Field Effects in a Theoretical Research

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Abstract

A field effect is a disruption of perception and interpretation of an object, a phenomenon, or a mathematical model. Field effects depend on the psyche of the observer, on its knowledge of the issue, and on the surroundings. They can lead to errors and misunderstandings.

The Primary Effect of Field

The perceptual illusion, or primary effect of field, was theorized by the Swiss psychologist Jean Piaget (1896-1980).

Example: A perception disrupted by its surroundings is a generalization of the Latin concept of *lusus naturae*, a trick played by nature:

Example: The aphorism *time goes by* assumes that *time* has a velocity, which would have to be expressed relative to time; but talking about the velocity of *time* relative to *time* would be circular, so the idea that *time goes by* is also untenable.

Example: *Time passing* at different rates, depending on whether the activity performed is enjoyable or not: the heterochrony is caused by a primary effect of field.

Example: Heterotopy or space alteration: a circle inside a larger circle looks smaller than the same circle inside a smaller circle. Perspective, claustrophobia, acrophobia, and vertigo are all caused by field effects.

Example: Metaphors associated with *time*, including the *arrow of time* [3], as well as descriptions of *time* which are based on spatial concepts, are led by primary effects of field.

Example: It is also primary effects of field that make some believe that mathematics exists in nature. The objects of pseudo-mathematical form, like waves or honeycombs, are called *naturalia*. *Naturalis*, which means *natural part* is used by the polygraph Cornelius Celsus (c.14 BC- c.50 AD).

Example: Judging ancient cultures with our current models is likely to produce primary effects of field.

I have introduced two more precise developments of the concept of field effect: the technical effect of field and the model effect of field.

The Technical Effect of Field

The observation of certain phenomena frequently leads to misinterpretations; reality can mislead the observer:

Example: The flow of a river brings to mind the irreversible passage of *time*, but the comparison is inappropriate: we know why the water is flowing, and if the flow were to reverse, we could explain why.

Example: Back in the days of steam, trains were never late, and as they crossed the countryside, people could deduce the *hour*; but these trains did not produce *time*. All rhythms encountered in nature or produced by

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artifacts are similar to those of passing trains: assimilation to a physical temporality is caused by technical effects of field.

Example: A particle going back along its trajectory is considered to be going back in time. However, we don’t know the nature of time; going back in time means nothing, and provides no information about the particle. In addition, the interaction of the particle with the rest of the Universe is always evolving, because between the outward and the return journey of the particle, the state of the Universe has changed, so the state of the particle has also changed: although the particle comes back through the same places, it does not return to its previous infinitesimal states: so the idea of going back in time is the result of a technical effect of field.

These interpretations go beyond reality; they are inappropriate. More seriously, not only do they not enrich knowledge, but they mislead everyone, when it is claimed that one can go back in history and bring the past to life. This is a fantasy.

Example: Faraday waves: this formation of sand waves (naturalia) is caused by the mechanical action of wind (Saharan dunes), the action of water (continental shelves), or the action of vehicles on tracks (similar to corrugated iron sheets). The sand seems to possess a wave structure, but it is not a wave. The same sand discharged by a quarry conveyor belt or flowing in an hourglass spontaneously adopts a cone shape, but the sand/Earth gravitational interaction does not give any potentially conical character to the sand. The sand is neither a wave system, nor a conical system; it has no particular spatiality.

Example: The Möbius strip is a three-dimensional object which has a single surface: it is a geometrical paradox only if the surface of the edge is neglected; but this would be a technical effect of field, because there is no strip without thickness. In fact, every strip have only one surface, consisting of the two main surfaces, and the edges which connect them.

Example: During a race, a technical effect of field makes that we think we are measuring time (Figure 1). Contrary to everyday language, time can’t be measured because it’s a concept; in fact we read what the stopwatch does simultaneously: the result is called duration of the race.

The Model Effect of Field

Dynamic phenomena are modeled using mathematical equations in which the presence of time suggests that it has an active role, which is wrong. A mathematical model can also suggest incorrect interpretations or interpretations that go beyond reality. There is a confusion between reality and model: the model misleads the theorist:

Figure 1: Time and Speed

Example: An entomological dating protocol: by evaluating the stage of development of fly larvae collected on a cadaver, forensic medicine of the police can determine the date of death:

Development of larvae (observed) ⇒ date of death (concept)

It would be a technical effect of field if this protocol was considered a measurement of time.

Example: The etiology of aging proves that aging is not caused by time, but by genetic inheritance, exogenous factors such as environment and way of life, and potentiation of both factors.

Example: The equation describing the space traversed by a train: Distance travelled = speed of the train x duration of the travel

The speed is the dynamic feature of the movement; if the speed is zero, the distance travelled by the train is zero. The duration does not play any active role on the movement of the train, because the duration is just what is indicated by the clock at the railway station.

Example: The wave/particle duality relates models, not realities. A neutron is not a dual system; strictly speaking, it is neither a particle, nor a wave, nor a wave package. However, a neutron is able to act either as a particle or as a wave, according to experimental circumstances. Particle and wave are associated models, which are intended to be used for evaluations and predictions.

Every particle is composite (not elementary), identified by a whole range of parameters which make it something very different from a simple grain of matter or a simple grain of energy, or a simple wave: mass, electric charge, speed, angular momentum, energy, spin,
strangeness, lifetime, collision cross-section, and so on. And to this one must add the enormous complexity of its internal structure and its specific interactions with matter, fields, and the rest of the Universe.

Example: The action is mathematically defined as the result of energy multiplied by time: a system exposed to a certain energy for a certain duration is subjected to an action given by:

\[
Action = \text{energy} \times \text{duration}
\]

The more the duration is extended, the greater the action. However, the active feature of the action is the energy, not the duration, which is only the indication on the laboratory clock, e.g., the exposure of a film to light.

Example: We have the same risk of model effect of field with the equivalence of mass and energy which was predicted by special relativity: \(\Delta E = c^2 \Delta m\)

This relation is confirmed in the strong nuclear interaction: the mass of the atomic nucleus is less than the sum of the masses of its nucleons. The missing mass \(\Delta m\) is hidden in the form of a binding energy \(\Delta E\) between the nucleons, and this energy is released during the process of disintegration of the atom.

Mass and energy are said to be equivalent because they are proportional; but they are not identical, because the properties of matter and the properties of energy are radically different.

**About Physical Laws**

A modeling is an arrangement with physical reality, but not a substitute for it. However, it allows a description, a quantification, an evaluation, and a certain prediction. Observation, experiment, the replication of findings, and mathematical models of physics lead to the formulation of laws which depend on the concepts and models used; they depend on the progress of research and progress of thinking in general. A physical law is not discovered in nature, but follows from a construction of the mind:

This provides grounds for making the following observations:

a) The accuracy of laws is not absolute; they do their best (*sic pro optima*), but they inevitably convey inaccuracies.

b) Physical laws are not immutable. For Einstein [4], laws are only temporary solutions to our conceptions of reality [4]. Concepts and models evolve independently of time; this evolution leads to changing laws. However, this does not cast shadow upon the genius of their initiators; to claim a century later that Einstein, Darwin, or Freud were mistaken is an anachronism.

For these reasons, neither nature nor the Universe obeys our laws; they are not compelled to abide by our laws; they do not operate ex lege, which means according to the law (in Cicero). Our physical laws provide certain descriptions and they make some predictions possible, but they do not prescribe anything. The main feature of our physical laws is that they provide a temporary description rather than a permanent imperative.

Expressions such as laws of the Universe and laws of nature (lex naturae, in Cicero) are survivors from ancient divinations of Nature, which were considered superstitions by Lucretius [5]. These expressions are examples of epistemic immoderation which should be excluded from scientific semantics and replaced by more circumstantial expressions, such as laws of biology, laws of astronomy, laws of thermodynamics, laws of physics, or physical laws.

Repeated train or aircraft crashes often make people conjecture some law about series of accidents, but this is a mistake, because the essence of a law is to predict, while these events are not predictable. The economic cycle is not a law of economics, because collapse is unpredictable. Moreover, economists and politicians are unable to predict crises; they do not even agree among themselves about how to find a way out of a crisis.

The principle of Roman law, *lex imperat* (the law dictates), is not true in physics; so the ambition to circumscribe the Universe (*totum, the whole, the totality*) with a corpus of immutable laws within a final theory is utopic (i.e., in no place) and uchronic (i.e., never, at no time). Einstein gave up looking for a global picture of the Universe, explaining that he was not disavowing a principle, but applying a method [4]. More thorough observations, more accurate measurements, more advanced mathematical models, and new theories will lead to changing laws, to the rejection of some laws and the introduction of new laws. Some of the current laws will be done away.

**Conclusion**

With regard to what we call time and space, it seems that we are in the presence of an objective reality, despite the lack of answers to the fundamental questions discussed at length above: the brain is misled, deceived, abused, either by a technical effect, or by a model effect. Given that physics equations are models of reality, we
could not expect these equations to provide meaningful explanations of time and space. For that, we had to look elsewhere.

References
1. Springer Verlag (2017) This topic has been developed in The invention of time and space.


