

Historical materialism & Science Or The finiteness of our scientific models/theories

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- Welcome, and many thanks to Alex Blum and Sascha Freyberg for the invitation to speak here.
- I'm not a theoretical physicist, nor a mathematician, nor a philosopher.
- If the following is Marxism, maybe Karl Marx would again say: *Then I'm not a Marxist.*

It is a well known American instruction to speakers to start with a joke.

First I've to apologize for my International English.

So, we start with two Jews meeting each other in NY in 1945

J1: Hello, Vat are you doing here

J2: Vell I'm polishing up my English

J1: AHa, I zink you can better English up your Polish



Sabine Hossenfelder

What is my quest

Within Historical Materialism we argue that all human factual knowledge and understanding is the consequence of an historical process, grounded in biological evolution and human societal productive capabilities

Hence, all knowledge and human models and theories are contingent/contextual.

In the ever increase of our knowledge we are confronted with an ever growing ignorance.

For that reason all closed thinking including formal logic are approximations only.

The uni... whole
Hence, th... be a structure.

A Draft Outline

What can we find out
about this structure?

In this talk I will use various approach
routes

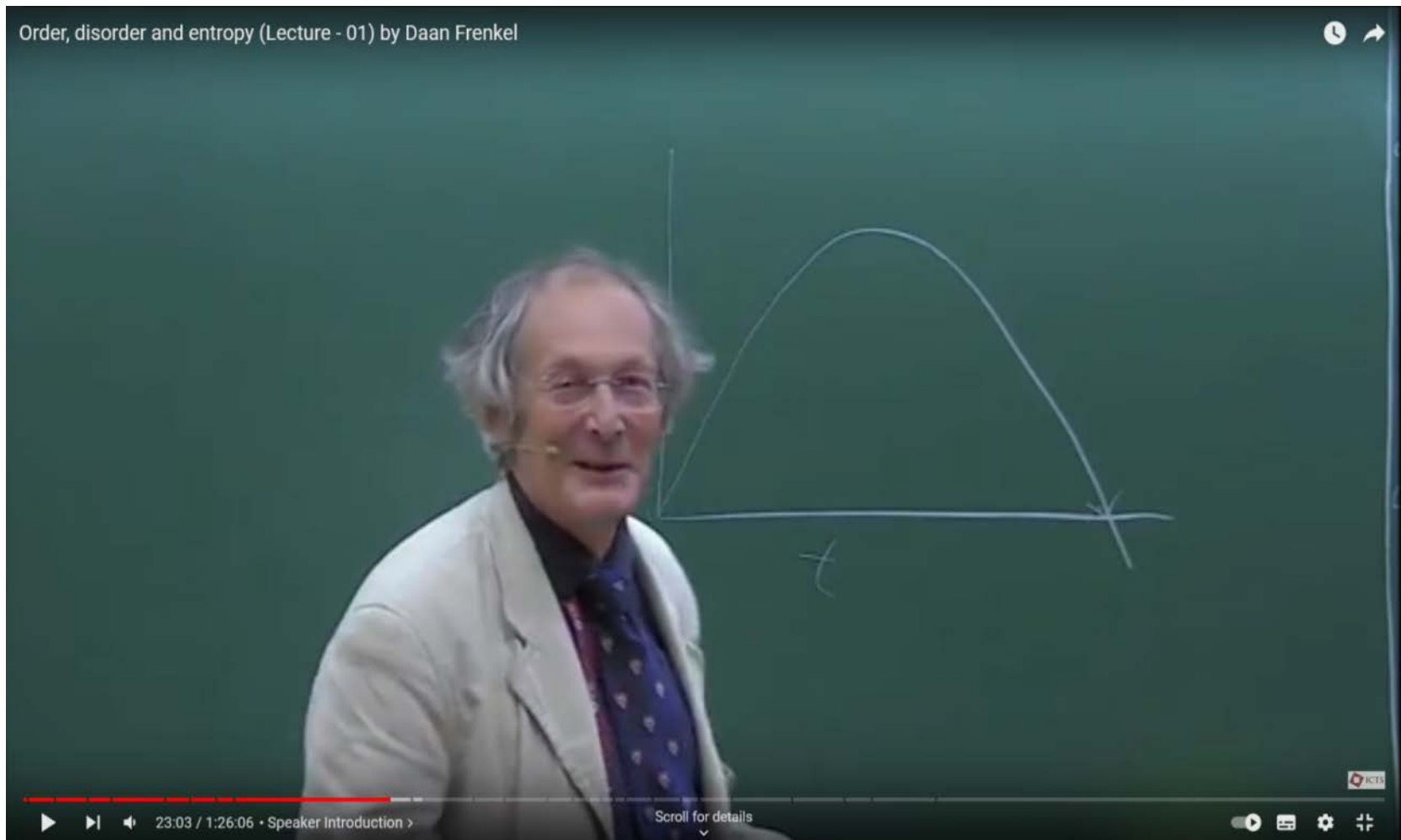


1st Aspect

The essential aspect of knowledge is
the ever increase of ignorance*

I refer to: (neuro)biologist
Stuart Firestein' book.
Ignorance how it drives science
And astrophysicist Neil de Grasse
Tyson and his fight to people who
Equate ignorance with God.

*) sounds a bit like entropy.



After a great many years Prof. Frenkel's understanding of Entropy drops negative!

Arthur Eddington

Goes out fishing

(1) No sea-creature is less than two inches long.

(2) All sea-creatures have gills.

These are both true of his catch, and he assumes tentatively that they will remain true however often he repeats it.



In applying this analogy, the catch stands for the body of knowledge which constitutes physical sciences, and the net for the sensory and intellectual equipment which we use in obtaining it.

It is not about the net but the sea

Eddington: *the catch stands for the body of knowledge*

However: The real quest is the sea. That what we don't know, might dream of, or suggest.

Human advance is about entering the unknown and extending our ignorance.

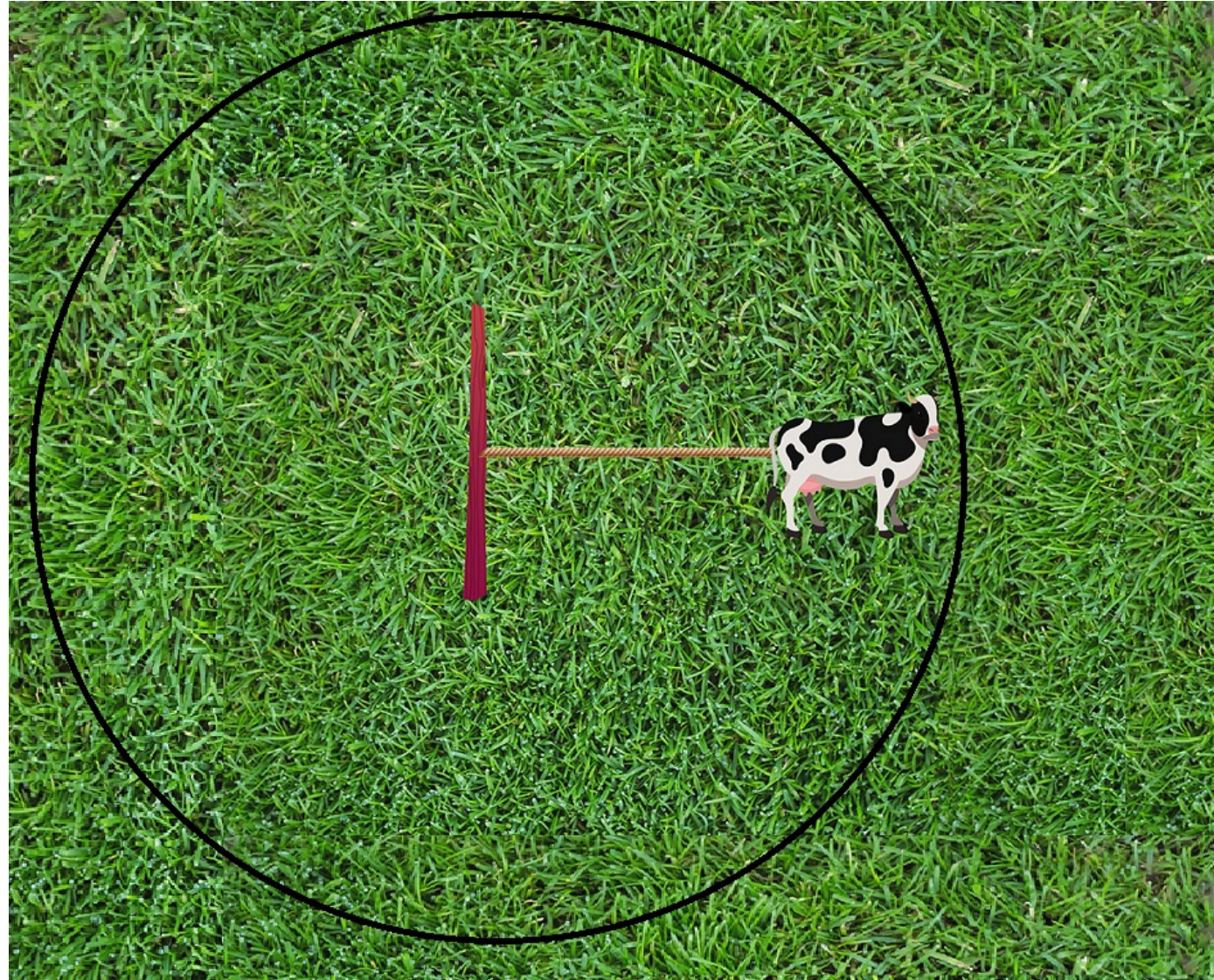
Ever since Albert

We give a geometrical explanation



The growth of ignorance

The void of
Ignorance
Outside the
Grass meadow



The void of
Ignorance

The void of
Ignorance

Happily the US-Dept. of Defense (DoD) is alert on **unknown UFOs!**

PHYSICAL CONSTRAINTS ON UNIDENTIFIED AERIAL PHENOMENA

Abraham (Avi) Loeb (1) and Sean M. Kirkpatrick (2)

1) Head of the Galileo Project, Astronomy Department,
Harvard University 60 Garden Street, Cambridge, MA 02138, USA

2) [Director of All-domain Anomaly Resolution Office](#)

1010 Defense Pentagon Washington DC 20301, USA

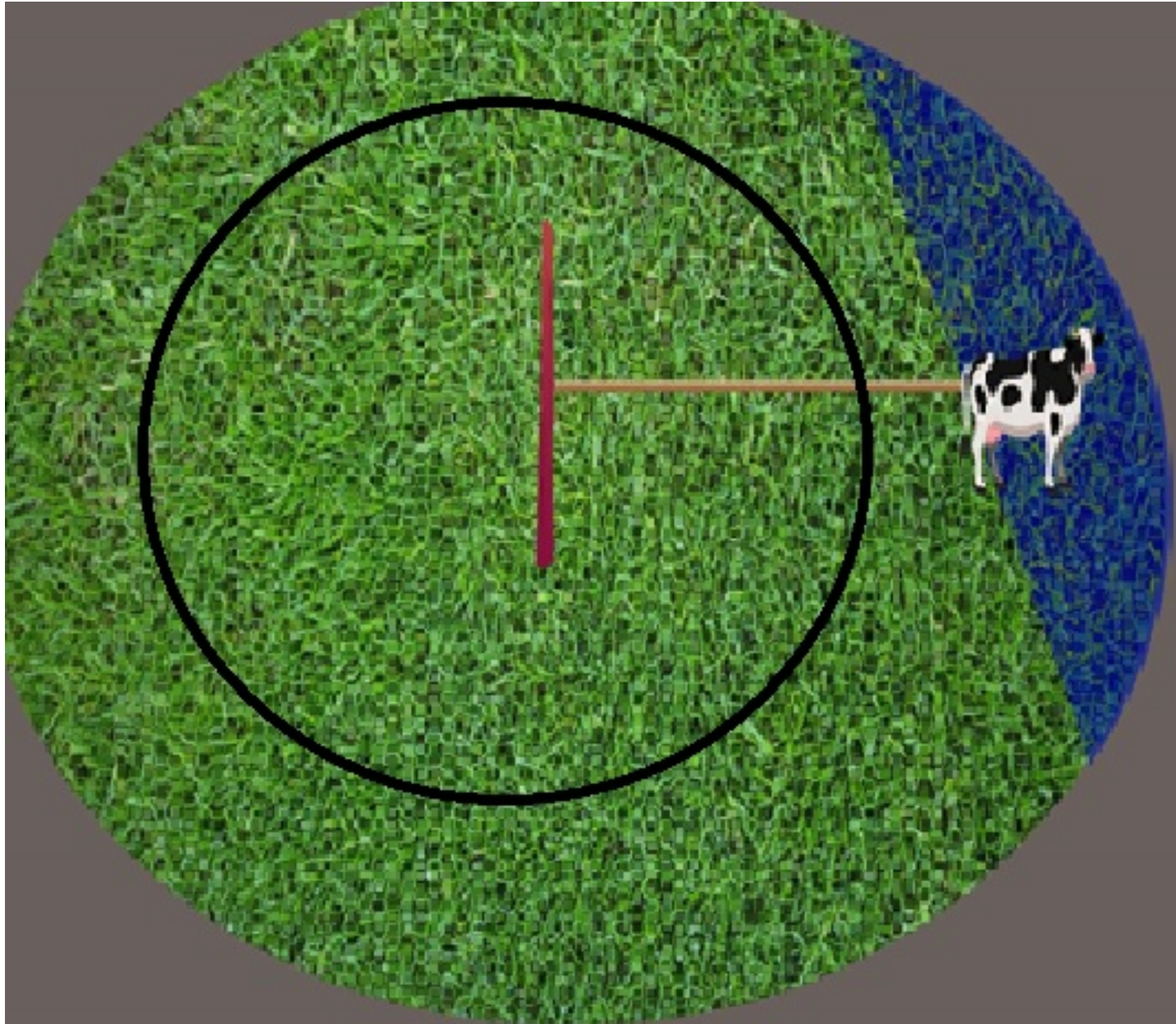


OFFICE OF THE DIRECTOR OF NATIONAL INTELLIGENCE

2022 Annual Report on Unidentified Aerial Phenomena

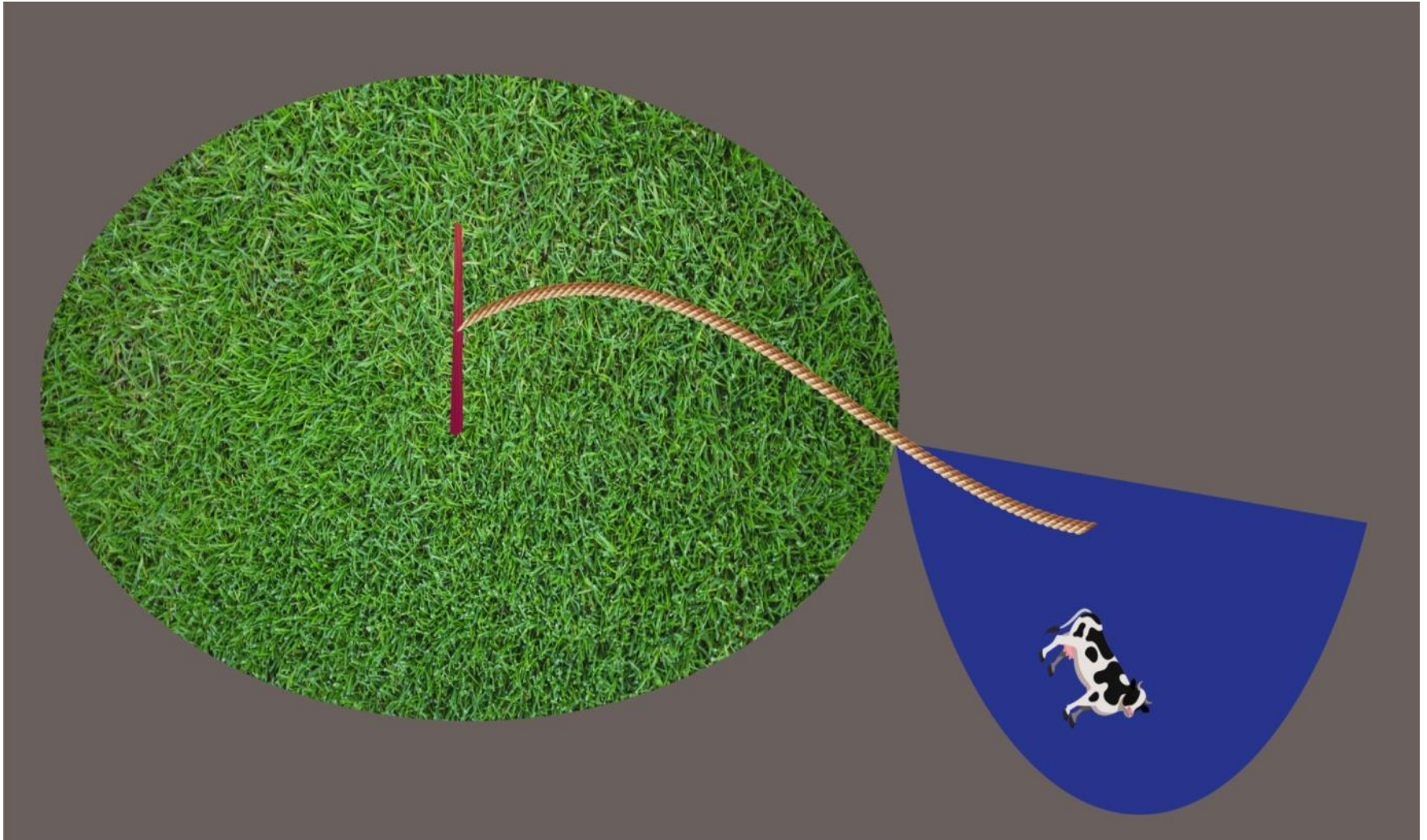
Unidentified Aerial Phenomena (UAP) reporting is increasing, enabling a greater awareness of the airspace and increased opportunity to resolve UAP events. In addition to the 144 UAP reports covered during the 17 years of UAP reporting included in the Office of the Director of National Intelligence (ODNI) preliminary assessment, there have been 247 new reports and another 119 that were either since discovered or reported after the preliminary assessment's time period. **This totals 510 UAP reports as of 30 August 2022**

A new plot induces a change of understanding



Rye grass
Becomes
Clover

Old knowns and Old unknowns versus Novel knowns and Novel unknowns



Scientific revolution

2nd Aspect

What can humans experience /Measure

How do they express them in language
in order to communicate

What about the human senses?

The role of language

- We experience bodily effects
- We couple them with sounds
- We communicate this sound to a fellow Humanoid
- We establish a (local) language



After a very long period

In labour and communication the language get structured

We try to communicate “globally”

The emergence of standardization

The emergence of signs (e.g. for long distance trade; tokens)

The emergence of writing (**communication freed from place and time**)



The quick brown fox jumps over the lazy dog

After a bit shorter period

The establishing of common models (including myths)

Quite recently

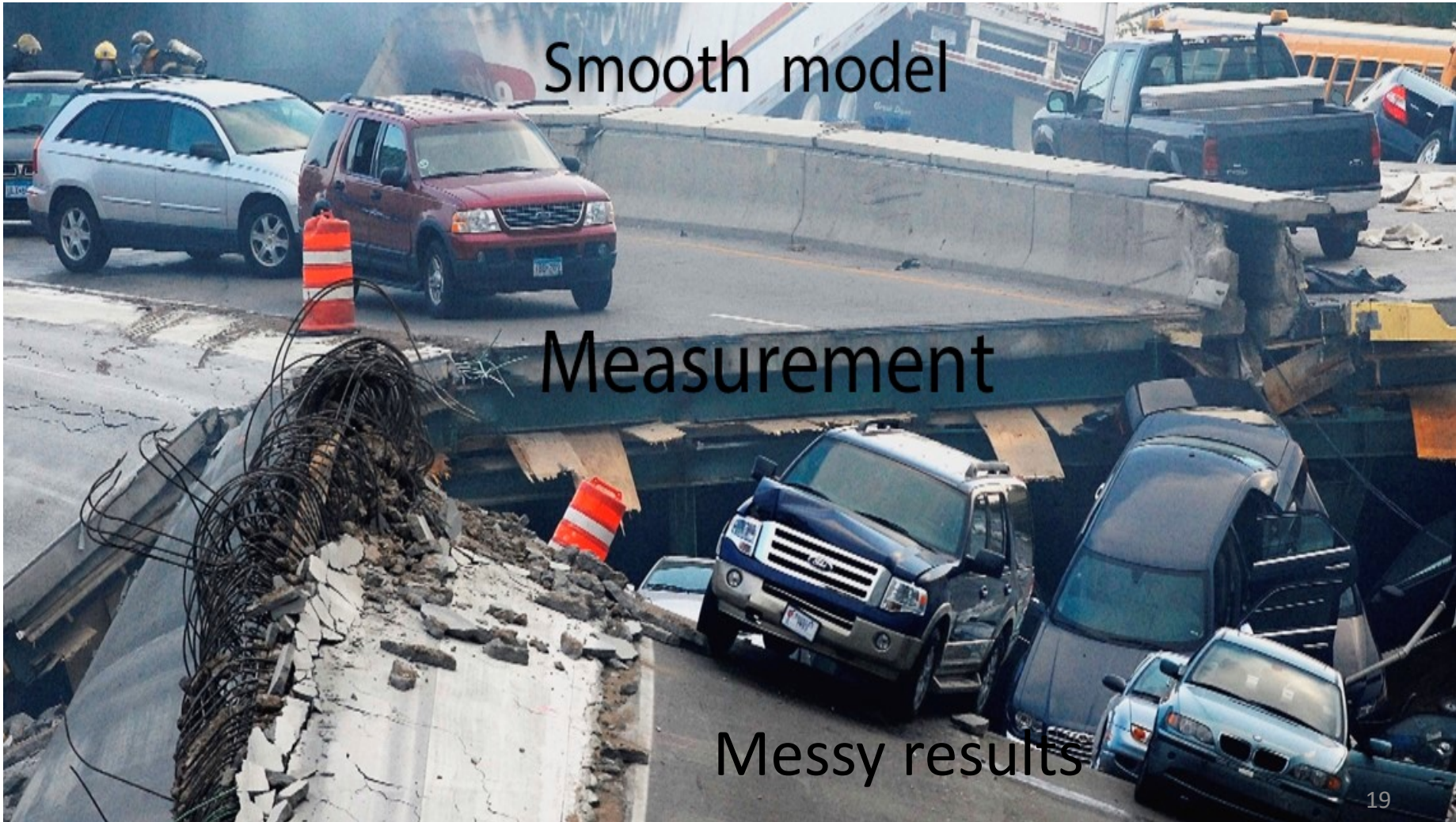
Scientific theories, formal sign languages,

Formal rift between Knowledge& Understanding

Newtonian worldview

Real traffic and Real collapse of a bridge

A real measurement of real objects before and after the disaster



Smooth model

Measurement

Messy results

In QM, the theory lives in Hilbert space
The collapse of the bridge IS the measurement
We measure the probable outcome



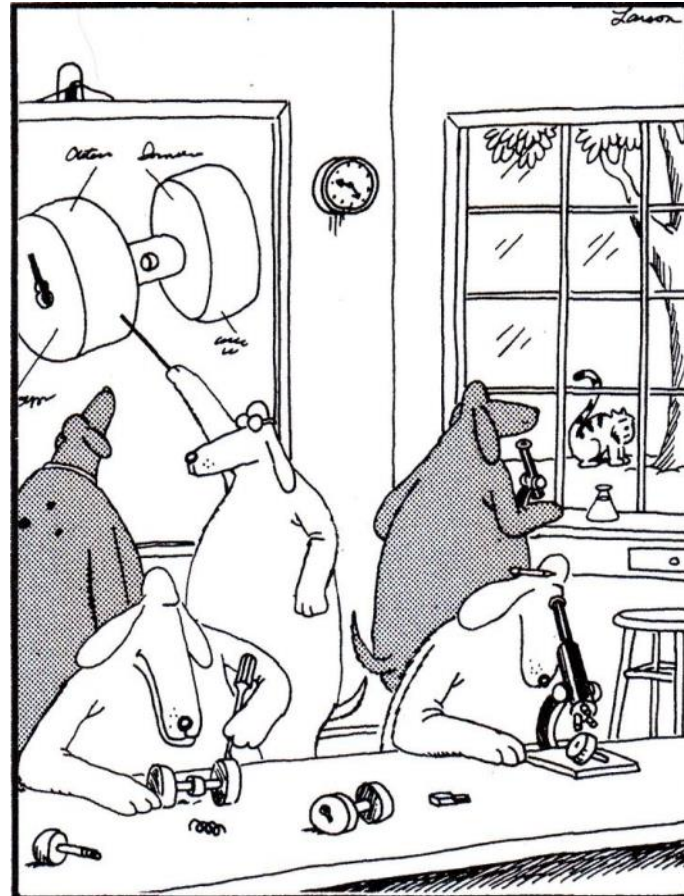
Smooth Schrodinger wave

Macroscopic measurement

$$|\langle \Psi | \Phi \rangle|^2$$

Our –Human- Sensory Stock

- Old Five+
 - Vision
 - Hearing
 - Touch
 - *Opposable Thumb*
 - Taste
 - Smell
 - *New: Vestibular (body position, tilt)*



Knowing how it could change the lives of canines everywhere, the dog scientists struggled diligently to understand the Doorknob Principle.

Our Sensory Stock plus

- To take into account e.g.
 - Magnetoception
 - Echolocation
 - Electroreception
 - Hygroreception
 - Infrared sensing
 - **Others**
 - Sense for time
 - Intuition
 - clairvoyance????



Young Ernst Mach

“looking” in- or outside?

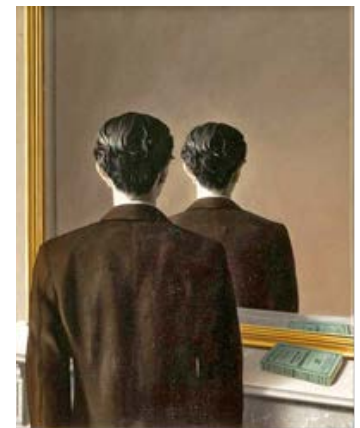
A problem with the positivist approach to the senses is that here ‘the self’ is seen as an object outside the brain, to be inspected. Our tools are then touch, vision, etc.

But we experience the self most of the time, not while shaving but if we experience pain, emotions and feel the tension of our skin (our own shrink foil) from within.

Presently, we don’t have a measure for this inside-out measurement as we have for outside-in experience such as the colour of your hair or your shoe size.



“What mirror will show him the reverse side of his eye, and in what device will his own act of vision be recorded?” (Castoriadis)



René François Ghislain Magritte 1931

We define objects

Definition

- As stable entities
- Invariance
- Intrinsic measure

Manipulating

- We know them by measuring them in some coordinate system
- Subsequently we introduce units of measure



Are we alone in the universe and worse are we the only possible interpreters?
The anthropomorphic quest of the uniqueness of our –human- life form in our
real universe.



3rd Aspect



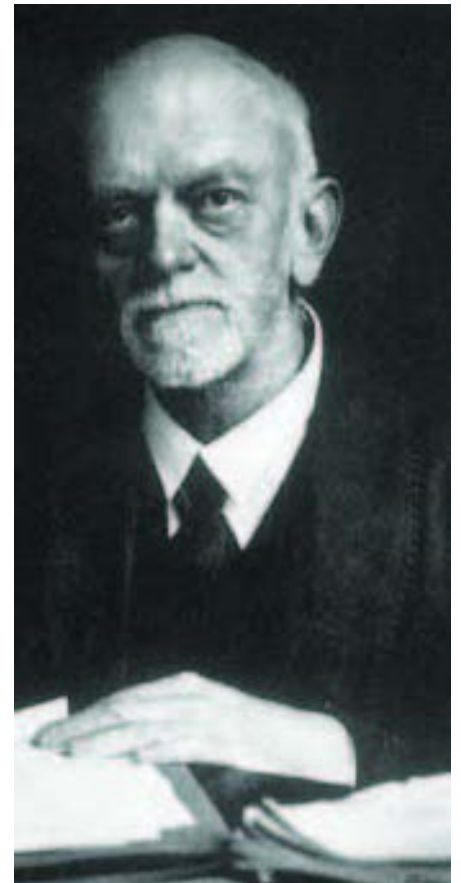
Ever since Babylon

The search for a universal language
(Neurath – Carnap - Esperanto)

Or get rid of the
(contextual) details and posit a sign
language

David Hilbert Radio: 1930

In der Tat: Wir beherrschen nicht eher eine naturwissenschaftliche Theorie, als bis wir ihren mathematischen Kern herausgeschält und völlig enthüllt haben. **Ohne Mathematik ist die heutige Astronomie und Physik unmöglich; diese Wissenschaften lösen sich in ihren theoretischen Teilen geradezu in Mathematik auf.**



." Indeed: we no sooner master a scientific theory than we have peeled out and completely revealed its mathematical core. Without mathematics, **today's astronomy and physics are impossible; these sciences virtually dissolve into mathematics in their theoretical parts.**

Mathematical models as shrink foil!

4th Aspect

**All communication is socially
contextual**

Historical Materialism

- 1) There is a real world of which humans are evolutionary offspring
- 2) Our bodily and mental understandings are contingent on our productive forces
- 3) Thinking is a bodily expression (following Spinoza's example about walking and legs)



Diamat exaggerations

According to Dialectical Materialism (J.W. Stalin 1953) first we declare the overarching so-called dialectical and then stipulates that histomat is an *extension* of dialectics.

In opposition to this religious approach,

Histomat posits that our capabilities (technical and mental) are historical processes. First the living/production and subsequently our models&theories (cf. Brecht: *Fressen -> Moral*).

Dialectics is a Human model

Simplistic relations

The famous John D. Bernal started with his important work *The social function of science*, slipped in pure catechisms in his highly popular *Science in History* (and praised Stalin as a genius in all fields of knowledge).

John Desmond Bernal (FRS)

&

Trofim Denisovich Lysenko
(*Stalin and Lenin Prize*)



In the same vein of history writing we have Alfred Sohn-Rethel, *Intellectual and Manual Labour*.



The issue of productivism where knowledge starts

We have to start with the human body as part of nature.

As Georg Lukács stipulates, **Human Labour is the only ontological force we have.**

It is human activity and production that induces and shapes our knowledge, models, and theory

This is immediately the source of the tension between 'reality' (what we experience) and theories and belief systems.

How deterministic is transcending from one historical phase to a next one?


When Marx & Engels analysed 19c society and the consecutive forms of oppression and formulated their class analysis, they stipulate that with the working class, within the capitalist mode of production, we reach a bottom line.

So, to overthrow their oppression the working class have to overthrow the system.

“Have to” not “will”

as Rosa Luxemburg famously stipulated.

It is not a law!



A good scientific theory suggests predictions based on regularities (aka laws)

Historical studies can ‘explain’ not prove why we arrived where we are and can only ‘suggest’ analogous advancing developments for the future.

Reminder as well: The Hellenistic culture was very advanced and after its demise it took till ‘the scientific revolution’ to pick up again.

5th aspect

Representations and laws

Examples

Fish and Quantum mechanics

Fish in shrink foil,

Fish as such

Fish in analytical determination

Eddington's Fish as found



For non scientific reasons the fish is smoked



Fish described in shrink foil

A description/determination from the outside



Removing its own shrink foil aka skin



Analysing the digestible parts Introducing boundary conditions



The bare bone mathematical structure



Does the final determinations induces the fish?



Contrary to Mackerel, QM lives in Hilbert Space

But QM claims to envelope in mathematical space, the “thing” living in physical space

What does the theory suggest us for physical space?

The finite knowability: Niels Bohr’s complementarity?

What does a model mean if taken for an approximate truth?

- Fundamentally probabilistic
 - wave function collapses (most theoreticians)
 - consistent / decoherent histories (Robert B. Griffiths)
- Introduction of new force/potential (David Bohm, Peter Holland) in phase space
- Super determinism, cellular automata (Gerard ‘t Hooft)
- Relational (Shelly Goldstein, Carlo Rovelli)
- P-adic structure /non Euclidian metric (Tim Palmer)
- Etc.

6th aspect

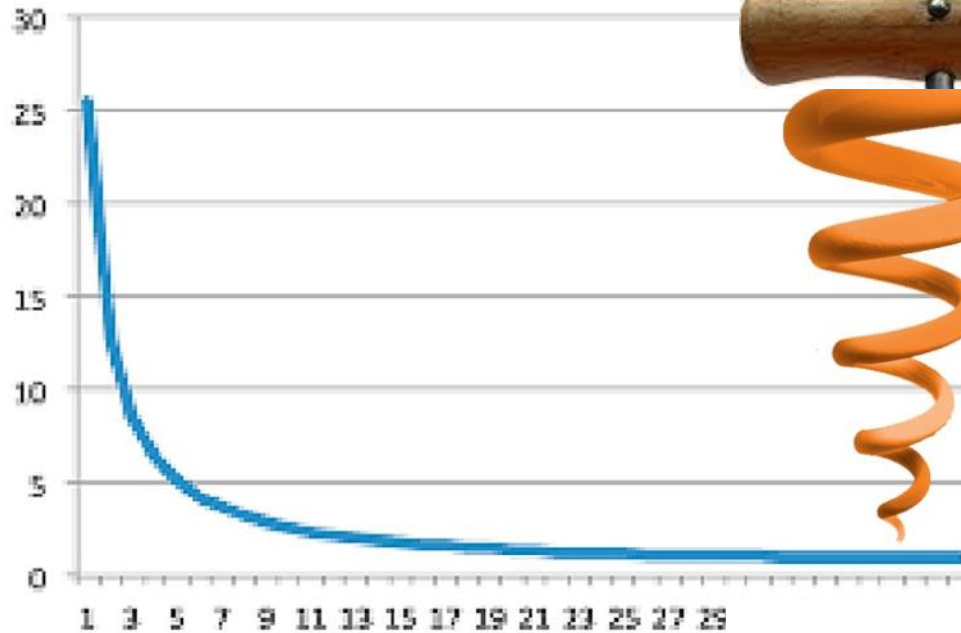
A never ending story

I expect that all attempts to do without fundamental laws of nature, if successful at all, simply result in the introduction of metalaws that describe how what we know *now* came about. *Weinberg's Dreams p.233*

OR

A final knowing?

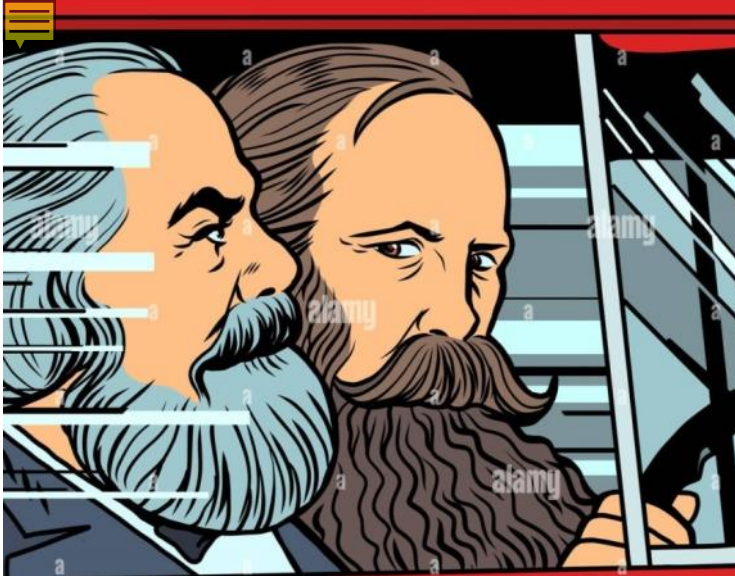
My own guess is that there is a final theory, and we are capable of discovering it. *Idem. p. 235*



We drill down to the ultimate *Ding an Sich*:
The fundamental building blocks of nature
The ultimate atoms of our model:
MADE BY GOD FOR OUR CONVENIENCE



Note: Although Immanuel believes in **G**OD, he has no beard.
Though Fred is an atheist and has a beard. No dialectics involved!



The role of context.
In every new stage in
*Human understanding
of Nature*
Novel entities and
relations **emerge**.

Quantity \longleftrightarrow Quality transitions

Inverting





Against Structuralism

The structuralists agree that semantic notions are contingent but dream of fixed universal underlying stable structures.

Their love for math, in particular set theory, started already with Claude Lévi-Strauss in 1949.

And culminated in Althusser's denial of history and Lacan's toying with formulae.

{does this ring a bell in Relational QM????}

Scientification (or scientology)?

If we dream of a final theory, structure, law, representation, etc., implicitly, we strive for a final (Kantian) destination.

This does NOT mean that we cannot strive for a limited inter-human transparent language (pasigraphy) in some contexts, cf. Neurath, Carnap.

As argued above: We hardly understand our body, we don't understand our mind, we cannot organize our human society: why should we claim universals *an sich* ? Beyond contingent environments.

7th aspect

What is a notion

What is an Ideal

Ewald Ilyenkov and the Ideal

Ideals are 'real' notions, however they express themselves in opposing representations in different situations. Standard example:

Value: Exchange Value versus Use value

In day-to-day operations we simply deal with a – linear- social- (but religious) measure: Money

He (=God) favours our undertaking.



New Order of the Ages

Ideals in physics

Entropy: $\Delta S = K_B \ln(W)$ versus $dS = dq/T$

In a binary world view we can represent Entropy as a “bit” of information. Zero and One (nothing and something?)

Change.

How to experience (think of) *Change* if we cannot compare the situation a with b, without a measure or an absolute memory? (aka block universe)

The tentative solution is ongoing *Clock Time* as measure. Rapid xtalisation is fast but means a lot of *Change*. Idem for only 1 year war.

This relates to the notion of proper time (where the clock is (part of) the changing system)



Time = money

An agent of exchange

This approach advances the discussion on *Value* and its representations in use resp. exchange value.

In order to communicate, that is to say exchange and compare e.g. in trade, we need a (contingent) measure.

In Economy and now also in our society the 'universal equivalent' is money

In the case of *Change* the universal measure is clock time.

Do I hear: *Wait a moment!*
I don't buy that argument



Another logic/math

Obviously the best –present- way to automate is by formal ‘logical’ rules. Formal logic and its modal offsprings allow classes of shrink foil.

Calculus incl. the limit notion, Method of exhaustion, Finite element method, So-called AI.

Every child recognizes a dog, but we need super computers to recognize dogness using 1000x more energy. (Tim Palmer)

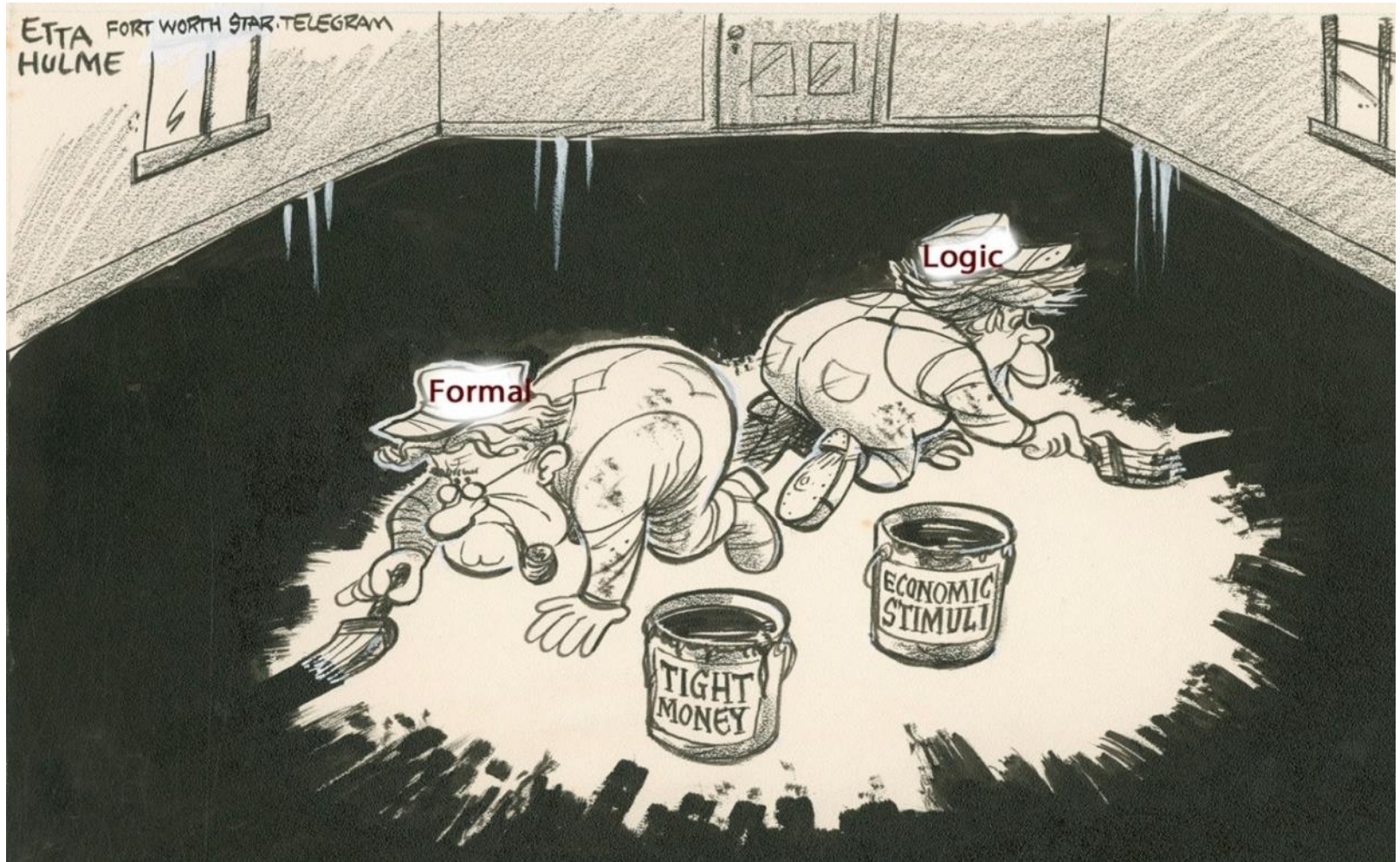
Emerging properties, novel levels of understanding, are difficult to mold into ‘old wine sacks’.

Can new notions equally be made operational as old ones? Or is Niels Bohr right that the buck stops at complementarity?

In my view it is way to early to claim so, more mathematical ‘engineering’ like string theory or AI does not bring us further to understanding.

Hence, the quest for novel mathematical ideals.

Today's academic obsession



"I'M CONFIDENT WE CAN GET THE JOB DONE TOGETHER, ARISTOTLE WITHOUT PAINTING OURSELVES INTO A CORNER"

After Etta Hulme Nov.1, 1977

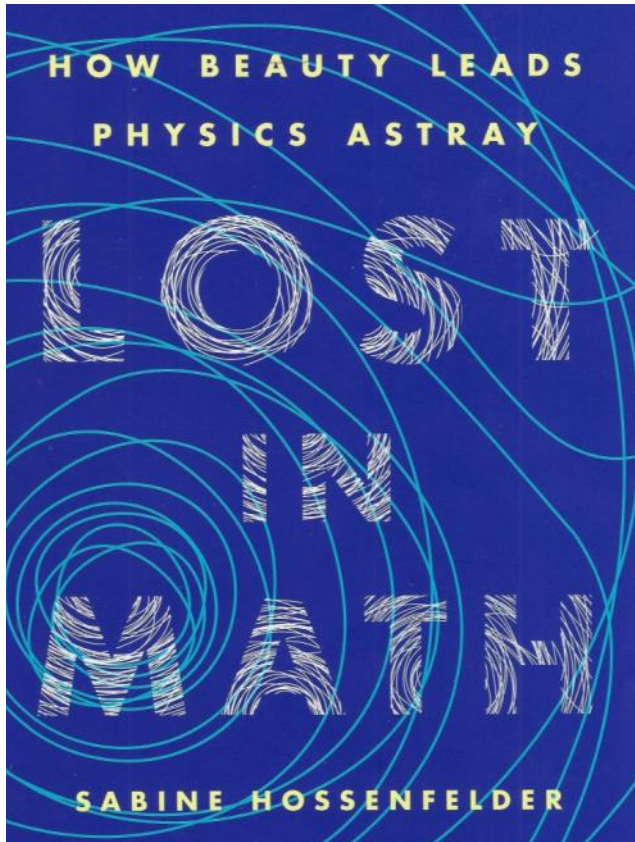
A lesson from Biology

Evolutionary adaptation

The best next step is that step that allows the largest number of choices in the subsequent step(s).

So, a kind of non-linear *hop, skip and jump* progression.





Physics isn't math.
It 's choosing the right math.

P.234

I would like to say:

*The beauty is in finding
other types of
Mathematics*

Thank you for your time and hopefully
understanding