An hypothesis for

How Influx into the Natural Shows Itself in Physics

Breaking the shell.
No more ‘closure of the physical’

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Parts of this talk

1. Overview
2. WHAT influx changes in physics
3. HOW influx changes could be used in physics
4. Numerical Demonstrations

1. Overview

Remember:

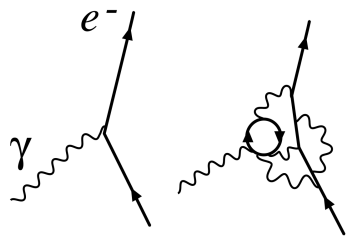
Physics we do not understand

3.1 degree of gravity ??

- Big debate for last 90 years on how to link the gravity of Einstein's "General Relativity" with quantum physics.
- Can we formulate 'quantum gravity'? No luck so far.

3.1 degree for 'fine tuning' parameters in QFT ??

- QFT does not deliver 'out of the box'.
- "Renormalized parameters" have to be fine-tuned to observed values, to fix:
  - Higg's mass (a hard problem)
  - Quark masses, electron mass, unit charge (a bit easier)



3.1 linking the spiritual with the natural ??

- No-one trying that yet ! Should we try? Yes.

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Now I am going to link these two

Linking Fine-tuning with Influx

- I propose that this 3.1 degree is where 'ends' are received into physics
  - Ends to determine the 'means'
  - Ends to manage (influence) the physical fields.
- This is 'fine-tuning',
  - not once for the whole universe (setting masses in Big Bang),
  - but differently at each time in each place.

"Local", not "global" physics variations!

- We suggest that this is specific to living organisms. That it occurs at all scales of psychology and biology: every day and every second of our lives.

What is the mechanism of this? How would we detect it happening? Test the idea?

Effect of Influx into the Physical

Our idea:

- the fine-tuned parameters (masses, charges) can be varied locally in order to achieve ends in nature.

We will focus on charge *e*.

- This is in 'fine structure constant' $\alpha = e^2/\hbar c = 1/137$
- Many physicists have proposed varying α over the age of the universe. So variations are conceivable.
- Now we propose to vary it over micro-seconds, and within living organisms, for uses. A new idea.

Digression on Time: metric & process times

- Swedenborg is emphatic there are 2 kinds of time:
  - Natural time (clock time)

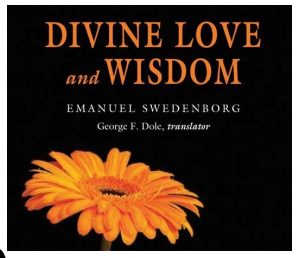
    DLW 73: “Space in nature is measurable, and so is time. This is measured by days, weeks, months, years, and centuries.”

  - Spiritual time of changes of state (successive actions of love)

    DLW 73: “But in the spiritual world it is different. The progressions of life in that world appear in like manner to be in time. . . but in place of these there are states of life, by which a distinction is made which cannot be called, however, a distinction into periods, but into states”

- There are corresponding 2 kinds of time useful in quantum physics:
  - Metric time as part of 4-dimensional space-time
  - Process time for propensity actualizations in 4D spacetime (measurements).
- We are going to use both kinds of time.

Specific New Church ideas for How love operates with wisdom



a) Input of Ends from above that defines a goal.
b) Foresight of the present up to that time
c) A measure of goal mismatch (discrimination)
d) A way to work on mismatch, thinking back to present
e) A way to work out how to change causes (now & soon) to reduce the mismatch (making a plan).

I will show a way how to do steps (b, c, d, e) in physics. With just dumb particles and fields: no consciousness involved in physics itself (the natural).

Do this with physics degrees 3.3, 3.2 known, and 3.1 proposed

Example:
Picking up a cup

a) Desire to pick up a cup
b) Imagine ahead to see where hand is going to be
c) Compare final hand position with cup position
d) If see a possible mismatch.
   Work backwards to present, see where hand is:
e) Work out how arm muscles have to move to reduce mismatch, so hand can grasp cup.

These are the same steps (a-f).

2. WHAT influx changes in physics

Remember:

Effect of Influx into the Physical

Our idea:

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We will focus on charge *e*.

- This is in 'fine structure constant' $\alpha = e^2/\hbar c = 1/137$
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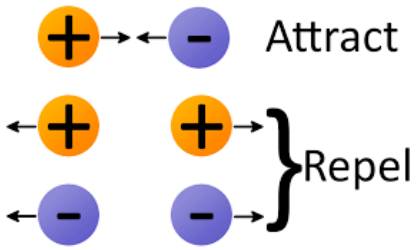


Electric Forces (inverse square law)

The electric force on charge q_1 at position r_1 and q_2 at r_2 is:

$$F_{12} = \frac{1}{4\pi\varepsilon}\frac{q_1 q_2}{|r_1 - r_2|^2}$$

So varying q_1 will vary force F_{12}.

Very similar effect by varying ε_1 or ε_2 : 'permittivity', while keeping charges constant. So:

$$F_{12} = \frac{1}{8\pi}\left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2}\right)\frac{q_1 q_2}{|r_1 - r_2|^2}$$

Helpful to vary just ε, as charge conservation built into the Maxwell equations.

But they do allow ε to to vary, as in dielectrics (capacitors).

But here, not just in dielectrics, but variations even in vacuum!

The four Maxwell Equations in a dielectric

standard physics

E = electric field ε = electric permittivity

H = magnetic field μ = magnetic permeability

ρ = charge density J = charge current.

1: $\nabla \cdot (\varepsilon E) = \rho$ electric field sourced by static charge

2: $\nabla \cdot (\mu H) = 0$ no static sources for magnetic field

3: $\nabla \times H = J + \frac{\partial(\varepsilon E)}{\partial t}$ magnetic field produced by varying charges (e.g. radio antenna)

4: $\nabla \times E = -\frac{\partial(\mu H)}{\partial t}$ electric field produced by varying magnetism (e.g. electric generator)

$F = q\,(E + v \times (\mu H))$ Force on charge q at velocity v, from E and H (e.g. in electric motor)

Speed of light $c = 1/\sqrt{\varepsilon\mu}$.

Keep c constant by $\varepsilon\mu$=constant no matter how ε varies

Conservation of Energy?

- For minds to have effects, physics must be extended . . .
- Many physics extensions have been proposed which keep
  - Energy conservation, and
  - Causal closure of the physical.
- For example:
  - Biased probabilities in quantum mechanics
  - Varying time of probabilistic events (Stapp)
  - Moving energy from one location to a nearby place (does not conserve energy locally)
  - Non-local entanglement (but cannot be used for signals)
- Remember: changes in quantum chances are very small!

Conservation of Energy?

- Permittivity is now $\varepsilon(r,t)$: varies in time & space
- That fact (alone) means total energy and momentum are <u>not</u> conserved!! (Noether's thoerem)
- Is that the end of the world? No
- Is that the end of physics? No
- Can still do physics calculations using

$$F_{ij} = \frac{1}{8\pi}\left(\frac{1}{\varepsilon(r_i,t)} + \frac{1}{\varepsilon(r_j,t)}\right)\frac{q_i q_j}{|r_i - r_j|^2}$$

Next I will discuss <u>how</u> the $\varepsilon(r,t)$ might be varied.

3. HOW influx changes could be used in biology

Want correspondences in physics for:
How love operates with wisdom

Remember the cup?

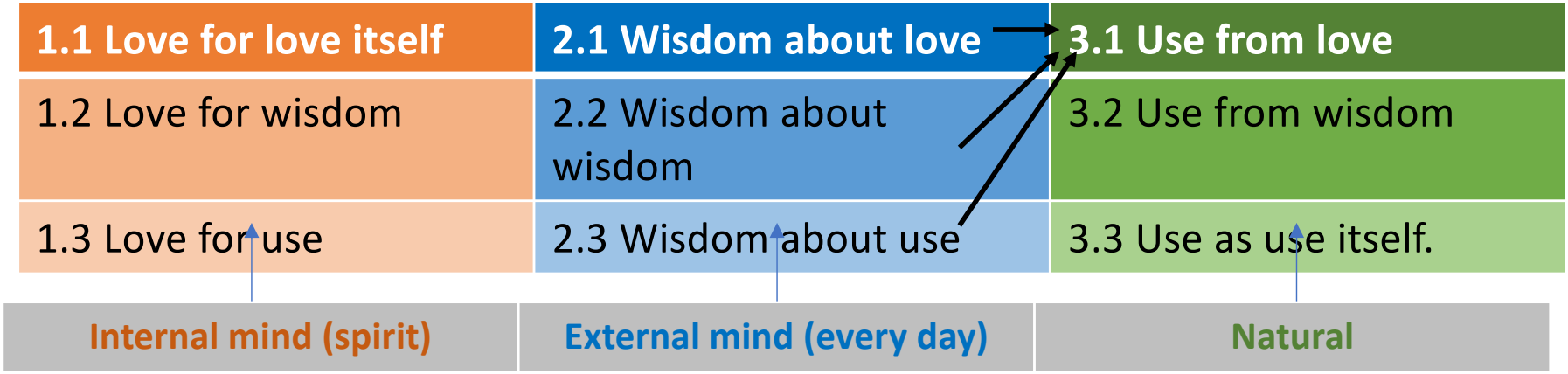
a) Input of Ends from above that defines a goal.
b) Foresight of the present up to that time
c) A measure of goal mismatch (discrimination)
d) A way to work on mismatch, thinking back to present
e) A way to find causes (now & soon) to reduce the mismatch (making a plan).

I will show a way how to do steps (b, c, d, e) in physics. With just dumb particles and fields: no consciousness involved in physics itself (the natural).

Do this with physics degrees 3.3, 3.2 known, and 3.1 proposed

(a) Input of Ends from above (by influx) to define a goal.

- This is what comes from the 1.x spiritual degree and the 2.x external mental degree, into 3.1 degree



By a 'goal' or 'target' or 'end' in the natural, I mean for example:
"How the molecules in the cell should be rearranged to achieve a use as an end."

The target could be a specific arrangements of molecules at some time T_g
e.g. a folded protein to be catalyst or enzyme. Part (a) of the plan.

(b) Foresight from the present T_p up to target time T_g

- We are talking of the ‘near future’ in metric time, where ‘process-time’ changes not yet occurred.
- In order to work towards a target, a cell must ’know’ whether it is ‘on track’, or not:
  - Must be able to extrapolate from present to target time.
  - But do so without any consciousness. This in the natural.
- Propose: we use the 3.2 electromagnetic fields extrapolated to the needed future time.
  - These fields are deterministic, with little quantum chance.
- So the 3.2 degree contributes to part (b) of plan.

Electromagnetic fields

- These fields follow a strict wave equation (e.g. Maxwell's equation for electromagnetic waves).
- The input to Maxwell's equation is:
  - Initial conditions, Charge *q* and locations of objects.
  - Any rescaling of vacuum permittivity $\varepsilon(r_i, t) = e^{2\psi(r_i,t)}\,\varepsilon_0$
  - Permeability $\mu = 1/c^2\varepsilon$.
  - Then solve:

$$\nabla \cdot (\varepsilon E) = \rho \qquad \nabla \cdot (\mu H) = 0$$

$$\nabla \times H = J + \frac{\partial(\varepsilon E)}{\partial t} \qquad \nabla \times E = -\frac{\partial(\mu H)}{\partial t}$$

- We can calculate e.g. how protein molecules move.
- Electrostatics is simpler: just first equation $\nabla \cdot (\varepsilon E) = \rho$

(c) A measure of goal mismatch (discrimination)

3.	Principles	Propagating causes	Effects
3.1	3.1.1 Reception of targets	3.1.2 Causes to arrange targets	3.1.3 Arranged specific targets
3.2	3.2.1 **Lagrangian:** Principles for quantum fields	3.2.2 Propagation of quantum fields for all future options	3.2.3 Results of quantum fields
3.3	3.3.1 **Hamiltonian:** kinetic + potential energies	3.3.2 Quantum wave function	3.3.3 Actual selections e.g. Measurements

- This is the task of 3.1.3.
- Having arranged a target, it provides feedback to how close the present future is to achieving the target.
- For example: a function G which gives difference to target.

  G = (extrapolation(T_g) — target)^2. So goal is 'minimize G'

(d) A way to work on mismatch, thinking back to present

- Use Adjoint Solutions:
  Time-reversed solution of Maxwell equations (for e/m waves) and of Newton equations (for particles) from T_g back to present T_p.
- Start with current target measure G.
- The overlap of the forward & adjoint solutions gives derivatives $\partial G / \partial \psi$
  - how the goal G varies with permittivity rescaling ψ .

This is a 'backpropagation method' common in computer modeling
https://en.wikipedia.org/wiki/Backpropagation .

Adjoint solutions are often used in design problems in engineering, to find the sensitivities to all input parameters of an overall performance measure.

See e.g. https://en.wikipedia.org/wiki/Adjoint_state_method

(e) A way to find changes to causes to reduce the mismatch G.

- The task is to minimize measure G by varying permittivity scaling functions $\psi(r,t)$.
  All the partial derivatives $\partial G/\partial\psi(r,t)$ are known.
- Simplest method is the Gradient Descent method:
  A. For some speed α, change all the $\psi(r,t)$ by a step $\Delta\psi(r,t) = -\alpha\,\partial G/\partial\psi(r,t)$.
  B. After each change of ψ, have to recalculate forward and adjoint solutions.
- Repeat above steps (A,B) until G is small enough.
  That is attaining to the target!

4. Numerical Demonstrations

Calculating Effects of Formal Causes
(Influx from 3.1 degree into 3.2 degree)

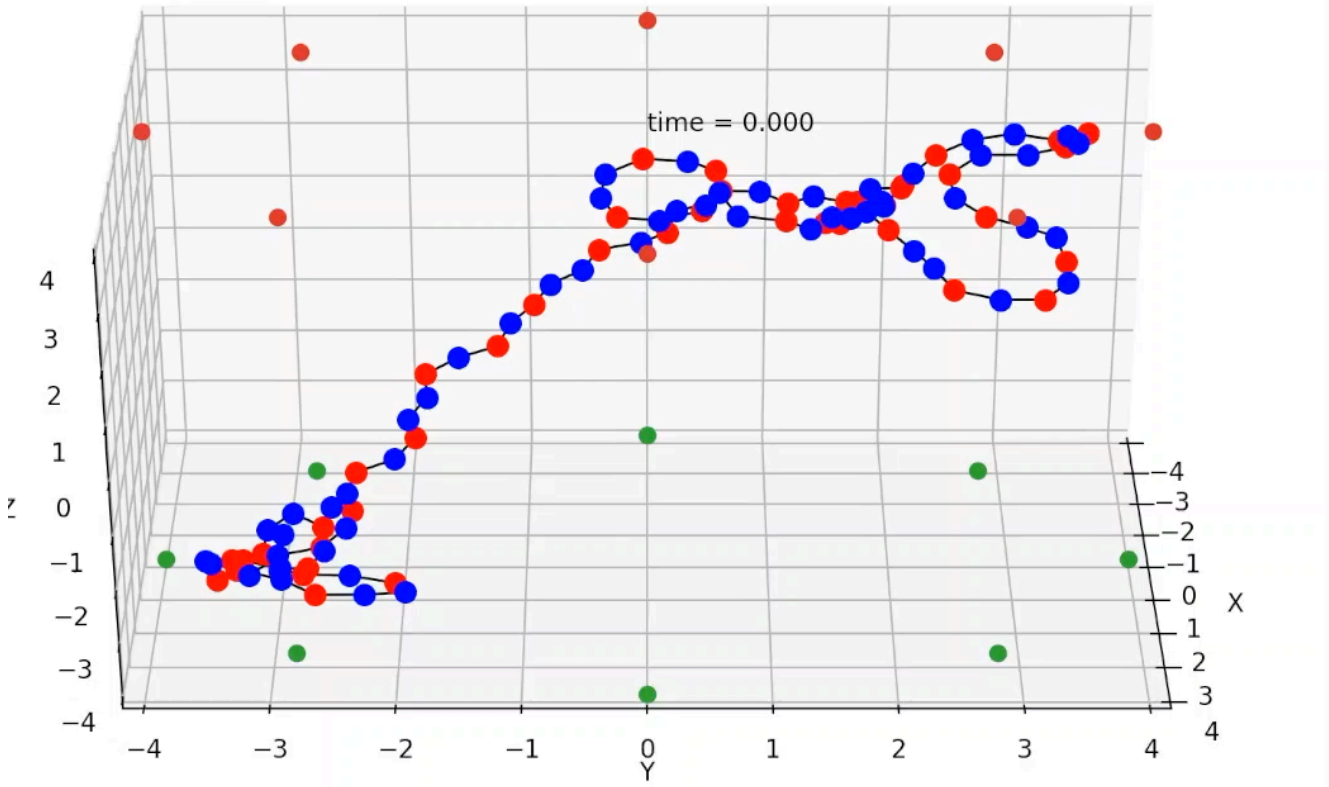
Backpropagation
to reach Targets by Varying Charges

Numerical Examples of schematic Protein Folding
using Molecular Dynamics models

Demonstration using 100 particles inside a cage of 2 rings, 16 charges

A molecule put in a smaller cage.

Units
Time:
ps = 10^{-12} s
Space:
nm = 10^{-9} m



Calculate trajectory vectors $\vec{x}_i(t)$, $\vec{v}_i(t)$ for each particle i.

Blue: +0.2e charge. Red: -0.2e charge (e=unit charge).
Cage charges are -3e, like GroEL chaperone molecule

Bond lengths and angles specified.
Repulsive cage wall. No water

Targets and Adjustments

- **Target** = Φ_i: the desired position for each particle i, at some later time T_g.
- **Goal** function = G which gives difference to target.

$$G = \sum_i (\vec{x}_i(T_g) - \Phi_i)^2.$$

So goal is minimize G. Preferably to $G=0$.

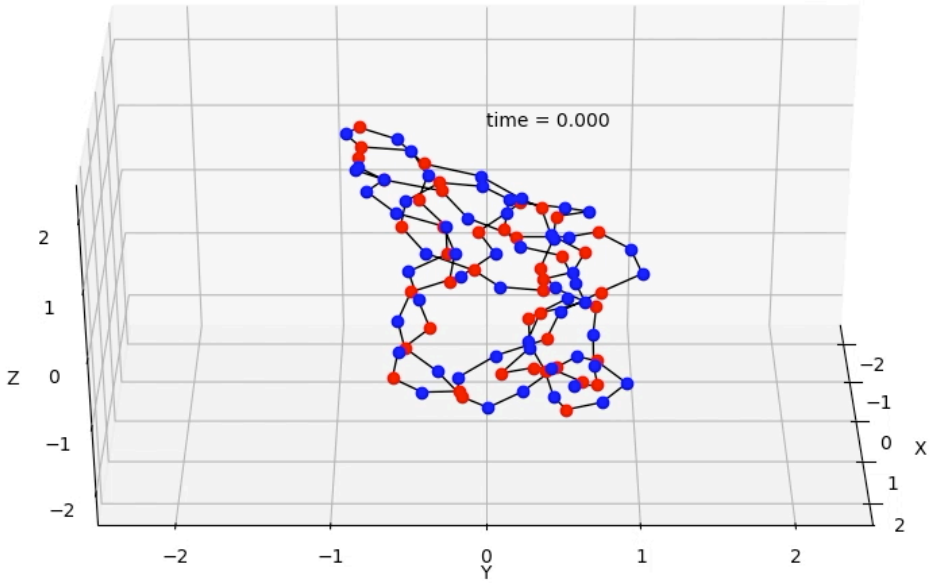
- **Adjust** permittivities = 'dielectric constants' (effectiveness of charges) by functions $\psi(r_i, t)$,

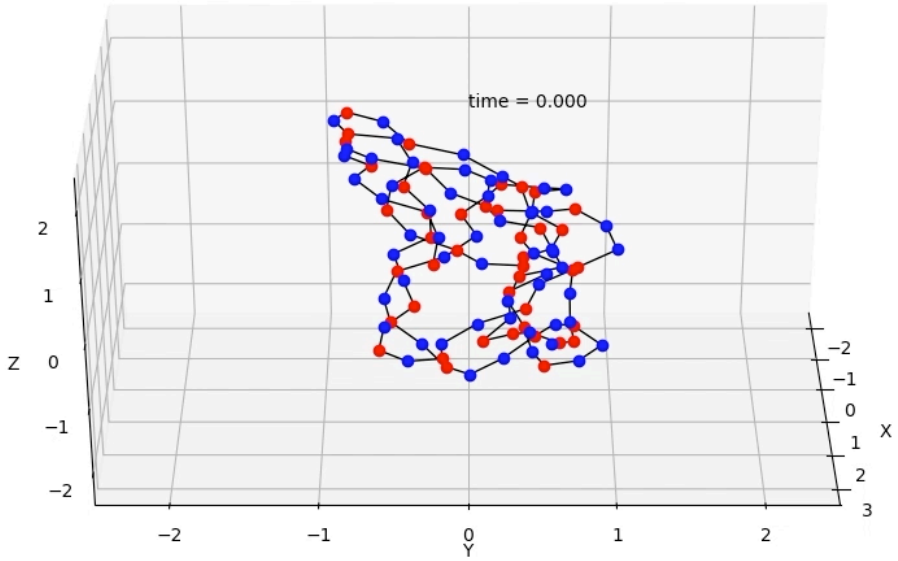
so $\varepsilon(r_i, t) = e^{2\psi(r_i,t)}\, \varepsilon_0$ (for each particle i)

  - So $\psi(r_i, t)$ = 0 is no change: $\varepsilon(r_i, t) = \varepsilon_0$

Done with 3700 lines of Python, with Cython to compile C kernels.

Demonstration 1:
Shifting centroid to the left by 1 nm





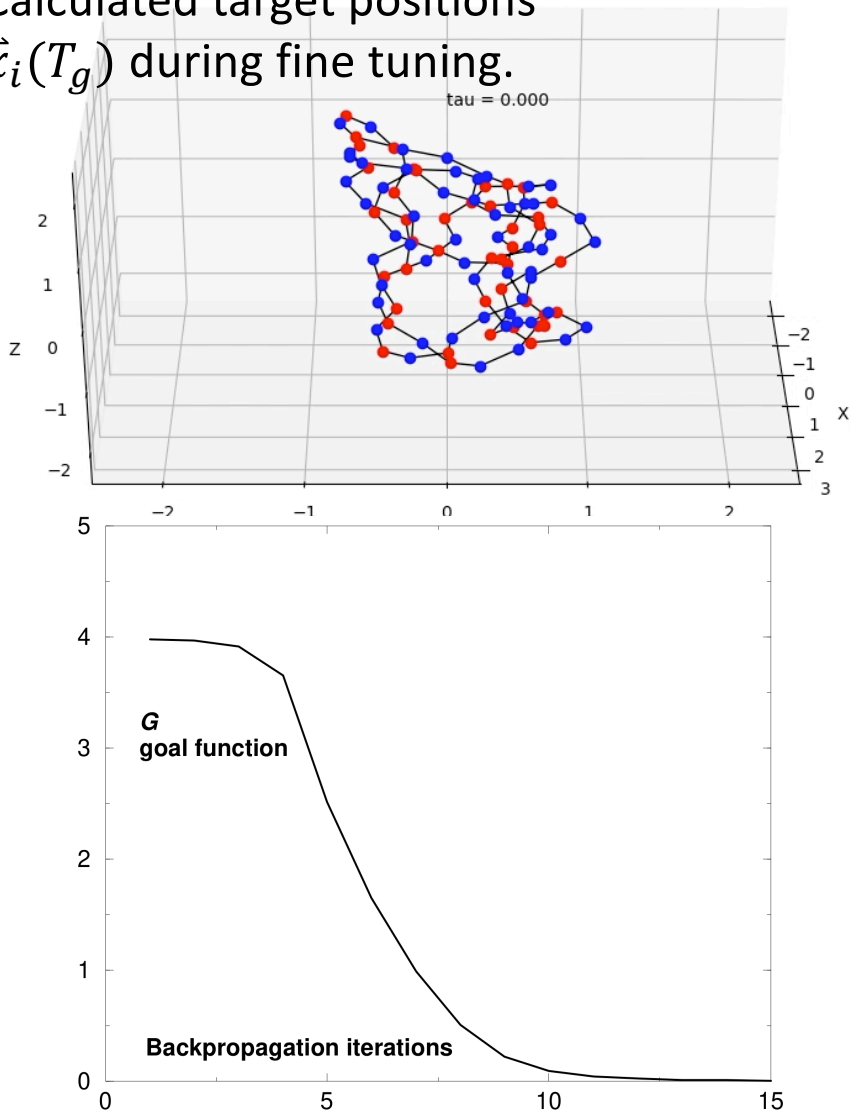
Normal time changes

Time changes with varied

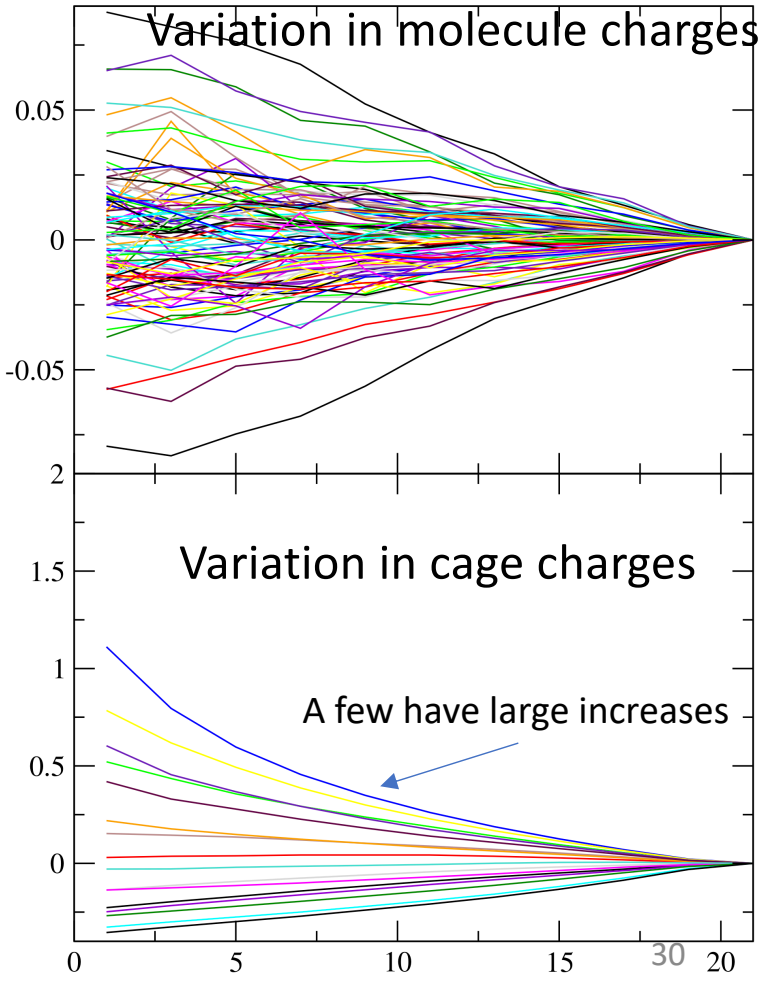
$$\varepsilon(r_i, t) = e^{2\psi(r_i,t)}\,\varepsilon_0$$

Demonstration 1: Shifting left. How?

Calculated target positions $\vec{x}_i(T_g)$ during fine tuning.



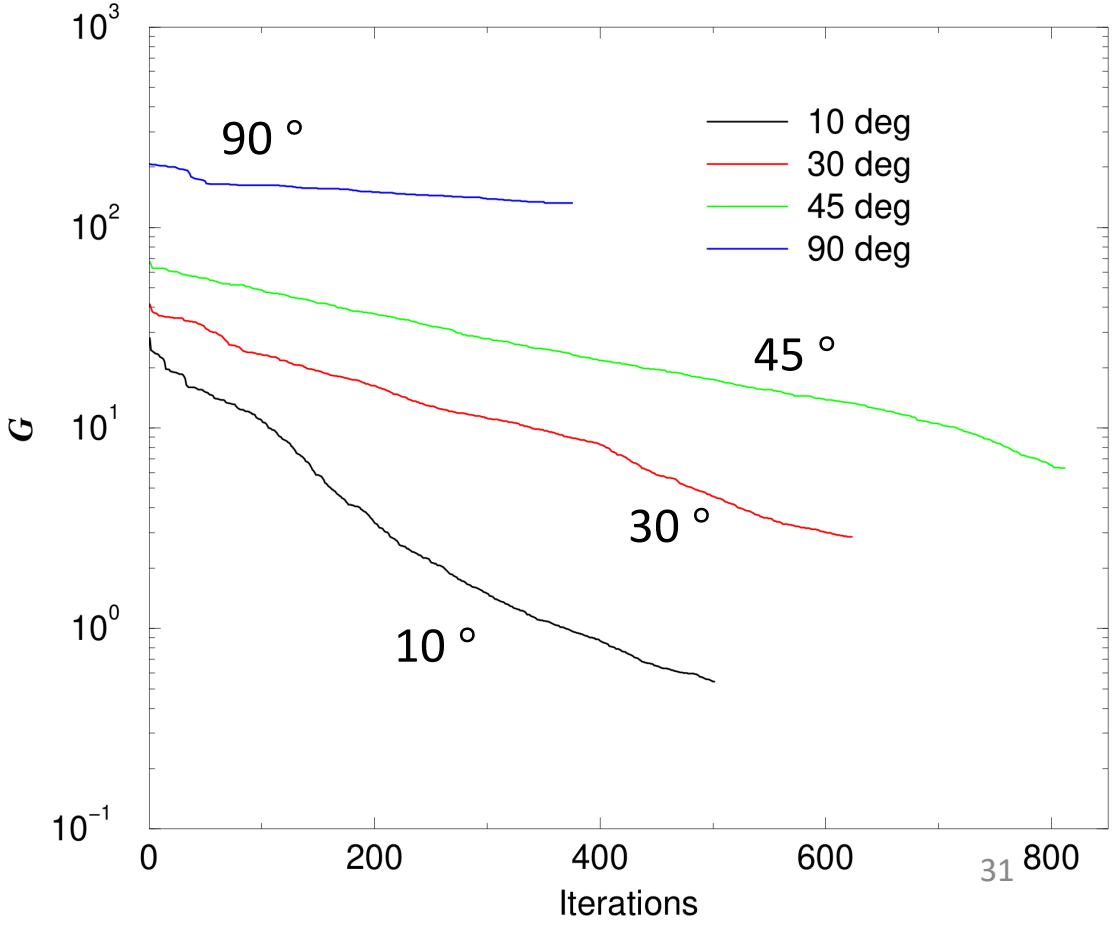
Variations $\psi(r_i, t)$ when converged to $G=0$



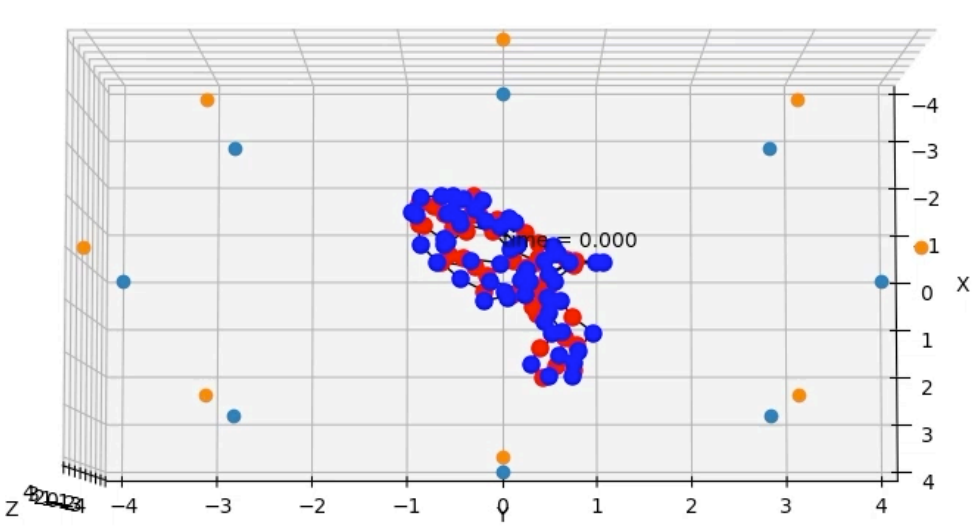
Demonstration 2:
Rotating whole structure by angle $\boldsymbol{\theta}$.

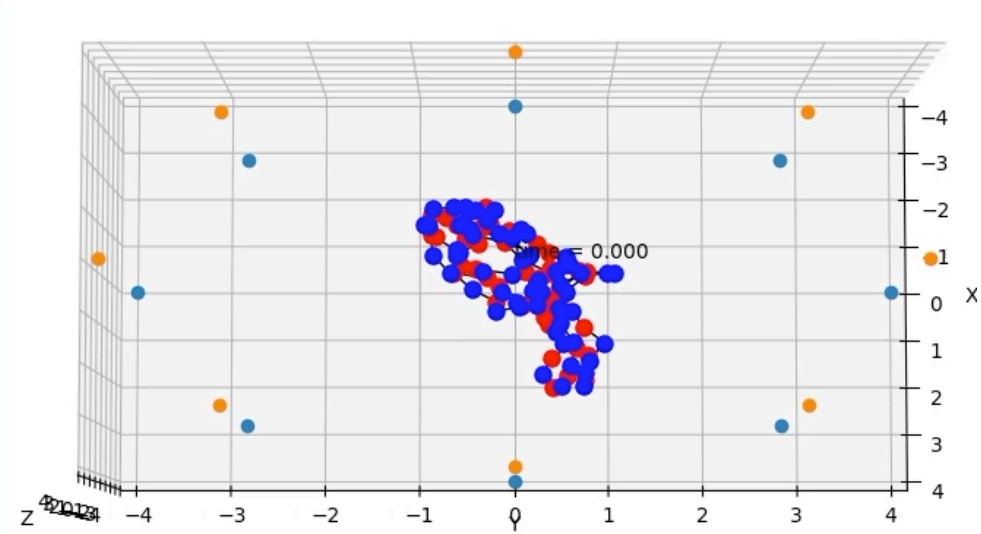
- Try angles $\boldsymbol{\theta} =$ 10° , 30°, 45°, 90°
- Method seems to fail for 90°
- Slow for 45°.
- (Has to fail for 180 °, as then stuck between left and right !!)

- Convergence is slower for large angles:



Demonstration 2: Rotating θ = 30°





Normal time changes

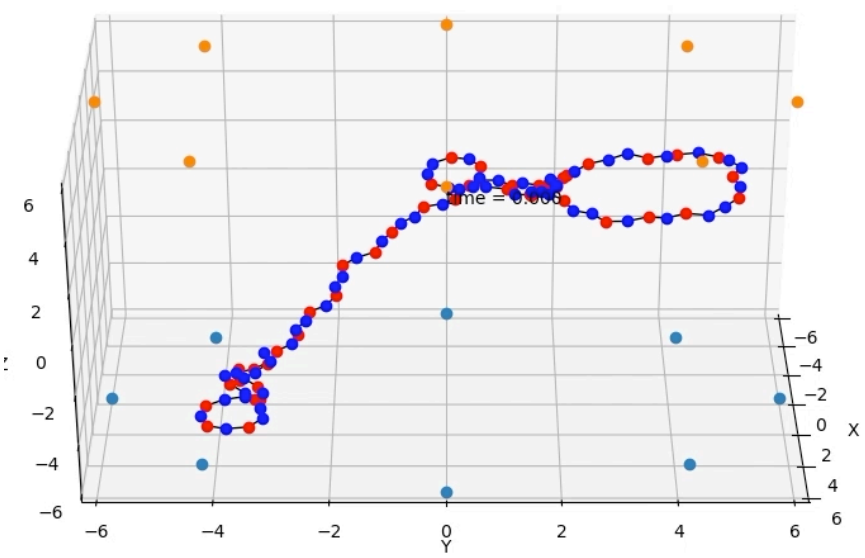
Time changes with varied

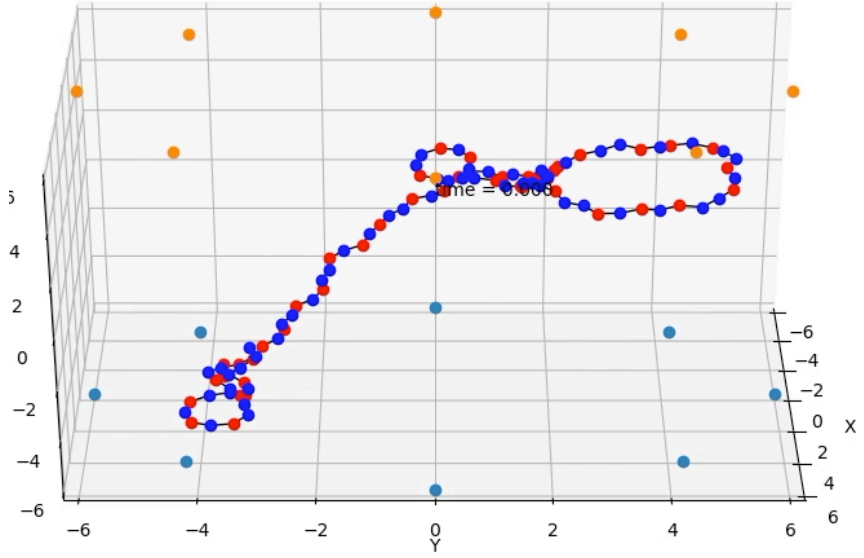
$$\varepsilon(r_i, t) = e^{2\psi(r_i,t)}\,\varepsilon_0$$

Note some changes to internal structures at end.

Demonstration 3
Reshaping part of a molecule

Target: shape with a dent in the upper loop





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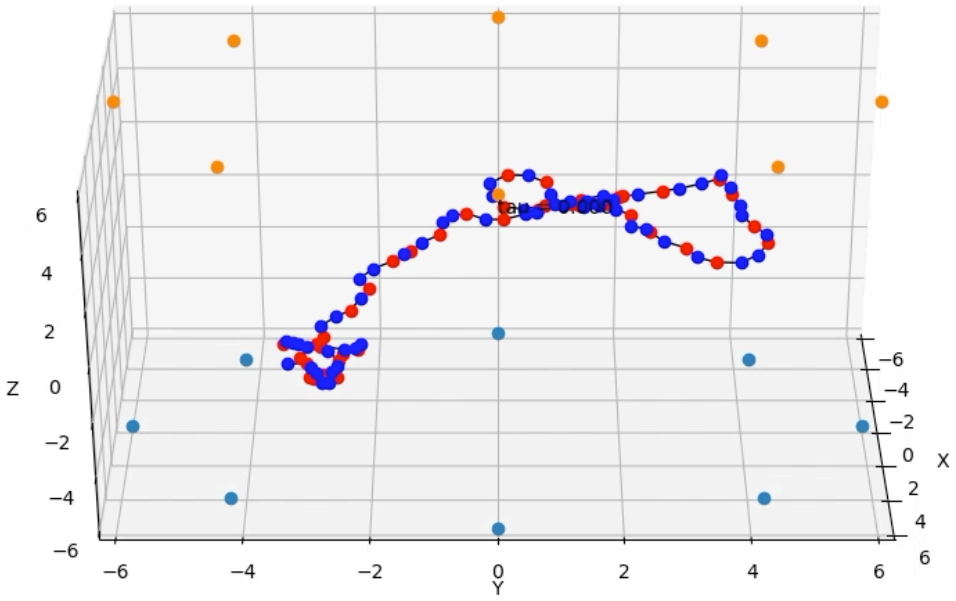
Demonstration 3: Reshaping. How?



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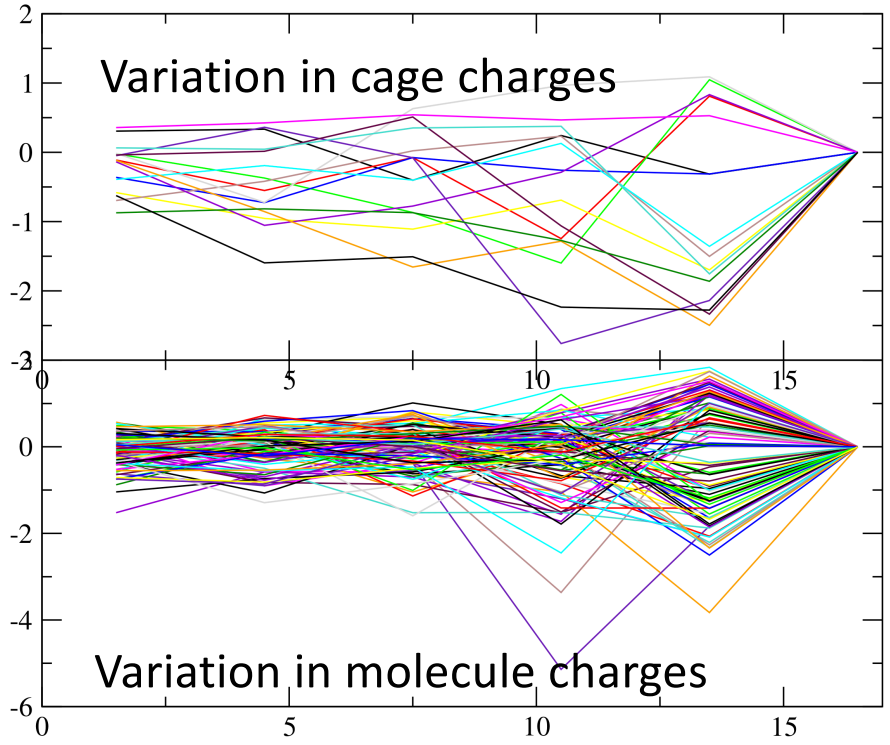

Variations $\psi(r_i, t)$ when converged to $G=0$

My ‘Observations’

- It can be done!
- Simple targets are easy to reach
  - Especially if zero or small energy change.
- More complicated reshaping can be done.
  - But often fails by getting stuck part way through.
  - G function has ‘local minima’ just like energy does
- Convergence $(G \to 0)$ is difficult at higher temperatures:
  - Thermal fluctuations produce many local minima with narrow barriers between them.

Improved calculations next:

- Try sequences of targets following each other
  - This method is not itself ‘intelligent’ at all.
- Put in water molecules as thermal bath
  - Try for convergence at higher energies.
- Improve convergence of fast fluctuations in $\psi(r_i, t)$
  - Maybe fast enough to match thermal vibrations?
- Do ‘all atom’ calculations, not just ‘amino-acids’.
- Realistic hydrogen bonds, dihedral angles, etc.

Summary of overall answers:

- We can propose two hypotheses to answer our questions:

1. WHAT influx changes in physics?
   Answer: The relative permittivity of the vacuum

2. HOW influx changes could be used in physics?
   Answer: For target configurations given by influx into the natural, there is a physical feedback mechanism to bring physical objects closer to this target in the near future.

What have we done? (or, tried to do!)

- Made a proposal for how ‘spiritual influx’ could have effects in nature.
- These effects on permittivity should be measurable

- This way, ‘final causes’ could be active in nature.
- We have a way to bring the future into line, without time travel, and without altering the historical past.
- No longer is the physical universe ‘causally closed’.
- A much greater range of scientific explanations should be possible.

THE END

Thanks to the Theistic Science group!

- Many discussions over the last two years.

❖ Ron Horvath, Stephen Smith, Andy Heilman, Reuben Bell, Forest Dristy, Gard Perry, and others.