

A SIMPLE TIME MACHINE

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Introduction

A clock can be thought of as a simple time machine. After all it keeps accurate time, at least for its own space time reference. Another kind of time machine would be a device that reveals times arrow. This short note may be missing something very basic; however it shows how time might be an inherent property of certain rotational motions, such as the forces and actions displayed by a kind of vector revealing gyroscope.

I think of time as having a well-defined arrow at all scales. The following presents some simple arguments about this.

Many physicists feel that time is not necessary in the equations describing particle interactions. As we probe smaller and smaller time evaporates and space becomes foamy and chaotic.

Popular writings on physics often say that if you made a film of an interaction and then played it backward you could not tell if it was being played backward since negative t gives similar mathematical results.

Let us use the reverse film idea and see if it is possible to reveal that the film is being played in reverse. If so, then for that film, times arrow has been exposed.

The ratchet wrench film

Take a simple ratchet wrench and open it up so you can see the working of the ratchet. Play the film forward and things look OK. Play it backward and you see the little ratchet dog leap over the cogs in the wrong direction while producing torque in the direction where the ratchet dog should be slipping over the cogs instead. You can tell the arrow of time with a ratchet wrench.

Why a ratchet wrench? Well, it is possible that some particles have some internal vectors or very simple mechanics that do not work in reverse. A ratchet wrench is a very simple mechanism but is not intended here to prove anything about a particle. Instead it is given as an example of the problems in reversing time on a human scale, or even the scale of most microbiological molecules. Here are some examples:

- *Mathematicians moving backward in time erase equations from blackboards and unlearn and unteach mathematics. Not only is this meaningless, but it makes a mockery of much of physics, logic and mathematics.
- *Physicists undetect particles and unprove the 'certainty' principle.
- *Bodily wastes insert back into all creatures. This is a rather unpleasant example.
- *The principle of entropy works in the opposite way organizing everything therefore it is no principle and never really was.
- *People breathe by inserting oxygen back into the atmosphere.
- *Plants use up oxygen and exude carbon dioxide.
- *Radioactivity works in reverse making stable elements unstable and unstable elements stable.
- *The sun sucks up energy.
- *Carrying this to extreme would gravity reverse so that matter repels matter causing the universe to fly apart?
- *Would protons attract protons and repel electrons while electrons attract electrons and repel protons? Would the strong and weak forces reverse?

The gyroscope film

Take a simple toy gyroscope and let it precess about a pivot. Attach an hour glass with one end removed at the outer end of the gyroscope. The sand grains falling out of the gyroscope describe an arc. Now play the film backwards. You see the sand grains describing the same arc but the gyro is precessing in the opposite direction. Thus you know the film is going the wrong way. Once again there is clearly a times arrow here. In fact the sand grains are traveling up into the hour glass when the film is in reverse, clearly not possible. Gravity always attracts.

Any experiment on a super small scale can show a clock or hour glass in the background which would reveal time going the wrong way when the film is reversed like the hour glass. However the gyroscope reveals a more basic time problem. The combined precession vector, if it could be detected and revealed when making a film of the gyroscope precessing, would point in the correct direction when the film is played forwards. This combined vector is shown schematically in Figure 1. When the film is played backward, the combined vector would point in the wrong direction. This is because the static, detected, and recorded vector stays pointing the same way no matter which way the film is played. Remember we decided to detect and record its direction when we made the time forward film. So even though this gyroscope is of macroscopic size, subatomic particles rotate and are subject to gyroscopic forces and gravity at the same time. Thus very basic experiments that do not detect and record combined vectors would not show any arrow of time in this sense, but (as physicists are fond of saying) they would be there in principle.

In a sense much of the argument that time is not necessary is a matter of semantics. Many aspects of detection are recorded and held valid in quantum mechanical experiments. Physicists like to give the example of just looking at a very simple natural phenomenon (where entropy increase is not obvious) and then saying that the basic equations describing it would give valid results for time going either way. Yet if it were possible to record many more details of that same observation an arrow of time might always be revealed. A hint of this already exists in mathematics where some vector multiplications give very different results when reversed. Mathematics already has a deeply psychological and completely ignored times arrow. It pretty much always proceeds in one direction, namely from problem to solution. You might object that a new solution often suggests new problems but this is just the cream of the evolving process of all science. The many unrevealed and unrecorded vectors of nature are like the unrevealed ratchet wrench mechanism. The vectors are really there but ignored because the calculations as presently done have no need of all these extra cumbersome details. Think of mathematics not as proofs cut in stone that do nothing else once proven but as time oriented activity of mathematicians. A proof does not exist if we do not learn how it works and use it (to research mathematics) with this mental dynamic understanding. It is like a flowing mental circuit. A robot or computer program would not care the slightest about a proof.

The electron moving in a magnetic field film

In this case there is a clear arrow of time. The electron curves one way moving through a magnetic field and a positron curves the other way. If the film is reversed the electron would be a positron, (traveling backward over the same path thus curving the opposite way). Clearly the film is going the wrong way if the experimenter left a note somewhere saying that the film shows an electron (detection means recording fully what is detected, including whether it is positive or negative). After all the difference between an electron and a positron is quite basic or they would not annihilate when brought together producing energy. If they were perfect opposites in all respects ones energy would be negative and the other one would be positive. Bringing them together would make them both simply disappear, producing no energy, just disappearing.

Gyroscope time machine experiments

Figure 2 shows a gyro made with a small hub and a larger ring. The hub and ring are connected with elastic spokes (rubber bands). Turning the device about a vertical axis while rotating it with a small drill shows a small twist between the hub and ring. This twist is opposite when turning it the opposite way about the vertical axis. If this were a film played backwards the twist would go the wrong way revealing a time arrow.

Figures 3 and 4 show a wheel with a bar attached at the rim by a pin through its center. The bar is free to rotate in either direction just far enough to point tangent to the wheel. When the wheel is rotated one way the bar immediately points in the direction of rotation. When rotated the other way it immediately points in that direction of rotation. Thus it is like a vector indicator showing the initial direction of rotary acceleration of the wheel. If a film of the wheel were played backward, this moment of inertia vector indicator would point the wrong way indicating an arrow of time. Any moving object has a directed moment of inertia. If the direction of time does not matter then all energy of motion would add up to zero on average. If a scientist truly wants scientific films he would want to record as many vector arrows as possible on each film strip. Humans with eyes pointing forward already have a built-in motion tendency vector.

Figures 5 and 6 show a special gyroscope having grooves about its periphery that each contain an indicator ball. I call these balls precession vector oscillators. The grooves are made parallel to the main rotation axis of the gyro and each ball is free to move back and forth in its groove about $\frac{3}{4}$ inch. When the gyro is wound up and allowed to precess about a pivot as shown in the figures the balls move from side to side in their grooves. Looking down from the top the balls move one way at the top of the rotation and then the other way at the bottom half of the rotation. This occurs because the gyro is precessing about the pivot. You can hear a distinct and pleasant clicking when the precession is rapid and the oscillators travel the full groove distance and hit the ends of the grooves. The balls show a diagonal line that would be going the wrong way if a film of the gyro were played backward. This line reveals that time has an inherent arrow in this case. It might be objected that the balls add a kind of entropy to the system. However once again we can say that in principle the balls can be made as small as we want. This reduces the entropy addition as close to zero as we would like, and would still indicate the arrow of time in the same manner if we allowed for their detection.

An information conundrum

Without knowing the arrow of time recorded information only has a 50-50 chance of being correctly interpreted and used. That being the case then the sum total of recorded information in the universe adds up to zero.

Conclusion

It seems almost simplistic and obvious that the universe is composed of a great number of vectors of all sizes and directions. Should you really want to reverse time you would need to reverse all the vectors. Forces and motion always require time to pass to be able to act, and forces always require vectors, (a direction and value). Imagine that one day a great scientist finally is able to reverse time throughout the universe, the vectors all reversing. Once all the gravity vectors reverse all planets stars and galaxies immediately fly apart. Perhaps time really does have a directional property, even more basic than entropy. The idea of reversing time would be like going the wrong way down a one way street. In its most basic aspect matter might have an internal mechanical flow pattern like road traffic. It would be pure simple self-organizing stuff.

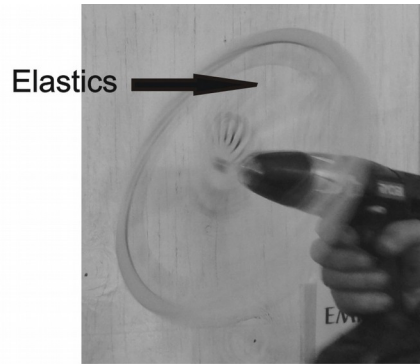
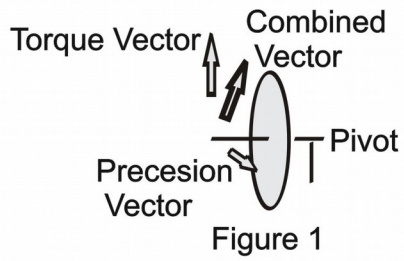


Figure 2

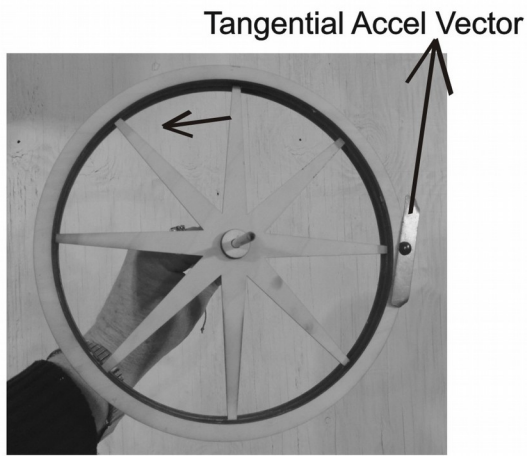


Figure 3

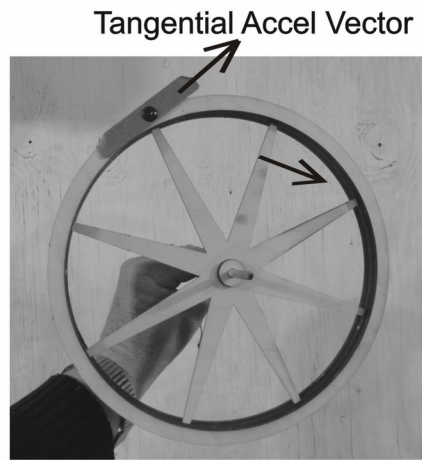


Figure 4

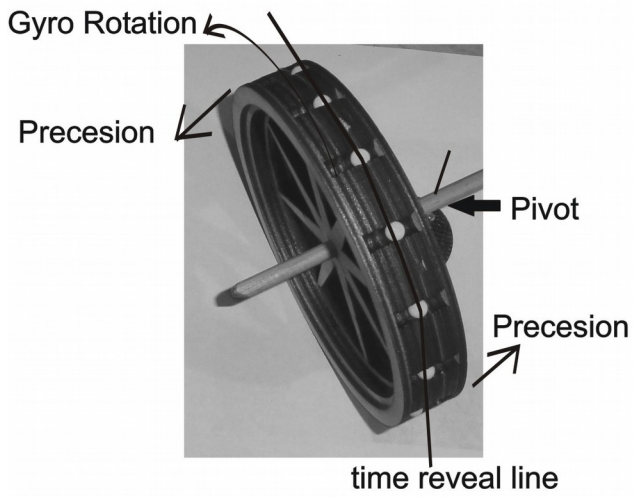


Figure 5

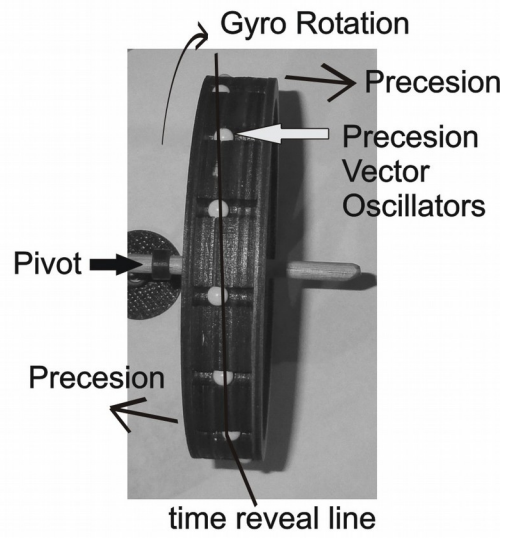


Figure 6