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Can we justify the induction principle if laws of nature are changing?

Métaphysique de l'induction, 8-9 juin 2022

1) **A classical metaphysical justification of the principle of induction**

2) **Unchanging laws of nature justify the principle of induction**

3) **The possibility of changing laws of nature?**

4) **Can one justifies the principle of induction if laws of nature could change?**

Outline

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Rule 1

No more causes of natural things should be admitted than are both true and sufficient to explain their phenomena.

As the philosophers say: Nature does nothing in vain, and more causes are in vain when fewer suffice. For nature is simple and does not indulge in the luxury of superfluous causes.

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Rule 3

Those qualities of bodies that cannot be intended and remitted […] and that belong to all bodies on which experiments can be made should be taken as qualities of all bodies universally.

[…] Certainly idle fancies ought not to be fabricated recklessly against the evidence of experiments, nor should we depart from the analogy of nature, since nature is always simple and ever consonant with itself.

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Metaphysical theories about natural laws

The metaphysical theories that will be discussed in this talk

- Lewis' style regularism

- Armstrong's style gouvernism

- Bird's style dispositionnalism

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Mills, Ramsey and Lewis position:

« [A] contingent generalization is a law of nature if and only if it appears as a theorem (or axiom) in each of the true deductive systems that achieves a best combination of simplicity and strength ».
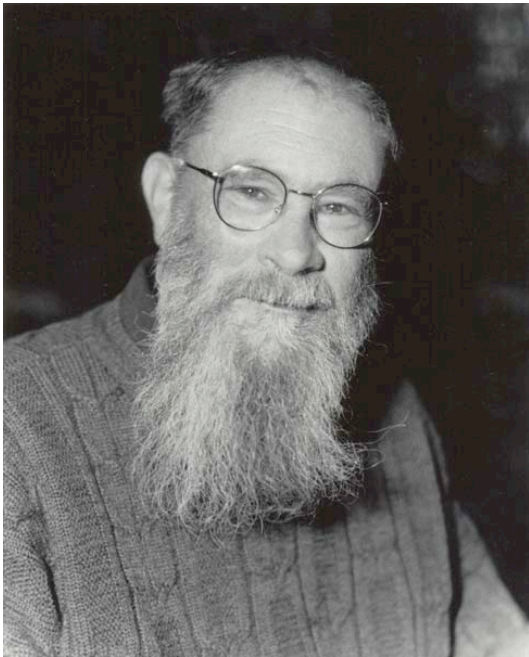
For this position to be an interesting conception of laws of nature (justify counterfactual conditionals...), we have to add a few metaphysical hypothesis.

The laws supervene on the mosaic of facts, the so-called Humean mosaic (HM).

(i) Fundamentalism: Perfectly natural (PN) properties form a unique set of properties whose instantiations constitute the bedrock ontology of a Humean world. From such a bedrock, other, derivative existents obtain through supervenience.

(ii) Physicalism: PN properties are physical and should therefore be identifiable as such by (the final) physics.

(iii) (Mereological) reductionism: Non-PN properties reduce to PN properties. Such a reductionism immediately follows from a strong interpretation of supervenience, to the effect that emergent properties are ipso facto to be excluded.

(iv) Eternalism: Past, present and future facts are ontologically on a par, to the effect that there is no genuine becoming in typical Humean worlds. This usually translates as considering HM as the block universe.

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(v) Universalism: Best system laws (BS-laws) hold everywhere and everywhen. They are regularities that span—or their supervenience basis S is—the whole of HM. This precludes them from having exceptions.

Because the HM is structured in such a specific way, inductive reasoning can often be used successfully.

Gouvernism

Armstrong, Tooley and Dretske position

The laws govern their instances.

Sentences like 'it is a law that Fs are Gs' should be understood as 'it is physically necessary that Fs are Gs'.

The relation $N(F, G)$ should be understood as

« Something's being F necessitates that the same something's being G, in virtue of the universals F and G ».

Gouvernism

Since relations among universals are timeless necessary connections, they mitigate the skeptical problem of induction.

Dispositionalism

Ellis, Bird, Mumford…

"If properties have dispositional essences then certain relations of necessity will hold between the relevant universals; these relationships can be identified with the laws of nature."

$$\Box(D_{(S,M)}x \longleftrightarrow Sx \; \Box\!\!\rightarrow Mx)$$

$D_{(S,M)}x$: x manifests M if condition S is present.

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Since essential dispositions generate timeless necessary connections among events, they mitigate the skeptical problem of induction.

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Sartenaer, Olivier, Alexandre Guay, and Paul Humphreys. 2021. "What Price Changing Laws of Nature?" *European Journal for Philosophy of Science* 11 (1): 12. https://doi.org/10.1007/s13194-020-00327-4.

UCLouvain Law of nature change?

Not simply different laws at different locations.

The laws of nature must dynamically change.

Local change: the laws are changing depending on the context.

Global change: the laws change everywhere at the same time.

Example: Let us suppose that biological systems evolution is not all grounded in physical laws. Local or global?

(v) Universalism: Best system laws (BS-laws) hold everywhere and everywhen. They are regularities that span—or their supervenience basis S is—the whole of HM. This precludes them from having exceptions.

Let us keep the unicity of the best system but allow for the possibility that regularities do not span on their whole supervenience base, on the whole mosaic.

W is BS-nomological world, (*F*,*L*), where *F* are factual statements and *L* are dynamical laws.

Let W_1 be like **W** except in an negligeable space-time zone S.

Then W_1 would be BS-nomological (*F*,S_1,*L*), where S_1 is the description of S.

Same reasoning even if the number of exception zones is infinite. What is needed is that the total measure of exceptions zones is negligeable compared to the measure of the total HM.
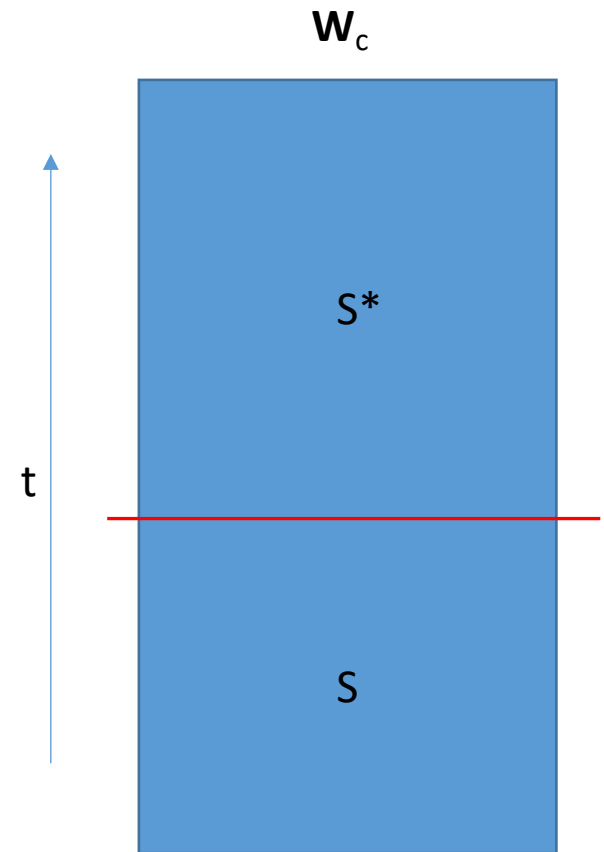
What about non negligeable zones ?

Two possible cases

1) The HM can be represented by a disjunctive BS.

2) The HM cannot be represented by a disjunctive BS.

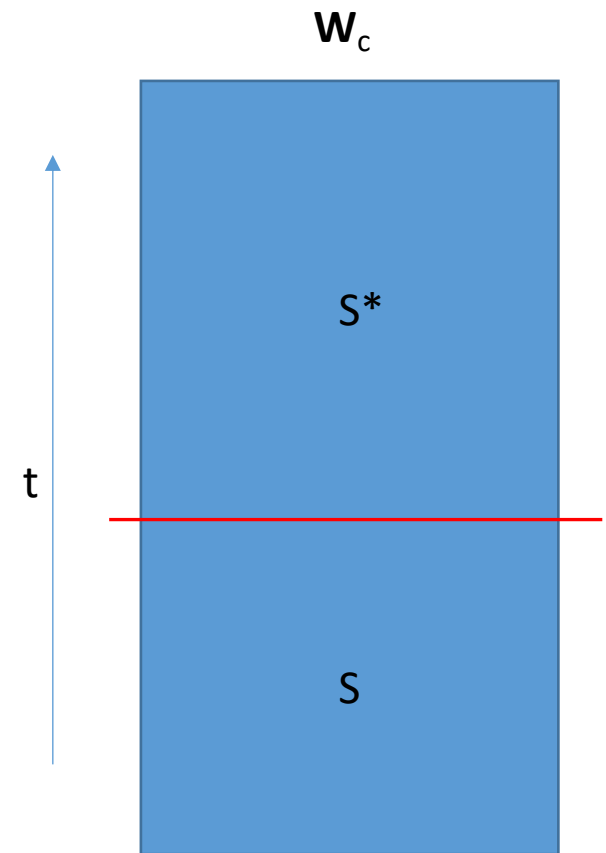For example, $\mathbf{W}_c$ is a world where the BS takes the form (F,L,L^*).

$\mathbf{W}_c$

S*

t

S

L is changing in **W** iff

1)   *L* is BS-nomological of **W**

2)   *L* changes, in other words there exists at least one zone of **W** where *L* is replaced by *L** (*L** supervenes on the same NP than *L*).

Note that the BS is the same everywhere in the HM but that a regularity is not necessarily the same everywhere.

W_c

t

S*

S

Law change - gouvernism

Two possibilities:

- A system is subjected to a change of natural necessities (same properties, different laws).

- The system is subjected to a change of properties that are not the result of the action of a law.

In this talk I will only discuss the first case.

Law change - gouvernism

Two situations, A and B, have the same properties but do not exhibit the same behavior.

Could A and B be governed by different laws?

A problem, the behavior change could be the result of a change of constraints and not laws (necessary connections among universal).

In this talk, I will presume we can always distinguish nomological aspects from accidental aspects in any situation.

Two cases

1 - The change between situations A and B is a brute fact.

A:N(F,G) $\longrightarrow$ B:N(F,G)'

If it is regularly happening, it is a problem.

Remember governism is a metaphysical theory supposed to explain natural regularities.

2 - The change between situations A and B is the result of a necessary change, i.e. of the action of a meta-law $N_2(L_A, L_B)$, where L_i are second order universals.

The necessitation relation does not relate universals of a completely different kind, in consequence $N_2=N$.

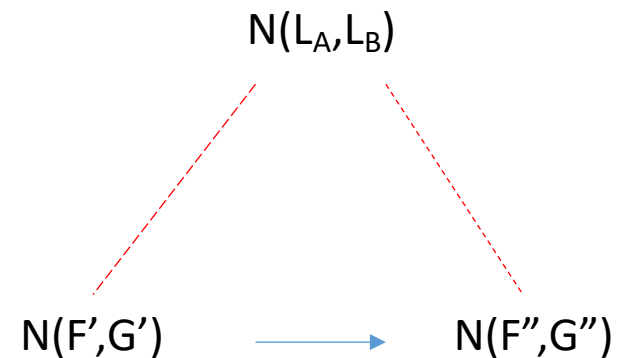The alternative is an infinite regression.

$N_2(L_A, L_B)$

$A:N(F,G)$ → $B:N(F,G)'$

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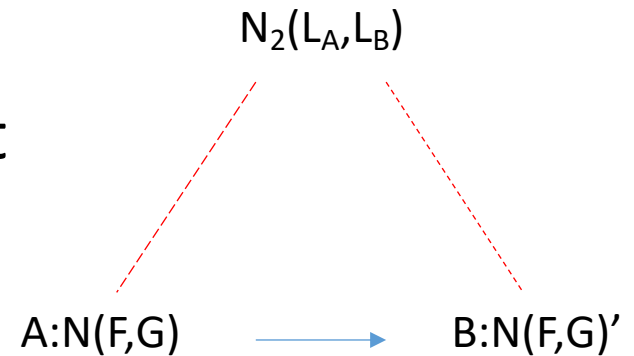
$N(L_A, L_B)$

- Not obvious that L_i represent natural properties.

- Difficult to see how different L_i would or would not be in the same category.

Two solutions:

- Weaken N: N would be contextual.

- Weaken universals: quasi-universals.

$$N(L_A, L_B)$$

$$N(F', G') \longrightarrow N(F'', G'')$$

$\square(D_{(S,M)}x \leftrightarrow Sx \;\square\!\rightarrow\! Mx)$

How such a law could change?

We will admit that in essential dispositionalism qualitative laws cannot change.

What about quantitative laws?

Let us suppose that Hooke's law is fundamental in world **W**.

This law asserts that the extension of a spring is proportional to the applied force.

Universals involved: to be a spring (not a composite object in our discussion), to be a spatial extension and to be a force.

Let us suppose that in **W**, we can identify a spring, a spatial extension and a force independently from Hooke's law.

In **W**, Hooke's law takes the form F=kx. Let us call this law L.

Let us suppose that in **W'**, one finds a law of the form F=k'x, where k≠k'. Let us call this law L'.

Are L and L' the same law but with different coefficient?

A strict essentialist would say non.

Is she justified?

If we use the same procedures to identify in the same way the same universals, the two elasticity constants can be understood as initial condition.

In **W**, Hooke's law takes the form F=kx. Let us call this law L.

Let us suppose that in **W"**, one finds a law of the form F=kx^2. Let us call this law L".

Are L and L" the same law but with different form?

If we answer yes, the law necessitates a polynomial dependence between a spatial extension and an applied force. This does not seem very plausible.

We should rather defend that the exact same universals can be implicated in different behaviour.

Law change - dispositionalism

$F=kx \longrightarrow F=kx^2$

From the contingency (potential restriction of scope) of quantitative laws, one can sustain that quantitative laws can change (temporal restriction of scope), even if qualitative laws cannot.

This change could be a brute fact or regular.

If it is regular, it is probably not the result of a meta-disposition:

1) Problem of the stimulus.
2) Problem of the distinction between the two levels of disposition.

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1) *L* is BS-nomological of **W**

2) *L* changes, in other words there exists at least one zone of **W** where *L* is replaced by *L** (*L** supervenes on the same NP than *L*).

In such a disjunctive BS, inductive reasoning cannot be used to predict something about a region based on the local regularities of another.

If we could the BS would not be disjunctive and there will be a way to subsume behaviours in different regions under the same law.
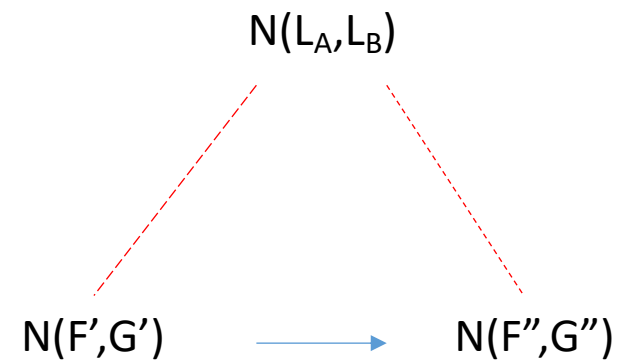
F' and F'' are quasi-universals referring to F.

G' and G'' are quasi-universals referring to G.

$N(L_A,L_B)$ govern the change of nomological regime.

Without certainty about the status of F' and G' as quasi-universals or universals, one should be suspicious about inductive inferences.

$N(L_A,L_B)$

$N(F',G') \longrightarrow N(F'',G'')$

Nevertheless, since the change of laws is itself regular, we can hope to learn the contextual trigger of the nomological change.

This could restore our confidence in inductive inferences if they are limited to the ontological domain to which F and G belong.

$N(L_A, L_B)$

$N(F',G')$ → $N(F'',G'')$

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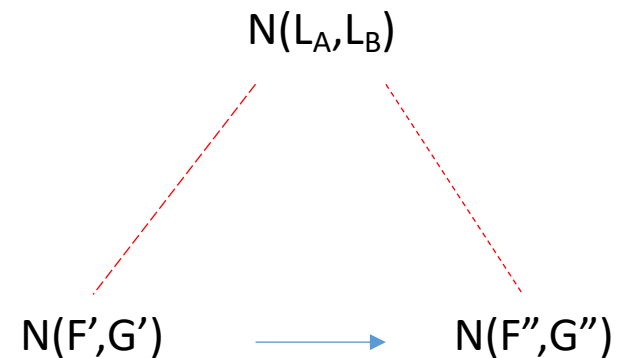
$$F=kx \longrightarrow F=kx^2$$

Qualitative laws cannot change.

Quantitative laws could change.

If the nomological transformation is a brute fact, the principle of induction is in peril.

If the nomological transformation is itself regular, but not the result of the action of a meta-disposition, it is a regularity without explanation. In consequence, the principle of induction is in trouble because the complete knowledge of the essential dispositions at play at a certain time is not sufficient to justify an inductive inference.

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❖ If BS regularist laws can change, the principle of induction is no more justified.

❖ If gouvernist laws change, a limited version of the principle of induction can be justified.

❖ If quantitative laws can change in the dispositionalist context, the principle of induction is no longer justified.