

Twin paradox of SR: Einstein confirmed a bit

Edgars Alksnis
e1alksnis@gmail.com

Light and temperature independent biological clock has drivers (*zeitgebers*), which are different for the twin, which stays on the Earth, and for other one, which flies away

keywords: special relativity, space biology, circadian clock, artificial biological clock, twin paradox

Reading the old literature (of chronobiology-E.A.) (from late 1920s till late 1980s) can be an exercise in frustration. There are creative ideas and plausible hypotheses that nobody has tested yet. There are lines of research that have been abandoned, yet modern techniques should make the continuation easy and fun, but nobody is doing it. (...) Finally, there is a long list of papers with data that directly contradict the current understanding of the way the circadian clock works... (<http://circadiana.blogspot.com/2005/01/forty-five-years-of-pittendrighs.html>)

Postulates of Special Relativity has been widely criticized for more than a century (Mueller, 2006). So called twin paradox, which states, that one of the twins after spaceflight returns home younger than that, which stays on the Earth because of „diferences in time flow” or „acceleration”, received especialy harsh critique. Interesting therefore is to see, that here is some truth- because twin paradox is connected with biological, not physical time.

Mainstream frequently tells us, that we have „built-in” *circa-day* biological clock and some other biological rhythms. However, half- century old cave experiment of Michel Siffre brings dismissal of that idea- outside of several natural irritants diurnal period of activity of Siffre moves to the night and lenght of his „day” significantly fluctuates.

That brings us back to papers of 1)Rosa Stoppel from 1916 (Pittendrigh, 1993), which states, that main biological clock on the Earth is connected not with temperature and light, but with self-rotation of a planet and 2)Japanese researchers, who a decade ago demonstrate, that core elements of nearly diurnal biological clock can be assambled in working mode in a test-tube (Nakajima et al., 2005). *Zeitgebers* („time givers”) of our biological clock (diurnal, sinodic-monthly, annually) are the Moon and the Sun, so here are a lot of intriguing questions- like 1)if year of the Earth would be 400 days, will human life be a bit longer, than



Fig.1 Rosa Stoppel (1874-1970)

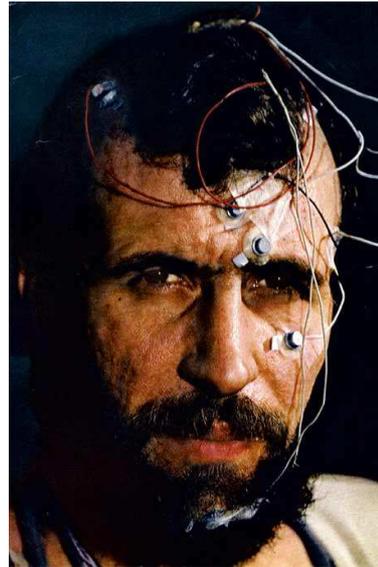


Fig.2 Michel Siffre during cave experiment in 1972

now; 2) does, for example, 900 year lifespan, ascribed for certain characters in Bible, reflect changes in „reference frame” or not (fig.3), and 3) what will happen with biological clocks if there are no *Zeitgebers*?

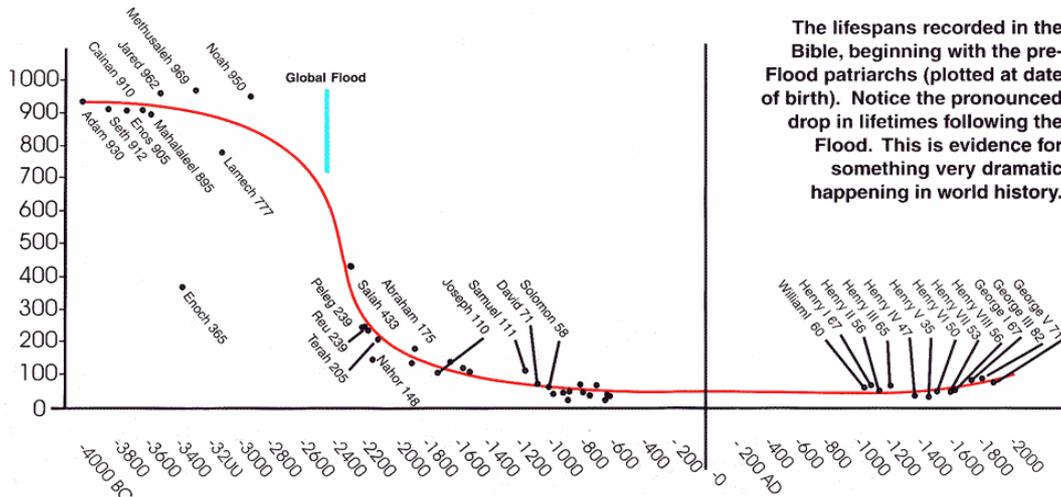


Fig.3 Lifespans of biblical characters. Credit: Carl Wieland, Creation.com

Satellites are moving fast around the Earth, so actually astronauts are in situation without proper drivers for their biological clocks- understandably the latter are disrupted (Mallis and DeRoshia, 2005). During longer flights within solar system without artificial biological clock perhaps ageing of flying twin will proceed faster, comparing with sibling on the Earth. With proper artificial *zeitgeber* flying twin may stay younger, without necessity to reach big velocities. So time is a bit relative, indeed...

References

Mallis M, Deroshia C. Circadian rhythms, sleep, and performance in space. *Aviat Space Environ Med* 2005; 76(6, Suppl.):B94-107.
 Mueller G. (2006) 95 Years of Criticism of the Special Theory of Relativity (1908-2003). Internet

Nakajima M. et al (2005) Reconstitution of circadian oscillation of cyanobacterial KaiC phosphorylation in vitro. *Science*. Apr 15;308(5720):414-5.
Pittendrigh C. (1993) Temporal organisation: reflections of a darwinian clock-watcher. *Annu. Rev. Physiol.* **55**, 17-54

© Edgars Alksnis, 2016