



The Ultimate Argument Against Convergent Realism and Structural Realism: The Impasse Objection

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Outline

1. Attacked positions
2. The main argument for the attacked positions
3. The impasse objection
4. Result

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Attacked positions

- The argument to be presented is not relevant to all sub-positions of scientific realism; it does not concern
- Plain scientific realism which states that our best mature scientific theories are true with respect to the postulated theoretical entities and their properties
 - Entity realism in which manipulability is the main resource for claims to reality
 - All forms of structural realism that either bracket the general defense of realism or do not use the “structural continuity claim” in its defense

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Attacked positions (2)

The argument presented in this paper concerns

- Convergent scientific realism about entities (CSRE)
- All forms of structural realism (SR) that base their plausibility on the “structural continuity claim”
- Any form of realism about X that bases its plausibility on the continuous presence of X in a sequence of theories (e.g., X = properties)

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Convergent scientific realism about entities (CSRE)

CSRE consists of two core assumptions:

1. Accepted mature scientific theories are approximately true, which means in particular that the theoretical entities postulated by them really exist (e.g., electrons, quarks, fields, big bang, selection pressures, continental plates, etc.)
2. Scientific statements about the properties of these unobservable entities become more and more accurate in the course of scientific development

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CSRE (2)

The following assumption is optional, although it is part of the name “convergent scientific realism about entities”:

3. Scientific theories converge to a true theory in the course of scientific development

The argument to be presented is independent of whether or not assumption 3 is included

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Main arguments for CSRE

Since the 17th century, there is an undisputed successive improvement of scientific theories with respect to their empirical performance
This progress is interpreted in the sense of CSRE for the following two reasons:

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Main arguments for CSRE (cont.)

1. In most cases, theoretical objects introduced into modern science stay there (exceptions can be explained away); this may be called the “entity continuity claim”
2. The miracle argument: only CSRE explains why science achieves use-novel predictions
“use-novel predictions” of a theory: theoretical predictions of phenomena that were not used in the construction of the theory

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Structural realism (SR)

Historically, SR goes back to the early 20th century
More recent discussion begins in 1989 with a paper by John Worrall: “Structural Realism: The Best of Both Worlds?”
SR concedes a very common counter-argument against CSRE which denies the “entity continuity claim”: scientific revolutions drastically change entities
Entities are thus inappropriate candidates for a realist interpretation of scientific theories
Instead, SR proposes structures that are somehow more continuous through historical change of theories than entities

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SR (2)

SR comes in two variants (Holger Lyre, 2010):

- “French-Ladyman-type” approach: no defense of SR in general, but straightforward application to physics
Not further considered in this paper
- “Worrall-type” approach: defense of SR mainly by the “structural continuity claim” (Ioannis Votsis, 2011):
Later theories incorporate the mathematical structure of earlier theories as shown, for instance, by the limit relations between them
Thus, there is a historically stable *structural core* in physical theories which is interpreted as reflecting reality’s structure

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Difficulties with theory convergence to the truth

Theory convergence to a true theory (optional assumption 3) presupposes

1. A theory space which contains all approximately true theories (the true limit theory itself does not have to be within this space)
2. An appropriate metric on the theory space measuring the distance of a given theory from the true theory
3. A way to identify convergence of a sequence of theories of which only a finite number is known, and the limit theory is unknown

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Difficulties with theory convergence to the truth (2)

The easiest way out of these difficulties is to drop the assumption that the sequence of theories converges to the truth

Thus, in order to defend realism one may only use the “entity continuity claim” or the “structural continuity claim”, or any “X continuity claim”, respectively, without explicitly claiming convergence of the sequence of theories

Basic idea: What is stable through progressive scientific development qualifies as candidate for being real
This is an abductive argument

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The impasse objection

The impasse objection exploits the principal weakness of the abductive argument
It is directed against CSRE and Worrall-type SR, both with or without a convergence claim regarding the sequence of theories
Let a sequence of empirically progressive theories with "entity continuity", or "structural continuity", or "X continuity" be given
The things that survive the historical change, especially scientific revolutions, are the candidates for the realist interpretation (entities, structures, or Xs)

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The impasse objection (2)

Imagine now that the respective continuity in the sequence of theories is due to its convergence to a certain limit theory – this is *logically* possible (in spite of the difficulties mentioned regarding the convergence of theories)
The realist is forced to claim that the limit theory is at least approximately true (whether she is sympathetic with the existence of a limit theory is irrelevant)
However, it must be excluded that the limit theory is a *fundamentally false* theory that is capable of making *very accurate predictions* – this would be an impasse

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The impasse objection (3)

"Fundamentally false":
• for CSRE: some of the limit theory's theoretical entities are radically different from the real entities, i.e., some theoretical terms of the limit theory do not refer
• for SR: the limit theory's structure do not even approximately represent nature's true structure
"Very accurate predictions": imagine that the limit theory's predictions are correct with a relative accuracy of 10^{-100}
It seems that the existence of this kind of limit theory, i.e., this sort of impasse cannot be excluded
In this case, the existence of continuity in the sequence of theories does not justify their realistic interpretation

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Objection 1: the miracle argument

Following the miracle argument, it would be a miracle if the limit theory with a relative predictive accuracy of 10^{-100} was fundamentally false
Therefore, it is extremely likely that the limit theory is at least approximately true

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Objection 1 (cont.)

Counter-objection:
In its only possibly defensible form, the miracle argument states that theories that produce *use-novel predictions* may be interpreted realistically
We do not know whether the limit theory produces use-novel predictions; nothing of this sort follows from its properties
Therefore, the miracle argument does not help to establish that the limit theory is at least approximately true – it does not eliminate the impasse objection

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Objection 2: general skepticism

The impasse objection presents only a logical possibility and is not a serious argument; it derives from a fundamentally skeptical stance
Fundamental skepticism is always a logical possibility and cannot be refuted
However, fundamental skepticism is sterile and should be dismissed
Therefore, the impasse objection should be dismissed

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Objection 2 (cont.)

Counter-objection:

The impasse objection does not derive from fundamental skepticism

It has the form of an absolutely normal mathematical argument: If someone claims that some mathematical object o has property F , I can challenge this claim by demonstrating that o may have property non- F

o : converging sequence of theories

F : limit theory is at least approximately true

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Objection 3: burden of proof

It is not the (CSRE or SR) realist who has to show that the limit theory is at least approximately true

On the contrary, the opponent has to establish that the limit theory is not at least approximately true

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Objection 3 (cont.)

Counter-objection: The realist has to claim something more specific than the opponent, namely that the limit theory is at least approximately true, whereas the opponent only claims that it is either approximately true or radically false

The more specific claim must be argued

Example: I claim that the limit of some converging sequence is between 2 and 4, and you claim that the limit is 3

You must argue that the limit is 3

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Result

The core argument for both CSRE and SR is the continuity of some aspect (entities, structures, or Xs) in the historical sequence of theories

However, this continuity could be produced by a fundamentally false but empirically very accurate limit theory

Therefore, the continuity of some aspect in the historical sequence of theories is not a reliable sign of their representing something real, and does thus not support the respective realism

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