



To Emerge or Not To Emerge, Reductive Freedom creates Life, Being and Death

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Independent

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[1]:0'00":30

Good afternoon.

My name is Bert Frederiks. I come from The Netherlands.

I am not **professionally** a scientist.

I just feel an urge to try to integrate (or unify) knowledge.

{I try to be eclectic in the positive sense of trying to use all facts available to falsify my ideas – conform Karl Popper.}

{As René Thom said: “To predict is not to understand”

{“Prédire n’est pas expliquer”}.

To understand our theories,

we must empathize with the entities of the external world.

Things have to live inside us.

That is what I {(as a kind of ‘truth artist’)} try to cause with my words.}

{From medicines, social sciences, ethics and electronics I became interested (and wrote books about) human relations, neural networks, learning and consciousness.}

{My design of a conscious machine lead me to the paper that I’ll present to you now.}



[2]:0'30":50

{As an introduction} let me explain the title of my paper.

- "To **Emerge**" means "*to come* into existence."
The "constructal law" is about *being* and *staying* into existence.
The "freedom law" (that I will formulate) is about life *coming into* existence.

Remark that the Latin word... "Natura" literally refers to the same, being the continual rebirth of reality.

{Remark further that to the ancient Greeks everything was alive, and that something was explained when its life was understood.}

- {**Freedom**} What I call "Reductive freedom", is the freedom named in Bejan's constructal law.
The term refers to cause and effect **not** being (fully) reducible to the parts that something consists of.
- {**Life**} To me the "constructal law" is the "law of life."
- {**Being**} Thinking in terms of life I like to speak of "beings", instead of "systems".
- {**Death**} Beings **die**. Biologically dead beings dissolve, but many physically dead beings are very persistent.

Life, Existence & Being

Constructal Law (Bejan):

For a finite-size **system** to persist in time (to live), it must evolve [freely] in such a way that it provides easier access to the imposed currents that flow through it.

⇔ Law of Life:

For a (finite) **existence** to persist (in time), thus to **live**, it (or its **being**) must evolve freely in such a way that it can handle what it encounters more easily.

⇔ Definition of Life:

Life is the (in time) persisting and freely evolving **being** (or flow-system) of a (finite) **existence** (or design) (that can handle what it encounters ever more easily).

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[3]:1'20":55

{So I want to use a somewhat different terminology than Bejan.}

Instead of "**system**" I like to speak of "**being**" and "**existence**."

- An "**existence**" is the system as a *thing*, *entity*, *object* or "*design*".
- A "**being**" is the system as '*living and flowing*'.

{Often it does not matter

which of these terms you use,
but sometimes it does.}

(In **Dutch** {written in orange} the terms are "**zijnde**" and "**zijn**".)

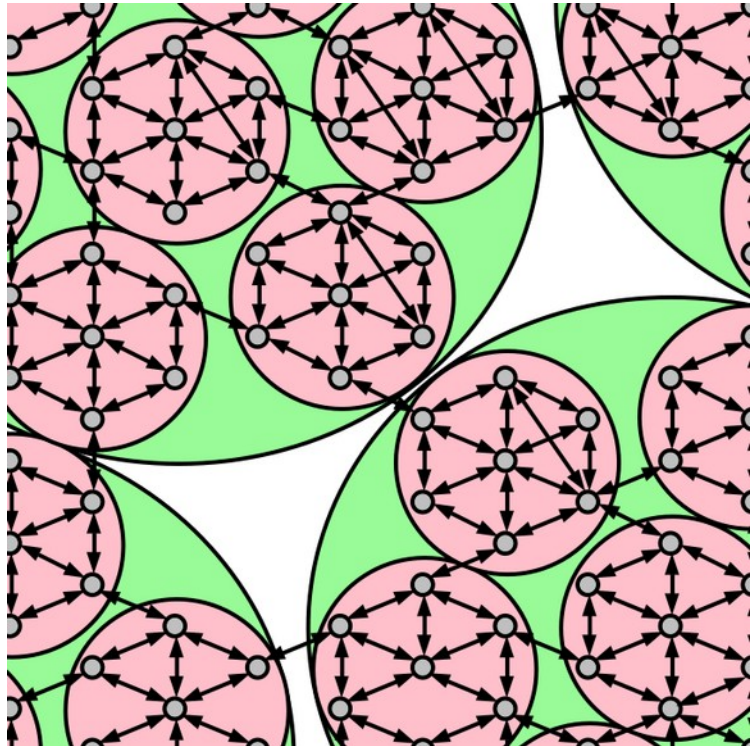
{So the distinction (between "existence" and "being") may be more natural to me than to you.}

(Remark that the distinction between the terms is related to the distinction between "object" and "subject".)

- I call my reformulation of the constructal law the "law of life":
"For an existence to persist, thus to live,
it (or its being) must evolve freely in such a way
that it can handle what it encounters more easily."
- From this I distill my definition of life:
"Life is the persisting and freely evolving *being*
(or flow-system) of an existence (or design)
(that can handle what it encounters ever more easily)."

Causation & Reductionism

- Reductionism: Smallest particles are causative.
- Causation by 'wholes' is an illusion.
- But: 'wholes' are systems/beings.



[4]:2'15":50

Reductive freedom (**and** the constructal law) is about causation.

{We live in a world that is reductionist in theory, but non-reductionist in practice.

{We are **reductionist** in theory because that is what we can understand at the moment.}}

Reductionism is the believe that everything that happens

in this world is (in the end) caused by the smallest particles
(and interactions between them).

As a consequence the 'wholes' that are formed by such "parts" or
"particles" are **not** thought to be 'really' causative.

For instance, our consciousness is thought to be illusionary.

{And psychology may not even be considered to be a real science,
because in the end everything is caused by quarks and quanta.}

That is absurd, so in practice we **are** non-**reductionist**.

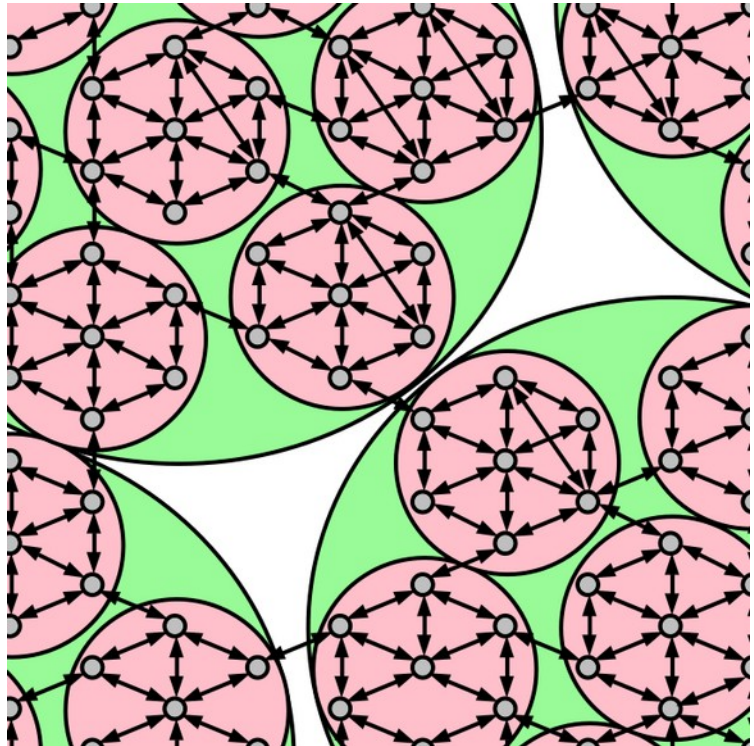
This said, 'wholes' (consisting of particles) (of course) are systems!

And generally they are living systems.

Therefore everything that the constructal law predicts will happen.
The 'whole' will be a living being.

Reductive Freedom

- My claim: Smaller particles often form a **mechanism, system** or **being** in which 'particles' are subdued.
- This creates (reducible) **reductive freedom**.
- Reductive freedom creates **life** with 'behavior' and possibilities.



[5]:3'05":75 Contrary to reductionism I claim that 'smaller' particles often form a mechanism, system or being in which these particles are subdued.

At a higher level (green in the picture) again a new, living system (or being) is formed, etc.

- If you turn one gear in a clock, then all gears turn with it, and with that all the atoms, quarks (and so on) in them.

Such a system or being is **made** such...

that a certain input leads (more or less) to a certain output.

- In other words; the system has a typical behavior (or possibilities).

On the outside it is of no importance how the system or being does this, since there is no causation from 'within' the system. It is reactive only.

The exception to this are systems that have no input, such as clocks and 'ordinary' entropy {think of temperature and brownian motion};

and (maybe) systems or beings that have a 'will' or 'mind' of their own, {but such systems will be large and complex, thus not causal from 'deeply within' either.}

- **Thus** there exists **freedom** of **reductive causation**!

I call that "Reductive Freedom";

This is the freedom named in Bejan's constructal law.

{This idea is should be easy to understand.

But it is not because it overthrows many worldviews and conceptions.}

Examples of reductive freedom & life

- A **micro-controller** provides functions & instructions to **software** (this is artificial, 'dead' **hardware** + **software** that needs humans to evolve);
- A **biological cell** provides *freedom* to **DNA** (alive at, respectively, an **ontogenetic** and a **phylogenetic** timescale);
- Your **thoughts, perceptions, consciousness** and **knowledge** live in your **brain** (alive as momentary **knowing & consciousness**, and as lifetime **knowledge & memory**);

Definition: A conscious being can incorporate (or copy) other beings within its knowledge, possibly including itself (=self-consciousness).

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[6]:4'20":60

Some examples... (What is colored **red** lives in what is colored **yellow**)

- A computer is made such that software can control it.

{This is an artificial example where hardware and software cannot evolve without us, humans.

But that makes some aspects more easy to understand.}

- Likewise a biological cell is made such that DNA can control it.
- Your brain and body are (partly) made such that your thoughts can control them – that is the essence of your machinery.

{Remark the different evolutionary timescales in the last two examples}

It sometimes helps to think of a being as conscious, even if it is not.

By definition a conscious being can incorporate (or copy) other beings within itself (or within its knowledge)

(possibly including itself; and then we call it self-conscious).

Then one may see that,

while software, DNA or knowledge runs in hardware, they hardly '**know**' **anything** about this hardware.

The hardware (that they run in) is 'invisible' (or 'unconscious') to them.

But to the hardware (or 'lower level' being) the software is not (completely) invisible (or 'unconscious'). For example, we can feel the forces of the social structure that we live in.

Erwin Schrödinger

“(i) My body functions as a pure mechanism according to the Laws of Nature. (ii) Yet I know, by incontrovertible direct experience, that I am directing its motions, [...] and take full responsibility for them. The only possible inference from these two facts is, I think, that I [...] am the person, if any, who controls the ‘motion of the atoms’ according to the Laws of Nature.”

Epilogue in *What Is Life? The Physical Aspect of the Living Cell* (Cambridge: Cambridge University Press, 1944)

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[7]:5’20”:20

Erwin Schrödinger formulated this nicely in the epilogue of “What is Life,” published in 1944...

In summary:

My body functions as a mechanism according to the Laws of Nature. Yet I know that I am directing its motions.

So I am the person, who controls the 'motion of the atoms'
{— as if I am God}.

[full quote below]

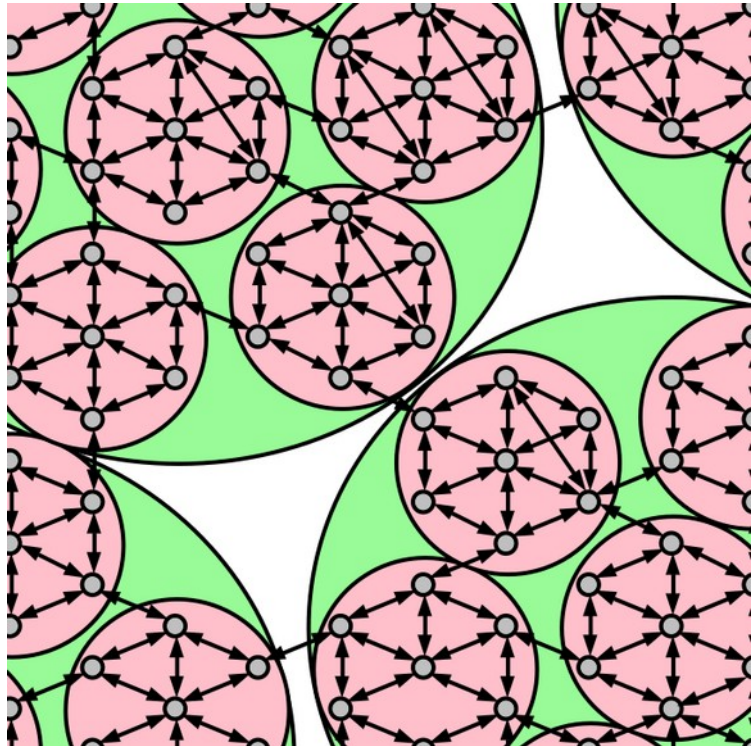
{ “(I) My body functions as a pure mechanism according to the Laws of Nature. (ii) Yet I know, by incontrovertible direct experience, that I am directing its motions, of which I foresee the effects, that may be fateful and all-important, in which case I feel and take full responsibility for them. The only possible inference from these two facts is, I think, that I – I in the widest meaning of the word, that is to say, every conscious mind that has ever said or felt 'I' – am the person, if any, who controls the 'motion of the atoms' according to the Laws of Nature.”

}

Subverse & Superverse

Reductive freedom creates a distinction between a subverse (or intraverse) and a superverse (or extraverse).

- The (intraverse or) subverse **causes** a certain **reducible freedom**, possibilities or 'behavior',
- and makes itself ~invisible.
- The (superverse or) extraverse is **made to be causative** through providing it freedom.



[8]:5'40":80

An essential and *existential* consequence of reductive freedom is that (on the one hand) it is created by the mechanism, system, being or life itself,,, and (on the other hand) it creates a **new order, system, realm, being or life**.

{In the image the first could be a pink circle created by interconnected gray circles, and the second could be a green circle}.

I call the former a subverse (or an *intraverse* or *intrabeing*) and the latter a superverse (or an *extraverse* or *extrabeing*).

- The (intra- or) subverse as a system creates and **causes** reductive freedom – thus the created freedom is itself reducible.
- Through that it makes itself (let's say) 'invisible' in the (extra- or) superverse {if this extraverse would have self-consciousness} {(thus from within the green circle the pink circles may be somewhat visible, but the gray circles are not)}.

i.e., in the (extra- or) superverse it is **not** relevant **how** or **why** the (intra- or) subverse behaves as it does. Only the result or "design" counts.

We, as conscious observers, may sometimes more or less 'see' both this subverse and superverse (such as hardware and software). But 'they' (the hardware and software 'themselves') cannot. They are different realms.

- The point is: The (extra- or) superverse is **made** causative {and alive.}

Examples of 'Invisibility'

- Software (and software engineers) use the instructions provided by a computer, but 'they' do (or need) not know how this hardware works;
- Information coded in DNA (which evolves phylogenetically) "supervenes" on biological cells, living in an ecosystem;
- Your thoughts, perceptions and consciousness *live* in your brain without having any knowledge about neural networks nor brains;
Lower level systems (=subverses) work for us (=caused top-down).

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[9]:7'00":40

To elaborate further on the examples mentioned...

- {Of course software cannot (consciously) "know" anything, but even software engineers need not know (and do not completely know) the workings of the hardware they program for.}
- The timescale of the life of DNA (called "phylogenesis") is very different from the life {and evolving} of a biological cell (called "ontogenesis").
- {About the last example on the screen...}
I claim that our brain is **made such** that our thoughts, perception and consciousness can **live** in it.
They do so without having any knowledge of brains (nor neural networks).
We are our thoughts,,, plus our brains and body, which we control extraversally through our thoughts (without knowing **how** we do this, because 'lower level' beings or systems do this for us.)
(This is 'the nature' of top-down causation).

'New' (or 'free') (")Matter(")

- If the reductive freedom of an existence would be *absolute*, then its inside/subverse/intraverse/being/system would be 'absent,' unknowable and **not causative**;
- Then we experience the existence to be a *particle* or *matter*.
- Note: This is what life/beings/systems do with 'input' and 'output'; If you know the output of a system at a certain input, then there is *no causation from within*.

(how could we not see this 100s of years ago?)

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[10]:7'30":50

- If **the** reductive freedom of an existence would be absolute, then its inside, intraverse or subverse would be 'absent,' unknowable and **not causative** regarding anything {(in its extraverse)} .
 - Then we {(ourselves being in the (extra- or) superverse)} experience the existence to be a particle or matter.
- If you tell this to fellow scientists you may need and want to put the term "matter" between quotes, in order not to offend them, but...

This is not just logic. This is existential.

The matter really comes into existence.

Examples of such matter are feelings and consciousness.

- Remark that this is what life, beings or systems generally do with 'input' and 'output'...

When they become predictable

they stop being 'causative-from-within.'

Then they let themselves be caused by their environment.

They make themselves non-causative.

{How could we not have seen this hundreds of years ago?

This is just like with the constructal law.

That should have been found hundreds of years ago too.}

Summary

- An existence is alive because
 - it flows (= its being or system), and
 - because it persists (= its design);
- 'Inside' it consists of a (flowing) (intra)being or subverse; (=existence as being)
- 'Outside' it is part of another being: its superverse; (existence as existence/design)
- This is not a part/whole structure (= reductionist thinking); (parts disappear)
- And it is not a descriptive structure (no arbitrary part/whole selection);
- Subverse and superverse result *existentially* from reductive freedom;
- Reductive freedom is predictive of (the structure of) reality.

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[11]:8'30":15/60

{To summarize,

An existence, being or flow-system is alive

because it flows and because it persists;

{'Inside' it has a (flowing) (intra)being or (intra- or) subverse.

That is its existence as a being or subject.}

{'Outside' it is part of another being, its (extra- or) superverse.

That is its existence as "design" or object.}}

Subverse and superverse result *existentially* from reductive freedom;

They do not form a part/whole structure.

{That would be erroneous and reductionist thinking;}

{It is not a descriptive structure either. What is part or whole is not selected 'arbitrary' or 'for human understanding' only;}

{Just imagine a system to be a whole of parts; it is more than that.

Add structure; {then} it is still not a being.

Only when the parts 'disappear' {(as seen from within the superverse)}
does it become a (new) being.

{Your body and brain are not **visible** 'parts' of your consciousness,
neither are various 'levels of unconsciousness'

living on **top** of each other in your brain.}}

Reductive freedom is predictive of (the structure of) reality.

Find the freedom and you will find a being emerging.

Freedom Law

When and only when reductive freedom arises,
life may cause new natural systems or beings
to come into existence, i.e. to emerge.

- The freedom law predicts the **birth** of a new being.
- The law of life (=the constructal law) predicts **how** and **if** this being will stay alive or die.

Find the freedom and you will find a being emerging.

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[12]:9'10":40/65

This is, what I call, the **freedom law**:

“When and only when reductive freedom arises,
life may cause new natural systems or beings
to come into existence, that is to emerge.”

- The freedom law predicts the birth of a new being.
- The law of life (or the constructal law)
predicts how and if this being will stay alive or die.

{Remark that the constructal law in fact says:

- “If a system persists, then it must,” etc.
- Or: “While a system lives, it must,” etc.}

{Thus, while the freedom law may predict the birth of a new being,
the constructal law may predict that this being dies.

{An (extra- or) superbeing, superverse, or environment **is**
part of a being (or flow-system) **too!**}

{25 {In general, when there are no feed-back loops
within a newly created (extra)being, then it will die.}

At the moment, for instance, we are killing our environment
through pollution and overuse of energy-resources.

?Since we are conscious units making up this system, can we counter
this? ?Or shall the system explode and end our lives too?

Catastrophes are very natural, unfortunately:-/ }}

Persistence, Life and Death

Life is the persisting and freely evolving being (or flow-system) of an existence (or design)

- Reductive freedom is **persistent**; persistent structures are stable.

Death may fixate existences or beings even more

- New atoms come into existence in stars;
they are rather 'dead' or 'bricked' at lower temperatures;
but with chemical freedom.
- DNA is quite fixed, ontogenetically;
- Memory in neural networks and brains is quite fixated in synapses;
- The design of a river is quite fixated in the sand that it flows in.

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[13]:10'25":50 ?How can living systems dominate reality?

?Why is life and reductive freedom abundant?

!Because it is stable!

{Wherever life arises it will tend to stay because that is the definition of life.

This is both logical and existential. {Such an "existential logic"
will be a feature of all laws applying to large quantities of things.}}

- This said, dead things may be even more stable...

Biologically dead things dissolve

{except for its DNA, which may have been past on to its offspring},
but physically dead things do not necessarily dissolve.

For instance:

...New atoms come into existence in stars.

They are rather 'dead' or 'bricked' at lower temperatures,

but with chemical freedom;

If we see death as 'fixation' then other examples come to mind:

...DNA is quite 'fixed' ontogenetically

(DNA evolves phylogenetically in a pool of living beings);

...Memory in neural networks and brains is fixated in synapses;

...The design of a river is partly fixated in the sand that it flows in.

Non-linearity & feed-back

- Less absolute freedom \Rightarrow a somewhat independent being;
- Non-linearities exist everywhere \Rightarrow life (and death) is abundant;
- Freedom / non-linearity is usually limited through *feedback loops*;
- Without feedback, beings die (except for artificial mechanisms).
- Dissolving after death is essential for the evolution of complex lifeforms (i.e. no old and inferior dead things laying around).

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[14]:11'15":60

Not all life-forms can be distinguished equally clear.

- I think that less absolute reductive freedom creates a somewhat independent being too. In practice any non-linearity will lead to the creation of a 'semi'-being.
- This is so because **Non--linearity** means that, without proper feedback, something tends to implode or explode.
- This must lead to death.
- Therefore we find feed-back loops everywhere in living beings....: biology, electronics, weather-systems, and (even) black holes.
- Without feed-back,,, beings die.
- In the biological realm dead beings dissolve and disappear.
Thus only the living beings remain in the biological realm.

In the physical realm dead things may get bricked or fixated.

Then it is these dead things that remain.

;-) In the mind of stubborn man one also finds lots of 'dead remains'.

Dissolving (and being removed from reality) after death
is essential for the evolution of complex life-forms

{– and, I would like to add, for improving (scientific) theories.

– and for your own mental and social health,
for which feeling ashamed is the psychic mechanism.}

Reductionism & Freedom

Since the Constructal Law *assumes* the existence of freedom;

⇒ it presupposes *emergence*;

⇒ it dismisses reductionism.

Reductive Freedom = Being free from reductive/intra-/subversal causality;

⇒ 'local,' extra-, or *superversal* causality ;

⇒ *emergence* (e.g. of consciousness, matter, our universe, ...).

(Intra- or) Subverses may break through (e.g. feelings influencing consciousness).

No constructal law nor life without reductive freedom.

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[15]:12'15":20

No constructal law (nor life) without reductive freedom.

{The constructal law presupposes reductive freedom.

Reductive freedom (and emergence) mean

that (local or) top-down causality exists

– since it is created by this freedom.

{Such a conclusion is anti-reductionist.}

But an (intra- or) subverse (that is; lower level life)

may break through in higher levels;

for instance feelings influencing our consciousness.

}

More examples...

- Your thoughts, perception and consciousness *live* in your brain;
- Language *lives* in communities;
- Truths *live* in spoken language;
- Our relativistic universe emerges from freedom 'designed' in the quantum mechanical realm;
- Reality – and consciousness – is a *tree of life* and death.

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[16]:12'35":20

Some more examples...

- Language lives in human communities;
- Truths live in spoken and written language;
- And (of a completely different order...):
I think that our relativistic universe
emerges from freedom
“*designed*” in the quantum mechanical realm;
- Reality
– and also consciousness –
is a **tree of life** (and death).

Squeeze Pouch (Quantum) Gravity



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[17]:12'55":90 {If there is time left then} I'll try to explain my
"squeeze pouch theory" on quantum gravity and general relativity...
Take the quantum realm to be a lattice or a "ball-pit".

I like to see it as a ball-pit, because I see 'quantum mass'
as a rotating oscillation. Something 'in it' rotates at the speed of light.
When the radius of this rotation becomes smaller,
then its frequency becomes higher.

(Further more, the movement of a mass is the movement of a wave.)

Mass in the quantum realm is not heaviness, but size and frequency.
What is more heavy in our world is smaller in size in the quantum realm.
Therefore the quantum realm will shrink wherever there is mass.

(we **don't** notice this because our measurement sticks shrink also.)
This shrinking works like a squeeze pouch, pushing 'bigger' (thus 'lighter')
things away and pulling 'smaller' (thus 'heavier') things in.

Thus quantum gravity works by squeezing!
Further more, the bending and shrinking of the quantum realm leads to
relativistic effects in **our** world.

Thus the relativistic universe lives (and emerges) in the quantum realm.
Further more, since there is a smallest (Planck) size,
there will be a maximum mass.

This leads to the forming of black holes, with holographic features.

And it leads to big bangs – which make for a living universe.

This theory may be wrong, but it shows a way to integrate QM and GR.

History through Etymology...

- **Life:** laufen, love, elevate; **zoi:** Chi (Hebrew), zoo, qi (Chinese life energy), **to go** (from 'to chew'; both refer to *motion*); **bio**.
- **To be:** nebo (Russian sky), oben (German **above**), nebula (Latin cloud or fog), Bein (German *leg*), B hieroglyph is a leg.
- **Death:** deaf (without breath no Word).
- **Adam:** *atmen* (German **breathing**); Spirit: breath, bird, bread, **birth**; Spirit = creative breath = (*animating*) words = using your *legs*.
- **Anime:** animal, *name*, animate.

<https://linguistics.stackexchange.com/questions/30002/why-are-there-words-meaning-both-breath-and-life-spirit-in-so-many-languages>

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[18]:14'25":20

{I mentioned that language lives in us – it even speaks us.

I think that in language one can find implicit theories about the world.

This means that one can study language (and its history)

to track our understanding of the world.

I copied some etymological possibilities from the internet to show how interesting this might be.

Our language contains a lot of knowledge

– if not always correct, still mostly interesting.

I hope **to add** the terms “reductive freedom”, “subverse” and “superverse” to it.

}

To Emerge or Not To Emerge
Reductive Freedom creates
Life, Being and Death

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Abstract

This article explains *strong emergence* in reductionist terms. Two laws are introduced which predict the structure of reality from general relativity to consciousness. The freedom law predicts (in a reducible way) how and when new beings, existences, life, and even new “matter,” will emerge and where reducibility ends. The law of life, or Bejan’s “constructal law,” predicts how this life will evolve or die. If this be-

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[19]:14’45”:15

Thank you for listening.

I think my **theory** shakes up too many things
to be understood and accepted instantly.

But **you**,
who already know and accept the constructal law,
are among the few people on this planet
who can understand it.

With that you’ll understand
the structure of reality
as it necessarily (and predictively) is.