On the Axiomatisation of the Natural Laws — A Compilation of Human Mistakes Intended to Be Understood Only By Robots

Johan Gamper\(^1\)

1 Subrosa KB

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**Abstract**

This is an attempt to axiomatise the natural laws. Note especially axiom 4, which is expressed in third order predicate logic, and which permits a solution to the problem of causation in nature without stating that “everything has a cause”. The undefined term “difference” constitutes the basic element and each difference is postulated to have an exact position and to have a discrete cause. The set of causes belonging to a natural set of dimensions is defined as a law. This means that a natural law is determined by the discrete causes tied to a natural set of dimensions. A law is defined as “defined” in a point if a difference there has a cause. Given that there is a point for which the law is not defined it is shown that a difference is caused that connects two points in two separate sets of dimensions.

**Keywords:** Natural laws, Axiomatisation, Causality, Objects.

1. Undefined terms

1. \(\rho\)
2. \(\sigma\)
3. Difference
4. Dimension
5. Relation
6. Element
7. Cause
8. Point
9. Belongs to
10. Existence
2. Initial definitions

- *a set* = *df* A specific existence of elements (in this extraction defined by occurrence within brackets (())).
- *a complex of dimensions = a field of dimensions = df* A set of dimensions.
- *D = df* A specific and limited set of dimensions.
- *π = df* The cause of ρ on σ.
- *θ = {σ, ρ, π} = df*
  1. A specific π that causes a specific ρ on a specific σ,
  2. the specific ρ that is caused by the specific π in 1. and
  3. the specific σ mentioned in 1.
- *D_{km} = df* A specific and limited field of dimensions; {d_k, d_{k+1},..., d_m}, in which d is a separate dimension and *D_{km} contains m-k+1 dimensions.*
- *form = df* A specific set of relations.
- *Ξ = df* The form of θ.
- *elements of relation = df* Parts of a structure of relations necessary to define a form.
- *Π, Ρ and Σ = df* The elements of relation of Ξ; where Π represents the relations of π, Ρ the relations of ρ and Σ the relations of σ.

3. Axioms

Axiom 1: ρ is a difference

Axiom 2: σ is a difference

Axiom 3: ρ belongs to *D_{km}* a specific and limited field of dimensions

Axiom 4: In all points X belonging to an arbitrary *D, Ξ is true.*

4. The object Ω

- *Ω = df*
  1. {ρ_1, ρ_2, ..., ρ_i},
  2. in which each and every ρ_x (1 ≤ x ≤ i) constitutes a difference towards {ρ_1, ρ_2, ..., ρ_{x-1}}, and where
  3. ρ_{x+1} constitutes a difference towards {ρ_1, ρ_2, ..., ρ_{x-1}, ρ_x}.
5. π:s relation to D

θ implicates an unique cause π to each and every ρ. For a specific and limited field of dimensions \( Q_{km} \) therefore, a precise set of causes λ is tied to included ρ. This specific set causes the total set of ρ in \( D_{km} \). Each and every ρ in \( D_{km} \) therefore can be explained with the set λ. Why \( ρ_{x+1} \), for instance, is answered with \( π_x \).

**Definition of the law λ**

\[
λ = df \{π_0, π_1, ..., π_q\}, \text{ in which each and every } π_x \text{ causes a } ρ_{x+1} \text{ belonging to the set } \{ρ_1, ρ_2, ..., ρ_q, ρ_{q+1}\} \text{ which constitutes the total amount } ρ \text{ in a specific and limited field of dimensions } (Q_{km}).
\]

From the definition above follows theorem 5 and theorem 6.

**Theorem 1:** (Not part of this compilation.)

**Theorem 2:** (Not part of this compilation.)

**Theorem 3:** (Not part of this compilation.)

**Theorem 4:** (Not part of this compilation.)

**Theorem 5:** \( λ_{km} \) causes all ρ in \( D_{km} \).

**Theorem 6:** Every ρ caused by a certain law \( λ_x \) exists in a limited and specific complex of dimensions \( D_q \).

6. Inter-relations of laws λ

**Definition of \( D_n \)**

- \( D_n = df \) The field of dimensions \( \{d_1, d_2, ..., d_{i1}, ..., d_{g1}, ..., d_{n-1}, d_n\}, 1 ≤ f ≤ g ≤ n \text{ that contains; } \)
  
  1. all \( ρ_x \) belonging to \( D_{lg} \),
  2. all \( ρ_y \) that can form Ω for \( ρ_x \) and
  3. all \( ρ_z \) that \( ρ_x \) can constitute Ω for.

**Definition of \( Λ \) of \( D_n \)**

- \( Λ = df \{λ_1, λ_2, ..., λ_P\}, \text{ where } P \text{ is the total amount of laws applying in } D_n \text{ and where } \{λ_1, λ_2, ..., λ_P\} \text{ causes all } ρ \text{ belonging to } D_n. \)
7. Definition of "λ defined in a point $X_0$"

With $\Lambda$ and its part-laws $\lambda$ each and every difference related to $\Omega$ has a cause $\pi$ belonging to $\Lambda$. Assume a point $X_0$ belonging to $D_{km}$ belonging to $D_n$. What "$\lambda_{km}$ is defined in $X_0$" means is defined below.

**Definition of $\lambda$ defined**

- $\lambda_{km}$ is defined in a point $X_0$ belonging to $D_{km} = df \theta$ is true in $X_0$.
- Theorem 7: If $\lambda_{km}$ is defined in $X_0$, $\Lambda$ is defined in $X_0$
- Theorem 8: If $\Lambda$ is defined in $X_0$, $\lambda_{km}$ is defined in $X_0$

A special case is at hand when for a point $X_0$ holds $\{\neg \sigma, \neg \rho, \neg \pi\}$. Is in this case $\lambda_{km}$ defined in $X_0$? Since $\lambda_{km}$ does not exist in $X_0$ ($\neg \pi$ is true and $\pi$ is $\lambda$'s representative in $X_0$), $\lambda_{km}$ is neither defined nor not defined in $X_0$. Thus the next theorem applies:

**Theorem 9:** If for a point $X_0$ holds $\{\neg \sigma, \neg \rho, \neg \pi\}$ $\lambda_{km}$ for the point is neither defined nor not defined.

Before going further some new concepts are introduced:

- **effect** = $df \rho$
- a point of effect = $df$ A point $X$ in which $\rho$ is true.

From the two definitions above follows:

**Theorem 10:** In a point of effect $\theta$ is true.

8. Beyond $\theta$

Either the state of things is such that it is not possible that $\theta$ does not apply in each point where $\pi$ apply, or it is not impossible. If the latter is the case something not of $\Lambda$ bound can emerge in a point. Arbitrariness though, in that case, is not imminent, nor chance, due to axiom 4: "In all points $X$ belonging to an arbitrary $D, \Xi$ is true" ($\Xi = df$ The form of $\theta$). This implies that if a law for a point is defined in that point $\Xi$ apply and if the law is not defined $\Xi$ apply:
Theorem 11: $\Xi$ is true in all points $X_0$ whether or not $\lambda(X_0)$ is defined.

$\Xi$ "the form of $\theta$", does not include chance because the form implicates a cause to each difference. Therefore the following is valid:

Theorem 12: It is not true for any point that effect can occur by chance.

9. Derivation and definition of $\rho'$ and $\sim \rho$

Assume $\Lambda$ is not defined in a point $X_0$. This implicates according to the definition of "$\lambda$ defined" that $\theta$ is not true in $X$. For $X_0$ then the following is true:

1) $\neg \theta$

$\theta$ has three elements for which thus apply "not":

2) $\neg \{\sigma, \rho, \pi\}$

(2) implicates that at least one element of $\theta$ is negated:

Theorem 13: $\neg \theta \Rightarrow \{\neg \sigma, \rho, \pi\}$ \lor \{\sigma, $\neg \rho$, $\pi$\} \lor \{\sigma, $\rho$, $\neg \pi$\} \lor \{\neg $\sigma$, $\rho$, $\neg \pi$\} \lor \{\neg $\sigma$, $\neg $\rho$, $\pi$\} \lor \{\sigma, $\neg $\rho$, $\neg \pi$\}

According to theorem 9 $\Lambda$ is neither defined nor not defined in a point $X$ where vii) is true, therefore vii) is not true in $X_0$.

Again $\neg \pi$ implicates a cause-less difference [iii) and vi)] and also a cause-less negation of difference [vi)]. Furthermore $\neg \sigma$ implicates that a cause of a difference has emerged at random [i)] respectively a cause of a negated difference emerging at random [iv)]. When a cause-less difference or negation of difference is equal to chance i), iii)-vi) implicates chance. Since axiom 4, by theorem 12, does not permit chance i), iii)-vi) are not true in $X_0$. $\neg \rho$ finally implicates negation of difference [ii)].

$\neg \theta$ then implicates seven alternatives of which six are not possible. Then the seventh, ii) $\{\sigma, \neg \rho, \pi\}$, is true:

Theorem 14: If $\Lambda$ is not defined in a point $X_0$ $\{\sigma, \neg \rho, \pi\}$ is true in that point.
10. Of \( P \) in \( X_0 \) where \( \Lambda \) is not defined

Theorem 14, though, does not show how \( \Xi \)'s elements of relation are fulfilled when it is lacking a fulfilment of \( P \). Axiom 4 implicates that \( P \) is fulfilled in \( X_0 \). Thus \( P \) is fulfilled in \( X_0 \).

Theorem 15: If \( \Lambda \) is not defined in a point \( X_0 \) then holds for \( X_0 \): \( \{ \sigma, \neg \rho, \pi \} \wedge P \) is fulfilled.

\( P \) is not fulfilled by the \( \rho \) that is negated (\( \rho \)), nor by the negation of it (\( \neg \rho \)). That which fulfils \( P \) in \( \chi \) can be called \( \rho' \).

Definition of \( \rho' \): \( \rho' = df \) That which fulfils \( P \) in a point \( X_0 \) for which \( \Lambda \) is not defined.

11. Dimensionality

In \( X_0 \) \( \neg \rho \) is true. Since \( X_0 \in D_n \), \( \rho' \) can not belong to \( D_n \), nor is it possible that the point which \( \rho' \) belongs to, belongs to \( D_n \).

Theorem 16: The point that \( \rho' \) belongs to, does not belong to \( D_n \).

Definition of \( X'_0 = df \) The point that \( \rho' \) belongs to.

Here a hypothesis will be introduced, in which it is assumed that \( \rho' \) exists in the dimensions \( D_n \) symbolises with the addition of some more, separating it from \( D_n \):

Hypothesis 1: \( \rho' \) exists in a complex of dimensions with the \( n \) dimensions of \( D_n \) plus \( \omega \) numbers of dimensions, \( \omega \in N, \omega>0 \).

Definition of \( D' \): \( D' = df \) The complex of dimensions that \( \rho' \) belongs to.

Theorem 17: \( D_n \in D' \).

12. New laws

\( \Lambda \) does not apply in \( X_0 \). In spite of that \( \rho' \) is caused for \( X_0 \) (in \( X'_0 \)). With this, one could say that \( \Lambda' \) determines \( \rho' \). The specific law that applies in \( X_0' \) can be called \( \lambda'_1 \). Also \( \pi \) did not cause \( \rho' \). The cause of \( \rho' \) can be called \( \pi' \).

Definition of \( \pi' \): \( \pi' = df \) The cause of \( \rho' \).

Definition of \( \lambda'_1 \): \( \lambda'_1 = df \) The law that the cause of \( \rho' \) belongs to.
13. The cause of \( \rho' \)

Since \( \rho' \) does not belong to \( D_n \), it cannot exist in \( X_0 \). Therefore there are two points to be considered though they are connected. For the pair of points \( X_0'X_0' \) holds:

\[ \#1 \{ \sigma, \neg \rho, \rho', \pi \} \]

\( \sigma \) and \( \pi \) on the other hand cannot belong to \( X_0' \), since they belong to \( D_n \).

In \( X_0' \) there is \( \rho' \). According to axiom 4 in \( X_0' \) there also has to be more elements. Axiom 4 states that the cause and condition of effect have to be found in the point of effect. Therefore cause and condition of effect is part of \#1. Since only \( \neg \rho \) is not occupied as an element of relation it has the quality of the two missing elements of \( X_0' \). Thus \( \neg \rho \) is part of \( X_0' \). For not violating logical rules of dimensions, namely that what is part of \( D_n \) cannot be identical to that which is part of \( D' \neq D_n \), \( \neg \rho \) in \( D_n \) is not identical to that of \( D' \). \( \neg \rho \) in \( X_0' \) can be called \( \neg \rho \) (“denied” \( \rho \)).

14. \( \neg \rho \) as a set

Because \( \pi' \) and \( \neg \rho \) are elements, not for instance numbers, the relation between the two can be formulated as a relation between sets. Then the one is an element of the other. Since \( \pi' \) definitely is one:

\[ \text{Definition of } \neg \rho: \neg \rho = \text{df The representation of } \neg \rho \text{ in } X_0' \]

\[ \text{Theorem 18: In } X_0' \text{ } \neg \rho \text{ is cause and condition of } \rho'. \]

\[ \text{Theorem 19: (Not part of this compilation).} \]

\[ \text{Theorem 20: } \sigma' \in \neg \rho \]

\[ \text{Theorem 21: } \pi' \in \neg \rho \]

\[ \text{Definition of } \sigma': \sigma' = \text{df What fulfils the relations } \sigma \in \text{ in } X_0' \]

Therefore:

\[ X_0: \{ \sigma, \neg \rho, \pi \} \]

\[ X_0': \{ \sigma', \rho', \pi' \} \]
Finally a theorem that sums up some aspects of the theory so far:

**Theorem 28:** If $\Lambda$ is not defined in a point $X_0 \{\sigma, \neg\rho, \rho', \pi\}$ is true.

15. The concept $\Theta$

If $\Lambda$ is not defined in a point $X_0$ belonging to $D_n$, $P$ for $X_0$ is shifted to $D'$, a complex of dimensions separated from $D_n$. $P$ in $D'$ is called $\rho'$. This implicates an existence of something with association to $\neg\rho$, $\neg\rho$. The cause of $\rho'$, $\pi'$, in turn, belongs to $\neg\rho$.

For $X_0 - X_0'$ holds according to theorem 28: $\{\sigma, \neg\rho, \rho', \pi\}$. In a point $X_1$, separated from $X_0'$, and belonging to $D'$, the case is: $\{\sigma, \pi, \rho\}$, that is, $\theta$. Between $D_n$ and $D'$ $\{\sigma, \neg\rho, \rho', \pi\}$ is true, a state of facts below symbolised $\Theta$.

**Definition of $\Theta$:** $\Theta = df \{\sigma, \neg\rho, \rho', \pi\}$.

That $\Theta$ can be true is the result of the present study.

16. Axiom(s) of existence

**Axiom of existence 1:** There is at least one point for which $\Theta$ is true.
17. Conclusion

Given this extraction something exists in two separate sets of dimensions. Extrapolating this finding we have a new perspective on quantum entanglement (Bub 2020). If a set of quantum particles pair wise are joined by what has been labelled “Θ:s” they would be entangled. It would also be interesting to investigate “interfaces” between separate sets of things (Gamper 2017) using the concept of “Θ”.

References