How to Build a Time Machine

Before I start, I want to make it clear that this is a discussion and not a speaker meeting. While I might start things off, I will be disappointed if someone doesn't interrupt me to disagree with what I say. Please don't be intimidated by the fact that I've built my own time machine in the attic. You still shouldn't be shy about interrupting me and telling me I'm talking bollocks.

As an aside, let me tell you how useful a time machine is. I've given this talk before, a few years ago. The first time I didn't really know what to say, so I checked the attic, and there was a completed talk sitting in the time machine. I had to remove some references to books that hadn't been written yet, and to the Great Hilda's Armadillo Invasion of 20-ahem. If, no **when**, I give the talk again and don't have any anachronism fixes to make, I'll know it's time to send it back in the time machine. The cool bit is that I generated a talk out of a paradox without ever having to write a word. It's even just what I would have written if I could be arsed.

I'll start off by making a few general and controversial statements. It's then up to you to disagree with me.

I believe that a time travel story isn't really a time travel store unless it involves travel into the *past*. We all travel forward in time at a rate of 24 hours every day, and there's nothing really special about speeding up that rate. Whenever you fall asleep, perhaps. You can achieve a longer leap forward with cryonic suspension. There's a film called ***Forever Young***, where Mel Gibson, frozen in 1939, is accidentally resuscitated in 1992 and has to learn about answerphones. As a decent chap, as of course everyone was in 1939, Jamie Lee Curtis falls for him, and it all gets very soppy.

If you want to get really ambitious, you can use the time dilation effect, either by travelling close to the speed of light, or passing through an intense gravitational field, such as close to a black hole. This is used to great effect in Joe Haldeman's ***The Forever War*** (and various sequels), where the dislocation felt by soldiers returning to earth centuries after they left is used as an allegory for the dislocation felt by returning Vietnam veterans.

Poul Anderson's ***Tau Zero*** takes this to extremes: after an accident, a spaceship is forced to accelerate continuously, allowing it to outlive the Big Crunch and another Big Bang.

But none of these are proper Time Travel stories. Jumping into the future offers a convenient mechanism for the protagonist to see what that future might be like (and that can be very interesting in itself), but gives no scope for doing anything unusual with Time, and critically, has no possibility for paradox. Embarrassingly, my stipulation that a Time Travel story requires travel into the past, disqualifies the seminal and probably most famous so-called "Time Travel" story of all. In H.G. Wells' ***The Time Machine***, the Traveller does eventually go back in time when he returns to the present, but this is a postscript to the main story, which involves Wells' ideas on the evolution of humanity and human society.

If you go along with this, *(and here comes controversial statement number 2)* Time Travel stories, probably more than those of any other subgenre, are all about plot. Characterization, literary merit, and extrapolation of technology or society, are all secondary to the 4-dimensional twists of the plot. Maybe this explains why many of the best Time Travel stories are short stories.

Anyway, I hope the plot-driven nature of these stores will encourage you all later to retell some of the cool time travel stories you have come across.

Before that, I have an admission to make. The title of my talk is a lie. I can't tell you how to build a time machine - sad to tell. The ***Regulations for the Control of Time Travel*** make that plain. But what I can tell you is how to write a Time Travel story, and hopefully inspire you to read some good books along the way.

You need a mechanism to travel back in time

In principle this is your biggest problem, but do not despair. Although most physicists will tell you that Time Travel is impossible, physics gives plenty of loopholes and buzzwords to choose from. Here are a few.

1. All you need to do is travel faster than the speed of light. Then you arrange for your superluminal device to transport you between a rapidly-moving spaceships, and bob's your uncle, you'll return from your jaunt before you set out. ***Tachyon*** is a good buzzword to use at this point (all it means is a superluminal particle).

2. If you think your reader too smart for that one, you can always arrange to fall into a black hole. Since no one really knows what happens then, particularly if there's a singularity involved, you can have the laws of physics break down in any way you like. The problem, of course, is that you'd probably be converted to neutronium by the tidal forces on your way in, unless you found a *really big* black hole to play with. *I'm sure I left one around here somewhere.*

3. This is all ignoring the gravitational physicists who keep coming out with papers suggesting ways you really could travel round a ***closed causal spacetime path*** (that's General Relativity-speak for returning to where and *when* you started). Sadly, the engineering requirements are a little extreme such as structures weighing more than the

rest of the Universe. Still, if you like technobabble, there are plenty of buzzwords to play with: as well as that **closed causal spacetime path**, there's also **negative energy**, and **violation of time-reversal invariance**. I slipped that last one in because it is a real effect that I am researching into - via related effect of **CP violation**. Although it sounds good, it unfortunately doesn't help in building a time machine. You don't have to tell your readers that, though.

4. You could of course cheat in the same way I did writing this talk. Your hero may not have to understand it to make a copy of your time machine and send it back to when she found it. This technique is used to good effect in John Varley's latest novel **Mammoth** - at least I think that's what'll happen because I haven't quite reached the dénouement. Actually, I think his purpose in writing the book was so he could have mammoths rampaging through downtown Los Angeles.

5. If all else fails, you can always use the mad scientist or magician dabbling in forces that no mere mortal (protagonist included) can understand. **The Anubis Gates** by Tim Powers is a good example of this. This is an excellent fantasy novel, that mixes in elements of horror, mystery, historical romance, as well as time-travel paradox. In a wonderfully convoluted plot, our hero meets Old Kingdom Egyptian sorcerers, Victorian romantic poets, a werewolf, age-old secret societies, grotesques inhabiting the London sewers,... and of course himself.

You need a *theory of time*

Unless you are going to be very circumspect, you need to decide how to deal with paradox. What happens if you go back in time and try to kill your mother as a child (the more traditional grandfather isn't such a problem given the difficulty proving paternity)? Herein lies much of the fun.

1. **Just can't be done.** You seek out your mother, but she's in hiding. You murder the little girl, and as you mount the gallows you see her identical twin watching you. Just as you cock the pistol, a meteorite strikes you down. Whatever you do, History (with a capital **H**) conspires against you.

2. A variation on this theme is **The end of the Universe**. A paradox would cause the universe to be destroyed. This thesis is carefully and thoughtfully examined in the **Back to the Future** films.

3. **Fixed past.** Perhaps one can travel backwards in time, but can't change anything at all. One is entirely an observer, unable to move a blade of grass (eg. **An Age** by OUSFG's founder, Brian Aldiss).

4. **Alternate Worlds.** When you kill your mother, a parallel world where you never lived is created (or revealed). This possibility can be convincingly justified with the **Many Worlds interpretation of Quantum Mechanics**. For more details, I'll refer you to Colin, who is the real expert - he wrote the [book](#).

5. **The Time Police** prevent you. Silly idea.

6. Although not much use for Time Travel stories, **Larry Niven** has made an interesting argument. Suppose that Time Travel were possible, with a single, malleable, timeline. This is an inherently unstable situation. As long as people go back in time and change the past, they will inevitably affect themselves, even if only slightly. These small changes are cumulative - eventually a timeline will come about where that person never invented the time machine, or didn't use it, or was never even born. This is the only stable state: where no one ever used a time machine. Since systems tend to evolve towards a stable state, this has probably already happened. Ie. Time Travel is possible, but never practiced.

Whatever your theory of time, the important thing is to **be consistent**. There's nothing more annoying to a reader than a gaping inconsistency, where the thrill of dicing with paradox is much of the fun that a time travel story affords.

At this point, let me recommend two Heinlein shorts, **"All You Zombies..."** (in **The Unpleasant Profession Of Jonathan Hoag**) and **By His Bootstraps** (in **The Menace From Earth**), which are classic tales of paradox.

The Plot

If your hero manages to avoid a paradox, then there's all the fun of twisting fate. What would happen if you inoculated the Central Americans against European diseases before Columbus's arrival? Orson Scott Card's **Pastwatch - The Redemption of Christopher Columbus** has a future society altering history in an attempt to bring about an enlightened present.

Could one fix up all one's past misfortunes and lead the perfect life? Oddly, this always seems to lead to one being the instrument of one's own misfortune.

How would you recognise other Time Travellers without alerting everyone else? **The Anubis Gates** has time travellers whistling **Beatles** tunes in Victorian London. In Ken Grimwood's entertaining fantasy, **Replay**, our heros place newspaper adverts referring to future events: the word **al-Qaeda** before 1988, or **Google** before 1998, would stand out, but be unrecognisable to most locals (actually the book uses different examples). In other ways, **Replay** is rather similar to last year's OUSFG Award shortlisted novel, **The Time Traveller's Wife**.

I'll gladly tell you more about any of the stories I've mentioned (and could bore you with many more), but it's your turn now.