



Zeitreisen und Zeitmaschinen

Andreas Müller

Heute Morgen war ich noch gestern

Time Travel and Time Machines

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This book grips you not only as an engineer but also as a member of a species called human beings and brings you up-to-date on the subject of time travel in a well-argued, yet entertaining technical-scientific way.

The subject is much older than space flight and was “officially” introduced by H.G. Wells’ “Time Machine” novella in 1895.

The author Andreas Müller (astrophysicist at TUM Munich and author of many scientific publications) provides you with a basic understanding of Einstein’s relativity principles: Special Relativity Theory (SRT): “the faster the clock is traveling the slower it is running” and General Relativity Theory (GRT): “the farther away a clock is located from a piece of mass (i.e. from a gravitation well) the faster it is running”. Those two principles are used in practice every day for the necessary correction of the satellite onboard clocks in navigation satellites (GPS and Galileo) to account for Einstein’s relativistic time dilation effects.

Having understood Einstein you move on to time travelling as imagined by writers and movie makers and the scientific background of those stories are assessed.

The most prominent movie example is the “Back to the Future” - trilogy. In part 1 the character Marty travels into the past to check out the consequences of “influencing history”, in the second part he also travels into the future of the year 2015 (the year 2015 laid very far in the future from the 1990 point of view) which allows a “God’s eyes view” from our today’s perspective.

Other movies are examined dealing with “black holes” or “wormhole” travels (“Interstellar”, 2014).

Concluding this chapter with the dry statement that even “currently not possible”, the described effects are very close to experiences one would have to expect if traveling to the past or into the future.

Three types of time machines are suggested in the next chapter: the SRT turbo-capsule (1), the GRT based parking (orbit) capsule (2) and the wormhole capsule (2), each based on the appropriate relativistic theories. The theories and solutions from Einstein’s field equations are described in detail and illustrated with scientific examples, again with references to their occurrences in sci-fi movies. The sobering result being that the SRT turbo capsule (1) would let you travel into the future only. The same would be true for the “parking orbit” (2) machine. Only using the wormhole “traversing” technique (3) travelling on a “closed timelike loop” would bring you to a point to the past “... if you could master to survive the bodily perils looming for you”.

The “closed timelike loops” go back to a solution of Einstein’s field equations by Kurt Goedel in 1949 (Goedel-solution), valid for a rotating universe – which ours isn’t. Nevertheless the mathematical existence of these loops is proven.

Again the author’s disillusioning assessment is that “wormholes are oddities of Einstein’s relativity theory which might not even exist”.

So much to the current state of affairs and the chance to see a time-travel-era soon. According to my judgement this is infinitesimal small for the near and far future.

The most interesting chapter in my opinion is chapter 3: “A society of space travelers”, where physics meets metaphysics. Using famous sci-fi examples to discuss the sociological consequences and resulting problems from time traveling (who will travel?, how can time travel be regulated?, etc.) moving on to more puzzling questions whether time travelling should only be exercised in a “passive” – observing mode - or if possible, could be used to learn and/or influence our past or future.

Interesting stuff, indeed but it's getting more complex - the “paradox” chapter (3.1) addresses phenomena which could arise under certain circumstances. The most prominent example being the “grandfather paradox”: A time traveler arrives in the past way before he was born, even before his father was married and had any own children – he meets his grandfather and kills him (accidentally or deliberately might only play a role in the second level of metaphysical evaluation). Is the consequence of that killing that our time traveler never will be born or will he be born again? What are the consequences for the future development of his own history? Do we embark on a totally different future development or will a “chronology protection conjecture” – as postulated by Stephen Hawking, prohibit the killing of the grandfather?

This fascinating subject triggered me to establish my own scenarios – you should try it yourself – like what would happen if in the above example the time traveler is killed by his grandfather?

At the end of this chapter the author finally poses the question if time travelling would be possible, why haven't we been visited by any time travelers from the future yet?

He offers five possible reasons:

1. Time travel is impossible in principle
2. Time travel into the past is not possible
3. It happened, but we have not noticed
4. Time travel to the future is possible but not allowed for ethical and / or safety reasons.

The author encourages his readers to come up with more aspects, therefore I would like to contribute a comment to item 4: “If something is possible it is out of our power (the inventors) to prevent it (Edward Teller)” and would like to add a 5th item: Time Travel will not be performed by any-body because the body, soul and mind of the traveler will not survive.

This is following up the account of a visionary time traveler “... I told you of the sickness and confusion that comes with time traveling” (as reported by the Time Traveler in H. J. Wells, *The Time Machine*).

In the next chapter, “Vision 2100” Andreas Mueller offers his own “honest-a-goodness” predictions for our future and what to expect until the end of our century by extrapolating and analyzing available studies reports and statistics, e.g., world population: by 2100 we will exceed the magical 10 Billion mark, the average lifetime expectance will be 110 years, cities will grow in height (e.g., buildings will grow taller, living space has to be explored in underground cities and possibly under water).

Of course much more interesting details are provided in the various chapters dealing with politics and economics, climate, energy, medicine, technology and traffic, entertainment, science and disasters to be expected (e.g. asteroid collision). Mueller's predictions have to be used “with a salt of grain” and he spices his predictions with ironic remarks like: the brain of Albert Einstein will be cloned and implanted into Joey who, within a short recovering period will solve the century old problem of how to quantize gravitation.

As a reader being interested in space exploration I acknowledge Mueller's visions: In 2045 completion of the first International Moon Station (IMS), in 2050 already 350 people will be living in “Lunar City”. Five more international space stations (ISS 1-5) will be deployed by the partners USA (NASA), Europe (ESA), China and India, in 2089 ISS-6 “Berlin” will be launched in honor of the 100th anniversary of the “fall of

the Berlin wall” and Carla Schwarzenegger, a granddaughter of a certain Arnold S. of Austria will be President of the USA.

In the chapter “Technology” I am missing the name Elon Musk, in particular with respect to electromobility (Tesla) but also with respect to. SpaceX, because I think Elon will be an important “shaper” of the 21st century.

The final chapter addresses the same subjects as mentioned in “Vision 2100” above from a viewpoint in the past, like the year 1910 and now the author tries to find out whether our grandfathers would have been able to predict the achievements of the coming 100 years in front of them. It is fascinating to be guided through “our” exceptional 20th century in “fast-forward” - mode and one can only marvel about the scientific, technological “quantum-leaps” achieved in a relatively short time of the past 100 years (with the outstanding years between 1905 and 1915).

The conclusion by the author is that the scientists in 1910 could not possibly have had a realistic vision of the coming 100 years, however some developments could have been predictable because they are subject to recurring laws and because people can not necessarily always learn from their mistakes.

The same is true for the future predictions for the 21st century because the world is much too complex and too dependent on coincidental, not predictable but important single events.

Does it make sense to have visions? The author Andreas Mueller answers with a convincing “yes” and summarizes his vision in detail at the end of this chapter with the purpose to outline the challenges we might have to face and better be prepared for.

Andreas Mueller’s message is that with a vision you have a goal – and we have to establish strategies and strive for solutions for how to actively influence our future to show responsibility for ourselves, our children and their descendants.

The book is rounded off by an exemplary glossary, summarizing a whole scientific library on just a couple of pages, a list of references (a treasure trove) and a subject index for quick location of key descriptions.

Unfortunately the book is only available for German readers – but it would well deserve to be translated for the English community.

The book is fun to read, very entertaining and provokes you to come up with your own thoughts, interpretations and opinions – you cannot expect more from a technological-scientific oriented book dealing with Einstein’s relativity theory and the future of mankind.

My compliments!