**Science, Technology and Society 1400-Present**

**Einstein. Time.**

**Constancy of speed of light.** Speed of light always the same no matter how fast you are going. Why called principle of relativity when its regarding constancy? To do with consequences of speed of light being constant, making other things (eg. length, duration, simultaneity) relative.

**Time-dilation ie moving clocks are slower.** Twin paradox. 2 twins, Ed and Dave; Dave stays on earth, Ed travels for a long time in a spaceship and ages 20 years. When 20 years pass by for Ed on the spaceship, maybe 200 years have passed on earth for Dave. So it’s not just clocks that slow down but everything.

**Space-time.** Space and time are not independent. Position of something and time at which it occurs are intimately connected. Usually illustrated in terms of simultaneity. Einstein showed that the time interval between two events depends on the distance between them – if I click by fingers in the same place and same time, these two events will seem simultaneous to a moving observor; but if I click them a distance apart, still at the same time, they will no longer seem simultaneous to a moving observor.

**Quanta.** Only certain levels you can take. If electron in quanta universe, there are certain levels of energy you can have, but cant have any level of energy in between these defined levels of energy. Certain positions a body can occupy that exclude all other positions.

**Observation effects causation.** Can know time and position of something very accurately, however you can’t know them at the same time. Discreteness of universe, degree of uncertainty in all measurements. If you make adjustment in the place of something, it is true that this will have an effect on the time of it.

**Galison reading** - Looking at Einstein - relation of how his work at a patent office may have influenced his theory. Synchronisation of train timetables important for Europeans. Need to make right adjustments to track to avoid disaster. Von Moltke - primacy of efficiency and organisation using railways to achieve success through military strategy. It seemed irrational to have clocks that operated in the same general places showing different times. Einstein’s father worked on electrical devices using mechanisms similar to that of clocks. Einstein at the centre of this context geared towards clocks and time. Theory of relativity, 1905. Talks of problems of clock synchronization, and how we will achieve this. Solution to have one master clock and by looking at problems he comes to the final point of special relativity. Some students were not convinced, saying Galison overemphasis the context; everyone in Switzerland was surrounded by clocks only Eistein came up with theory of special relativity, confusing inspiration with causation. Undermines prerequisite breakthroughs and experiments provided by previous physicians. Still, Galison’s paper is not a complete waste of time – he has told us \*something\* about the origins of Einstein’s paper. Conclusion: he overplays the role of clocks in comparison to other factors.

**Staley reading** - Tries to show links between classical and modern physics. Can’t be too prescriptive when talking about the distinctions between classical and modern physics, they are relatively linked and is therefore unfair to separate them too strongly. Political context allowed progression in physics in the early 20th century to be described as a revolution. Need to think actors point of view. Debate going on regarding how revolutionary the physics was. Focus on the discourse regarding the physics and the physicians themselves.

**Summing up:** two papers which can be read in an extreme was as saying that science is determined by its technological context (Galison) and that the classical/modern distinction is an illusion (Staley). However we can draw useful lessons from these papers even if we don’t accept an extreme interpretation of them.