not seem to pose any problem – even though the Time Traveller says ‘substance’, which surely also includes air.

2.1.4 Event horizon

One of the most obvious differences between time travel with a time machine and without it is the event horizon. As event horizon I would like to describe the specific line which delineates what travels and what stays behind. The scientific term for it would probably be ‘Cauchy horizon’, which is the technical term to describe “the outer edge of a region of space-time influenced by a given event” (Toomey 343). The event horizon can vary greatly; in contrast to Wells, where the event horizon

³⁴ This sounds like a very fancy concept indeed – one’s arm rematerializing in a concrete wall – but it is just as problematic as in the other examples given: if Dana’s arm actually gets stuck in the wall, then she *has* to be rematerializing inside whatever substance she finds herself with the rest of her body as well, but again, air is no problem. I would venture to say here that authors apparently tend to forget that the air is not a great big nothing, but a chemical substance that is physically there – it can be measured, weighed,.. The other idea I would like to offer is that authors simply ignore that problem in order to not unnecessarily complicate things.

comprises the space occupied by the time machine, which appears to create some kind of bubble, and where everything inside it (or at least everything that is directly connected to or sitting on the time machine) travels³⁵, Niffenegger chooses to establish that everything that does not belong directly to Henry's body is left behind (Mieszkowski 394). This leads then to Henry – contrary to the most likely impeccably dressed Time Traveller – always arriving without any clothes, which is, according to Nahin, not even an uncommon idea in time travel stories. In "Barrier" (1980) Boucher even goes so far as to suggest that "time travelling in the nude' might actually be the most reasonable as nakedness is the costume of all ages" (qtd. in Nahin 40). If a time traveller suddenly appeared out of thin air, what would astonish more, Boucher asks, "a naked man, or an Elizabethan courtier in full apparel?" The *Terminator*-movies follow the example of naked time travellers as well; the robots that are sent back from the future always arrive without clothes.

While the idea of Henry not being able to take anything with him, be it his clothes or something else, is perfectly alright, there is nevertheless the slight problem of where Henry's personal time travelling event horizon actually is. His fillings were always left behind so he finally had the tooth pulled; apparently, the filling does not belong to his body. So, the question is: what does belong to his body and what does not? If we chose to draw the line at his DNA – what carries his DNA travels, what does not is left behind together with the clothes – then the chyme and all chemical fluids³⁶, as well as any bacteria or viruses inhabiting his system, would not travel along either. This is obviously not the case. There are three ways to explain it: Firstly, Niffenegger either found another rule to determine the event horizon. The second possibility is that she simply forgot about this issue. My third idea would be – and personally I believe it to be the most probable one – that she was aware of the problem but chose to ignore it due to the genre. After all, the romantic qualities of the story would be seriously tainted by such unpleasant details.

³⁵ The idea of a bubble is not unreasonable, considering that the Time Traveller does travel for a certain amount of time and that during that time he needs to breath – if he is cut off from everything that is part of the world progressing at normal speed outside the time machine, he needs to take some sort of air-supply with him.

³⁶ E.g. the stomach acid HCl is inorganic and does not carry any DNA.

2.1.5 Travelling

Ryan says about time travel stories that

[...] they differ from reversed time travel narrative through the fact that they do not play the film backwards. Rather than focusing on the experience of traveling through time, that is, on the movement itself, they instantly teletransport their characters at some point in the past or the future, and from this moment on, they let time flow at its normal pace in its normal direction.

(Ryan 150-1)

This is certainly true for Henry in *TTW*: Henry does not experience any travel time – one moment he disappears and in the next he is somewhere and somewhen else. However, we do not know that it actually is like that; this is the way Henry experiences it to be. For all we know, he could be in some kind of temporal cache, which saves all time travellers until the moment comes to release them. Since this cache would be beyond space and time, no time would pass for Henry and he would therefore feel he has arrived immediately after his departure. Vaas asks where the time traveller is between the time he departs and the time he arrives as well; will they be ‘neverwhen’, since they are jumping through time and space?

The other idea Vaas mentions is along the lines of Wells’s description of travelling through time, i.e. time passing by at a much faster speed than normal (Vaas 213). Here we also have the main difference between travelling through time in *TTW* and in *TM*: while Henry simply shifts from here and now to then and there, the Time Traveller truly travels through time. Harrison (*Dr. Who* 12) mentions in this context the popular idea that outside the time machine’s window (supposing it has one) one could see time running backwards. This naturally leaves the question whether that is possible, but, if seen from Parry’s (12) point of view, it also raises the problem of what one would actually see: Parry advocates the view that we are only at precisely one moment in time, namely the one we experience at our present and that we do not leave any copies of ourselves running around in the past, occupying every single spot in space-time we have ever been to. If we take this to be true, it then logically follows that we cannot see anybody rushing past our window in fast and jerky backward motion – there would be nobody there for us to see. If we take this one step further, it must become clear that also buildings and even the planet – if admittedly much more durable and less moveable than a human person – are not

absolute entities locked in eternity but passing things, which, ergo, would not leave any past copies standing around either. It follows that under these circumstances there really would not be anything to see at all during the journey, since space-time would have to appear genuinely empty, a single vast nothingness. But what does 'nothing' look like? Is it... dark? Black? My physics teacher at high-school once gave us a wonderful explanation of what nothing is: nothing is what one sees with one's little finger.

To come back to Lewis, Henry's travel time would be zero, since it happens immediately, and the Time Traveller's travel time would be positive, meaning that he experiences time passing. According to Firchow, seen in the context of his time, "[e]ven the idea of *traveling* in time is new and original with Wells" (123). We must not forget that at the turn of the twentieth century travel literature – especially about exotic places, which was probably due to colonialism – was very much en vogue in Britain, and Wells's *TM* is clearly written in that tradition. Since a good travel story obviously includes travelling and not just being somewhere else and experiencing exciting adventures, Wells simply transferred these concepts to the time travel story – which would, of course, also include actually travelling through time.

2.1.6 Effects on surroundings, body and mind

I would like to differentiate between the direct and indirect effects time travel has on the body. The direct effects of time travel with and without a time machine as such appear to be rather similar, although the point at which they are felt differs. Henry suffers from dizziness, disorientation and a more or less strongly pronounced nausea every time he arrives, which is basically along the same lines of what the Time Traveller goes through. However, the Time Traveller experiences them during travelling through time and not after arriving (Wells 20). Another direct effect, which they both share, is crashing/ crashing into something at stopping or when reappearing. This does not happen always, e.g. when the Time Traveller returns home he manages to stop the machine smoothly or when Henry simply plops back into space without any obstacles being in his way.

The indirect effects, however, differ greatly between travelling with and without a time machine. While the Time Traveller can take along whatever fits into the bubble created by his machine, Henry travels with his body and his body only. This can be embarrassing in the best of cases and life threatening in the worst: when he strands in the middle of the winter, he does not manage to get out of the freezing cold in time and loses both his feet to frost bite. The indirect effects of time travel are always inflicted upon Henry by either society or weather and mostly on the grounds of him wearing no or strange clothes.

2.2 Narrative Context

In this chapter I will elaborate on different devices that are used to illustrate and/ or enforce the paradox in the story. The first point will focus on planting, pay-off and epiphany (the terms will be explained presently), which are vital devices for the construction of a – more or less – unexpected turn or revelation at the end of the story. More or less, because, if well done, the reader will take in the supplied information and use it to make sense of the story, but not realise that there is a second dimension to maybe even a number of different, at first apparently unrelated bits of information. At the final revelation, all of these pieces then fall into place, and, seen in the light of the final surprise, the epiphany, reveal their double-meaning. The bits and pieces of information necessary for the epiphany could, to a certain degree, also be compared to the proverbial trail of breadcrumbs. In the second sub-point to this chapter I will argue that in many time travel stories the overall structure of the text further supports the paradoxes in the story. I will also show that some texts that tell a time travel story containing a paradox are meta-referential in the sense that they have the characters in the story discuss the paradox. Last but not least, I will analyse how the paradoxes and, perhaps more importantly, their effects are enforced linguistically and what visual choices are made to illustrate them.

2.2.1 Planting, pay-off and epiphany

According to Trottier (16), it is possible to “get away with almost anything” in a story, as long as it is set up or foreshadowed early enough. At a later point this ‘plant’ will then make a necessary requirement of the story, e.g. a character being able to recognize prime numbers, appear natural and convey the impression of it being an organic part of the story. These devices basically help to keep actions – but also exposition – from looking entirely arbitrary, i.e. like a solution suddenly drawn out of the proverbial hat to resolve any given situation at hand. In old Greek and Roman plays it was very often the case that a god would show up at the end of the play to disentangle the situation and solve all problems. Since the actor playing the god would be lowered onto the stage with the help of a machine, i.e. a cable winch, this dramatic device was and still is referred to as *deus ex machina*. While it was well-received in older times and a perfectly legitimate way to handle matters, it is nowadays sometimes seen as the cheap way out: nowadays it would not be a god who is responsible for the resolution; it would rather be more or less unlikely coincidences. I believe that the main reason why solutions based on the *deus ex machina* principle do not work in the same way as in the past, is that people are not prepared to accept unlikely coincidences – or supernatural powers in a setting that did not originally contain them – anymore. Trottier (17) also says that foreshadowing “creates a sense of unity in a story” and that it can provide “more than one use for an element”. Howard and Mabley describe this device as follows:

A ‘plant’ is a preparatory device that helps to weave the fabric of the screenplay together. It can be a line of dialogue, a character’s gesture, a mannerism, a prop, a costume, or a combination of these. As the story unfolds, this plant is repeated, thus keeping it alive in the audience’s mind. Usually near the resolution of the story, when the circumstances of the characters and the audiences have changed, there is a ‘payoff’ on this plant in which the gesture, prop, or whatever takes on a new meaning. This resembles a poetic metaphor, when the plant takes on new meaning at the payoff.
(Howard and Mabley 72)

The more common, or mundane use, as Howard and Mabley (73) put it, of planting and payoff would be more in the direction of what Trottier said above, namely that it offers a bit of information which might be rather meaningless and apparently inconsequential at the time, but which proves to be critical and of vital importance at

a later point in the story. Also, it helps to “increase the audience’s feeling of involvement in the story, for we sense we have special, inside information, we know secrets and have discovered new or hidden meanings in the very fabric of the story” (Howard and Mabley 72-3).

In the context of a time travel story, which is prone to paradoxes and other logical challenges, I understand planting as anything that points towards a (time travel related) epiphany at a later point of the story. In this context my definition of payoff correlates to a certain degree with my definition of epiphany; an epiphany could be, for instance, that the past cannot be changed and that all actions taken to avoid a certain outcome maybe even brought about the present result (which is not to say that planting and payoff does not exist in the context of the butterfly-effect – as I shall show presently, it is, in fact, a vital ingredient to make the butterfly-effect work). The term ‘epiphany’ means ‘a manifestation’ or ‘showing forth’ and was originally used in the context of “signify[ing] a manifestation of God’s presence in the created world” (Abrams 85). For James Joyce it “signif[ied] the experience of a sudden radiance and revelation that occurs in the act of perceiving a commonplace object” (Abrams 85). Abrams also remarks that it “has become the standard term for the description [...] of a sudden flare into revelation of an ordinary subject or scene” (Abrams 85). In the context of time travel and its related paradoxes there would be an epiphany when either the characters in the story or the reader realises e.g. the self-consistency of a string of events, i.e. that there is a causal loop, or that whatever the protagonist has done has only lead to the situation as it was at the beginning of the story. In the case of the butterfly-effect the epiphany would be the realisation that things have changed. Here planted objects and ideas do not only acquire a new meaning when they finally pay off; they might actually change as such and thus help the characters and/or the reader to recognize the effects of the butterfly-effect. This is extremely well done in *BP* (see chapter 2.3.3).

In *BhBst* the biggest epiphany is “He was Diktor. He was the Diktor. He was the only Diktor.” (55), when Bob Wilson realises that there really is only one character in the whole story – himself. He himself is Diktor, the very same person that brought him to the future and who he was trying to avoid and ultimately fight with for supremacy as the ruler of the new country that he has set up. However, *BhBst* manages to have a number of similar epiphanies, namely every time that the main character realises that he is yet another one of the persons involved in his story: first he realises that it is his

earlier self that he is supposed to send back to the future, then that he is the ominous 'Joe' who persuaded him to go to the future, then that he is the person who wanted to keep Joe from sending Wilson back to the future but who ended up doing it himself by accident, then that the troubles with his girlfriend were instigated by himself, then that the prank phone call came from himself as well, then that the person approaching his room was him again, and finally, that he himself is Diktor, who opened the Time Gate in the first place. This last epiphany is what I would like to call a 'double-epiphany', because it not only reveals Bob Wilson to be Diktor, but also the circularity of the story. A noteworthy aspect is that Diktor's identity as Bob Wilson becomes clear to the character and the reader at the same time.

Planting and payoff in this story are done rather understatedly until the epiphany has taken place; as soon as Bob Wilson has understood his situation, he starts remembering certain things that, in hindsight, were rather obvious indications of what was going on, e.g. taking on Diktor's name, installing himself in Diktor's quarters (all for the reason of 'having been there first' when one day the 'real' Diktor should show up and claim the place), taking up a girl that reminded him of Arma and changing her name to Arma in memory of the girl he once knew, the fact that he could only ever see himself through the time travel machine... Some of these, such as Arma, are only revealed after the epiphany. While clues to the outcome of the story can be found throughout the story if one knows what one is looking for, they are so well integrated that they do not draw any special attention to themselves during the story.

In *BttF1*, Goldie Wilson is running for mayor in 1985; when Marty travels back to 1954 and meets the young Goldie Wilson, Marty inadvertently tells them that Goldie will once be mayor – which is where Goldie gets the idea from in the first place. This, as such, naturally is a causal loop, but it is also an example for planting and payoff. It also foreshadows that Marty's presence in the past might be influencing the future. *BttF1* mixes and matches all different kinds of time travel paradoxes rather freely – sometimes the future is actualized (as in Goldie's case), sometimes it is changed (the life-style of Marty's parents) and sometimes it is even avoided (Doc's death – this one could, however, also be argued as changing the future). In any case, a great deal of foreshadowing takes place, e.g. that the future will change: "Yes, well, history is gonna change." (00:07:37), "Remember, fellow citizens, the Future is in your hands." (00:35:17) and, referring directly to the plot, "If Grandpa hadn't hit him, then none of you would have been born" (00:15:38).

In the case of *BttF1*, exposition (and in a way planting and payoff are a clever form of exposition) takes an important role: the audience has to know what the past would have been like if Marty had not shown up – or, at the beginning of the film, what the past was and the present is like without Marty having done any time travelling. The stage has to be set for Marty to perform the changes – it could be said that the past needs to be set for the events to come. This is done by having Lorraine, Marty's mother, tell their children the story of how she and their father met, including the crucial point at which she knew they would be going to stay together (00:16:20). As the past is about to be changed and since the audience does not actually get a chance to see the 'original' past, the memories of the characters are the only frame of reference to compare the past from 'before' and 'after' Marty's interference. As I have indicated in my definition of planting, I consider anything that hints towards an upcoming, time travel related epiphany as planting the information that is necessary to make the epiphany work. In this case, it is not the memories themselves that are planted; 'planting' here refers to giving the audience the necessary information about how the past was originally. This is cleverly done by packaging it in the form of memories, which lets giving the information not appear as the main aim of the scene, but rather slips it in unobtrusively.

In *AYZ* the young man tells his story and the bartender constantly assures the young man that he knows what he is talking about, admits that he has experienced the same or can in some other way be connected to what the young man is saying (for the first three it is always the young man making a statement and the bartender commenting on it; the fourth line is said by the young man; in the penultimate quote the bartender starts and the young man answers; the last line is the bartender's):

"My parents weren't married." [...] – "Neither were mine."

"Then, when I learned about sex – and, believe me, Pop, you learn fast in an orphanage –" – "I know."

"Then I met this city slicker with his hundred-dollar-bills. [...] If I could find him, I'd kill him!" – "I know how you feel."

"She was snatched. [...] Somebody came to see her, claimed to be her uncle. [...] Just a man, with a face-shaped face, *like yours or mine* [my emphasis]."

"[...] And the life of a female is not an easy one." – "A lot you know about it!"

"[...] and you'll do well. I know."

(all from *AYZ*, n.p.)

Before the epiphany – all characters are really just different stages of the same person – the bartender's answers seem more like the typical sympathetic remarks that one would expect from a bartender; however, after the epiphany has taken place it becomes clear that the bartender *had meant* what he was saying – being the same person, he *does* know what the other person is talking about.

2.2.2 Sub- and metastructure of the text as reinforcement of the paradox

Sometimes the structure of a text actively reinforces the paradox. In *BP* a very interesting parallel structure can be found: while the government official is talking about changes and alterations of the present that can or cannot occur due to the time travel experiment, the time machine 'chronar' is doing its work, ricocheting back and forth between present, future and past (in this story Newton's third law of motion, i.e. action equalling reaction, also applies to time travel, which means that if something is sent into the past, and equivalent of the mass has to be sent into the future). Every time it materialises in the past, the changes immediately become obvious in the present, either through the narration or through what the character himself is saying. These two parallel narrations – the continuous narration of the story and the fragmented narration of the different materializations of chronar in the past – are also visually set apart and presented in a way that enforces the relative parallelism and immediacy of the changes (relative, because in truth the changes would have happened many thousands to millions of years ago, but in a way they also happen at the same time or parallel to each other). Another point that enforces the butterfly-effect here and that creates a good deal of irony is that the changes are taking place while the government official is talking about how ludicrous and scientifically unfounded the idea is that the experiment could cause changes.

In *BhBst* the overall structure of the story is circular, which reinforces the idea of the causal loop; the same is true for *AYZ*. In *BhBst* the story loops around itself so that it ends almost exactly where it started (and, like *The Big Bang* (5.13), it only gets started because it has already been started, but more about this in chapter 2.3.1),

having taken the reader through all the stages and different viewpoints of the main character.

In contrast to this, *SoTh* is told in a rather linear manner from the beginning in the present, to the main part in the past and back to the present. This, however, supports the butterfly-effect – if something is changed in the past, the repercussions run straight through time and affect the present.

In *TTW* the structure of the novel mirrors the story: Henry's life and his relationship with Clare are, temporally speaking, out of order, with events being attended by one version of Henry at the beginning and by another one at the end (e.g. his wedding), scenes getting muddled up and different stages of the two meeting in truly complex ways. The reader's understanding of how Henry and Clare must experience life is deepened by the scrambled arrangement of the chapters in the book – the order of the scenes and chapters in the book is as mixed up and out of order as for the characters in the story. Having said that, it should be noted that the reader does receive a certain amount of help to make sense of the story – at the beginning of each scene it says when the scene is taking place, where, and how old Clare and Henry are in this scene. Strictly speaking, Clare and Henry have a small guidebook too: the mysterious list with the dates, which certainly helps them – especially Henry – to negotiate their way through time. As this list only contains the dates at which Henry will meet Clare in the meadow, however, the support that they receive is far less than what the reader can draw on.

A similar effect of the audience experiencing a fraction of the same thing the main character is going through is achieved in *BttF2*, where there is a generous amount of shots that have already been used in *BttF1* – as it is the same action taking place again, this is not only justified, but also a brilliant device to create a feeling of déjà-vu among the audience as well (and for the studio to save money).

2.2.3 Linguistic and visual choices for illustrating time travel and the paradox

Since none of us – so far – have had any experiences what it would be like to travel in time, but since it, nevertheless, might be necessary for the author to describe it in the story, he or she has to use certain concepts; in the furthest sense, a language that we can understand: since we have a hard time grasping time as it is, describing any movement through time is even more taxing as we do not have a firm grip of the words and concepts to go with it in the same way as we have when it comes to space. However, even space can be fuzzy: to warp space describes a more or less clear concept in physics, but the term has a somewhat hollow ring to it – examples, analogies and similies are needed to transport the idea, e.g. if space was a trampoline and if I threw something heavy on it, this thing is going to cause a ‘dent’ in the otherwise even surface of the trampoline. This need to somehow describe something that probably cannot be described at all, even if it should be one day possible to experience it, is in my opinion maybe one reason for comparing time travelling to a film that is being rewound – playing a film in reverse is our only experience of time seemingly running backwards. Much like Wells (*TM* 20, 21) describes the succession of day and night when travelling to the future, Bradbury in *SoTh* has his days and nights fly past as well – only in the other direction:

First a day and then a night and then a day and then a night, then it was day-night-day-night-day. A week, a month, a year, a decade! A.D.2055. A.D.2019. 1999! 1957! Gone! [...] Time was a film run backward. Suns fled and ten million moons fled after them.
(*SoTH* 213)

In *BttF1*³⁷ time travel is immediate without any suns or moons rushing past; however, the theme of time is established very early on by showing dozens of clocks ticking away in the Doc’s home/ laboratory (00:00:33) and later enforced by always returning to the clock tower or the digital clock at the Twin Pines Shopping Mall (00:17:38; 01:39:26). Both of these clocks are immediate means to measuring the time related to time travel – the clock tower counting the minutes until the lightning bolt strikes that will send Marty back to the future; the digital clock indicating the exact time at

³⁷ It should be noted that also the title of the movie, *BACK to the FUTURE*, already paints a linguistically interesting picture, as ‘back’ would usually be connected to the past. It could be said that the paradoxical events of the story already start in its title.

which Marty comes back to the future and at which, after a stiff run due to the DeLorean finally having given up its ghost, he arrives at the shopping mall, where the earlier scene of Doc being shot and Marty escaping into the past now unravels before his eyes. This also gives the audience an idea of the immediacy between Marty disappearing into the past and Marty running down to take care of Doc.

Apart from the omni-present clocks, *BttF1* also uses the recurring entrance gates to the Lyon Estate (00:11:25; 00:32:40) to indicate 'when' we are. In fact, when Marty first arrives in 1954 and wants to go home, there is nothing there except for the entrance gates and a poster advertising the homes yet to be built: "Live in the home of tomorrow... today!" (00:32:40). Another means for indicating that time travel has occurred – or for making the character who has time travelled believe that they did so – is having them read a newspaper from that day. Accordingly, Marty picks one up and reads the surprising date of "Saturday, 5th November 1954" (00:35:37). To come back to foreshadowing, planting and payoff, let me mention that on the back of the newspaper there is an advertisement for a new car with the slogan "You'll be noticed driving the car of the future" (00:35:36) – which is also a meta-reference to the story itself. When Marty travels to the future in *BttF2*, he is scared by the holographic projection of a white shark – an advertisement for *Jaws 19* ("This time it's really, really personal!") by one Max Spielberg (00:11:26) – Steven Spielberg produced the *Back to the Future* trilogy and is also the mastermind behind *Jaws*. The holographic shark – an image without substance – could be argued to foreshadow what Biff will 'become' in course of the movie: even if Biff will not try to actually eat Marty, he will try to get him out of the way – which is, basically, what Biff is always trying to do. Also, Biff's grandson will hunt Marty on a hoverboard that is painted to look like the jaw of a shark. On another note, the nineteenth sequel to the original movie also indicates how far in the future Marty must be.

Another indicator that helps to track Marty's and Doc's meandering way through time (not so much space actually; they do shift but more or less stay in the same larger area, namely Hill Valley) is the town sign. While it basically stays the same through all three movies, it always changes slightly accordingly to the specific time – in *BttF1* from simple and modern in 1985 (00:06:23) to idyllic in the 1950ties (00:35:10); in *BttF2* there is a 'good future' town sign, very modern and floating in the sky-way (00:05:46) and an 'alternate future' one, where Hill Valley has gone down the drain (00:41:43).

One of the strongest visual illustrations of the grandfather paradox is the photo of Marty and his siblings, who start to disappear after Marty inadvertently changes history by saving his dad from being knocked over by the car. Piece by piece and one by one Marty's siblings fade out until finally even Marty is almost gone – with even his real hand (as opposed to his hand in the photograph) becoming transparent. A wonderful way of illustrating the causal loop paradox can be found in *AYZ*, where the main character wears a ring showing “[t]he Worm Ouroboros... the World Snake that eats its own tail, forever without end. A symbol of the Great Paradox.” (n.p.)

Bradbury in *SoTh* chooses to illustrate the effects of the butterfly-effect by showing the advertisement of the Time Safari company once at the beginning and once at the end of the story – the differences are minimal, but they are there:

Time Safari, Inc.
Safaris to any year in the past.
You name the animal.
We take you there.
You shoot it.
(*SoTh* 211)

Tyme Sefari Inc.
Sefaris tu any yeer en the past.
Yu naim the animall.
Wee taekyuthair.
Yu shoot itt.
(*SoTh* 223)

In *BhBst* the same scene happens over and over again; each time being only slightly different as it is seen from the point of view of another temporal stage of the main character. Depending on how he perceives the situation before him, the word-choice for the description of a certain action may vary from one time around to the next, as will become obvious from the following examples of the same sentence.

“He knows me,” he said meaningly. (*BhBst* 5)

The newcomer turned away from his interrogator and looked sharply at Wilson. “He knows me.” (*BhBst* 19)

Wilson turned to “Joe”. “He knows me”, he said significantly. (*BhBst* 29)

The first time Wilson is drunk and watches an exchange between two strangers; the second time Wilson is aware of being ‘Joe’, and the third time he is the one trying to prevent his earlier self from going to the future. As his point of view changes

throughout the story, it is interesting to see that whatever he decides to do – out of free will and the current state of his emotions (it can be argued whether that would actually contradict free will) – in the end leads to what he remembers to have happened before. In this sense, there are no limitations to his free will or his range of action; it just happens that whatever he decides to do is what he has already done before, there is no influence of any outside force either (cf. free will and determinism in 1.2.5, as well as my discussion of chronology protection conjectures and related aspects in 1.3.3).

2.3 Time travel paradoxes

Just remember this – There are some very strange paradoxes connected with time travel.
(*BhBst* 12)

2.3.1 Causal loops and self-creation

2.3.1.1 Names, notebooks and an impossible dialogue

In *BttF1* Marty's mother Lorraine has a crush on her son, Marty – a detail of which she is unaware, of course; for all she knows this is a young boy called Calvin Klein and a perfectly acceptable recipient of her attentions. Apart from a number of delectably humorous scenes, this also gives rise to a paradox: although Lorraine finally falls for George, Marty's father, she likes the name Marty (01:27:25) and in the end gives one of her children that name: Marty. Marty therefore got his name, because that was the name he had already had when he met his mother. Apart from then causing his mother to give him the name she gave him, Marty also invents rock'n'roll by playing *Johnny B. Goode* at the Enchantment Under the Sea Dance – the lead singer of the band phones up Chuck Berry (who 'originally' wrote the song) to tell him that he has found the sound that Berry has been looking for (01:24:55). Incidentally, *Johnny B. Goode* is often considered as the first real rock'n'roll song and was first released in 1958 (the movie is set in 1954).

A similar case involving names is Arma. Arma is the slave girl in *BhBst* that Diktor presents to Bob Wilson during his first visit to the future. Wilson does not return to the future, but, due to the way events develop, hides in the past, where (when) he prepares himself for the supposed arrival of the real Diktor. He never really forgets

Arma, and after some years he takes on a girl that reminds him of Arma and changes her name to Arma in memory of his original Arma. As it then turns out, this girl has to be the Arma that Wilson had seen when he first came, and who was called Arma. Where did this name then come from? Clearly, the girl had not been called Arma before. Did Diktor make the name up? But he referred to her as Arma when she was first introduced to him, and since he named her in memory of that girl...

It seems that absolutely nothing is exempt of falling victim to a causal loop: in *The Shakespeare Code* (3.3) Shakespeare shows a tendency for 'borrowing' lines that he likes, mostly from The Doctor, e.g. "All the world's a stage..." – 'Mm, I might use that.'" (00:15:10). Since The Doctor is mostly quoting Shakespeare though, Shakespeare ends up using his own lines – but where did they really come from? When Shakespeare muses about existence and about being or not being, The Doctor suggests that he should use that line, but, ironically, Shakespeare is not too fond of what is today known as his most famous line and does not consider it to be especially good (00:24:15).

More or less the same, but in a much more extreme way, happens in *BhBst* and *TTW*. In *TTW* Henry and Clare can only meet and consequently bond and fall in love, because they have a list of dates at which Henry will show up in the meadow outside Clare's house. The list, then, is obviously vital for the story. The problem, however, is that the list does not have any real origin, thus making it a perfect example of an information loop: Henry learnt the dates on the list by heart and then dictated them to Clare when she was a child; when they meet for the first time in real time Clare gives Henry the list so that he can learn it by heart (*TTW* 11, 12). As discussed above, Henry's way of time travelling forms an important factor here – as he cannot take anything with him, any object loop would be out of the question anyway, making an information loop the only thing to worry about. The riddle of the origin of the information, however, remains unsolved – which Niffenegger and also the characters in the story seem to be aware of: "You told me a few years ago that you memorized the dates from this list. So I don't know how exactly this exists [...]" (*TTW* 12). It is, in any case, not the only information loop in the story: Henry also teaches himself to pick pockets (*TTW* 50) – literally teaches himself in the sense of that an older self teaches his younger self how to do it: this then, of course, means that the information did not necessarily come from anywhere either.

As I have just said at the beginning of the last paragraph, there is a parallel between *TTW*, *BhBst* and *The Shakespeare Code* (3.3): some piece of information is handed down and in the end loops back to itself. In the case of *BhBst* this happens when Wilson, having decided to travel to the past and to set himself up as ruler of the country instead of helping Diktor (37), buys the items on the list that Diktor has given him before (27) and operates the Time Gate (which, incidentally, he has been shown how to use by Diktor, i.e. himself: an information loop) so that he can travel to the past. However, when he first starts rummaging around in the dark beneath the controls, trying to switch on the seeing device necessary for operating the system, he finds his old hat – just the one he had thrown through the gate so many years before. He then finds a notebook, which contains a list of vocabulary. Wilson also takes that with him, reasoning that “it might have taken Diktor months or even years to work out the relationship between the two languages; he would be able to ride on Diktor’s shoulders in the matter” (37). In the end, after having discovered that he is the real and only Diktor, he has another epiphany:

The notebook, the notebook – Mm-m-m- Something funny, there. When the notebook he had stolen had become dog-eared and tattered almost to illegibility some four years back, he had carefully recopied its contents in a new notebook – to refresh his memory of English rather than from any need for it as a guide. The worn-out notebook he had destroyed; it was the new one he intended to obtain, and leave to be found.

(BhBst 57)

By copying he made his way around the entropy-problem of object loops, but the information loop is there, nevertheless. Wilson, or Diktor, understands the problem of where the information came from and is conscious of the paradox involved: “But when had he learned the language, in order that he might prepare such a vocabulary? To be sure, when he copied it he then knew the language – copying had not actually been necessary” (58). As I have already mentioned in my chapter on internal and external time, there is the *Doctor Who* episode *Time Crash*, where the characters explain what just happened like this:

Davison-Doctor: You remembered.

Tennant-Doctor: Because you will remember.

Davison-Doctor: You remembered being me, watching you, doing that!

You only knew what to do because I saw you do it.

Tennant-Doctor: Wibbely-wobbely...

Both: ...timey-whimey!

(Time Crash 05:44)

Another brilliant case of such a thing, the existence of which should be impossible, is the 'Easter egg' dialogue in *Blink* (3.11). All the material that the Doctor uses to solve the problem of the weeping angels has been collected and put together by Sally Sparrow, who gives it to him when she accidentally meets him about a year after she has experienced the events. As she hands over the package of papers, pictures and DVDs, she realises that it has been her all along who gave the information to The Doctor – this epiphany is shared by the audience. Among these materials there is also the transcript of a dialogue. The Doctor then records his lines of the dialogue and has them put onto all the DVDs that Sally owns so that she will, at some point in the future, realise that the message is intended for her. As Sally starts talking to the pre-recorded sequence of the Doctor, her friend fills in what she is saying into the appropriate places of the transcript that he has made of the tape. This way he then has “a complete transcript of the whole conversation” (00:30:46) – the exact version that The Doctor claims to have in front of him on his auto-cue in 1969. Again, this leaves open who created the dialogue – and if it can be argued that both The Doctor and Sally came up with their individual parts, then the question remains what was there first – the transcript or the video tape.

In the same episode there is also a self-consistent chain of events: when Sally and her best friend Cathy Nightingale are in the old house to investigate, the door bell rings (00:06:11). Cathy prefers to stay upstairs and so Sally leaves her alone to go downstairs and open the door. Outside there is a young man with a letter for her – from his grandmother, Cathy. Understandably, Sally is rather disturbed by these news and suspects a practical joke, but by the time she bursts into the room upstairs, Cathy has already been taken by the angel. Had Sally not left Cathy alone, then she probably would have never been sent back in time; consequently, there would have been no grandson to ring the door bell and thus make Sally leave Cathy behind... Or the other way around: it is only because Sally left Cathy alone upstairs that the door bell could chime and thus make Sally leave Cathy upstairs in the first place.

2.3.1.2 Looping stories and a daughter who is her own parents

A little similar to Jocasta's story that Harrison tells³⁸, AYZ is about a person who is child, father and mother in one single edition. As already mentioned above, the overall structure of the story is circular, taking the main character literally back to where he started from and on the way creating his/her very existence. When the bartender picks up his male younger self, who has just seduced his female younger self, he tells him: "Now you know who he [the bad guy who seduced him when he was still a girl] is – and after you think it over you'll know who you are... and if you think hard enough, you'll figure out who the baby is... and who I am" (n.p.). The main character of the story is just like "The Snake That Eats Its Own Tail, Forever and Ever" (n.p.). He makes the point that he knows where he came from, "but where did all you zombies come from?" (n.p.). This is an interesting point of view as it basically turns our perception of the paradox upside down: the bartender, or Jane, can track every stage of her existence and of her ancestors', while for the rest of the world this goes back and back and back, without there ever being a clear point where the chain of parents having children, children becoming parents and having children really started. Maybe Jane is right and she is indeed the only one who really exists in the world – and all other people are zombies.

About as loopy, but without the self-creation of an entire person, is *BhBst*. Since Wilson is bored while he is waiting for Diktor to come around and have it out with him, he plays around with the controls of the Time Gate, trying to relocate his former home. Suddenly his younger self falls through the Time Gate – and Wilson realises that he is Diktor. This makes it now necessary for him to instigate the chain of events that will bring him to where he is now, the ruler of the country in the future, starting by sending his younger self back to persuade his even younger self to come to the future:

³⁸ cf. 1.2.4 Moral dilemmas – Jocasta finds a man in a deep freeze, marries him and has a child with him; the child uses his father's book to build a time machine and father and son set out to the past. When supplies run out during the story, the son eats his father, but adopts his name out of strong guilt. He then builds a deep freeze (instructions for this are also in the book), takes the book with him and wakes up when Jocasta finds him many years later. This story was offered as parting point for a discussion on logically impossible crimes by Harrison in *Problem* (65).

“Let bygones be bygones”, Diktor repeated. “Ah, if we only could! But we can’t. That’s why I sent you back – in order that you might come through the Gate in the first place.”

“Huh? Wait a minute – I already had come though the Gate.”

Diktor shook his head. “Had you now? Think a moment. When you got back into your own time and your own place you found your earlier self there, didn’t you? [...] He – your earlier self – had not yet been through the Gate, had he? [...] How could you have been through the Gate, unless you persuaded him to go through the Gate?” [...]

“But that’s impossible! You are telling me that I did something because I was going to do something.”

“Well, didn’t you? You were there.”

(*BhBst* 23,24)

What makes this causal loop especially hard to comprehend is how Bob Wilson the First can be thrown through the Gate when nobody has been back yet to actually throw him through – what makes the whole matter even more complex is that, strictly speaking, it was not even Bob ‘Joe’ Wilson, i.e. the person sent back to fetch him, who finally pushed him through, but the third hard copy of Wilson to arrive at the scene, who originally wanted to prevent him from going through. While doubling and crossing world lines do not present any problems of greater consequence as such, there seems to be one particular type of doubling back that creates something that might be called a break in the line, a real impossibility. In my understanding, this happens in *BhBst* and also in *The Big Bang* (5.13) and I shall explain it presently.

2.3.1.3 How *The Doctor* got out of the *Pandorica*

At the end of *The Pandorica Opens* (5.12), The Doctor is locked in the Pandorica. Fascinatingly enough, he seems to be out and about when *The Big Bang* (5.13) starts. This is slightly puzzling, and equally puzzling is the explanation of how he got out – mind you, out of the perfect prison, especially devised for nobody but him. So, when he shows up in front of a very devastated Rory – who, being a plastic dummy for the time being, was forced by his software implants to shoot his girlfriend Amy (with a laser gun hid in his right hand), who had just remembered him after he had been erased from existence – it is rather understandable that Rory could not help but feel slightly confused (and I doubt that The Doctor’s explanation helped much to remedy that):

“You need to get me out of the Pandorica.” – “But you’re not in the Pandorica!” – “Yes, I am. Well, I’m not now. But I was back then. Well, now from your point of view, which is back then from my point of view. Time travel. It’s difficult to keep straight in your head.”
(*The Big Bang* (5.13), 00:09:24)

The chain of events here is rather complex, so let me first enumerate what events exactly happened and in what objective chronological order; there remains, however, the question whether something like an objective chronological order is even possible when a time traveller is involved. In any case, I will be enumerating the events according to how they would appear if somebody simply read off the events on the time-axis of a Minkowski diagram without paying attention to the movements of the world line in question (even though this is not the order in which the events are shown in the episode, at least not entirely):

- A. The Doctor gets locked up in the Pandorica, which should be a dead end.
- B. The Doctor shows up in front of Rory, wearing a fez and a mop. He informs Rory that Amy is not dead, although she is dead now.
- C. The Doctor disappears again.
- D. The Doctor shows up again, still wearing the fez, but without the mop. He tells Rory to get him out of the Pandorica, to which end he gives him his sonic screwdriver.
- E. The Doctor disappears again.
- F. The Doctor shows up again, telling Rory to put the screwdriver into Amy’s left upper pocket when he’s done.
- G. The Doctor disappears again.
- H. Rory opens the Pandorica and releases The Doctor. They put Amy into the Pandorica.
- I. The Doctor zaps back to the future, leaving Rory behind to guard the Pandorica.
- J. Young Amy finds a flyer of the National museum, with the Pandorica being circled in red.
- K. Young Amy goes to the museum with her aunt to see the Pandorica.
- L. While standing in front of the Pandorica, her drink is whisked from her hands and at the same time a note appears in front of her, telling her to stick around.
- M. At night, Young Amy comes out of her hiding place and touches the Pandorica.

- N. The Pandorica opens and releases Amy, who is alive again.
- O. The Doctor shows up, as does a Dalek. While running away from the Dalek, the Doctor grabs a fez and puts it on.
- P. Rory appears and shoots the Dalek.
- Q. The Doctor, Amy, Young Amy and Rory run from the Dalek. The Doctor grabs a mop to barricade the door behind them.
- R. The mop triggers Rory's memory and he informs the Doctor that this was how he looked like when he showed up two thousand years ago to give him the screwdriver.
- S. The Doctor immediately jumps back in time.
- T. The Doctor reappears and uses the mop to barricade the door.
- U. The Doctor jumps back again.
- V. The Doctor reappears again. They are about to continue their flight when The Doctor realises that he now has no screwdriver.
- W. The Doctor jumps back in time.
- X. The Doctor appears again and pulls the screwdriver out of Amy's pocket.
- Y. The Doctor asks Young Amy how she knew she should come here. Young Amy shows him the flyer and the sticky note and tells him that she is thirsty.
- Z. The Doctor grabs a new flyer, a new sticky note and a pen, writes the notes and jumps back in time.
- AA. The Doctor reappears and gives Young Amy her drink.
- BB. A second Doctor from the future shows up and apparently dies.
- CC. Young Amy disappears; the others flee from the Dalek and save River.
- DD. The second Doctor wires himself to the Pandorica.
- EE. The Doctor is shot and disappears.
- FF. The second Doctor flies the Pandorica into the exploding TARDIS.
- GG. While his existence is being rewound, he tries to speak to Amy, who can only hear but not see him.
- HH. The Doctor appears in the episode *Flesh and Stone* (5.5; 18:30) and tells Amy to remember what he said to her when she was little.
- II. The Doctor talks to Amy when she was young, telling her about the sad man with a blue box.
- JJ. The Doctor is erased from the Universe.
- KK. Amy remembers The Doctor and he reappears.

The important part for us is the chain of events until event X. The rest is merely given for the purpose of completeness. The main problem in this world line, the one that causes the aforementioned break, is that The Doctor only gets out of the Pandorica, because he is already out. Bootstrapping in its truest sense: The Doctor pulls himself over the fence (or rather, out of the Pandorica) by his bootstraps. A future self travels back and lets him out, so that he can become the future self to let himself out. This is rather confusing indeed, but the main issue might at least become a little clearer when shown with the help of a space-time diagram (see next page). The main problem is that event C precedes event H and is necessary to bring it about, when at the same time event H is an earlier point in the internal world line of The Doctor and therefore would have to happen first. Also, event H – being released from the Pandorica – is a necessary event to make event C – travelling back in time to give Rory the screwdriver – happen.

In this episode there is cleverly hidden one of the biggest – and cleverest – epiphanies of the whole franchise, which transforms the series in a time machine itself. When The Doctor's time line is being rewound after flying into the centre of the explosion, he re-lives a number of scenes with Amy and discovers that although she cannot see him, she can hear him. However, since she has already forgotten him partly, she does not stop to listen to a body-less voice coming out of thin air. The Doctor then, ingeniously, tries talking to her in a situation, when all Amy has to rely on is what she hears – when she is in the forest of the spaceship in *Flesh and Stone* (5.5). After The Doctor of that episode is done talking to her and prepares to go and look for a way to stop the angels, The Doctor of *The Big Bang*-episode appears and tells Amy to remember what he told her when she was seven. During the *Flesh and Stone*-episode one hardly notices – it feels as if there was a small disruption in the flow of the scene, but since there is no evidence of something being amiss, one simply attributes The Doctor's slightly out-of-place statement to The Doctor's general specialness. Also, it could just be kind words to give Amy something to do, to think about while sitting with her eyes closed. However, if one pays close enough attention, it is possible to see that The Doctor wears a different costume... The costume from the *Big Bang*-episode.

As a last note on the diagram, I would like to point out three things. Firstly, the space axis only shows displacement, but not in any accurate relation to reality. Secondly, event K does not feature in the diagram as it is not directly connected to The Doctor's world line. Thirdly, the diagram is not accurate with regard to events J and L, which would, technically speaking, also have to be drawn with a slight inclination to the left as The Doctor here, too, is travelling into the past, snatching Young Amy's drink. This, by the way, also creates a causal loop – later Young Amy is thirsty, because she had not been able to finish her drink before, so The Doctor fetches her drink from before to finish it now. Had he simply left her the drink, she would not have been thirsty...

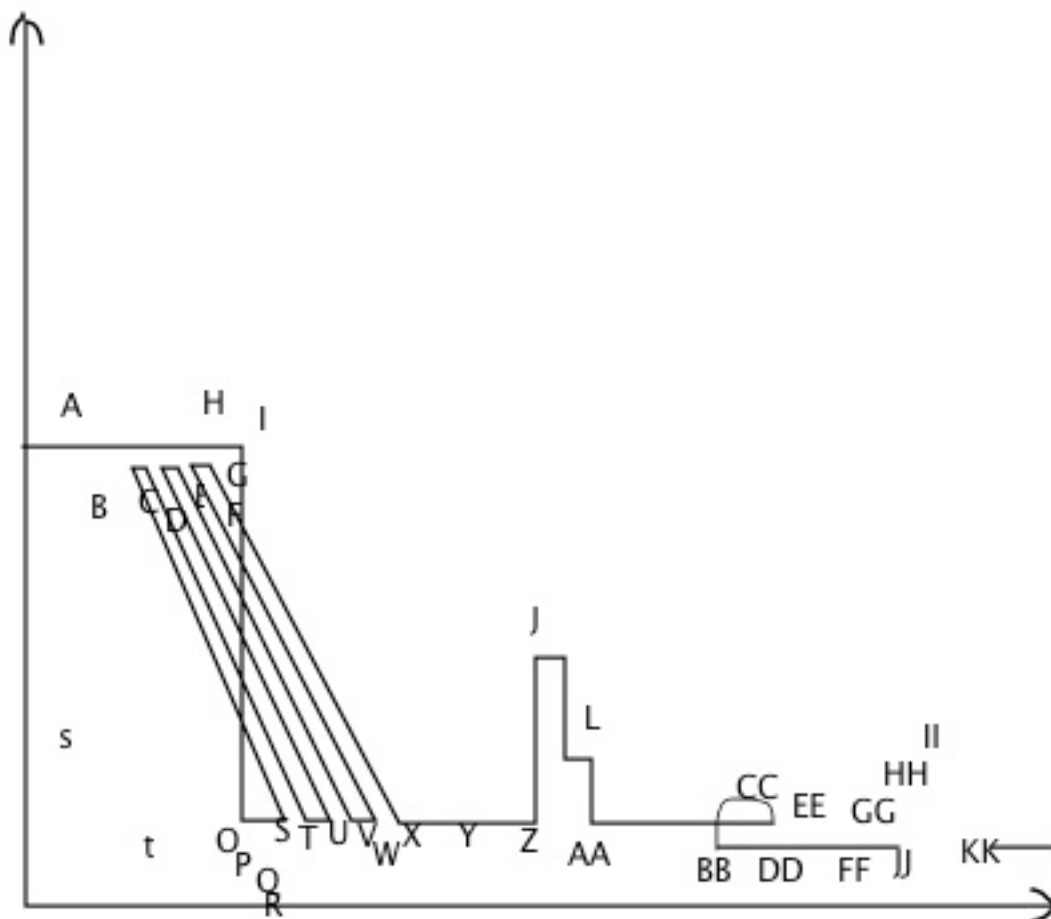


Illustration 5: The Doctor's Wordline in *The Big Bang* (5.13)

2.3.2 The grandfather paradox

As I have discussed at length in my theory part in 1.2.5.2, the grandfather or auto-infanticide paradox describes the attempt of a time traveller to end their existence at a point in the past (either by eliminating one of their ancestors before the time traveller has been conceived or by having the time traveller double back to an earlier stage of himself and directly kill themselves). Now I would like to point out some examples from my primary literature for the grandfather paradox and changing the past.

One of the best examples is doubtlessly *BttF1*, where Marty needs to ensure that his parents fall in love. The main idea is stated by Lorraine (00:15:38): “If Grandpa hadn’t hit him, then none of you would have been born.” Due to Marty, Lorraine’s father does not hit his father George with the car, which consequently endangers Marty’s and his two sibling’s existence. Apart from getting back to his own time, Marty has to make sure that Lorraine and George kiss on the dance floor of the Enchantment Under the Sea Dance: their mother has often told them about how she knew that she would spend the rest of her life with him when he kissed her on the dance floor (00:16:25). When Marty remembers this story and understands what he has to do, the ‘plant’ of the kiss, being almost a necessary condition for Marty’s existence, pays off for the first time (cf. planting and payoff, 2.2.1). The second time is towards the end of the movie when an already fading Marty is restored immediately after the kiss. Apart from giving Marty a clear aim which has to be achieved if he values his continued existence, it also sufficiently highlights the importance of the kiss to make it plausible that this single kiss would be enough to ensure that there would be a marriage and children – which normally, clearly, would not be sufficient to conceive a child. But, due to the importance that has been placed on this kiss earlier, the audience accepts that and feels satisfied that Marty suddenly feels all right again and is no longer transparent as soon as his future parents kiss.

Apart from that, having Marty and his siblings fade away when their existence becomes less and less likely is a very interesting choice to handle the consequences of the grandfather paradox. *BttF1* explores what would happen if one’s parents never met and what would have to be done about that. What is slightly puzzling is that while

Marty partly actualizes the present (Goldie Wilson runs for mayor because of a remark Marty made and Doc Brown wears a bulletproof vest since Marty informed him about the shooting), he changes it in other respects: suddenly his family's life style is much better, his parents are still in love and his whole family is successful, with Biff being the one working for George and not the other way around. To me mixing these two concepts seems a little inconsistent. As has been clearly established by having the McFly-siblings fade from existence, the past can be changed and consequently also the present and future can be changed. However, if the concept for the film would be an unchangeable past with all actions only leading to the actualization of what happened, then this would not be possible – the result of all of Marty's actions would have to be exactly what is presented as the present at the beginning of the movie. The only way of solving this problem of these two concepts clashing with each other would be to accept the idea of a changeable past and to allow for coincidences – maybe Goldie Wilson would have been told the same thing as Marty told him by some other person anyway, resulting in his running for mayor with or without Marty's remark. Doc Brown wearing a bulletproof vest could be argued to be a genuine change as it is not clear whether he already wore the vest the first time around – the picture quality in combination with the camera perspective make it impossible to determine whether the Doc actually wore a vest beneath his radiation suit or not. The circumstance that Marty tries to 'come back early' but fails because of the car spluttering its last, could either be ascribed to a dramatic choice of the film makers or it could be seen as a banana peel – one of the many coincidences that might occur to prevent changing the past. However, as I have just taken the position that in *BttF* the past can be changed, I shall go with the dramatic choice in this case. It only remains to be said that *BttF2* sees the creation of an alternate reality when Biff changes the past by giving the sports almanac to his younger self – strictly speaking, the same would have to happen in *BttF1*. As Marty, however, fixes the damage he has caused, there are no problems in his returning to his proper future.

In *Dr. Who: Father's Day* (1.8) changing the past yields slightly more severe consequences. Rose has never really met her dad, and when she asks The Doctor to take her to the past and let her watch her dad at least from a distance and be with him when he dies so that he does not die alone, The Doctor complies. However, the first time they try, Rose is too scared to go to him. When they try a second time, Rose suddenly runs forward and saves her Dad from being run over by the car

(00:06:00). The Doctor's and Rose's earlier versions consequently disappear. Contrary to *BttF*, it is not only the lives of the people in question that are changed because of this event: hideous monsters appear and devour every single person on the planet (only those who happen to be in an old place or building at the time can endure a little longer). As The Doctor puts it: "There's been an accident in time, a wound in time, they're like bacteria, taking advantage of it. [...] Time has been damaged and they've come to sterilise the wound. By consuming everything inside it." (00:19:45) Only by changing events back to what they were before the change was made can bring everything back to normal. One has to wonder why these monsters do not show up more often in the Doctor Who universe, considering how many people are travelling around in time and that something somewhere somewhen is constantly different from what it should be.

Something that is very much different from what it should be is what happens in *The Sound of Drums* (3.13): The Master uses the TARDIS as a paradox machine, the purpose of which is to let past and future collide without changes made to the present having any influence on the future. This allows The Master's little metal spheres, the remains of the human race from the end of the universe, to not only come back to the present, but also to kill as much as they like. This would normally form a paradox – a perfect example of a grandfather paradox: the people of today would necessarily be the ancestors of the spheres from the future – as the spheres should cancel themselves out (*Last of the Time Lords* (3.14), 00:21:00). When the paradox machine is finally destroyed in *Last of the Time Lords* (3.14, 00:36:59), time reverses – a video running backwards, including the sun shooting from West to East like in *SoTh* – and the year during which The Master has ruled the Earth never existed.

2.3.3 The butterfly-effect

It's the ripple effect!
BttF2 (01:32:42)

When Nero appears in *Star Trek*, this changes everything – the flow of history, everybody's fate, future and destiny (01:07:42). Apparently, (accidentally) sending a gigantic spaceship back in time, through an even more massive black hole, created by something called red matter,³⁹ and blowing up a federation vessel, could be seen as a sufficient cause for triggering a butterfly-effect. However, as is shown in the short stories *SoTh* and *BP*, much smaller things might be sufficient to cause this effect – in the case of *SoTh*, something as small as a butterfly:

He fumbled crazily at the thick slime on his boots. He held up a clod of dirt, trembling, "No, it *can't* be. Not a *little* thing like that. No!" Embedded in the mud, glistening green and gold and black, was a butterfly, very beautiful and very dead. "Not a little thing like *that*! Not a butterfly!" cried Eckles. It fell to the floor, an exquisite thing, a small thing that could upset balances and knock down a line of small dominoes and then big dominoes and then gigantic dominoes, all down the years across Time. Eckles' mind whirled. It *couldn't* change things. Killing one butterfly couldn't be *that* important! Could it?
(*SoTH* 223)

The company is very much aware of the danger of changing the past and therefore the present – they do not know for sure whether something will happen, but they take a lot of precautions: everything that is taken to the past is sterilized, the path does not touch anything, not even a blade of grass, oxygen helmets assure that no modern bacteria can get into the ancient atmosphere, and every animal is carefully preselected and marked by a paint bomb (216). I have to admit that I cannot fully follow how using a paint bomb *does not* compromise the past, especially in the light

³⁹ This is part of the 'scientific licence' *Star Trek* enjoys – physically speaking any sort of travel through a black hole is utter hogwash. However, this has to be seen as another feature of 'startrekky coolness' defying the laws of physics – the latest addition to a long line and part of something that could almost be called a tradition. When physicists first had declared beaming impossible due to Heisenberg's uncertainty principle, the writers of the television series had simply added a filter to counterbalance it.

of all the other measures taken to protect the past – even the bullets are retrieved (221).

What is fascinating about both *SoTh* and *BP* is that both discuss the butterfly-effect in the text – maybe in order to better illustrate its effects. In *SoTh* the discussion centres on whether the changes would be big or small:

The stomp of your foot, on one mouse, could start an earthquake, the effects of which could shake our earth and destinies down through Time, to their very foundations. [...] Or maybe it can only be changed in little subtle ways. [...] Perhaps only a soft breath, a whisper, a hair, pollen on the air, such a slight, slight change that unless you looked close you wouldn't see it.
(*SoTh* 215)

In *SoTh* the changes are apparently rather subtle, judging by the examples of the changes discernable in the room at the company: “The room was there as they had left it. But not the same as they had left it. The same man sat behind the same desk. But the same man did not quite sit behind the same desk” (222); also, somebody else becomes President and the language seems to be slightly different. These are, however, only the changes that are mentioned in the text; the description of what Eckels feels upon his return to the present implies that there might be many more changes, the above mentioned being the only ones that can be noticed inside the room of the company building. The only ones aware of the differences are the time travellers; from the point of view of the man sitting behind the table in the room nothing has changed, everything is as it always has been. Something similar happens in *BP* – but, since there are no time travellers present, the changes go utterly unnoticed by the people in the story.

As I have already outlined in 2.2.2, the structure of *BP* is wonderfully suited to underline the paradox of the butterfly-effect unravelling itself. What is especially ironic about this is that the government official keeps boasting about the government's project and rebuffing any notions that the scientists who warned against possible, probably even undetectable changes might have had a point; all the while being entirely ignorant of all the changes that are happening to him and his surroundings.

The changes themselves are only minor at first – after the first temporal displacement of chronar (i.e. the time machine probe that is supposed to take pictures in the past and conduct a number of measurements) the metal bucket seats (239) of the briefing

room have been replaced with a long, wooden bench (244) and the journalists are no longer squinting through the translucent screen that only allows for “grayed and blurry” pictures (240) but looking at the scene through the transparent laboratory floor above them (244). What had happened in the past? Chronar had displaced some vapour which had condensed and fallen down to Earth. The government official’s comment upon the reappearance of the two spheres before their second journey:

[H]as anything changed? Isn’t everything the same? But the dissidents would maintain that alterations have occurred and we haven’t noticed them. With such faith-based, unscientific viewpoints, there can be no argument.
(*BP* 244)

“Five or six thousand complex molecules los[ing] their basic structure” (244) leads to a 33 hour day, two moons and the government official gesticulating with his pseudopots. In the end, the bloated, slime-washed bodies of the journalists dissolve into liquid and they flow towards the machine, which is formed of four square blocks and the government official, extending his fifteen purple blobs victoriously proclaims that “Those who billow were wrong: we haven’t changed” (255).

Apart from drawing a rather sorry picture of the human race, the text tunes down even further the interaction between time traveller (or in this case, rather time travelling device) and its surroundings. However, contrary to many other time travel stories focusing on the butterfly-effect, amongst them also *SoTh*, *BP* has more than interaction with the past – *BP* crushes more than one butterfly, so to speak.

Conclusion

The first research question that I would like to address is whether time travel has any influences on the story. As I have chosen time travel stories as my sources, this question can be considered to be redundant in so far, as a time travel story naturally includes/ has to include time travel as one of its key features; taking it away would drastically alter the plot. In *TTW* Henry and Clare only get to meet and live together the way they do because of time travel. While in the other texts that have been analysed time travel exclusively happens by means of a time machine, *TTW* is the only one that works without one. In fact, the story in *TTW* can only exist the way it does because Henry does not have a time machine, or, even more specific, because he does not have any control over the three points that are typical for a time machine: with a time machine it is possible to decide exactly when to leave and where and when to go (provided that the time machine is working correctly). In Henry's case departure and destination are random. There are some factors that influence Henry's time travelling, but in general he is swept away without being able to do anything. Mieszkowski argues that Henry's unintentional dropping out of the present is the central fantastic element in the text. In her opinion it is the breaking of the fundamental rule of a linearly progressive time and the dealing with the consequences of that breach, what makes the text so intriguing (394). This is certainly true in the respect that time travel in this case gives a very original aspect to an otherwise regular story – boy meets girl, they have difficulties, first in getting together and then in having a child, finally there is a tragic ending when he is shot. It should, however, be noted that time travel here merely functions as a device – if a decisive one – and does not take centre stage in the way it does in some of the other texts.

My other primary texts allocate a much stronger and much more central position to time travel, although it could still be argued that time travel is used as a means to the end of setting up time travel paradoxes. One way of differentiating then would be to introduce a differentiation of two categories of plots: those in which time travel is a vital means to develop the plot, e.g. *TTW* and *BttF*, and those where time travel is the plot, e.g. *BP*, *BhBst* or *AYZ*; if there were no time travel, there would be nothing to tell – it is impossible to tell a story of little incidents in the past amounting to avalanches

that change the future without being able to send something into the past to cause the change. Likewise, a person cannot be their own father, mother and daughter without being able to meet themselves in the past and conceive the child. And how should Marty upset the first proper meeting between his parents when he is stuck in his own present? In *BP* a whole world is changed drastically, because of time travel; the same happens in *SoTh*, even though on a smaller scale. Last but not least, where would The Doctor be if he did not have his TARDIS? In *Doctor Who* time travel is not a necessary ingredient in all episodes and stories; very often the theme is centred on different things such as self-confidence, friendship or integrity and sometimes time travel is only necessary to get somewhere (-when), but not for the subsequent story that takes place there (then), e.g. *The Shakespeare Code* (3.5). However, if the episode focuses on time travel and its paradoxes, it mostly does so very explicitly.⁴⁰

Taking all evidence into account, it would seem that ‘traditional’ science fiction magazine stories such as *BP*, *BhBst*, *AYZ* and *SoTh* take time travel and the paradoxes entailed as their centrepiece, for if there were no time travel, these stories simply would not exist – as I have just outlined above, the paradoxes could not be established without time travel. As these short stories were all published in science fiction magazines, it seems logical that they chose a more ‘sciency’ approach to time travel, i.e. they all use a time machine (in *BhBst* it is called a ‘Time Gate’, but it still amounts to the same as a time machine). In this sense, they could be, along with *BttF* (a time machine in a DeLoren) and *Doctor Who* (the famous TARDIS – Temporal and Relative Dimension in Space), considered post-Wells. Strictly speaking, even *TTW* would have to be considered post-Wells: it is true that Henry does not use a time machine, but Wells did not only invent time travel via a time machine – in a broader sense he also headed the movement away from magic and mystical happenings towards science- and technology as the basis for fantastic fiction. Taking this into consideration, the scientific and medical explanations, as well as the approach of defining Henry’s condition as an actual illness – chronological impairment – that will maybe even be curable one day, actually put *TTW* in the tradition of classic science fiction stories.

⁴⁰ It should also be noted that most of the really ‘timey-whimey’ stories are usually written by Steven Moffat, e.g. *Blink* (3.11) and *The Big Bang* (5.13).

Interestingly enough, Wells's *TM* is the only text without a paradox. The Time Traveller sees time passing increasingly fast either in a forward and later, on his way back home, in a backward direction, but there is no paradox. A reason for this might be that at Wells's time his version of actually, physically travelling into the future was already fantastic enough; also, the story does not require a paradox to render it more interesting or enticing. In this respect it becomes clear once more that Wells has written his story before the background of a long tradition of travel narratives, with the difference that in his case the travelling happens not only spacewise but also timewise. In the strictest sense, one could even claim that time travel does only make a qualitative difference, adding an uncommon and surprising taste to an already existing genre. By having his Time Traveller both narrate his travels and report back from the world's end and an at first glance utopian world, Wells achieves a blend of two, at that point already existing genres: by combining the best of the travel narrative and the best of the historical narrative, Wells achieves something which will come to be known as 'future histories' (Slusser and Chatelain, *Communication* 175). While travelling has the function of transporting the Time Traveller into the future, the journey through time itself is a spectacle to be experienced – in the same way as joy rides on the train once were (if slightly more adventurous and through time instead of space).

The next logical question that begs to be asked at this point is how travelling through time is dealt with in the other texts. I am not referring now to time travelling in the sense of achieving a spatio-temporal dislocation, but travelling as an experience; as I would like to call it, "travelling in its own right". Admittedly, the question is redundant as far as *TTW*, *BttF*, *BP*, *AYZ* and *BhBst* are concerned, for in these stories there is no real 'travelling' at all: the time machine disappears here and reappears there, apparently without any time passing for the occupants of the time machine (or the device, cf. *BP*). Only *SoTh* has any description of the travelling as such, and this one is very close indeed to the one in *TM*. But wait a minute: if five out of seven primary sources do not pay any attention to travelling as such, would that not indicate that it is no longer seen as important? Or at least, not as important as it was for Wells? Personally, the effect reminds me of riding a train – when trains, cars and planes came out for the first time, it was an adventure to ride one, and people would try to actively experience that, simply by paying attention to the journey. Nowadays transport is seen more as a nuisance, a necessary evil. It is only a proposition and it

would require more research, but I would still like to suggest this idea. Interestingly enough, *SoTh* uses the time spent in the time machine for the entire discussion of the butterfly effect – which makes me wonder whether travelling really exists in its own right in this story or whether it is just a clever setting to make the exposition of the butterfly-effect, i.e. the foreshadowing of what is to come, more appealing. The focus of all my primary sources, apart from Wells and *TTW* (where the main topic is the love story between Henry and Clare), is then what is achieved by travelling into the past – the exposition of a paradox.

The next question standing in line to be answered is whether the way of time travel – i.e. with or without a time machine – is in any way connected to the kind of paradox that is created. With regards to the grandfather paradox and the butterfly-effect, this question can be confidently answered with no. However, the manner of travelling does have an indirect influence on causal loops, and here also only on one type of causal loop. As has been made explicit in the chapter on causal loops in my theory part, there are two main types of causal loops, namely object loops and information loops, self-creation being a special case where something exists *ex nihilo*, i.e. without ever having been made or invented. Object loops involve the problem of increasing entropy, meaning that an object's entropy cannot steadily increase as it gets older and then suddenly go back to the original state. In the case of a notebook this would, as mentioned before, require ink to 'fade in' again, pages to become 'unworn' again – literally untouched by time – paper particles etc. to somewhat magically reappear and reattach themselves to the notebook, so that the effects of entropy would be counterbalanced and that the notebook then could be the *exact* same as it was when it started the loop before. One way to solve the object loop problem is to transfer the information contained in the object to another form, i.e. copy the notebook. This, however, still does not solve the problem of where the information came from in the first place. As should have become clear by this explanation of object and information loops, an object loop can only occur when there is a possibility of sending a particular object back in time, which would require a time machine. Consequently, object loops can only be created with the help of some kind of time machine, while information loops can be created by any sort of time travel. This becomes most obvious in the comparison of *TTW* to any of the other stories.

In any case, it is interesting to note that there has not been a single case of an object loop in the texts that have been sifted and analyzed for this thesis: I could only find a

broad variety of information loops involving self-creation and causal chains that circle back on themselves, i.e. that could only be started because they had already been started before. In my opinion this shows a certain preference of the human mind for keeping matters as logically sound as possible. Naturally, the origin of the information cannot be discovered (apart from the approach that everything encodes everything and that therefore all information is around us and can be extrapolated and decoded using the appropriate means), but at least it is possible to eliminate entropy from the equation. Noteworthy examples for different information loops are the list of dates in *TTW*, the vocabulary notebook in *BhBst*, the information loop in *AYZ*, which entails a whole person, the impossible dialogue from *Blink* (3.11) and The Doctor's escape from the Pandorica in *The Big Bang* (5.13).

The last main point that I would like to address is how the time travel paradoxes are presented in the text. I have already touched upon time travel paradoxes being handled differently in different texts. Closely connected to these time travel paradoxes is epiphany. I have proposed that time travel stories always tend to contain some sort of epiphany, at least when they centre on a time travel paradox. The analysis of my primary sources has shown that this claim is at least partly valid, for some texts more than for others. In *TTW* for instance, where time travel paradoxes form only a relatively small part of the story⁴¹, there are a number of smaller epiphanies; as in the other texts, they basically happen every time that one of the paradoxes culminates, e.g. when Henry and Clare talk about the date on a drawing she did and decide to leave the date off despite knowing that, in the future, the drawing will show the date, only to find that Clare put the date on later for fear of paradoxes, thus fulfilling the future and the past. *BttF1* is a special case as the epiphany happens very early on, namely straight after Marty's trip to the past, when he first bumps into his parents and then realises that he, as a result of changing the past, has put his existence in jeopardy. *SoTh* and *AYZ* both feature what I would like to call a 'proper' epiphany, i.e. the big revelation at the end that, in one case, the present has changed, and in the other that all characters in the story are in fact the

⁴¹ When I say relatively small part I am referring to the amount of paradoxes relevant for this thesis, which are rather few. Naturally, there are all the self-encounters and a lot of fulfilling the past, but as Henry apparently is unable to execute any changes to what has already happened, there really is no danger of him causing a grandfather paradox. Technically speaking, he could cause a butterfly-effect, but as in his world everything seems to be rather predetermined, I doubt that a butterfly-effect could happen in the same way as it could in *SoTh* – *SoTh* allows for a flexible, changeable time, while *TTW* does not.

same person. In *Doctor Who* there are differences from episode to episode and from story to story – clearly – but as a general rule of thumb I would argue that episodes which specifically focus on or involve strong aspects of time paradoxes usually also sport an epiphany that is related to and often caused by time travel. My primary exhibit for backing up this case would be *Blink* (3.11 – it was Sally all along who gave The Doctor the materials that help them through the trial of the weeping angels⁴²), followed by *Father's Day* (1.8 – history has to be fulfilled for things to go back to normal) and, to a somewhat lesser degree though, *Last of the Time Lords* (3.14 – the spheres are the humans from the future, and killing their ancestors works because of the TARDIS functioning as a paradox machine⁴³).

BP is somewhat special as there are epiphanies all along the development of the story. Still, it could be argued that the main epiphany takes place when the experiment has finally come to an end and the government official proclaims that the world still is as it was – he has not noticed any of the changes after all, even though he is now not even human anymore. *BhBst* goes along the same lines: every person that appears in the story – apart from Genevieve, his girlfriend – is revealed as being nobody else but a future version of the main character, resulting in a number of epiphanies along the way and a final big one when it becomes obvious that Diktor is the main character as well⁴⁴.

I would like to finish by once more pointing out that nobody has yet provided any definitive answer to the question of the possibility of time travel. Apart from the fact that the universe is bigger and more complicated than can be grasped by us at the

⁴² In fact, I might even be so bold as to argue that this episode is – an implicit – causal loop: knowing The Doctor, he would probably at some point come across Sally's portfolio and decide to investigate the matter – after all, it's weeping angels! – and consequently get caught up in the whole story.

⁴³ Also, at the end of the episode there is the great revelation that Captain Jack, who is locked in time and who therefore can never die, is the famous Face of Bo – also an epiphany related to time travel: had The Doctor and his various companions (which in a way also includes the audience) not met the Face of Bo in the future, there would be no epiphany when Jack first worries about aging while being immortal and then tells them about an old nickname of his – the Face of Bo (*Last of the Time Lords* (3.14), 00:44:57).

⁴⁴ The recurrent revelation of every figure being the main character also functions as a planting and payoff device for Diktor being the main character as well – by analogy, Diktor's true identity is foreshadowed very effectively.

moment, Harrison (*Dr. Who* 23) also suggests that our knowledge of this universe may even be restricted by our having preconceived notions about it. Using our imaginations, he continues, may thus “to some extent free us from these logical blinkers, in which case we might discover that the universe is a more interesting place than we had supposed” – a thought that I can only second whole-heartedly. For who says that the frontiers of time will be off limits forever? No-one but ourselves. As Sir William Osler (qtd. in Kaku xv) said : “The philosophies of one age have become the absurdities of the next, and the foolishness of yesterday has become the wisdom of tomorrow.” Only our imagination is the limit.

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Illustration 5: Michaela Schober, 2010.

Appendices

Appendix A: Table of Episodes from Doctor Who

The episodes are ordered according to their position within series one to five.

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| 1.8 | <i>Doctor Who: Father's Day.</i> (1.8). Screenplay by Paul Cornell. Dir. by Joe Ahearne. DVD. BBC, 2006. |
| 1.12 | <i>Doctor Who: The Parting of the Ways.</i> (1.12). Screenplay by Russell T. Davis. Dir. by Joe Ahearne. DVD. BBC, 2005. |
| 3.3 | <i>Doctor Who: The Shakespeare Code.</i> (3.3). Screenplay by Russell T. Davies. Dir. James Hawes. DVD. BBC, 2007. |
| 3.11 | <i>Doctor Who: Blink.</i> (3.11). Screenplay by Steven Moffat. Dir. by Hettie Macdonald. DVD. BBC, 2007. |
| 3.14 | <i>Doctor Who: Last of the Time Lords.</i> (3.14). Screenplay by Russell T. Davis. Dir. by Colin Teague. DVD. BBC, 2007. |
| 4.0 | <i>Doctor Who: Time Crash</i> (Children in Need Special). Screenplay by Steven Moffat. Dir. Graeme Harper. DVD. BBC, 2008. |
| 4.3 | <i>Doctor Who: The Fires of Pompeii.</i> (4.3). Screenplay by James Moran. Dir. by Colin Teague. DVD. BBC, 2008. |
| 4.7 | <i>Doctor Who: The Doctor's Daughter.</i> (4.7). Screenplay by Stephen Greenhorn. Dir. by Alice Troughton. DVD. BBC, 2008. |
| 4.9 | <i>Doctor Who: Forest of the Dead.</i> (4.9). Screenplay by Steven Moffat. Dir. by Euros Lyn. DVD. BBC, 2008. |
| 4.10 | <i>Doctor Who: Silence in the Library.</i> (4.10). Screenplay by Steven Moffat. Dir. by Euros Lyn. DVD. BBC, 2008. |
| 5.4 | <i>Doctor Who: The Time of Angels.</i> (5.4). Screenplay by Steven Moffat. Dir. by Adam Smith. DVD. BBC, 2010. |
| 5.5 | <i>Doctor Who: Flesh and Stone.</i> (5.5). Screenplay by Steven Moffat. Dir. by Adam Smith. DVD. BBC, 2010. |
| 5.12 | <i>Doctor Who: The Pandorica Opens.</i> (5.12). Screenplay by Steven Moffat. Dir. by Toby Haynes. DVD. BBC, 2010. |
| 5.13 | <i>Doctor Who: The Big Bang.</i> (5.13). Screenplay by Steven Moffat. Dir. by Toby Haynes. DVD. BBC, 2010. |

Appendix B: Abstract in German

Diese Arbeit behandelt die Fragen wie das Motiv der Zeitreise in verschiedenen Texten behandelt wird, ob die Art, wie durch die Zeit gereist wird, einen Einfluss auf die Geschichte hat und wenn ja, in welcher Form: Gibt es, zum Beispiel, einen Unterschied zwischen dem Reisen durch die Zeit mit einer Zeitmaschine und ohne einer Zeitmaschine? Würde dies auch eventuelle, durch die Zeitreise entstehende Paradoxa betreffen und, falls dem so ist, in welcher Form würde das geschehen? Hieraus ergibt sich bereits der nächste Punkt, nämlich einerseits, welche Zeitreiseparadoxa im Text vorliegen und andererseits, wie diese behandelt und dargestellt werden – nehmen sie einen prominenten Platz ein oder dienen sie lediglich als verzierendes Beiwerk um die Geschichte interessanter zu gestalten? Wie werden sie sprachlich und, im übertragenen Sinne, visuell umgesetzt?

Es wird auch die Frage behandelt, ob die durch Zeitreisen ausgelösten Paradoxa an eine verblüffende Erkenntnis gekoppelt sind, sprich ob am Ende (oder an einem anderen Punkt des Textes) eine überraschende Erkenntnis bzw. Wendung steht. Hierbei kann es sich, je nach vorangegangenen Paradoxon, um die Erkenntnis handeln, dass die Ereignisse, welche hätten vermieden werden sollen, genau durch die Handlungen ausgelöst worden sind welche ihrer Vermeidung hätten dienen sollen, oder dass das Zertreten eines Schmetterlings in der Vergangenheit tatsächlich weitreichende Folgen für die Zukunft haben kann. Insgesamt werden in der vorliegenden Arbeit drei Zeitreiseparadoxa diskutiert, nämlich der Butterfly-Effekt, zu Deutsch Schmetterlingseffekt, das Großvaterparadox und kausale Schleifen.

Im ersten Teil der Arbeit wird eine theoretische Basis geschaffen, verschiedene essentielle Aspekte von Zeit, Zeitreisen und Paradoxa werden auf eine interdisziplinäre Weise beleuchtet und aktuelle Meinungen zu den Themen diskutiert. Im zweiten Teil erfolgt die Analyse und Interpretation der Primärquellen vor dem Hintergrund der zuvor vorgestellten theoretischen Konzepte. Die Zusammenfassung enthält durch die Analyse erlangte Erkenntnisse und versucht mit deren Hilfe eine Beantwortung der zuvor gestellten Forschungsfragen.

Appendix C: Abstract in English

This thesis focuses on how the motif of time travel occurs in the text and whether this, as well as the manner of travelling, influences the story. Would there be, for instance, a difference between travelling with and without a time machine? If so, does this also relate in any way to time travel paradoxes, and if yes, to which? This question leads to the next point, namely, on the one hand, which time travel related paradoxes there are in the text, and on the other hand, how these are dealt with. Does the text give a prominent position to time travel induced paradoxes or do they only function as a device to render the story more interesting? Another question that is raised is how the time travel paradoxes of the story are illustrated linguistically and visually, and whether they are connected to an epiphany. It is also discussed what devices are used to create an epiphany and in how far the structure of the text mirrors and reinforces the paradox. As a last point, possible solutions to time travel paradoxes are discussed.

In the first part of this thesis a theoretical basis is established, where different aspects of time, time travel and time travel paradoxes are discussed and which introduces the current opinions of experts on these fields. In the second part a number of primary sources will be analysed and interpreted against the background of the theoretical concepts that have been discussed before. The main points of consideration here include the differences of travelling with and without a time machine and how these influence the story, how the narrative context and the structure of the text illustrate and further enforce the paradoxes in the text and what linguistic and visual choices are made to achieve certain effects.

Paradoxes that are dealt with in this thesis are the butterfly-effect (a small change in the past can ricochet through all of time, resulting in a slightly to drastically changed present), causal loops (object loops, information loops and the special case of self-creation, i.e. something exists without ever having been made or invented) and the auto-infanticide paradox, also known as grandfather paradox (if the time traveller went back in the past and killed his grandfather before his father is conceived, the time traveller would not have been born and thus unable to kill his grandfather). The conclusion presents the results of the analysis and, in combination with the theoretical concepts outlined before, uses them to answer the above mentioned research questions.

Appendix D: Curriculum Vitae

Personal information:

Name: Michaela
Surname: Schober
Date of birth: December 3rd, 1986

Education:

09/1997 - 06/2005: Bundesgymnasium und Realgymnasium Neunkirchen: A-Levels

Course of studies:

10/2007 – current: English Language and Literature
(diploma, corresponds to MA)

Focus on:

Language contact, intercultural communication
Shakespeare, Shakespearean English
British national identity

Title of diploma thesis (work in progress):

The construction of Britishness through humour

10/2005 - current: English and Spanish studies
(teaching degree, corresponds to MA)

Focus on:

Short stories, narratology
Science fiction & fantasy, especially time & time travel
Film analysis and play/screenplay structures

Title of diploma thesis:

Breaking the Time Barrier: Time Travel Paradoxes

Chinese studies
(BA, MA)

Focus on:

Chinese language teaching in Austria
Imagery in Chinese poetry
Tea and tea culture

Title of MA-thesis (work in progress):

Chinese language teaching at Austrian schools

Special commendations:

02/2012:	Performance scholarship, University of Vienna
11/2011:	Student Award: "English-Chinese Language Contact", Department of English Studies, University of Vienna
02/2011:	Performance scholarship, University of Vienna
03/2010:	Erasmus scholarship (summer term 2011), University of Vienna
06/2010:	Research Grant for Temporary Scientific Work Abroad, University of Vienna
02/2010:	Performance scholarship, University of Vienna
02/2009:	Performance scholarship, University of Vienna
05/2007:	Scholarship for Chinese Studies in China, University of Vienna
03/2005:	Language Skills Competition English, Lower Austria: 4 th rank

Stays abroad for the purposes of study and research

07/2011-09/2011:	Workshops at the Royal Academy of Dramatic Arts, London; research at the British Library, London
02/2011 - 06/2011:	Erasmus Universidad de Santiago de Compostela, Spain
09/2010 - 10/2010:	Conducting research for thesis in English studies London, UK; funded by the University of Vienna
07/2010 - 08/2010:	Teaching English to native speakers of Chinese Advisory, teaching and research purposes IELTS International Language School, Shaoxing, Zhejiang, PR China
09/2007 - 06/2008:	Scholarship for Chinese Studies in China, University of Vienna Shaoxing University of Arts and Sciences, Zhejiang, PR China
08/2006:	Shaoxing Summer School, University of Vienna Shaoxing University of Arts and Sciences, Zhejiang, PR China

08/2004: Intensive Language Course English
Bristol Language Center, Bristol, UK

07/2004: Intensive Language Course Spanish
Instituto Cervantes, Valencia, Spain

Further qualifications

Languages: German (C2)
English (C2)
Spanish (C1)
Chinese (B2)
French (A2)
Latin

Additional Information

10/2009 - current: Teaching Assistant
Department of Educational Sciences, University of Vienna
Department of English and American Studies, University of Vienna

11/2005 - current: Student member in the work group for the creation of a
curriculum for teaching degrees in Chinese
Department of East Asian Studies, University of Vienna

06/2009, 06/2010, 06/ 2012: Course: "Introduction to Chinese"
Assistant to the management & head of additional courses
International Summer Academy for Highly Gifted Students
Teaching Council of Lower Austria, Semmering

09/2011, 09/2012: Lectures: "Introduction to Chinese", "Chinese tea culture"
Symposium "Lust an Sprache" in Hollabrunn, Lower Austria
Pädagogische Hochschule Lower Austria

07/2008 - 08/2008: Teaching Assistant
Shaoxing Summer School, University of Vienna

07/2007: Assistant to the management
International Summer Academy for Highly Gifted Students
Teaching Council of Lower Austria, Semmering

07/2004: International Summer Academy for Highly Gifted Students
"English: Love through Literature"
Teaching Council of Lower Austria, Semmering

- 12/2003: Pull-Out Course for Highly Gifted Students
"English Drama: Romeo and Juliet"
Teaching Council of Lower Austria, Semmering
- 07/2003: International Summer Academy for Highly Gifted Students
"English: Business English"
Teaching Council of Lower Austria, Semmering
- 07/2002 - 08/2002: International Summer Academy for Film, TV and Multimedia
"Film Analysis and Screenplay"
Film School Vienna
- 07/2002: Summer Course: "Hotel and Service"
Hotelfachschule Waldegg
- 07/2001: International Summer Academy for Highly Gifted Students
"German: Harry Potter"
Teaching Council of Lower Austria, Semmering