"*There is no limit to what a man can do or where he can go if he doesn't mind who gets the credit.*"
(Ronald Reagan, 40. President of the United States of America)

"*Inspired by the staggering beauty of America's* ***native*** ** wilderness, many early American writers rejected the Baconian view that man held dominion over nature: their subsequent works heralded the birth of the environmental movement.*"

- The Trustees of Reservations, in: The Ecologist, Journal of the Post Industrial Age, Vol. 11, No. 3, 1981, Page 135

* "*Untouched by human hands*" - and so of pristine *wealth*!

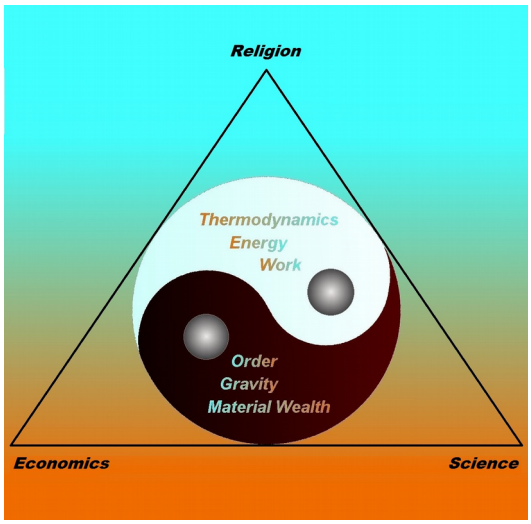
The Second Law of Thermodynamics

or

[Transcript of the webpages [1]]

Collected over the years

Wealth Creation vs. Job Creation



Gravity vs. Thermodynamics

'Relax,' said the night man,

'We are programmed to receive.

You can check out any time you like,

but you can never leave!'

(The Eagles, Hotel California)

Work is costly Business

God or ***no God*** - there is a fundamental mechanism in the universe:

An organising power, which *in itself* is **The Source of All Life on Earth**.

And the opposing force, which messes things up through mixing them up, we call **the devil**.

[1] http://project-icarus.de/atspace/strange/secondlaw.html

Contents:

Prologue to - Prospect 1850 -

From an economic point of view, the result of human activity is always zero,

as the assets and liabilities split up in the production process

will always cancel each other out; and physically,

the result is a loss.

So where then

is the profit?

The physical basis of ecology and economics is that all living beings, humans, machines, and matter movements on the planet's interactive surface, deplete, according to the laws of thermodynamics at a loss, an energy potential and entropic gradient which is provided for, and then replenished, free of charge and for thermodynamic gain, by the force of gravity.

These processes are sometimes intermixed.

From astrology to astronomy in economics

Within certain limits, it is not important that something is correct, but that it is *useful*.

It does not matter if something is completely understood *theoretically* (which in theory it can never be), but only that its *effect* is recognized. That is the only way a monkey can use a stick as a lever, and it is also the only way humans could employ fire without knowing anything about oxidation, and send an arrow into the target without having any idea of theoretical mechanics. To this day, flat, and thereby necessarily *incorrect* maps are used to navigate a globe, and no- one gets lost when if they are *used correctly*.

Similarly, humans have been orientating their lives along the **course of the stars** above for thousands of years; and their cleverest, on all continents, at all times, have endeavored to trace and predict their paths; but naturally, they succeed only **within the framework of their theoretical possibilities**.

As long as they proceeded from the assumption of a flat, static, asymmetrical world, and divided it into sectors from their point of view (in the Babylonian- Egyptian European region into divisions of **12**, **60**, and **360**), the result was *wrong*, but *employable*; in particular, the calculation of the planetary orbits resulted in completely chaotic reproductions from the point of view of the Earth as their theoretical center - although they were quite regular; so regular, in fact, that astronomical phenomena could be predicted, albeit with great difficulty (and so precisely, that unforeseen ones, such as comets and supernovae, were considered harbingers of doom; and quite rightly so, as only the likelihood of catastrophe was unknown).

But it took **three theoretical revolutions** to send satellite probes onto distant planets. From the subjective, **flat** (or rather: **pyramidical**) Earth with a fixed "**up**" and "**down**" side (which in the universe does not exist, in stark contrast to *right* and *left*), first to a **three-dimensional sphere** (this, incidentally, was done thousands of years ago with admirable precision [2]; but ecclesiastically, and thus *morally* and *socially accepted* only since a few hundred years, and finally so only since a few decades); then the idea of a universe with the Earth in its center needed to become **heliocentric** (as a result of which, theoretically non-calculable, varyingly erratic planetary orbits, first, became circles, then, with increasing precision, fluctuating ellipses); then, from a heliocentric world view, to one of a universe with a **past big bang** in its center, thus changing it from *space* to *time*- and who knows how many changes are still to come.

It was possible to navigate *within* each of these world views; but *not beyond*. And every time a sacral edifice, oriented towards the postulated **eternal** course of the stars, and thus the society built according to these calculations, went **out of focus** because of the dynamics of the universe, the respective society dissolved; because its fundamental beliefs, its stability, and thus the justification of its structure were now in question.

[2] https://en.wikipedia.org/wiki/Eratosthenes#Measurement_of_the_Earth.27s_circumference

And for **precisely the same reason**, because **neither nature or universe revolve around man** in any way; just as the human-centered, assumption-based, astro*logical* world view had to become a centerless, observation-based, astro*nomical* world view (in which not even *time* is constant any more), in order to progress; so the human-centered, assumption-based, eco*nomical* (actually, eco*logical*) picture of the world must become a *centerless*, observation-based new economic view of the world; in order to escape the eternal cycle of unforeseeable economic events.

As in **astrology**, the calculations and accounting (which, in addition to the *macroeconomic* governmental money systems, include the *microeconomic*, such as the presentation of taxes and levies, the pension payments and so on) in the current economy are *inconsistent*, *confused*, *baseless*, *complicated*, *inscrutable*; even experts do not comprehend it (not because they are stupid, but because it is **based on false assumptions**); and, above all, foreseealbe only to a very limited extent.

Here now is no less than the attempt, as at that time by Eratosthenes of Cyrene [3] to emerge from a false view of the world.

The second law of thermodynamics

The second law of thermodynamics allows for different formulations; one statement is that a *temperature difference* in a thermodynamic system can only ever *equalize*, *but never spontaneously develop or increase*.

However, since such temperature differences, which cannot arise thermodynamically, in reality not only *exist*, but are a *precondition* for the running of a thermodynamic process, this necessarily requires a mechanism existing *outside of thermodynamics and its laws*, which spontaneously forms or increases these necessary and existing temperature differences; the same can be said for differences in *energy* and *entropy*.

This force outside the laws of thermodynamics, which provides for temperature, energy and entropy gradients, and thus enables thermodynamics, is called **gravity.**

As necessary as the thermodynamic conversion of energy is, without gravity it would not exist, nor would there be material bodies to implement it; there would also be no *order* or *negentropy* [4], without which life is not possible.

It thus forms the prerequisite of all that exists beyond pure matter; and is - directly and indirectly - the basis of any movement.

Why bother with the second law?

- **For one thing, it rules much of what happens on Earth.**
- **For another, much of what happens in the universe.**

Maybe not everything. But still, it might be wise not to try to work against it.

[3] https://en.wikipedia.org/wiki/Eratosthenes#Measurement_of_the_Earth.27s_circumference

[4] short for *negative entropy*, literally an impossibility

To avoid this, we must know how the second law of thermodynamics can be used to test the validity of our actions. And there are signs that, some thousand years ago, people, through **instinct**, **experience**, **religion** or **science**, were more prone to obey it than we are today.

Some of these insights may have even engrained themselves into our mythology [5].

However:

- The **economy of the real, physical world** states that you always have to **put in more than you can get out of a process** involving work.
- **Human economics** tell you **the exact opposite**.
- The former being in action universally for **multitudes of orders of magnitude longer in time and further in space** than the latter, which lives and dies with the short human existence on this tiny planet Earth, should at least provoke the question as to **which idea is more likely to be real** - and why we tend to believe in the other; and what consequences that might have in store for us in the long run.

On the other hand, and contrary to much popular belief, **the human economics even of today are not really a science**: apart from perhaps some very simple truths, there is no scientific proof that certain economic assumptions are valid.

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[5] Part of the mythology:

- Babel (the impossibility to achieve infinity),
- Sysiphos (the impossibility to achieve the end of it), and maybe in future,
- Chernobyl (what happens if we try).
- Gravity is free of charge.

The beginning of everything:

"*In the beginning was the Word, and the Word was with God, and the Word was God. Everything has become by the Word, and without the Word nothing has become.*"

Thus it is in one of the oldest writings of mankind. But what does it mean? Let us look at the following in summary:

In the beginning God created Heaven and Earth; but the Earth was desolate and confused. God separated the light from the darkness; and God separated the water below the vault from the water above the vault. Then God said, "*The water below the sky shall gather together in one place, so that the dry can be seen*".
The dry he called land, and the gathered water he called the sea. God saw, it was good.

The history of creation, in one of the oldest writings of mankind, is the description of the creation of all that is, through order; in which God, or whatever, separates things from each other, sets them apart from each other, and thus defines them and allows them to be named. The power that accomplishes this in the universe is called **gravity**.

And the opposition to the creator of order we call diabolos, the devil, "he who messes things up".
Or Lucifer, the light-bringer: As in thermo-dynamics.

In fact, the results of some economic experiments in recent history have shown vast aberrations from the predicted outcome and indeed from the results of similar experiments. It seems fairly safe to say that few economic experiments in history have been able to meet the prime criteria for scientific validity: consistent, reproducible results; this perhaps except in failure.

Were this otherwise, a great deal of policy-making would disappear from politics and economics would become an engineering profession with largely predictable results. Betting on the outcome of economic decisions on the stock exchange would loose its importance.

As it is, economics present themselves as more of a religion based on certain beliefs and values and depending on others believing in it as well to keep it going, notwithstanding periodic system flame-out. According to the economists themselves, "trust", belief ('credit'), and "psychology" play a major part in the game. It is a game, and a game of chance at that.

Whatever the reason for this, it is therefore disputed that economics are a science at all, and as it seems, the Nobel Prize for economics is not a real Nobel Prize either. All of this puts economical theories in line with **mediaeval alchemy** rather than with post-gallilean science; calling some of it "voodoo-economics" therefore does not really qualify as an insult.

Do economics have a real base in physics?

It may be that the following is a bit jumpy and sketchy, but this is a first, in itself perhaps somewhat crude and alchemistic stitching together of three seemingly complete separate subjects:

I. **Thermodynamics** (**We cannot live by our own effort**),

II. **Gravity** (The **second principle**)

and

III. **Human Economics** (The **law of insufficient returns**).

The connection between or rather the complementary nature of the first two lays the background for the relation between the first and the last.

There will be no calculations put forward, just some global observations and an attempt of logic.

I. Thermodynamics

Motion through heat; from order to disorder in the universe

- Not only can the laws of thermodynamics themselves be put in different ways, to explain and to understand the workings of the universe - their implications for human society, far beyond the realm of physics, are manifold as well.

- The question about '**Life, the Universe, and Everything**', for which the answer found by the fictional computer "**Deep Thought**" was a random number (42), remains unanswered, if the question itself is not known. Perhaps we can come closer to knowing the next question if we look at the answers we already have.
- In the end, the answer to "**Life, the universe, and everything**" may not be "**42**", but "**gravity**".

Bluntly, the second law of thermodynamics seems to stipulate that:

- **We cannot live by our own effort**

  And, in consequence,

- Since our financial systems are based on this fundamental misconception, they are **prone to serial collapse**.

However, **life goes on regardless of what humans do**, it has gone on and - if we are not careful - will go on without any human action to further or disturb it.

This is not trivial; there is a **human misconception** that life will not go on if we do not make it go on. Even the Bible states that differently.

This misconception is based on, and is expressed in, the popular belief that:

- **Everything in the universe goes from order to disorder** (increasing what is called "entropy").
- **There will be a heat death when everything in the universe has the same temperature**.
- **We have to work against that to keep it up** (which, in reality, is a contradiction to the former, as working levels differences in energy)

One could hold against this that, in reality:

- **Everything in the universe goes from disorder to order.**
- The universe - and our tiny place in it - was already a set of highly ordered surroundings before we came along. We could not have come into existence on a ball of molten stone in a cloud of steam and dust blotting out the light - if there was light. As we know, before God - or whatever - separated light from darkness, and land from water, thereby creating what we call "order" there was not - as expressed in the modern term of 'singularity'.
- **There will be a cold death when everything in the universe has the same temperature.**

- This is a question of definition, but if the universe is still expanding, it is probably cooling off (and also probably becoming still more orderly - if it follows the laws of thermodynamics strictly in this point [A]; this, however, is still under dispute).
- **The only place there is a disorderly mess is where we, as humans, make one of the highly ordered surroundings we find to our advantage.**
- Of course, this goes for any living being, especially one that can move, do, and therefore perform **work**. It even goes for **inanimate objects** that can do so.

One could put it this way:

- **Left to itself, nature, over time, will create order**
- **Does she do so by 'work'?**

  [She should not do so **against the laws of thermodynamics**. These apply, if differently, to animate and inanimate objects in the universe alike in supreme indifference.]
- **The question remains, however, if creating order is a thermodynamic process in itself**. This should be difficult, since a thermodynamic process usually is defined by creating overall disorder (entropy).

This is a question of definition.

Is '*order*' defined by a state of everything being spread out evenly in a hazy cloud of everything, or is '*order*' defined by a state of everything being sorted out and separated as far apart as possible? In the first case, even hydrogen atoms would be a disturbance of order, since defining order is a question of definig entities. The second definition seems more viable.

One could also describe any difference in temperature as '*disorder*' - or as '*order*'. Usually, '*entropy*' is used to describe the amount of temperature indifference. Taking into account the above said, an indifferent cloud of everything at the same temperature would be a description of greatest disorder - and it would be a neat description of the beginning of the universe (by Christian religion and by scientific description). The next split second, order began to grow with the universe, by the separation of matter, by expansion (creating time and space) and by the separation of different velocities and temperatures from each other.

The result, at this momentary point in time, is a highly ordered transitional state of things, with high differences in temperature, in matter concentration, and in all of the rest, therefore low entropy. It seems to be still evolving in that direction, and certainly has done so without human influence whatsoever.

One could say that the conception that humans think they have to work to clear up the mess they see surrounding themselves is caused by the very fact that this is because that is where the mess always is - it is always right where we are.

We carry disorder around with us. In fact, we create it. Wherever we are, we make a mess. **We would die if we did not**, and therefore not be there to observe it. Creating a '*mess*' or disorder in this case means, by above definition, a degradation of order, i. e. an overall leveling of temperature differences and a decrease of the arrangement of matter. It may not seem so at first glance, but a camp fire does just that. So does the digestion of food, or the operation of a diesel engine.

Every form of work or turnover of energy, almost by definition, follows the laws of thermodynamics in this way.

If in doubt, you may ask yourself for what you would be willing to pay more for: *economically*: *diesel fuel* or *exhaust fumes*, *nourishment* or *body waste*, *wood* or *ashes and smoke*. This is where we may catch a first glimpse of the **connection between thermodynamics and economics**: Not the **work done** is valuable, but the **work not yet done**, i.e. the energy to do work. Work done leaves a mess which has to cleared up by yet more work, and so on.

What we decline to see is that this disorder we create tends to disappear by itself, to clear itself up, as soon as we are gone - albeit that it might take some time for it to do so.

We can notice this phenomenon only if we move fast and far enough - i. e. if we are able, for a moment, to outrun the mess we have created wherever we happen to be. In a picture, the still morning lake will calm itself only after we have left it; no amount of active "calming" will achieve that as long as we are still in it.

Like the sonic boom trailing an aircraft, the faster we move, the more terrifyingly the disorder we create will build up and overtake us form behind the minute we slow down again - thus causing us, in panic and fright, to move at ever increasing speed to outrun the consequences of what we are doing. But as we know, there is an end speed to everything. When that has been reached, economic, ecologic or thermodynamic collapse occurs.

This prevails until whatever degraded has had time to regenerate itself (not: be regenerated by the degraders), new and greater sources of energy, new and deeper waste deposits or new places to degrade have been found.

This is seen not from an arbitrary, moralistic point of view, but from an **inevitable, physical** one. One could see it as a description of the collapse of ancient European, South American, or other empires; the deforestation of the Mediterranean area during the Roman Empire for fuel could be seen as one example.

From the other perspective, there is hardly a greater human pleasure than to be the first to ski on a slope of freshly fallen snow, to dig up oil, gold and diamonds which have taken millions of years to form and accumulate (a form of creating order in the above definition), to view a landscape untouched by human hands, to build their house on a green field, to visit the desert, the arctic, uninhabited new places in the universe and on this planet, and so on - in other words: to enjoy what we have not created, and which has not already been used, messed up and left disorderly up by others. And **there is nothing more rewarding** - in an emotional, and, this is the important correlation, **in the financial sense as well**.

As stated further down below, the stark beauty of the North American wild led to the insight in Europeans fleeing Europe that maybe there should be places, called nature or national parks, where nature is left to itself and where no human is allowed to live and work (and "create wealth") beyond the absolute necessary (and even that is very difficult to realise, as the debate about regulating wild forest fires has shown). The wealth is there to behold - but, in this case, **not to take**.

We humans crave order, and we instinctively know that we cannot create it.

What we have not yet understood - or what we have once more forgotten - is that we live off and live by destroying order, and nothing else.

Maybe this is the Original Sin, with which we are plagued ever since we had to leave paradise, where there was abundance, that we are forced - perhaps by our own actions - to live by work, and therefore create a mess of things; and that we can never achieve the status of creator of things, no matter how we try.

In fact, the more we try, the worse it gets, for the more we try, the further we distance ourselves from creation by trying (if one discounts creating a mess from creation itself, which is not at all a trivial distinction).

However, this is not religion; it is religion borne out by the physics, i. e. the workings of the universe, therefore of creation itself. Humans, however much they may try, cannot put themselves outside of creation, as they are part of it. Even attempting to do so can be labeled an act of blasphemy, and there will be merciless punishment of such action in consequence - God or no God.

That, too, is borne out by the laws of thermodynamics.

To understand this, one must understand where the boundaries are between what we may and what we may not do.

Returning to pure physics once more, the laws of thermodynamics state (as can be seen below), among other things, that nothing ever runs by itself (and they do **not** state that nothing ever runs without humans to keep it running). However, there seem to be some processes which augment themselves, like a forest catching fire or an avalanche rolling down the mountain. What about them? Can we not tap those?

First, a self-augmenting process of the first kind is simply a leveling out of potentials.

Like in lightning, avalanches, forest fires or other runaway processes, these do not really run away. They do not augment themselves forever, but from a state of inertia start quite slowly, build up speed and momentum, but then come to a halt again, sometimes abruptly (thereby usually causing damage or at least change), to then remain inert again in the new state until enough new potential has accumulated for the process to repeat itself. Like ocean waves hitting the shore, they are simply a jerky state of equilibrium or motion.

Second, a self-augmenting process of the second kind, which truly feeds itself, would never stop. It would therefore ultimately destroy not only itself, but everything else within reach.

Maybe black holes in space can be seen as such truly self-augmenting processes, although even this is doubtful, although they might give us a clue on what may ultimately be the cause of that order in the universe which the laws of thermodynamics seem to abhor.

One thing, though, is quite certain: life, in speciality human life, is quite impossible in their presence. Therefore, whatever the consequence, we will have to face our life without them; and so without the prospect of eternity in our lives - if one can call the complete disappearance of everything '*eternity*'. And it is no wonder that we came upon the stage only when everything else was ready and order had been created.

However, since something, for the moment at least, obviously does exist, and since we, for the moment at least, obviously do exist, let us look at the details - if only for recreational purposes:

The laws of thermodynamics, which govern all creation (at least all that we know of), state that, since the creation of the universe,

- Energy and matter can take on different forms, but cannot be created or destroyed
- Energy moves from hot to cold, from concentration to dissipation
- We shall all perish

In more detail, the first and second law of thermodynamics therefore stipulate:

- Within creation, nothing ever comes from nothing (leaving aside the first creation of everything) or disappears into nothing (leaving aside the final destruction of everything).
- Motion depends on energy, or rather on a difference in energy or energy potential.
- Motion wears itself out over time through loss of energy, or rather the loss of difference in energy potential.
- This difference in energy potential finally dissolves into the surrounding heat - or the uncoordinated motion of all particles of all matter with the same intensity in all objects at the same time, called entropy - if there would then be objects left in the universe at all, which is the big question (motion itself, as apart from heat, is the directed, simultaneous or coordinated motion of particles of matter, thus forming an entity we call a "body", which can be anything from an electron to a solid rock to an interstellar cloud of hydrogen of galactic size).
- Motion (or deformation, which in principle is the same) therefore calls for an input of energy (or negative **entropy, negentropy**) which is then lost by dissipating into the environment in the very process of that motion, thereby at once decreasing the potential for further motion by increasing entropy (and we can begin to see why humanity is obsessed with states of the environment where this has not recently been done).
- And, in consequence:
- There is no such thing as perpetual motion (*forget it*!).
- There is most certainly no such thing as perpetual motion that creates an output of energy to boot (*forget it completely*!).

This implies that, left to themselves,

- All processes are self-degrading.
- Nothing ever gets done by itself.
- All processes use up energy, or energy potential, and so finally come to a halt.
- Everything gets more disorderly over time.
- Things get mixed up and do not sort themselves out.

And so on.

Whether the universe will dissolve or collapse, whether the universe will suffer from a heat death or a cold death in the end, whether it will burn up or freeze over and whether the heat will ever be distributed evenly, is still an open question - just as open as the question whether one should describe the latter as 'heat' or 'cold' and if such a name makes any sense in this context.

- **However, if all of this is true** - if everything in the universe is self-degrading, does not get done by itself, slowly comes to a halt, get more disorderly over time and does not sort itself out - then **where does the potential come from, by which we live? The original order?**

- **How can anything self-degrade, which has not been graded, how can anything exist, which did not get done in the first place?** How can something which the Bible so aptly calls "chaos", come to a halt, if it never got moving? How can complete disorder become even more disorderly over time without first sorting itself out?

But even putting aside the theoretical problems of comprehension - one look at your surroundings, at Heaven and Earth, indeed at one's own self, in one word: at creation, at the things that be, will show anyone who believes that he or she is not under delusion of existence (which then would render any thought about said existence superfluous), that **the universe, since the days of creation, is not a chaos, but the complete opposite of chaos**.

- **In Fact, the universe is a veritable parade of gradation**, of self-organisation, of energy potential, of order and is characterised by a clear separation of things that are and those that are not (this self-organised order, as it follows *possible* paths, not pre-determined ones, is what we now call "chaos" - order is chaos and chaos is order).

- **Furthermore**, the universe is clearly and distinctly in motion and as it seems to us, possibly even simultaneously expanding, sorting itself out, picking up momentum and cooling off, in any way seeming to defy the most fundamental laws of thermodynamics which are supposed to govern it.

If these laws, which should govern all creation, have governed it (at least) from the beginning of time (and they would not be the universal laws they are otherwise), then clearly they have not been very successful in doing what they should have done and at what they are so good at when it comes to governing life on Earth.

One solution to this dilemma can be stated thus:

Obviously, there are other forces at work in the universe which seem to counteract the laws of thermodynamics or at least balance them out.

II. Gravity

Motion without heat; from disorder to order in the universe

Taking up the old Yin - Yang - idea of necessary complementaries, one could construct a table of opposites which would seem to correspond:

Crude Table 1

State caused by the universal working of thermodynamics:		**The opposing state, in existence or at work at this same moment in time:**
Disorder (disorganisation)	-	Order (organisation)
Entropy (loss of potential)	-	Negentropy (gain of potential)
Self-diminishing processes	-	Self-augmenting processes
Dissipation of energy	-	Concentration of matter
Consumption of energy	-	Release of energy
Source of motion:		Source of motion:
Energy	-	Gravity

Crude as this may be, this brings to mind that there is something which is at least as fundamental and powerful in ruling the universe as are the laws of thermodynamics: gravity.

Maybe this could be called the **second principle**.

- Gravity is a property of all matter. It is **not driven by energy**, though it can, and does, accelerate bodies.
- **Gravity gives rise to order**, since every individual particle with a mass exerts gravity on every other individual particle with a mass.
- **Gravity causes matter to self-concentrate**, thereby, oh wonder, creating an even higher potential of gravity, therefore indeed creating potential as such.

This process is self-augmenting, at least as long as there is enough matter to feed it, and possibly even beyond that.

Therefore, other than in processes ruled by thermodynamics, **in processes ruled by gravity** [6]:

- **Motion does not depend on energy**, but on gravity itself or rather a potential of gravity, even between identical objects. There need be no difference.
- **Motion**, if it is not reduced through the generation of energy, **tends to accelerate**. The driving force itself does not wear out or dissipate over time.

There is even **creation of energy by motion** - this in fact could be seen as the source of all energy. Furthermore, this process is **self-accelerating**.

In consequence, there could - in principle - be **perpetual motion** if there was a perfect balance and no creation or release of energy (which is fictional).

Left to itself, gravity creates a higher state of order by separating matter from non - matter, and while thus concentrating and compressing it, creates or releases mechanical heat and energy, which grades this matter even further (if so by chemical reaction; in this there is a certain order of sequence), possibly even igniting the matter itself to turn it into energy, which then dissipates and is ruled by the universal laws of thermodynamics, or rather, calls them into being - or better still, interaction.

Further concentrations of gravity may or may not then even trap this self - released energy (again), but this need not be a matter of discussion here, as there are even more unanswered questions: The universal laws of thermodynamics rule an expanding universe. Would they rule a collapsing one? If an expanding universe is an open system, however uselessly producing eternity by making time and space travel ever more impossible, and a static one is a closed system prone to thermodynamic heat death, what would we call a once again collapsing one?

Is there a third state of being after '*open*' and '*closed*'? '*Negative*'?

- For all we know, this does not touch the question at hand.
- In an expanding, static or collapsing universe: as long as there is matter, there is gravity.
- As long as there is gravity, there is motion.
- **This motion is not ruled by the laws of thermodynamics, as there are no thermodynamics involved**.
- **This motion does not need or consume energy.**

It **creates** and **releases** energy, first by accelerating matter, then by destroying it - while by the way creating waste product matter that constitutes this planet, ourselves and everything in the solar system apart from the Sun (which strangely enough concentrates the lightest and most primordial of all matter in the center of the system). Thermodynamics become involved only in the **result** of that primary motion.

[6] And even possibly some others, such as electrostatic, magnetic or some forms of subatomic forces; the latter may even be the secret to life itself, but shall not be a matter of discussion here

Apart from the interesting and romantic fact that we are indeed made of stardust, gravity in stars causes the lightest and simplest of matter or element (hydrogen) to gradually turn into they heaviest and most complex one (matter or element, not material), while destroying some of it and releasing it (not using it!) as energy, and that heavy matter at the end of the chain (uranium, plutonium) is so instable as to in itself spontaneously release energy (the question, if the reverse is possible, i. e. the construction of matter by the trapping of energy, shall not be discussed here).

Given what we know, gravity can be looked upon as that source of negentropy which allows the laws of thermodynamics to be and rule the flow of energy.

These intricate interactions of thermodynamics and gravity can be observed in our own solar system: the concentrated mass of the Sun keeps the planets revolving around its center by its very gravity, while on the other hand the energy generated by that same gravity and particles accelerated by this energy released and dissipating from the solar center (what we call '*solar wind*' and '*light*'), for one thing, by its pressure, keeps a cloud of interstellar dust and debris outside of the planet's paths, thus allowing a time of somewhat undisturbed life on them (if at all possible) and at the same time delivering the energy for that very life exist to by.

Gravity may be at the root of energy, but that is then ruled by the laws of thermodynamics.

The opposite pairs in that **first crude table** (above) describe the universal preliminaries we live and exist by. (Which, one day, may too be set into some beautifully neat little formula like $E = mc^2$. This would not necessarily make us mightier.

We cannot bend the laws of thermodynamics, which rule our life, and we **most probably could not control gravity**, a property of sheer existence.)

With that mental stumbling block (where does everything come from?) somewhat out of the way, we can now take a closer look at the workings (how does it work?) of thermodynamics:

We are part of a thermodynamic system, consisting of the Sun as a source of energy, dissipating that into the universe surrounding the solar system which acts as an energy sink, and our comparatively small wet twirling granite marble bathing in that energy flow, absorbing a little bit of that energy mostly on the sunlit side and dissipating it again mostly on the unlit side (mostly, since weather and reflection account for the rest).

Anyone who has had the fortune to witness a solar eclipse knows what it feels like when that benign dynamo is taken off the power line. The lights are snapped off, and a veritable cloth of death spreads itself over the face of the Earth. The darkest of nights cannot compare to that deep, eternal, cold, darkness. Our dependency becomes very clear, and medieval people would rightly have been frightened to death by such an experience.

The solar energy pouring out of the Sun accounts for life on Earth past and present, it accounts for the surplus of energy we are firing and for almost all energy-driven motion (it does not, for instance, move the tides or tidal power plants; that is down directly to gravity).

The question may be if this is necessarily so.

No, it is not.

Planet Earth itself, being hotter than the surrounding space by its own gravity, could, for instance, account for a thermodynamic energy source, and nuclear energy of any kind puts the copy of an energy source driven by the destruction of matter into the hands of man. That would be a different world, **but a possible one.**

Would things be very much different otherwise?

Putting aside the problems which such use of energy might create, **a simple change in the source of energy would not change much**, since either which way, **humans and their economy are driven by energy, not gravity itself**. So is every other form and action of life on Earth as well as of most of the inanimate motion and deformation on the surface of the Earth (that begins to change a few feet below the surface).

It does not matter if we do not - yet - understand how this happens in detail (and therefore cannot - yet - copy it).

It suffices to say that these are the processes governed by the universal laws of thermodynamics which we can neither change, bend, staple, mutilate or escape from.

Applied to life, in speciality animal life, in even greater speciality human life, on Earth or otherwise, this means, without any possibility of escape:

- **We are energy-driven thermodynamic entities.**
- **We need a source of energy to survive upon**
- **We need somewhere to get rid of this energy to be able to live on it**

The second law of thermodynamics tells us that furthermore, in order not to come to a standstill and, if alive, thereby die:

- **Source and sink of this energy flow may not be isolated in the same entity**
- **The system in question must be open, not closed**

For living and active systems, there is a third:

- **The flow of energy must not be interrupted**

In everything we do,

- We need an energy source
- We need an energy sink
- We cannot live off nothing (*forget it*!)
- We most certainly cannot live off nothing and create an output of energy to boot (*forget it completely*!).

And therefore:

- We cannot survive by drinking our own blood.
- We cannot live **and** create a net output of energy potential for others to live by.
- Period.

It is astounding how often these simple and known facts are put out of the human mind.

As a human being:

- You are a consumer
- You are not a creator
- You are a destroyer
- You are not a source of energy
- You are a consumer and dissipator of energy
- You do not create order
- You create disorder

In fact,

- You destroy order
- You cannot live otherwise
- No matter how you may dislike and deny the facts of life, they rule you
- You cannot rule them

And so on.

But as we do not like it, we tend to twist the truth to suit our need for self-esteem.

Twisting it back again, we would find that, notwithstanding the fact that **the provision and turnover of work is absolutely necessary to survive** as energy-driven thermodynamic entities,

Crude Table 2

the words:	in effect really mean
That person is a source of energy	That person consumes a lot of energy
That person is a creator of things	That person destroys a lot
That person is orderly	That person hides his mess well
That person is a hard worker	That person is a great consumer
That person does a lot of work	That person consumes a lot of work
That person feeds him - or herself	That person is sponging somewhere
That person feeds a lot of people	That person may be starving a lot of other people
That person can sustain him - or herself	That person most certainly cannot sustain him - or herself

This may sound quite silly at first, and it is only a crude allusion.

But since most people are deeply convinced that not only do they sustain themselves by their own work, but whole families and communities, it is sometimes necessary to remind them that they do not.

No thermodynamic entity in the universe could to so.

Any number of humans put in an enclosed space left to fend for themselves and "*sustain themselves by their own work*" will inevitably die, and will die even faster for so trying, as, without an external energy source and an external energy sink, the thermodynamic entity called human being will, by working, only use up its reserves faster. *But die it will*, in any case.

The illusion that humans sustain themselves by their own work is created by happily forgetting the fact that every one of us alive has to have an energy source and a sink, and through the inevitable thermodynamic heat loss will have to consume far more energy than he or she can turn into useful heat and motion, and therefore most certainly will consume more energy than he or she can put to use.

In fact, we put out energy in the dimension of a few percent [B] of the energy we consume. This can not only be measured, but seen in the many tons of biochemicals we have to force through our intestines and turn into waste just to form and keep alive a hundred kilos or so of living matter for as long as we are able to do so. When we cannot any more degrade, i. e. digest, we die.

This, too, is a manifestation of the second law of thermodynamics.

To make another point clear: Not even a farmer can feed himself, let alone feed others.

No person in the world, furiously pedaling on a bicycle-driven dynamo feeding at best a 100 watt light bulb, can even dream of coming anywhere close to producing enough light to grow the very food to keep him or herself pedaling, not even under the most sophisticated circumstances. He or she will miss that goal by several orders of magnitude - and perish.

The impossibility of this feat **in principle**, too, is stipulated by the second law of thermodynamics. It is universally impossible.

What goes for the single person, **goes for society as a whole**, as numbers do not alleviate the problem.

So let it be said, for once and for all, that, for the reasons described above, no society in the world is able to "sustain itself".

Any economic system conceivable that postulates self-sustainability and more is, has been, and will be doomed to fast and utter failure.

The consequence of such an attempt usually has been mass death by starvation.

And what goes for the single economy, **goes for the world as a whole**, as, again, numbers do not alleviate the problem.

This, by the way, does **not** touch the issue of what is termed '*sustainable development*' or the like, as that does not mean self-sustainability in the physical sense, but quite the opposite.

What it **does** touch upon is the issue that, caught in a strait, real or imagined, humans will automatically assume that they can pull themselves out of the swamp by their own hair, as in Muenchhausen's Tales, and tend to propagate this idea to others - blindly overlooking that fact that, even in that context, this was a lie. **It is a feat completely impossible, and therefore has never been performed**.

Archemedes, to be able to move the world, needed not only a fixed point, but it had to be outside of this world. Just as an engine will not run in a sealed compartment, nor a human live, all thermodynamic entities need an *open* system to perform, with sources and sinks outside of themselves. The idea that this can be short-circuited to become self-sustained is completely false.

From the eremite to the world economy: What sustains you is the fact that you use up far more energy than you put out (even if this is the wrong expression, because the energy is always balanced), that you have an external source for this energy that you do not have to fill, and that you have a place to get rid of your mess that you do not have to empty, and that it had in certain circumstances better not be the same place.

It is a

- **thermodynamically completely forbidden dream** - as for this machines, animals and humans would have to cool by working :
- **~~Input of work in kWh + extra gain in kWh = work output in kWh~~**
- **(work output is higher than work input)** [7]

It is a

- **thermodynamically forbidden dream** - coming into existence and growth would then be impossible:
- **~~Input of work in kWh - no loss in kWh = work output in kWh~~**
- **(work output equals work input)**
- **thermodynamic reality**:
- **Input of work in kWh - inevitable loss in kWh = work output in kWh**
- **(work output is lower than work input)**

Even if the material or ideal work output can be deemed as *economically more "valuable"* than the input (as in "*shoes are more valuable than leather*" or "*a solved problem is more valuable than an unsolved one*"), there is always a loss of energy which has to be replenished by an external source which in turn suffers a loss. Furthermore, no work process comes without an added loss in itself: there is always wasted material or wasted energy (such as heat through bending a wire). Without this loss no work would have been performed (maybe even wasted time should be considered, but its passage seems to be undisturbed by a work process; strangely enough, though, while the momentum gained by a body through a certain drop in gravitational altitude depends on that difference in altitude, the time it takes to achieve that momentum **does not**).
This way, **in human economics**, (only) **a real, physical loss or destruction of energy potential is turned into or calculated as an economic gain**. This may be all right - as long as there is something left to destruct.

We pride ourselves in our constructions and the amount of exertion that goes into them. That the destruction of order is an arduous task is no contradiction to the fact that it is a heavily loss-making process; it is important that we cannot (re-)produce the order we destroy in the process of construction, and that, according to the laws of thermodynamics, the original order is worth more than the result of this construction. Our constructions are secondary constructions and on balance constitute a process of destruction.

And as we turn over as much energy as never before, we can imply that thereby as much work is being performed as never before, even if not always by human beings; and that by doing so we are destroying as much as has never before been destroyed in a like space of time.

[7] kWh = kilowatt-hours, a measure for physical energy (potential work) and / or work performed. In thermodynamics, the input of energy in a work process is always higher than the resulting output of work; the difference has to be lost as heat to the environment (the energy sink). One kWh equals 860 kcal (kilocalories) or 3400 BTU (British Thermal Units) and will bring about ten liters of water to boiling point.

Crude Table 3

Rough period of time:	**Human thermodynamic activity:**	**Highest or sole source of energy:**
10 000 years	Hunting, fishing and gathering	Recent solar energy
5 000 years	Intensified hunting and gathering (herding and agriculture)	Recent solar energy
2 000 years	Agriculture and charcoal forging	Recent and stored solar energy
200 years	Coal-driven industry and farming	Fossil solar energy
100 years	Oil- and gas- driven industry and farming	Fossil solar energy
? years	Nuclear-driven industry and farming	Artificial solar or planetary energy

The only thermodynamic difference between individual people and individual societies which are beyond starvation and have not yet suffered waste congestion is the **amount of energy they consume**, the **magnitude of their energy source** and the **magnitude of their energy dump**.

This energy, regardless in what form it is consumed, is measured in calories, kWh, BTU... and other thermal units. For humans, it is usually provided for by nature or agriculture. However, the same fat, oil, corn, rice or wheat we consume can be - and sometimes is - burned to fire a steam turbine.

The great feat of modern agriculture is to have reversed this by turning petroleum (or *petra*-oleum, *rock* or *mineral* oil) back into vegetable oil via synthetic nitrogen compounds, heating and other forms of energy input with the added help of some solar energy.

It is said that modern agriculture thereby consumes more energy than it actually puts at our disposal.

Strictly speaking, it has always done so; following the laws of thermodynamics (at least in this point), only a small part of the solar energy that hits an agricultural field is finally stored in **carbohydrates**.

Modern agriculture now only uses up more chemical energy resources than it puts at our disposal. **From a source of carbohydrates it has turned into a sink for carbohydrates while producing more carbohydrates than ever before**. This is one example of what is expressed in the second crude table further above.

We cannot create.

We can only destroy.

THAT is the Second Law of Thermodynamics.

Two things should be noted: Up to now, the periods in which a certain energy source remained the primary one and the human thermodynamic activity concentrated on a certain method of turnover seem to be becoming shorter (with no claims to the future).

But of more importance is the fact that to remain stable over a long period of time, **growth had to remain at a minimum** [C].

Human society, as are all societies depending on a natural environment, is an ecological system which will expand until it reaches its optimum (just below maximum) and stays there **as long as there is no change in thermodynamic activity**.

- Of course, there are transitional periods, and there is always **change within the System**. For instance, plants and animals are bred and cultivated, until they reach their maximum energy turnover capacity possible in a given agricultural system. The system stabilizes at that point, and any attempt to force higher yields without putting in more energy usually results in severe famine. The same applies for over-hunting, over-gathering, over-herding and over-fishing etc.

- However, the **growing dependency of modern farming in fossil fuels** may also result in world-wide famine once these become less abundant.

- It may even be that the release of fossil energy will wreak havoc not from an undersupply, but from an oversupply of energy, and that the point of environmental overload has already passed unnoticed, since we are releasing energy into the environment at the rate of about 1 million years to one in a very short period of time, and with that are beginning to make a noticeable impact on the planetary energy system.

Perhaps, also, the period of long-term equilibrium was already cut short during the coal age and will therefore never be reached during the fossil fuel age as a whole; but this is a field of speculation, as we are still in that period and have in our history hardly ever been in true conscious control of our energy consumption.

However, it should safe to assume that by the time these fossil fuels have replenished themselves (if ever), so little will be left of what humans had accomplished by their depletion that terming that achievement "*growth*" might be called somewhat euphemistic.

In fact, judging from their relative rate of decay, the Egyptian pyramids, built almost solely with recent solar energy, may remain the most reliable sign of human activity on this planet for some time yet.

III. Human Economics

No motion without heat; from order to disorder in the world

Apart from the simple and easy, if perhaps romantic proof of human destructiveness in any landscape now uninhabited by humans - even in those places devoid of all life:

Do we not create houses, buildings, cities, bridges, cars?

Indeed we do, and very much more. And so, in their own way, do **many other living beings**. And maybe even, by now, some inanimate machines.

But whatever we (and they) create, we (and they) leave a pile of mess, waste or disorder behind which is greater than the pile of order we (and they) created - and which has then to be taken care of.

This is not only in form of waste material, but in form of used up, degraded or dissipated energy (which in itself of course is never lost in the momentary phase of creation; it therefore hangs around, making life more difficult, and causing us to use up even more - a self-augmenting process of the first kind).

- **To do things, and be it only to digest food in order not to die, we must always consume more than we create.**
- **What people call "work", regardless if this is performed by man, beast or machine, is the result of the consumption of energy resources and the dissipation of energy.**

To stay alive, and to be able to work, people must, **by this very work**, tap into an energy source which delivers more energy than the work needed to gain this energy.

If the person uses up more energy by working than he or she gains by this work, **that person starves**. [D]

Cynically speaking, this would not really help, since even while slowly starving that person has been using up energy to the detriment of his or her surroundings. To keep from starving, he or she must use up far more energy, to the even greater detriment of the surroundings.

This may be why, in modern times, the purposeful extermination of people usually begins with their internment in "*labor camps*", only to be starved to death without further ado or forcefully killed there a short time later. Working people to death is costly; the "*labor*" in "*labor* camp" is just an excuse. For the same reason, forced labor is forbidden in societies that value human life (although it tends to creep in).

What is positive for the individual, is negative for the environment. What is negative for the individual, is possibly only *less* negative for the environment. You cannot escape.

And, again, it does not matter if you count the single person, a single society, or the world population as a whole.

- **The overall energy balance of what you achieve is always negative.**
- **It becomes even more negative the more you achieve, and possibly even disproportionally so.**

Considering or even not considering the undiscussed added net degradation of materials caught up in the process of human creation:

- **The more we create, the more we destroy.**
- **We always destroy more than we create.**
- **We cannot do otherwise.**
- And there is more:
- **Our financial systems and economic spreadsheets take no account of this**
- **They therefore deliver false gains**
- **In reality, the balance is always negative**
- **To make it look positive, we simply leave out enough of the costs**

However,

- **Reality, or the universe, is not bound by what we put on paper**
- **It will always receive its tribute**

And this is not negotiable.

That is the Second Law of Thermodynamics.

It does not matter either whether gravity sets the thermodynamic preconditions for work on Earth via the Sun, or otherwise, whether by water or wind power, or bioenergy, whether via mills or working beasts or humans, or via gasoline or diesel engines, or aircraft turbines, or steam engines: the result is always the same. Only the *form* changes, in which energy from gravity is thermodynamically transformed; like the chemical form of the carbohydrates (even though fodder can be converted to gas and burned like mineral oil, and mineral oil biochemically transformed into fodder). It really makes little difference whether an animal or a human is treading the mill - or an engine is running it.

In particular, the issue of "growth" has to be addressed. **There has been no overall "growth" on this planet since billions of years**, and therefore none in the last hundred.

There has been *change*, but the overall sum of all changes most probably amounts to zero. The assumption that there have been gains, is just as valid as the one that there have been losses.

It may not even be sure if the overall amount of living matter, or biomass, has risen or fallen, depending on whatever space of time is being examined.

Balanced systems do not grow. An individual tree may grow in a forest, the forest itself, once grown, does not, if circumstances remain constant .

Not only does one thing grow at the expense of another, the growth of a tree, for instance, may be influenced by, but is **completely independent** of, the "work" of a thermodynamic entity such as a human being - but not of the energy produced in the Sun through gravity.

On the other hand, the growth of a thermodynamic entity such as **a human being**, again for instance, **is completely dependent** on the previous growth of entities such as trees or potatoes.

Does a potato "work"?

With all these things in mind, the concept of economic **growth**, founding on the **work** of the individual members of that economy, begins to falter somewhat.

Of course, there is no question that things do happen, and that things are done, and successfully so. This is not a question of fantasy or reality. But what does "*economic growth*" really mean?

Our lives may be more complicated than that of a zebra, and our actions be on a larger scale than that of corals, ants and termites (even if that were doubtful - this is a question of principle, not of magnitude) but in effect we do little else.

Even a wandering, grazing zebra **works**; it moves, and its muscles consume energy, in the end just to rebuild itself. If it did'nt, it would die and decompose. The same is true, *mutatis mutandis*, for amoeba and bacteria - perhaps not for viruses. Or sometimes even for them? Sceptics may replace **zebra** with **cow**.

How would a zebra, an ant, a termite, or a coral define "economic growth"? Or a potato?

And what would be the consequences?

Let's consider work:

Throwing a stone into the sky is work. That stone falling from the sky is not work. Carrying a brick up some stairs is work. Carrying it down again is work as well: both use up energy potential. Letting that brick drop from the high-stair window is not work, but generates energy potential (as can be observed by the ensuing hole in the ground).

Evaporating water is work. That water falling from the sky to run our power stations is not work. Sunlight falling from the sky is not work, but the opposite of work. Both *enable* work to be done, the latter for example by evaporating the water.

Running mechanical appliances powered with electricity generated by falling water, again, is the performance of work.

Digging a hole is work. Filling that hole again (i.e. undoing it) is work as well, albeit perhaps less than digging it - it does not replenish the resources consumed by digging it, but consumes further resources. **The only consequence of tracelessly opening and closing a hole in the ground is the irretrievable depletion of resources**.

Leaving it to forces driven by gravity to, within the passage of **time**, level the ground again (or in general destroy the artifacts of man, usually erected **against the force of gravity**, which in turn indirectly delivers the thermodynamic power to do so) reduces the work load by achieving the same effect without thermodynamics.

It seems that, directly or indirectly, **all work is performed against the force of gravity.** In a way, (constructive) gravity can be looked upon as the one agent which generally tends to destroy work or the result of (destructive) work (or entropy): **gravity destroys work and thus enables it to be done**, by giving it new room.

Even the clearing of a muddy puddle by the clay sinking to the ground is a result of gravity, and may have given some ancient observers some food for thought about creation and the force that divided the Earth from the waters - or today, when looking at the spontaneous separation, stratification and clarification of water, mud, sand and stones under the influence of gravity in a glass jar. The order is increased without an energy supply; more so, *only if* energy is not introduced by shaking or stirring the mixture. The process of separation must therefore be *actively prevented*, i. e. thermodynamically, by an input of energy. Now, is this formation of order, under the influence of gravity, necessarily accompanied by a release of energy? Not as much as a meteorite impact, certainly - but could it still be experimentally measured?

Following the laws of thermodynamics, heated air expands and rises against the force of gravity; **gravity** on the other hand compresses the atmosphere from top to bottom irrespective of temperature. Air, according to the laws of thermodynamics, should be cool and compressed at ground level and warm and decompressed at high altitudes. As anyone knows, this not necessarily the case. Even if the universe had a common average temperature throughout, the atmospheres would still be seeming to defy the laws of thermodynamics by having, through the forces of gravity, various degrees of pressure at a common temperature.

The one thing that gravity does not directly generate is *money* - though strangely enough this money, while being the most immaterial of all commodities, tends to self-aggregate like matter: money comes to money, as it is said.

Our *economy* is driven by *thermodynamics*.

Only the **depletion of energy resources** generates (monetary) wealth and debt at the same time, regularly making the **country with the highest efficient thermodynamic energy consumption** not only the most powerful, but simultaneously the richest and most in debt. [**E**]

Debt and wealth are generated in equal magnitude by working - although perhaps unevenly distributed, overall they amount to zero.

The intricacies of modern economy on which the adepts capriciate themselves hide one simple fact: To reap gains, the producer has to pass his debt (the original credit) on to his customer, and that is where it usually stays, albeit perhaps parked in the public domain.

One detail of this mechanism is that **in anallegedly labour-wage driven market economy**, no matter on what scale, the consumer (who else?), through the price of the product and out of his wages, **has to pay for his own wages plus overhead and gains**.

As this is mathematically impossible, **it leaves a difference to be covered by debt and insolvency**. Of course, the overhead and gains constitute income as well; but that part of them which constitute monetary wealth, constitute monetary debt to the same extent. In a true economy, the paycheck, the bank note or bank account is a loan which has to be destroyed, nullified or written off in the end.

This is not a minor problem, as it forms the backdrop of financial congestion and in-fighting; the inevitable writing off of such debt automatically writes off credit, i.e. monetary wealth in equal magnitude. However, it is a **secondary** one. Material wealth will remain untouched, if it is not materially destroyed, for instance in an ensuing war.

The real problem is calling this mechanism "economic growth" - by first ignoring debt, and, furthermore, ignoring the laws of thermodynamics it is embedded in.

One of the signs that economics have thermodynamic preconditions is the fact that even economists know the "**law of diminishing returns**", which states that profits are easiest achieved in new markets, where new sources exist and the costs have not yet built up. The plundering of gold reserves and oil fields accumulated over time is much more rewarding than costly mining. This corresponds to the depletion of the energy source and sink in a thermodynamic process.

In fact, the postulation of economic growth tends to ruin financial systems. It does so by inflating (monetary) surplus and deficit.

The winner may be the one who first (or again) constructs an economic system that does not depend on growth or at least accounts for the losses that balance out the gains, i.e. describes and controls *change*, not growth. In the end, the costumer (the consumer) has all, and pays all.

Our balance sheets do not describe the **material change or material wealth generated by applied thermodynamics**, but monetary wealth, and tend to forget, for instance, to consider the monetary debt generated in equal amount. In short, they describe inflation. They should describe zero-growth, i.e. balance out to zero.

This ***change***, over time, is only a **forced change in the extent and method thermodynamics are applied** on this planet. **All forced change is temporary**. Of course, for that period of time, it makes a noticeable difference if and how for instance fossil or nuclear energy is released.

The trouble with financial systems that concentrate on percentage and growth is that they strangely tend to **overlook the absolute, and consequently call relative and temporary developments absolutes** in themselves.

However, the "law of diminishing returns" only applies to the economic, i.e. balance sheets concentrating on the relative; an economic system relying on internal profits will stop before it reaches a return of zero. This does not stop the thermodynamic entities within it, who rule their lives by economic balance sheets, from consuming to stay existent, and therefore going into (economic) debt. In fact, this discrepancy (and the debt) is built in from the very beginning, but seems negligible as long as profits outrun the costs, which then accumulate and grow over time, finally overtaking the profits. It stems from the fact that **there is no net profit in a thermodynamic process, and work is a thermodynamic process**.

Therefore, the "law of diminishing returns" should be replaced or supplemented by a **Second Law of Economics**: The "**Law of Insufficient Returns**":

No economic system based on work can ever sustain itself, or produce a net gain.

Humans, whatever they do, **are always net consumers**. **Singled out or in their multitude**, they are not needed to keep the thermodynamic processes on this planet in action. In fact, they are not even needed to keep their own thermodynamic processes alive.

The inability to accept this constitutes one of the greatest problems of human society and leads to recurring crisis. **Human existence can not be justified by its necessity, and it is useless to try to work yourself out of that dilemma**.

It this were otherwise, there would be no poverty or starvation in the world, as every exertion would necessarily reap rewards, and the **countries with the highest populations** would indeed be the wealthiest; in fact, children (or slaves) would be a true source of commercial wealth.

Alas, **this would constitute a perpetuum mobile forbidden within the laws of thermodynamics**; world population, instead of being fed by ever higher and more efficient use of external energy, would feed itself, with every consequence conceivable.

As it is, **human labour is not an asset, but a cost**, always has been, and always will be. It is only then economically justified if employing it is to secure access, directly or indirectly, to **sufficient external energy resources**.

In fact, the underlying cost of human life stems from the fact that the vitally necessary steady work performed by the human body, and be it only the beating of the heart, comes at a price.

Seen economically, humans are indeed "costs on two legs"; seen from the physics point of view, they can even be described as "losses on legs". But then, so are animals and machines; with or without legs.

Following the laws of thermodynamics, no economy can survive that depends solely on service, or, indeed, any other form of human or other labour. No such economy could even come into being. The idea that such an economy ever existed is aroused by ignoring the energy supplied by its surroundings.

Completely ruled by and dependent on thermodynamics as we are, half of what we live by does not constitute "work", and the other half seems to be instigated by something other than work - "work" meaning a thermodynamic turnover of energy.

Apart from the political and sometimes deadly, indeed murderous consequences of the misconception of work as an instrument to ensure a net gain, the thermodynamic turnover of energy instigated by humans has reach a dimension where it is beginning to affect the global energy balance and interfere with the conditions of human existence in itself.

Time has come to sort these things out, to define the meanings of unclear terms and to re-address our balance sheets.

Further insights and discussions:

- The BBC Archives: **Comments on the second law of thermodynamics** [8]
- Population collapse through surplus Energy: **The Seneca Trap** [9]
- And taken from **Ugo Bardi: Entropy, Peak Oil, and Stoic Philosophy** [10]

Entropy and economy

So, I am asking you to follow me with this idea; that the bell curve is a "natural" behavior of production for non renewable or slowly renewable resources. With "natural" I mean that it is the way the system is expected to behave when there are no strong interferences from political or other kind of perturbations. Then, I said that we should look at the inner mechanisms that make the economy behave in this way. I believe that we don't need to invent a brand new law, as Newton did for gravity. We already have the laws we need - even though so far we failed to apply them to this case. These are the laws of thermodynamics. Here are the three laws in a simplified form:

- You can't win
- You can't get even
- You can't quit the game

That is, of course, very simplified! There are even simpler versions. For instance, for economists it would be just a blank slide (sorry, I said no economist-bashing!). Before going on, let me tell you that this is a new idea that is moving forward nowadays- the idea of applying thermodynamics to the economy. More exactly, to apply "non equilibrium thermodynamics" (NET) to the economic system. It is a work in progress. So, what I'll be telling you is still tentative, but I do believe that we are on the right track.

Now let me show you this image of a waterfall:

And now let me ask you a question: what makes water fall? You'll say it is gravity; and that is correct. But there is a deeper factor here - this movement is eventually generated by the laws of thermodynamics. Nothing escapes thermodynamic laws. It is a question that I ask to my students, sometimes: how do you explain that water flows down in thermodynamic terms. It is difficult for them to find the answer right away, and yet they have studied thermodynamics. So, let me tell you; water flows down because of the second law - the entropy one.

- *End of citation* -

[8] http://www.bbc.co.uk/radio4/history/inourtime/inourtime_comments.shtml

[9] http://thesenecatrap.blogspot.de/2017/02/another-seneca-effect-mouse-utopia.html

[10] http://cassandralegacy.blogspot.de/2011/05/peak-oil-thermodynamics-and-stoic.html

Negentropy (a personal comment)

- "*We consume order*": A living system imports negentropy and stores it.

  This Idea seems to have been originally expressed by the Austrian physicist **Erwin Schroedinger** in chapter VI in a book called "**What is Life**", published 1944, in which he also states the Sun to be the source of that order (he does not, however, state gravity as the source of that order within the Sun).

  There seems to some agreement that, in order to be able to explain why living beings are highly ordered entities and have, with time, become more and more ordered and complex throughout evolution, one has to state a "local exception" from second law of thermodynamics somewhat along the following lines:

  "The Sun produces positive entropy ("disorder") **over there**, *therefore we can have* negative entropy ("order") *locally* ***over here*** *on Earth"*

  No. There are no exceptions. The Sun itself, through its very own gravity, produces a higher order (negative entropy), for instance in forming many discreet chemical elements out of just one, hydrogen; and, as **Schroedinger** suggests, it dissipates this "order" into the surrounding space in the form of electromagnetic waves and particles, where it is intercepted by the planet Earth and locally used by its living beings.

  Therefore, with its help, so it is said further, we can produce order (negative entropy) - as long as the Sun does so: all our energy comes from the Sun. However, this is **not quite true**: we, nature, and therefore evolution, do not *produce* order or negative entropy; we simply *consume and store* it. Our genes, for instance, are a small cupboard of stored order, accumulated over a billion years - and without our doing, it could be added.

- It is also legitimate to call energy stored work. We only release it, and rely on its steady and slow supply. What we really seem to be doing at the moment is to take short-wave energy (light) and release it in our bodies as long-wave energy (heat). Perhaps primitive beings living off volcanic gravitational energy take high-amplitude heat energy and release it in their bodies as low-amplitude heat energy. These things, however, need to be measured and calculated properly, for it is said that green plants are green because they themselves absorb the red long-wave light spectrum - either which way, the difference can only be small.

  Indeed, looking at what distinguishes crystals from living matter (both are able to grow and, in a way, reproduce their own pattern) it may be that crystals represent a saturated, rather tight-fitting, low-energy composition by precipitation of molecules or atoms, while living matter on the contrary can only move and reproduce itself by "never being satisfied", i. e. always having a "hole" or "gap" or energy deficiency somewhere in its molecular chain, which, when filled or completed or complemented, rips open a (similar or different) hole, gap, or deficiency somewhere else, at best the same one further up the chain, thus reproducing itself endlessly by what we may deem as "hunger".

  In fact, should a newly docking molecule NOT produce or leave another deficiency, the "living molecule" is probably energetically smothered once and for all by having its "hunger" satisfied and would instantly be reduced to dead organic material (alternatively, decomposing by falling apart is another form of death).

A "living molecule" has therefore to be sufficiently complicated and twisted and so under tension as to never be "satisfied".

- Furthermore, there may be something in the idea that the freshness of food is indeed determined by its inherent content of light (photons) or order. Perhaps this is the difference between a fresh vegetable and a wilted one: the loss of order. But I really have no idea if plants oxidize or exude energy or CO_2 while wilting.

  I do not know how far **Schrödinger** extended his view to cover fossil fuels as well. But as we ourselves produce or rather exude CO_2 when metabolising, or, indeed, decomposing, this can be used to measure the amount of disorder on this planet.

  It seems to me that, over time, only a finite amount of order has accumulated on this planet, and we are possibly destroying it by consumption faster than it can be replenished, and this by several orders of magnitude.

Adding some thought experiment

"***Thermodynamics deals with irreversible events - which, according to Newton, should not exist.***"

- so someone said.

So let us combine both in some thought experiment, and consider the field of mechanical energy *storage* and *recovery* - a process that is reversible in principle [11].

First to the dynamic realm:

The lake of a pumped storage power station is filled, with the help of a defined amount of energy E (+HL1, the inevitable heat loss) [12]; when emptying, the same amount of energy E is recovered (-HL2, the again inevitable loss of heat).

So, the same amount of energy (minus the waste heat not to be converted) was employed, then recovered; the difference is zero; and with the water back in its former place, the original state is indeed restored. In the meantime, however, tons of water were moved. By *what*? Is not the amount of energy consumed zero? And was not the water moved *upwards*, against gravity, half of the time and distance?

Now to the static realm:

A pendulum is deflected and swings (almost) up to the same height on the other side (again, the loss is not recoverable). The potential energy of the pendulum is now the same as before; however, the mass of the pendulum is now in another place. *How did it get there*? Because again, half of the time (and distance) the pendulum was moved *upwards*, against gravity.

Both processes correspond to the oscillating of the balance wheel in a mechanical clock.

[11] The point is not to dispute the laws of mechanics and thermodynamics that have been proven and applied for centuries, but to look at their curiosities, presuppositions and connections.

[12] That portion of energy that is not used for the movement but heats the environment.

Of course, there are valid explanations [13]; but the matter becomes really remarkable when one considers that both of these processes do not work in weightlessness; outside of a gravitational field there is no (mechanical) potential energy; so a pendulum stays put in any position.

On the other hand, if you accelerate a bucket of (of course frozen) water in a certain direction in weightlessness, not only will you be accelerated in the opposite direction; as with a bowling ball on a ping-pong table or boat on a lake, you will need additional energy to reverse and catch up with the bucket drifting off in the opposite direction - without, on balance, being able to benefit from its energy.

So, as it seems, this type of mechanical energy storage and recovery is only possible within range of a gravitational field [14].

(Other, secondary ones, of course are; such as electrical, chemical, compressed-air- or spring-loaded.)

<u>But it goes on</u>:

Even more important is the *energy-producing* and *entropy-destroying* effect of **gravity**:

A rock in the universe, with its absolute place and velocity indeterminate [15], has, in itself, neither *kinetic* nor *potential energy*, only **mass** [16]; if, however, a planet approaches it with its gravitational field, it may accelerate the chunk to a speed higher than its own; the formerly energy-free stone now possesses *both forms of mechanical energy*, and this even increasingly so, in relation to the other's center of gravity.

And when it impacts, thermal energy is generated: several thousand degrees are created in place of a former temperature close to absolute zero. And all of this **without the use of outside energy**; all this energy, up to then, **was simply not there before**.

Could it be that here, right before our very eyes and yet unnoticed, a mystery has its solution, namely the unconditional **emergence from nothing**, the source of *all being* beyond a cloud of hydrogen, as well as the **energy** that energizes the existing, and ultimately allows life within it?

And is this **newly formed energy**, whose movement (and compulsory disorder and loss) generating laws are so well known, at the same time, albeit to varying degrees, inextricably intertwined with its origin, the likewise energetic and orderly acting, creative **gravity**?

Is this the end of the search for the **<u>fountain</u> <u>of</u> <u>youth,</u>** the source of all life? Even if eternal renewal can not proceed without eternal destruction, because nothing is *lost* in the universe, but always has to be *recreated anew*.

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[13] Also for the track cyclist- problem: Taking a longer detour through a gravity sink leads to an earlier arrival at the same final speed (i. e. the same final energy).

[14] This applies, at least indirectly, to any energy storage and recovery, as well as energy generation.

[15] Newton's first law of motion, known as 'The Law of Inertia', states that objects at rest, and objects moving in a straight line, are equivalent; not moving at all and moving in a straight line are one and the same thing, and cannot be discerned; it is impossible to tell if an object is standing still or moving in a straight line; this depends on the frame of reference.

[16] Matter is passive and inert; it can only be influenced from the *outside*. Objects cannot move by themselves: "*If nothing happens, nothing happens.*" -So how can living beings move?

Physical Esoterics

The more it unfolds, the simpler it gets

Reducing my model to five major points or theses:

Everything in the universe, and with that everything on Earth, as the existence of planet Earth itself, can be traced back to **gravity** in just a few simple steps.

1. ALL MATERIALS heavier than hydrogen were and are being forged in the center of stars by nuclear fusion as **a consequence of the gravity** of these stellar objects. [17]

2. Each new atom so created is more complex than its predecessor, and is created in an ever shortening span of time. Thus **the effect of gravity** INCREASES COMPLEXITY, and so, by that definition, REDUCES ENTROPY; it does so on all levels. [18]

3. ALL FORMS OF ENERGY prevailing, such as heat, light, and movement, on Earth ultimately originate in the Sun, the Moon or the Earth itself as **a consequence of the gravity** of these stellar objects as well. The same applies for others. [19]

4. LIFE ON EARTH is but the latest stage of COMPLEXITY in this location in space and at this moment in time. Along with the ENERGY it feeds upon and the MATERIAL that it is composed of, living tissue is, simply put, just **another consequence of gravity**. [20]

5. The high- energy, low- entropy conditions brought forth by the **self-** accumulation and **self-**organization of matter through its **own gravity** sparks a THERMODYNAMIC REACTION, of which human economy is a part. The laws governing this process will not allow a profit. [21]

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[17] This is undisputed, as far as I know.

[18] Highly controversial. Science is divided on how to exactly define **entropy**, depending on its purpose.
For the sake of the arguments provided here, (low) entropy will be defined as a measure of *complexity*, *gradient*, and *potential*; the nuclear transformation of hydrogen to helium alone then is proof of the entropy- lowering effect of gravity, as would be the reduction and separation of carbon and hydrogen oxide (or mineral water) to carbohydrates and free oxygen via **photosynthesis** (*effective of the gravity of the Sun*), or similar processes via **chemosynthesis** (*effective of the gravity of the Earth*).

[19] My thesis; the general opinion of science on this is unknown to me.
It seems almost to not have been looked for very seriously yet. Usually, the debate stops short at "*the Sun*" as a "*source of all earthly energy*", but goes no further; thus ignoring (not only) the energy that *the Earth itself* provides.

[20] A consequence of points 1 - 3; as everything else, life is only a special form of what is.
Living tissue, as all else, except for perhaps the existence of matter itself, is a chain consequence of gravity. Just as gravity creates a mix of **increasingly complex atoms** out of simpler ones in the center of the stars, the lesser gravitational forces in the region of their satellites generate **ever more complex molecules** through chemical reaction, once pressure and temperature fall below the values necessary for serial condensation - first *exothermic* (oxidation...) then *endothermic* (reduction...); first **loaded**, then **fed** by the energy generated through the nearby **centers of gravity**.

[21] A consequence of points 1 - 4; applies to all forms of energy conversion, of which the **human economy** is only a special area.

More:

·Economics are not recognized as a "*real*" science by other scientists, since their forecasting prowess range within that of competent astrology, independent of their respective ideology; their proponents can easily be consistently wrong with their predictions, and still be considered experts. This shows they have no better alternative to fear.

Could it be simpler?

All matter, by its own gravity, constantly increases its own structure, order, grading and complexity, thereby providing the complement, rather the prerequisite, for any thermodynamics.

Not the other way around. This **increase in complexity** (or **reduction of entropy**) as the key element presents itself in three, by now parallel, but consecutive stages, each one shorter than the one before, and each one accelerating for itself (a property of all gravitational systems):

1. **Physical**: All the known elements are produced over time in the gravitational centers of the stars, by nuclear fusion and under the determining influence of gravity, from the original, most primitive and simplest of all elements, hydrogen, which constitutes them as the only existing material in the beginning of the universe. The number of natural elements known to us is thus advanced from 1 to about 100; in addition to this come the variety of internal atomic structures of the individual elements.

2. **Chemical**: These new elements are scattered into space in supernovae and then accumulate again in smaller centers of gravity, such as planets, and, again under the same determining influence of gravity, and over time, but in less than was necessary for their formation, themselves form ever new molecular combinations; the number of new materials now present in the universe already becomes incalculable.

3. **Biological**: Under appropriate conditions, some of the increasingly complex molecules acquire the ability to thermodynamically decompose other molecules and excrete the waste, without themselves fundamentally changing, by exploiting the material and energy streams produced by the gravity of the gravitational centers in their proximity. Life begins, and with that evolution or change in ever shorter time. The number of different molecules able of being thus biologically generated is beyond any measure.

So life on Earth (or anywhere in space) is not a frighteningly unlikely coincidence, contradictory to all natural laws of decline and dissolution, but simply a result of 13 billion years of creative physical influence by the gravity of matter upon itself. As well as is every dead planet, and the entire cosmos in its present form.

·However, if forecast outcomes are wrong more than half the time, then the underlying theses, or premises, will most probably themselves not be right.

Thus to the contrary, point 5 states:

·The **physical** value of work is always **negative**; and with that, so is its **economic** value; a profit exists only in the form of (ignored) **debt**.

·By that token, **work** is just another form, or rather level, of **consumption**, albeit a tedious one, for it is subject to the *Second Law of Thermodynamics*.

·By the same, work may indeed lead to a *fortune*, but not to *wealth*. Wealth is bound to that state which **can not** be produced by **man**, **beast**, **plant** or **machine**, but has previously been generated by matter itself, outside of thermodynamics - something akin to *order* as opposed to *disorder*.

·The need to perform work to achieve a goal may be inevitable, but the product thereof is always *less* valuable than the resources which are, just as inevitably, destroyed in the process (which may include something like a clean environment - **negative entropy**!).

·As the **Second Law of Thermodynamics** states, the net resources depleted by work cannot be (re-) generated by the performance of work; work should therefore be performed economically, or limited to the minimum required for the desired result. Alas...

Everything else is just a statistical probability, not a coincidence - "*There are no coincidences*". Just as there are no real contradictions - one of the assumptions involved is wrong (Ayn Rand).

In one sentence:

In the course of 13 billion years, the matter of the universe transformed itself, by its own gravity, and over several levels, from a dead cloud of hydrogen gas or plasma partially into living, self- sensitive matter- and that's just the last step in this place at that time.

Is that important?

The planet does not care why it is. People *do*, and that has consequences.

Until the invention of the steam engine, all humanity was of the opinion of being created or descended from a god or several supernatural gods - supernatural because, logically, man was not able to create man and certainly not the rest of the world, from which man depends upon in prosperity and ruin.

This view has lost its value in the industrialized world, the more people were capable of mastering nature. Man, ideologically, was transformed more and more from creature to creator, now even of his own self; that too has consequences.

Industrialization has already allowed two world wars, in which humans were pit against their own mechanical creations. Anecdotally, the machines won and as a result are now taking over the world.

The theoretical penetration of thermodynamics 150 years ago had a share not to be underestimated in this new image of man as creator - which on the one hand allowed humans to become more and more powerful, on the other hand, however, depicted their existence, together with that of their planet which they were now controlling, as an inexplicable, accidental and incalculable whim of nature, in a cosmos that was becoming less and less logical; the more science advanced, the more the result became ever more esoteric, contradictory and confusing.

What now if the theory contains an error? Then all that changes. If the assumed theoretical flaw is sufficiently basic and primary, if it for example is based on a mathematically or physically unfounded and sufficiently false definition of entropy, then man, at least according to this description, returns from creator to creature again.

And that has consequences as well.

"***Contradictions do not exist***. *Whenever you think that you are facing a contradiction, check your premises.* ***You will find that one of them is wrong***." (Again, Ayn Rand)

tl; dr:

$$S =/= Q/T$$

$$S = T/Q$$

My pleasure!

Does a Potato Work?

Plants **do perform work**. They move large masses of matter against strong forces by burning carbohydrates produced with sunlight via **photosynthesis**.

However, plants are a **secondary form of life**. Life was *before* plants; and even today, primary and secondary life goes on in lightless deep- sea volcanic areas via a process aptly named **chemosynthesis**.

- During **chemosynthesis**, bacteria living on the sea floor (or within animals) use energy stored in the chemical bonds of *hydrogen sulfide* and *methane* to make glucose from the water and carbon dioxide dissolved in sea water. Pure sulfur and sulfur compounds are produced as by- products.
- Wherever there is or was magma and (sea-) water, **chemosynthesis** is possible: *sulfates* in deep sea water penetrating through cracks in the crust are converted to *hydrogen sulfide* at **heat** and **high pressure**, which, when it is again released into the ocean through deep-sea vents, bacteria break down and metabolize as the first step in a food chain.
- Of course, the **Sun** produces far more concentrated *energy* (and therefore *negentropy*) then does the **Earth**; it's mass and gravity is far stronger; so, naturally, **photosynthesis** took over with a vengeance, once seaborne life had come into contact with sunlight.

Where did it all go wrong?

To put it as brutally as possible:

In my opinion, **Marx** was utterly wrong when, around **1867**, he stated that *all profit stems from human labour*; but all others were too, for he was not alone in this assumption.

Even his sworn enemies still today postulate the economic profit of human labour; their only fight with their counterparts is over the proper allocation of that purely arithmetic cookbook profit - and, more importantly, the allocation of the **clandestine debt** hidden deep within the recipe.

They were, and are, **wrong on two counts**: *one*, that human labour is the (sole) source of profit, as opposed to that of animals or machines; *two*, that this profit exists at all.

Humans, animals, or machines all produce a *loss* through *any action*; this loss, if not compensated for by **gravity**, is then hidden somewhere to produce a faux and faked profit.

Were it otherwise, industrialization would not have taken place.

Strangest is the fact that this idea of "*profit through human labour*" caught on *the very instant* **mills** began harnessing outside power, then **steam engines** *began to outperform* both humans and animals; yet no-one ever thought of allocating profit to an object, inanimate or not; only to its *owner*.

It may have been nothing more than some thought of *compensation* for *expropriation*.

Furthermore:

If two people pay each other for goods & services, they won't earn any money - their cheques (or **i.o.u.**'s) will just keep bouncing back and forth ("**circulating**" between two people).

And raising the number of participants has no effect on this inside game.

As a story in a comic strip called "*Lucky Luke*" once told of a Chinese town in the West, its inhabitants had decided to go, evenly, into one of two businesses; laundry shops and restaurants.

Their idea was, of course, to thereby **live clean and satisfied** lives for ever after. Instead, they could not afford each other's services, and were **dying dirty and hungry** - until our hero Lucky Luke cajoled a horde of equally dirty and hungry cowboys into town, who brought in outside money and saved the day for everyone.

Funny as it is, it's wise as well.

The Chinese town inhabitants **could not survive on themselves**, because any economic activity produces **a net loss**: food is **consumed**; as is heat for water and soap, to name just a few.

The waste of this activity is then, hopefully, washed out of town by the river running through, polluting it on the way and depleting resources for ever by taking them into the sea. To compensate, '*outside*' money has to come '*in*' to purchase new resources as replacement from '*somewhere else*'.

However, in a global economy there is no '*outside*' money, nor are there '*outside*' resources. Global resources have to be replenished **in situ** by something *non- monetary*, *non- thermodynamic* and *non- economic*:

I. e. gravity.

So much for economics

Now, for the physical side of things.

According to wonderful Wikipedia, the concept of **entropy** was introduced by Rudolf Julius Emanuel **Clausius,** a German physicist and mathematician.

"*In 1865, Clausius gave the first mathematical version of the concept of entropy, and also gave it its name... He used the now abandoned unit 'Clausius' (symbol: Cl) for entropy. (1)*

1 Clausius (Cl) = 1 calorie/degree Celsius (cal/°C) = 4.1868 joules per Kelvin (J/K)

The landmark 1865 paper in which he introduced the concept of entropy ends with the following summary of the first and second laws of thermodynamics:

The energy of the universe is constant. (2)

The entropy of the universe tends to a maximum. (3)"

But why is it so difficult to calculate, let alone to measure **entropy** in any meaningful way or manner, and is it so fraught with *exceptions*, *caveats*, *definitions*, *restrictions* and *special cases*?

In my opinion, it could be that *Clausius* misinterpreted the physical dimension of entropy in **1865**.

Interestingly, both *possible mistakes* (by *Marx* and *Clausius* respectively) would then have been made very much at around the same time,1865/67, about 100 years after the invention of the **steam engine**; and moreover, both had to do with it.

Both *Clausius* and *Marx* wanted to theoretically understand the effect of running a steam engine, one *physically* and one as a *means of production*; *Clausius* as a physicist and *Marx* as an economist.

Both could have made a *similar mistake*, by viewing something the **wrong way around**; *Marx* by ignoring the **inherent loss** of the work process (**energy and resource consumption**), *Clausius* by naming something as **positive** which is inherently **negative** (**entropy**).

And things went on from there.

<u>To Note</u>:

- *Clausius* clearly meant and aimed entropy to be measurable (in Cl); as in 3 Volts, 5 liters, or 25 Clausius, expressed generally in Q/T or energy divided by temperature.
- This unit was later "*dropped*", and **dropped altogether**. The question of a unit for entropy was never resolved.
- Of course, Q and T can be expressed in a variety of ways, and have to be, a specific unit missing, giving calculations of entropy a decidedly **esoteric** quality.
- Still, in physics, you can define any **physical quantity** you like. Some are dimensionless by nature, but Q and T are both quantifiable and have different units (J, K), so they don't cancel each other out.
- Defining S (Cl) = Q/T (J/K) or 1 Cl = 4.1868 J/K or any other fraction
- is therefore **perfectly legit**.
- Thermodynamics had already introduced the concept of *irreversibility*, which is expressly **forbidden** in classical mechanics.
- Newton's classical mechanics, useful as they still are, are an *idealization*; in reality, all processes on the level of energy conversion are not at all completely reversible, they "*run out*" after some time; but the overall **conservation** of **mass** and **energy** still holds.

<u>However</u>:

- This is no longer the case in the realm of either nuclear or astronomical physics, which do not abide by the Second Law of Thermodynamics; *relativity* or **$E/m=c^2$** states that, once you go beyond classical *mechanics*, or classical *thermodynamics*, neither **time** nor **space** nor **energy** nor **mass** are *constant* in that classical sense.
    - So, the energy of the universe is NOT constant - at least not the way *Clausius* would have meant it in 1865.
    - But he could not have known this; as **$E = mc^2$** was formulated almost half a century later by *Einstein* in 1905.
- *Clausius'* definition of **entropy** puts the **temperature** in the **denominator** of the fraction

  Q/T;

  if **T** approaches **0**, Q/T approaches *infinity*, independent of Q.

<u>This begs two questions</u>:

1. How can the entropy of the universe still tend to a maximum, when its mean temperature is already near absolute zero (and has been for long), and therefore **its entropy S** should be near to infinity accordingly?

   When & where was that at its **minimum**? When the temperature of the universe was extremely high in the beginning?

2. For something to have **low entropy**, either the temperature T in Q/T must be *high*, or the energy content Q must be *low*.

   However, zero entropy is being constantly defined as a condition prevailing at T = 0 K.

   For that, its energy content must be exactly 0 as well, or a forbidden **division by zero** takes place.

These are mathematical conditions, not physical ones.

May it not have been a *sign error*, but an inversion *by choice* after all?

Back in 1865, these were the very beginnings of the understanding of thermodynamics; and Wikipedia and others tread, very, *very carefully, by Jove!* around the question **WHY** *Clausius* defined the new and hitherto unknown physical quantity of **entropy** as Q/T and not, say, T/Q.

Never mind the confusion of naming something as negative as "*disorder*" with a positiv expression, thereby forcing the positive expression to be negative - "*negative entropy*" as in "*negative disorder*" or order.

An assumption

Let's just assume that way back then, an esteemed scientist named *Clausius* tentatively noticed a relationship between two physical quantities in the new field of thermodynamics concerning that very practical steam engine, where almost every definition was still unbelievably hazy; he had a 50/50 chance of getting it the right way around, and, just by chance, *missed it*.

Now, in science, anyone who comes up with something new has the patent, so to speak; it has to be plausible, yes, but it does not have to be proven right very much beyond that; in fact, the others have to prove it wrong.

This typically takes one or two generations, or 60 - 120 years; as scientific generations come along with hoards of disciples and scholars, with very vested interests. Einstein's revolution of physics would have been the perfect chance to right all wrongs; unfortunately, the scientific community was, at that time, involved in blowing one another up with utmost efficiency.

And if they perhaps slowly began to realize that this entropy thing might be a bit wrong in theory and dimension, maybe in some controversies decades later ongoing, I could guess they didn't want to rewrite everything they had already written on the subject, and get everyone & everything all horribly confused, so they quietly dropped the unit as useless and left it at that, hoping that as X/Y = 1/Y/X, they could handle it mathematically, as this was all extremely theoretical stuff anyway - or so they thought.

Unfortunately, 1 liter makes sense, but 1/liter is a pretty useless expression. Reality is a bitch... you cannot express volume in 1/liter or measure 1/volumeth by 1/liter without completely messing things up, and in consequence ripping an ever- widening hole in the time- space continuum, raising **Cthulhu** and causing chaos to reign in the process of going mad - especially once you find out that you are not dealing with something marginal that you can frame at will, but the effective, glowing CORE of all being.

- Of course, you can always use J/K to express or compare a certain amount of S, as in $2{,}4 \times 10^3$ J/K or any conversion thereof.

- But it still seems like they want to (very successfully!) deter you from doing so and hide the fact that S = Q/T makes no real sense, and cannot be expressed as some measurable quantity as in:

  "x J/K" *will have twice the effect of* "x/2 J/K"

And so you will find very few concrete and public **calculations of entropy** on the net... and indeed, there are controversies about whether it can be measured at all.

So let's just further assume that if someone defines a new **physical quantity** you can **measure**, and a **unit** you can **express** it in, but then his colleagues go on to *scrap the unit*, while continuing to *calculate the quantity* under **multiple definitions**, **names** & **combination of units** - well, there seems to be something amiss.

I have no Idea if this is the case or even a viable thought; but it may be that the concept of entropy could be in for a major revision, perhaps a new definition.

- **So, just for the exercise**, let us re- define entropy as "**untropy**" **Su = T/Q** (*Ugh*).

  If **T** approaches **0**, T/Q now approaches **0**, again independent of Q.

<u>This results in the following changes of the above</u>:

- The **untropy** of the universe can still tend to a maximum, but since its mean temperature is near absolute zero (and has been for long), and therefore its **untropy Su** is at the moment *very low*.
- When & where was its maximum?

  When its temperature was extremely high in the beginning? Could be. Or perhaps in the end, if it collapses. Who knows, who cares, we now have a long way to go.

- The **untropy** of objects such as the **Sun** and **Earth** or a **can of gasoline** could quite easily be calculated and measured in "*Ugh*", by dividing its momentary temperature by its energy content - if that makes any sense.

  "x K/J" *will then indeed have twice the effect of* "x/2 K/J" -

  or 2 *Ugh* (K/J) have twice the effect of 1 *Ugh* (K/J) -

  probably true, whatever it may mean.

- If you burn the can of gasoline, or run an engine on it, the overall **untropy** in the surroundings will **rise**, because the overall temperature T rises, while the *First Law of Thermodynamics* sees to it that Q stays the same.

  So, nothing changes there; the laws governing thermodynamics are safe.

- For something to have **low untropy**, either the temperature T in T/Q must be low, or the energy content Q must be high.

  So, **zero untropy** being defined as a condition prevailing at T = 0 K is perfectly fine. At 0 K, any energy content is irrelevant. That sounds Ok...

- At any temperature above 0 K, the energy content Q must be high for the **untropy** to be low.

  Low untropy means high energy potential? That sounds Ok as well...

- There seem to be no exceptions and conditions and caveats here...

  Everything falls into place...

The workings of gravity

So, with this **new quantity** in mind, let's have a qualitative look at the workings of gravity again, shall we?

A cloud of hydrogen the size of a solar system and a mean temperature of around 0 K collapses and forms a star. The energy content Q is now higher. The temperature T, formerly near 0 K, now is higher as well.

Is Su2 = T2/Q2 (after collapse) <|> Su1 = T1/Q1 (before collapse)?

If you set Su to T/Q, something very strange happens. The **untropy** within the space taken up by the cloud is already near 0, as T is near 0. Now the mean temperature T within that space increases as it empties, being very hot in a very small concentrated center but staying near 0 K in the outskirts of that solar system; and empty space has no temperature anyway. Increasing T, however slightly, **increases untropy Su**.

But how high is Q? That is up for debate; but as the hydrogen cloud collapses, billions of tons begin to dislocate and move towards their center of gravity, steadily raising their energy level until the release of nuclear energy may occur; Q is increased. Increasing Q **lowers untropy Su**.

Which factor will have the upper hand? The race is on. But one thing is clear: under these premises, the **untropy** of a dark and cold cloud of hydrogen gas or plasma is already **very low** at the beginning, and gravitational collapse tends not so much to *lower* untropy but to *preserve* that original state of low untropy while *increasing* the energy level of the system.

It may yet be that **untropy** is only viable where energy release or conversion takes place; simple heat transfer may not suffice.

This outcome of a mathematical manipulation is very strange indeed.

The overall concept

But the overall concept even has a **philosophical** or **theological** aspect:

What people do, what physicists do, with all respect, is *totalitarian*: they would like to ensnare everything that humans have ever thunk into one, single, all- encompassing *Theory of Everything*.

The trouble is, humans just keep on thinking, to be "*as God*" - and that already went wrong at least once before.

Now, looking for the *Source of Everything* is quite the opposite. Once you have the source, **the quest is over** - no matter what follows next. It just keeps on unfolding. Like so, for instance:

- As a human being, you are part of creation. So far, so good.
- If, as a human being, you need the concept of **God** in your mind for *Creation* to be (zebras don't) - you're stuck with it.
- If however you need to REFUTE the concept of **God** in your mind for *Creation* to be (zebras don't) - you're stuck with it *as well*. The universe is *not* symmetric!
- But if you neither *need*, nor *need to refute* the concept of **God** in your mind for *Creation* to be - for ***you*** to be - because creation is able to happen by itself, while following a very rigorous physical principle, then you are free to *believe* or *not* to *believe*, without jeopardizing the possibility of your own existence; and one is relieved of that final decision.

And that freedom alone is quite overwhelming.

Could this be a solution?

tl;dr: $S \neq \frac{Q}{T};\ S = \frac{T}{Q}$ - by courtesy of *Lymphater*	[If you use the second formula, the expansion and cooling of the universe ***alone*** would lower its entropy]

As an example (an analogy):

The (re-) definition of speed 500 years ago

The technical vs. everyday **definition** of **speed**:

- **Technically**, we define ***speed*** by the **distance** an object travels in a given **time**, i. e. "*miles* per *hour*" or "*meters* per *second*"; the *higher* the speed, the *faster* the object; so far, all is well.

- But in **everyday life**, we do the opposite: We declare how much **time** it takes the object to travel a given **distance**, i. e. "a *four hour* drive" or a "*two hour* flight" from **here** to **there**; but now, the *longer* the time, the *slower* the object:
- *Double* the time is *half* the speed; *half* the time means *double* the speed.
- So we have to *invert* the **duration** to come to a conclusion about the **speed**. This takes knowledge - and time.

So why do we do this? Until recently, the speed or velocity of objects was *maybe* of military importance; the distance was all-important, and so was the time.

Then someone came along and found that inverting the *formula* spared you inverting the *result*. But who, when and why? And what *for*?

Wikipedia states that the current definition of speed was first arrived at by **Galileo Galilei,** who laid down that "*velocity*" (*v*) should furthermore be defined as "*distance* by *time*", or:

v = d / t

Now, it is of minor importance *if* it was indeed **Galileo**, or someone else, or *when* speed or velocity was defined exactly. The importance lies in the fact that:

- This was a decision to make, as the relationship between space and time could be set in two ways:
- **v = d / t** (= **distance** by **time**)

  or
- **v = t / d** (= **time** by **distance**)
- Both definitions are equally valid *mathematically*. But they are not the same; their use has dissimilar consequences.

Now, even before *one* definition was chosen over the *other* for all future, physical **speed**, other than "**entropy**" some centuries later, was *not* a **new concept**; it had been an issue over millennia, in the realms of *sports*, *military*, *commerce* and many more.

That said, since obviously up to a certain point in western history (~1500) it had *not* been defined in a mathematical equation, *how* had it been defined before?

And why did **Galileo**, if we credit him with the new mathematical definition (revolutionizing science, as he was wont to), favor "*distance by time*" over "*time by distance*"?

The mathematical consequences

If you wish to validate a definition or formula, you test for the **extremes - infinity** and **zero**; zero is usually enough.

Let's do so for both. And what do we find?

- **v = t / d** (ancient, everyday definition: a two days' march from here to there)

for **t = 0** (no time at all)

Duration = 0 / d = **0**

Meaning: if the **time** needed to cover a certain **distance** is *zero*, then the **duration** to cover this distance is *zero*; this may be silly, but *mathematically valid* - and *impossible* in *reality*, as Einstein will find out, defining the **minimal duration** of any movement as the minimal duration light with *~1/300.000.000 s/m*; **t can never be 0**, not even for the shortest of distances.

Of course, even before Einstein, people knew that **movement** always takes **time**, and there was no such thing as **infinite speed**. For if the time to cover any distance was zero, then an object would be in *more than one place* at the *same time*, if the **distance** was not **0** as well.

However, the *really impossible* is *mathematically valid* in this formula.

- That's problem number one (with that formula).

But even worse,

for **d = 0** (**immobility**)

Duration = t / 0

the formula is **not defined**.

In other words, in *this* definition of **speed**, **immobility** is *mathematically invalid*.

And that is bad, as immobility *exists in reality* - at least *relative* immobility here on Earth.

- That's problem number two (with that formula).

Now we try the new, inverted formula, as in use and credited to Galileo Galilei:

- **v = d / t** (new, technical definition: the speed of the object as such)

for **d = 0** (**immobility**)

Velocity = 0 / t = **0**

Meaning: if an object stays where it is, its (relative) speed is **zero**. This passes the reality check and is *mathematically valid*: Immobility exists.

But for **t = 0**

Velocity = d / 0

the formula is **not defined**.

In other words, in *this* definition of speed, **infinite speed** is *mathematically invalid* - which is also an expression of reality: An object can only be in one place at any time.

But if the formula **v = d / t** was or is *invalid* **at** or **near** the point of *t=0*, if the distance is not *0* as well, does that not theoretically make it *universally* invalid, as it is not *universally* valid - since the point from where it becomes increasingly impossible is not clearly defined? Well, *t=0* is still an *improbable condition* - it still means that an object can be in *two places* at the *same time*.

And when that condition finally became imaginable, **Einstein** came along and defined the **speed of light** as the **ultimate speed** with *~300.000.000 m/s*; again, **t can never be 0**, not even for the shortest of distances; so the theoretically *possible* mathematical problem does not exist in *reality*, due to external circumstances - which is interesting all in itself. (Has gravity something to do with it?)

- Now, whenever

  v = d / t

  nears the speed of light, *relativity* steps in or rather, out of the margin of error, and strange things happen to time and space.

- Both ends of the spectrum - **zero speed** (**immobility**, **d = 0**) and **ultimate speed** (**the speed of light**) are now *validly defined*.

Problem solved

Invert the ancient definition of speed, define it as **d / t**, and without having misrepresented reality *one way* or *another*, all you need to throw now is **one exception only**, **which is real**, and let **Einstein** take care of that.

Was **Galileo** just **lucky** to pick the right *one* out of *two* possibilities, the one where the **zero condition** is **excepted** by **nature** (with the end speed of light), or **genius** enough to *think it through*?

We may never know. But then, again, other than **entropy**, **speed** was *already known*.

And so, that is what I *think* will happen if we turn **Clausius' mangled definition of entropy** *on its head*:

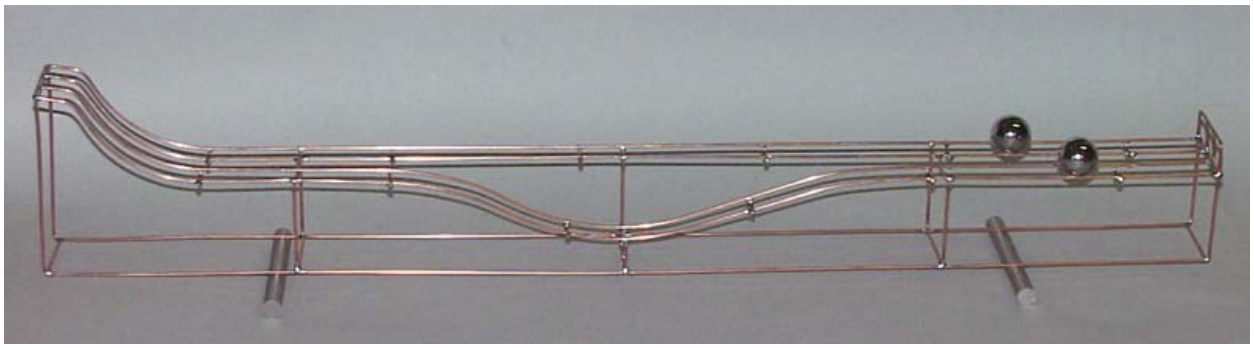
The mess clears up instantly

And then all we have to do is calculate *everything* once more.

Just once more. ; -)

Just for curiosity: The gravity 'time machine' experiment

If both spheres are released simultaneously on the left, the one with the longer distance to roll will reach their common goal first



Taken from **http://www.hcrs.at/KUGEL.HTM** [22]

A detour through a gravity dip saves time

This simple experiment does not prove or disprove anything

I have put it here to show that, while the laws of thermodynamics rule, there may be more to it than meets the eye.

The Author of the site I took it fromwrites:

The track cyclists's trick

"Sometimes a cyclist can overtake another one only by letting himself be carried far up the steep curve, to then gain speed on the way down. This is so widely known by athletes that nobody thinks very much about it.

Dr. Werner Klein has nevertheless made the effort to examine this effect more closely in the periodical '*Physics in our Time*' (*Physik in unserer Zeit*) 1998 / 2. In my opinion, this is the first actual proof that there is more at work here than the law of conservation of energy, although, contrary to all other opinions, this is expressedly not violated by it."

And he asks:

"**What, if not Energie, has caused the goal to be reached in shorter time?**"

(My translation)

[22] Source: This experiment was taken from the site http://www.hcrs.at/KUGEL.HTM, where it is explained and put into context with more descriptions, including an excel-spreadsheet (all in German).

This simple machine, which converts potential energy into kinetic energy, does not break the rules of thermodynamics, but shows that taking a detour through even a slight gravitational dip will conspicuously save time - even though in sum, no extra energy is gained or consumed.

The detour saves time, not energy - space is crossed in **shorter time** by taking a **longer route** at a **given energy consumption**. The end speed is obviously the same. In simple mechanics, one should expect exactly the opposite - or should one?

A longer route in shorter time means higher average speed -

which is acheived here **with the same energy potential** -

and therefore with equal end velocity.

Epilogue

Notes:

"*When the past no longer illuminates the future, the spirit walks in darkness.*"

(**Alexis de Tocqueville**, **1805 - 1859**) - a contemporary of

Charles Robert Darwin, **1809 - 1882**

Karl Heinrich Marx, **1818 - 1883**

Rudolf Julius Emanuel Clausius, **1822 - 1888**

Note the dates.

Comments from the BBC *In Our Time* Series [23] on "*The Second Law of Thermodynamics*" [24] on Thursday, 16. December 2004

Quotes:

"**Gravity produces negative entropy or order out of disorder**"

"**Energy and Gravity in the universe add up to Zero**"

"**Gravity stores negative energy**"

- so I gather this is not entirely unknown ... -

NOTES

[23] https://en.wikipedia.org/wiki/List_of_In_Our_Time_programmes

[24] https://www.bbc.co.uk/programmes/p004y2bm

[A] COMMENT:

Yes, in some detail, plants do seem to violate the second law, as they are able to upgrade the energy potential delivered in a narrow spectrum of sunlight by somewhat illegally storing surplus electrons in the chlorophyll molecule long enough to fill gaps in the carbohydrate chain while knitting it together, and somehow keep from catching fire or dissolving in the process. Do they really "catch the sunlight", i. e. increase the mass of this planet?

Who knows?

Maybe they even actively cool the planet by doing so, and maybe that is their primary role: to cool the planet while and by stuffing carbohydrates (hydrocarbons) underground. When these are burned by foolish humans, that energy is on the whole released as long-wave infrared heat radiation of lesser energy potential (as so happens by eating them), so overall there seems to have been no violation…

It may be that not life depends on plants doing what they are able to do (ours does up to now), but that plants depend on life in doing what they are able to do.

As it seems, plants were not the first form of life on this planet, but rather a follow-up, evolving out of what ever there was there before; and that the first degradation of energy potential to turn a matrix of molecules in a warm muddy clay puddle into living matter was not of sunlight, but of lightning and volcanic heat, and that this continued for quite some time, until the first complex green chlorophyll molecule finally evolved that could catch and trap the energetic photons of the sunlight beating on the waters of the primary ocean, but that in itself certainly seems not to have been the first living matter on Earth - it does not even live by itself; so, even if life did develop in the sunlight, it did so without green plants at first and so obviously did not depend on that specific mechanism.

Green chlorophyll in itself seems to be an end product of molecular evolution, having, once evolved into its effective form, quite rapidly invaded every wet or moist place on the planet and proceeded to break down millions of megatons of carbon dioxide over billions of years, for ever changing the surface of the Earth while in itself hardly or not at all changing over that period of time.

If industry could find some way of for turning mineral water into soda pop by exposing it to energy over an inanimate catalyst, it would probably do so immediately.

Especially if that would violate the second law, as this would open an access to unlimited energy potential.

[B] COMMENT:

Efficiency: As humans (and animals) are only able to turn over food into work load with an efficiency of perhaps 10%, and plants generate this food with an energy content of perhaps 10 % of the received light as well, one can calculate, having added the various other losses throughout the processing chain, the huge margin by which humans (or other forms of life) are completely barred from ever sustaining themselves through a closed work cycle.

But even if both plants and humans were to turn over and release the respective energy received to 100% (an impossible feat), humans would still only able to just sustain themselves by working day and night without the chance of even clothing themselves with anything else but their own hair. They would not even be capable of reproduction, as any loss of substance or energy - or, indeed, the need to grow - would need extra resources surpassing 100%.

As this extra energy is our real source of income, losing our access to highly concentrated mineral oil by global depletion and / or its substitutes will cut our income greatly on a world - wide basis, as many alternatives may have been depleted by that time as well - so I suppose. And it may come as a blow.
As we live by wasting, roughly calculated, something like 99 % of the energy we receive on our behalf, taking account of the millions of energy units of stored solar energy we are now releasing (ultimately into the atmosphere and then back into outer space), and looking back to the hard-working days of purely agrarian society, we probably stand to lose, equally roughly calculated, about 90 % of our income; and that world-wide and for a very long time.

We could not generate our present income relying on human labour, not even by enslaving all of humanity.

[C] COMMENT:

In fact, a study of the OECD for the year 2000 seems to come to the result that 'economic growth' is quite a young phenomenon in the history of mankind. Looking at the economic growth of the years 0 to 1998, it came to the conclusion that the income per head stayed more or less stable world-wide until about 1800, economic growth keeping more or less in step with the growth of the world population. After about 1780, economic growth becomes independent and increases by a yearly average of about 2%. This is interpreted as an enormous acceleration through the industrialisation of production on the basis of fossilized energy.

It has been calculated that, up to the year 1800, people lived on an average of $3 a day per head, worldwide, and this virtually unchanged for more than 10,000 years ever since humans settled down to farm. In advanced civilizations, as in ancient Rome or the ancient Chinese Empire, this could increase to $6 or $7, to fall back to $3, or even less, once that had collapsed.

In other words, people lived on the edge of subsistence, and that everywhere. This did not change until the eighteenth century - coinciding with the invention of the steam engine. Since then, the average income in OECD countries has risen to about $100 per day per capita, an increase of an incredible 2,900 per cent. Such an increase has never happened before in the history of the world.

[D] COMMENT:

Indications vary, but according to one old standard schoolbook of the 1970ies, (which leaves no excuses for not knowing by now!) **the equivalent result of the average human physical working week** is about **1 kWh** (kilowatt-hour), which can at the time be purchased for less **than a dollar** and describes the work performed by electrical appliances for instance in one hour of ironing or vacuum cleaning. In a recent fun fair exhibition, people were enticed to run a treadmill generating electric energy. The whole town combined did not come up with a single kWh.

Compared with mechanical work, sheer human physical work is therefore overpaid at two dollars a week. The food needed to keep this human barely alive, let alone working, costs more. Other calculations put the real cost of human labour at about 10 dollars per kWh for every dollar wage per hour.

This relation becomes even worse when turning from physical labour to routine evaluation, representation, accounting or the like. Anything else, even human interaction, seems to be up for grabs.

Of course, this average human physical working week of about 1 kWh is somewhat fictional and it describes the sheer mechanical work output; the necessary energy intake is given at about 20 times that amount (20 kWh per week), which leaves an efficiency of about 5%; machines run at 30%. The maximum turnover for athletes is given at about 10 kWh per day, the maximum steady output of hard labour at about 1 kWh per day.

Humans -working or not working- need an intake of at least one thousand kilocalories (**kcal**) per person per day just to stay alive; this corresponds to a necessary daily intake of at least 1 kWh (the maximum that person can put out in a day of hard labour, but with an intake of about 5 kWh per day or 35 kWh per week). The standard daily intake is about 2.5 kWh on average and 3 kWh in industrialised societies (which again results in about 20 kWh energy intake per person per week on average, most of which is exuded as heat at an average rate of about 100 watts); or 50 x 20= 1000 kWh per year. People seen laying about in poor countries often are not lazy but simply hungry, i. e. lacking the physical energy to move about freely.

[This amount seems comparatively tiny; and it is. For on the other hand, one square meter of soil in central Europe receives enough sunlight to technically harvest roughly **1000 kWh** per annum; which would equate to one square meter of farmland being able to keep one human alive in central Europe. Of course, this is not true; in reality, it takes about 1000 square meters, so it is said; and that to generate the necessary food only. If you divide the amount of arable land on this planet by the number of people on it, the result is said to be 2000 square meters available per person, so we already in the region of the limit - if theses numbers be true. If your labor does not give you access to the products of 1/4 acre of sunlit arable soil at least for the food alone, you are only working yourself to death. But, as is mentioned further on, external energy is already being employed to pick up the tab]

Turn it which way you will: no human is able to feed himself, and may not even do so according to the laws of thermodynamics without freezing to death instantly (and all of these calculations even depend upon everybody working flat out, including newlyborns).

At current energy prices and wages (which, taking everything into account, will just about feed the labourer) at the turn of the millennium, human labour costs about ten times the as much as mechanical labour does. Other sources even put the relation at a hundred to one.

But there is yet worse to come: this does not influence industrial work alone, but the external energy needed to keep living beings alive, which has been provided by the Sun for millennia, has for the last century partly been replaced by fossil fuels, causing, among other things, world population to jump by roughly doubling the supply of food in the so-called 'green revolution'.

Farming, in the developed world, has turned from a net provider (or consumer) of solar energy -in which land ownership was and is crucial- to a net consumer of fossil fuels; some sources put the relation at one to five, i.e. five times more wh of fossilized energy than is provided by direct solar energy is contained in every kWh provided by the food in highly industrialised agriculture; others at one to ten. It is estimated that pre-industrialised societies humans used about four to five times the amount of external energy needed to feed themselves; now it is forty to fifty times that amount.

Having reached peak oil and gas production, this supply will begin to wane, while the world population will probably continue to rise for some time. What we have come to term "economic growth" is largely due to and has developed parallel to the consumption of fossil fuels, first coal, then oil and gas. Putting economic growth down to growth in consumption of energy is probably not wrong. In other words, a drop in the consumption of energy will probably lead to economic regression.

Already today, some countries in the so-called developing world, far from developing, are unable to generate enough income to pay for their energy imports, rendering them chanceless.

This is enhanced by the fact that **energy is energy**, which creates a tendency for nations or corporations to subsidise their agriculture as soon as they are able to so. This cheapens the food for their own people or customers by subsidising, more or less directly, the diffuse and limited solar energy with concentrated fossil or nuclear energy, making it impossible to compete for those who are not able to do so.

Once the stocks of fossilized energy are depleted, we tend to lose, roughly, maybe, about half of our food available world-wide on a yearly basis - in real terms; through this real starvation will ensue, as solar energy alone is already now unable to furnish enough food for every human being on Earth, even if its agricultural surface is used for nothing else - leaving no space for the solar production of biofuels. Anyone who has ever tried growing modern crops knows of their dependency on artificial fertilizer and other paraphernalia. This calculation is independent of climate or climate change: who knows if the thawing of the arctic permafrost will be able to compensate for the loss of agricultural land in the tropical regions of this planet.

And, of course, our cities will fall into disrepair, as industrial nations are currently using the equivalent work force of ten to thirty times their own population to build and maintain them.

And this has happened before: the ancient Roman Empire, having no access to or concept of fossil fuels, once it had de-forested most of mediterranean Europe, lost its prowess for steel and mortar production, was overrun by primitive swamp dwellers and woodland tribes, and all but disappeared from the face of the Earth, leaving goats to graze amongst its ruins on the hills of Rome for nearly a thousand years and the inhabitants of Europe slowly to work their way out of the proverbial and very real dark ages, while biofuels were equally slowly replenishing themselves around them.

[E] COMMENT:

Some undigested thoughts on kryptocurrency, 2017/18

·Up to now, to turn energy consumption into money, factories had to produce goods to sell.

·Now, with bitcoin™ and other computer-generated so-called kryptocurrencies, people have found a way to short-circuit that process, by hooking up factory-size server farms to power plants, to so in turn (and in these) generate money directly, without a detour via the production of any goods; thereby generating a productless profit through the depletion of energy resources.

·To find a perspective: by 2017/18, these kryptocurrencies, whose factories have been newly-built where energy is cheap (like Iceland, or Mongolia), have been devouring the electricity consumption first of Morocco, then of Denmark, which lies at around 30 billion kWh; and some say by 2020 they would consume the entire amount of electricity produced world-wide, if this pace is kept up.

·At this moment in time, the monetary "worth" of all kryptocurrency, worldwide, is said to lie at around $100 billion for these 30 billion kWh, while the total GDP of Denmark is at around $300 billion; but then, electricity, again at the same time, typically makes up around 20% of total energy consumption in an industrial economy, meaning the total energy consumption of Denmark should lie at around some 150 billion kWh; in which case producing money directly would be quite a bit more profitable than via products, as long as these are not missed too much.

·I suppose that currency produced at less energy cost, like writing something akin to "2000 Billion Oodles" on a slip of paper, would remain worth less, as worth mirrors the amount of energy destruction. Perhaps this has always been the case.

As a side effect, the production of kryptocurrencies should drive up energy production by cheap nuclear power and coal, as renewable energy is more expensive; and material products will still be needed, to buy something with the money thus produced directly, by deleting energy resources without producing any (other) product.