# How-possible explanations for impossibilities

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## Outline

1. How-possible explanations (HPEs)
2. The modal aspect of HPEs
3. How-possible explanations and impossible models
4. How-possible-like explanations (HPLEs)
5. Detaching explanation from modality?

An announcer broadcasting a baseball game from Victoria, B.C., said: “It’s a long fly ball to centre field, and it’s going to hit high up on the fence. The centre fielder’s back, he’s under it, he’s caught it, and the batter is out.” Listeners who knew the fence was twenty feet high couldn’t figure out how the fielder caught the ball. Spectators could have given them the unlikely explanation. *At the rear of centre field was a high platform for the scorekeeper. The centre fielder ran up the ladder and caught the ball twenty feet above the ground.*

## A distinct type of explanation

The last two sentences, Dray (1957) says, provide an "explanation" of sorts.

> I am not sure the label 'explanation' makes sense in this case in ordinary language, but Dray is free to adjust language as he pleases. More on this later.

Now, the *question* that this "explanation" addresses is not the usual why-question (*why-X?*). Rather, it is a how-question (*how-X?*).

This can be seen clearly when we consider that:

1. Potentially contextually salient why-questions (*why did the fielder caught the ball?*, etc.) have easily available answers (thus, they are not salient).
2. A certain how-question, namely *how did the fielder caught the ball?* is contextually salient.
3. The question is addressed and resolved by the given "explanation".

## How-possible explanations

The context makes a how-question salient because there is an *appearance of impossibility* to what happened. Center fielders do not usually catch the ball at twenty feet high. That it did, goes against our expectations.

In these cases we want to explain how something could have happened. We want to grasp how is it that the fact was even possible.

Accordingly, we will call these explanations *how-possible explanations* (HPEs).

## HPEs as partial explanations?

The main debate on HPEs is concerned with what is their status vis a vis why-based explanations.

A common thesis is that

**Partial** HPEs are partial explanations, that is, they are parts of potential explanations.

Complete explanations entail HPEs. Things had to happen in a certain way at least in part because they could happen in that way.

Dray himself says that this is misleading, because HPEs answer a distinct type of question. So HPEs are not just part of potential explanations (in Hempel's sense).

Still, the debate continues. Brandon (1990) argues que HPEs are not complete explanations. Cf. also Forber (2010), Pearson (2018), Verrault-Julien (2018), etc.

## Do models provide HPEs?

Some models are merely hypothetical. If some of these hypothetical models are able to represent possibilities, constructing them can show how something could have happened (hence, provide a potential HPE).

Weisberg (2013) says this is how we should understand Schelling's segregation model. The model show that segregation is possible even is there is no discrimination at a collective level or even if no individual has a salient bias (it shows that it is possible for segregation to appear when each individual has a small preference to have similar neighbors and tries to satisfy their preference).

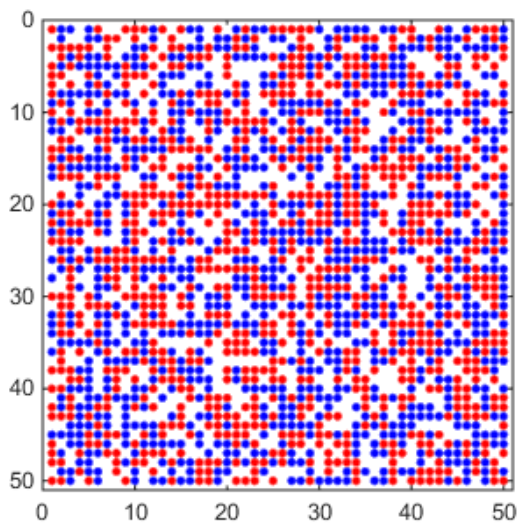
## Schelling's computational model of segregation

Different types of individuals are represented by different colors. Each individual has a location in a grid, and has the preference for at least $n\%$ of their neighbors to be of the same kind (in Schelling's model, $n = 30\%$).

From an initial distribution of individuals in the grid, the model proceeds sequentially:

1. Each individual $i$ checks if $n_i\%$ neighbors are of their same type.
2. If so, $i$ remains in place. Otherwise, they move to the first closest empty location available.

After a number of iterations, even from a random initial distribution, clusters of neighbors of the same type tend to form.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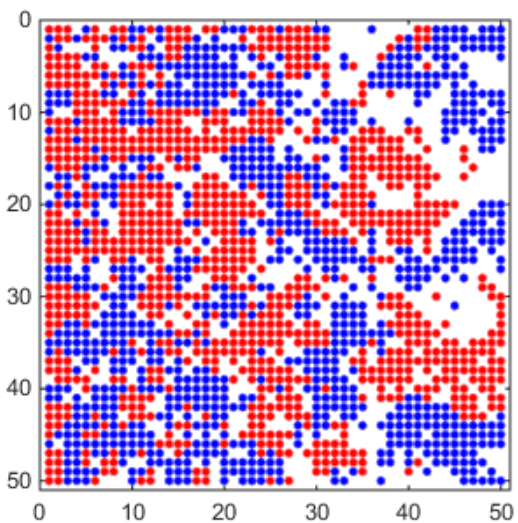
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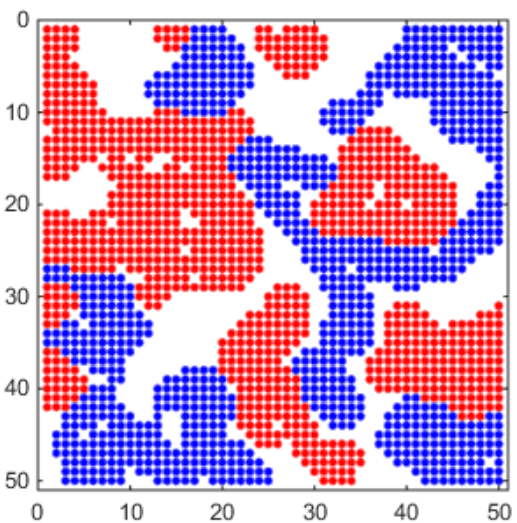
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## Schelling's model may not provide an HPE

Verrault-Julien (2018) raises the worry that Schelling's model does not answer to a need to explain a phenomenon that is taken to be impossible in any substantial sense (going back to Dray's characterization).

At most, we may initially think that it is implausible that segregation emerges from something that is not a strong discriminatory preference.

> I don't necessarily see this as a problem for the model providing HPEs. There could be a range of degrees of implausibility that could demand HPEs.

This points towards something important (cf. Brainard 2020):

how-possible *modelling* is not the same as how-possible *explaining*

## HPEs and how-actually explanations

Dray distinguishes HPEs from other explanations also in terms of the modal character of their content.

We can think of a class of explanations that rather than aiming at giving an account of how something is possible (like HPEs), aim at giving an account of how things *had* to happen. Call these *how-actually explanations* (HAEs), because they show how something actually happened.

In contexts where HPEs are salient, we do not seem* to require HAEs, even when available.

> Dray suggests that why-based explanations are HAEs. When we ask *why did X happen*, we want to know what "made" X to happen, where the "making"-relation involves some sort of necessitation.
>
> We do not need to assume that why-based explanations are HAEs in this sense, but the distinction between HPEs and HAEs will be useful to keep in mind.

## HPEs and 'just-so stories'

HPEs are similar to so-called 'just-so stories'.

A just-so story is a narrative that cannot be verified that tries to explain some phenomena.

Just-so stories give possible development courses for phenomena. But they can be problematic in ways that HPEs in general are not.

We do not even know why we are relatively hairless or why we walk on two legs, so finding the origin of religious belief is a tall order. Undaunted, Barash explores various ways in which religion might have been advantageous for early man, or a consequence of some other advantageous trait. It might, for example, have been a byproduct of our curiosity about the causes of natural phenomena, or of our desire for social connection. Or maybe religious beliefs and practices helped people coordinate with others and become less selfish, or less lonely and more fulfilled. Although he does not endorse any of these ideas—how could he, given that there's no possible way to know after all this time?—Barash concludes that it is "highly likely" that religion owes its origin to natural selection.

(from Anthony Gottlieb's review of David Barash's book *Homo Mysterious: Evolutionary Puzzles of Human Nature*)

## The modal status of genuine HPEs: a contextualist account

How should we distinguish between HPEs and other kinds of "explanations" in terms of their modal aspect?

Just-so stories impose too few restrictions on the relevant sphere of possibilities.

We can ask: "it could happen that way, but could it *actually*"?

'Actually', like most modal expressions, is context sensitive—it represents a restriction on the worlds that we are supposed to evaluate (namely, that they have to be linked in some particular contextually defined way to the actual worlds).

## … generalized

Let us generalize:

**Context** A putative explanation is an HPE in context C only if, given the criteria K fixed by C, it represents a K-possibility (a possibility that is at least compatible with criteria K).

These contextually defined criteria necessarily include some reference to the actual world. Just-so stories do not necessarily meet these criteria; otherwise, they do not differ from HPEs in their modal aspect.

Another upshot: some HAEs can be HPEs ('$w$ is how-actually $X$' is an answer to the how-possible question 'how could it be that X?').

This explains that in different contexts we are variably satisfied with certain HPEs.

## Verrault-Julien on HPEs' modal character

Verrault-Julien (2018) provides an alternative account.

According to him, HPEs provide information to the effect that *possibly, p because q*.

Like before, the sense of possibility in question varies with the context; this also allows them to distinguish between HPEs and just-so stories.

I think it is a mistake to require that the relation between the *explanandum* and *explanans* of HPEs to be the because-relation. What we are talking about is a building relation that involves possibilities and ways—the expression 'how-possible explanation' is misleading.

## A problem: impossible models

A problem with the idea that models provide HPEs is that some models are in some sense impossible (for example, models that embody idealizations that realized, would prevent them to be realized; cf. van Riel (2015)).

However, there is the common assumption that HPEs must be in some sense possible. If models are impossible, they cannot provide HPEs.

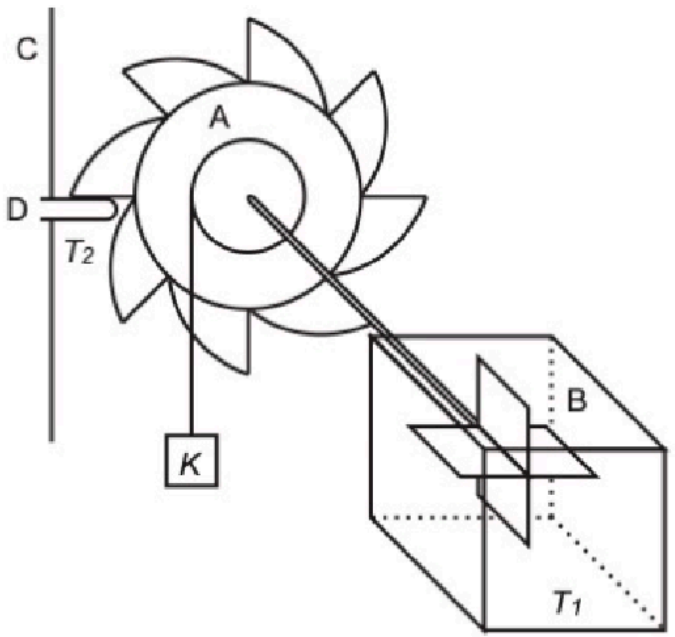


Figure 1: A Brownian ratchet, an apparent perpetual motion machine.

## Relative impossibility

We have to be careful with the sense of impossibility that we are dealing with.

A model can be impossible in some sense without being impossible in some other sense. If the impossibility comes from incompatibility with certain assumptions, we can often* obtain a sense of possibility by relaxing or omitting those assumptions.

We do not need to say that apparently impossible models are absolutely impossible. The problem seems to limit itself to the case of absolutely impossible models, and this is a special case that we care about only in a limited range of cases.

> However, we have to account for the practice of developing 'proof of concept' models, where the sense of possibility involved is very weak (we often do not know if what we are modelling is possible).

## What impossible models teach

Even if we do not reject the idea that the relevant models are impossible, we can accept that they can teach us something about what *is*, in fact, possible.

For example, someone could say that impossible models give us information about part of the phenomena, the limits of what is possible, or about the general restrictions under which phenomena occur.

This is a fairly common strategy: Nguyen (2020), Verrault-Julien (2018), Weisberg (2013) and Tan (2022), all adopt it. Here, Weisberg on the Voltka-Volterra model:

> While no real population can have long-term exponential population growth, the model may be a reasonable approximation of population growth in the short run. More importantly, there are several things that can be learned about real-world targets by studying this model… (Weisberg 2013, 125)

## A minor dispute

One implementation of this strategy (indeed, the strategy that Weisberg applies in the quote) consists in saying that while the model is impossible, it might have possible targets.

However, Weisberg himself argues that in some cases, models might have impossible targets (he offers perpetual motion models as an instance).

Verrault-Julien (2018) argues that we can extract something about actuality even in that case.

What worries me is that this suggests, by making the value of impossible models parasitic on what knowledge we might extract, that the only reason why one would want to model an impossible target is either ignorance or the possession of mistaken beliefs.

My hunch is that impossible targets can be pursued on their own terms, without making this parasitic on whatever knowledge of actuality this could provide (I will now, however, defend the claim that it is particularly valuable to do so, which I think is implausible).

## Generalizing HPEs

HPEs provide representations of ways in which something is possible.

Here, I take 'way'-talk seriously. In a world (a primary point of evaluation), there are ways in which something is made possible (ways are not just worlds at large). We get an explanation of something by grasping these ways.

Now, there is no real need to think that only possible worlds are inhabited by ways that make things true or false (other than to think that there are only possible worlds, which I will set aside).

So we could get how-possible-like explanations (HPLEs) about impossibilities that do not impose modal restrictions on explanations. HPEs would be a subset of HPLEs.

## Should we go in this direction?

A reason to assume that HPEs must be restricted to possibility is that when it comes to impossibilities, there is no obvious way to distinguish between genuine explanations from something that merely appears to be explanatory.

Something is impossible for a reason; something *makes it so*. What is the strength of this?

The traditional answer to this is that what makes something impossible makes the whole world (point of evaluation) impossible: logically, from a classical point of view, from a contradiction anything follows.

But then the availability of explanations depends on what is possible.

So we have reason to drop some of the assumptions that lead to this.

Explanation and modality could (and perhaps should) be taken as orthogonal matters.

## A technical problem

That is the wish, but how do we do this?

A lot depends on how we deal with impossibilities. A common way to treat them is to introduce some stock of impossible worlds and adjust the semantics of the language we are using to handle the cases we are interested in (Priest 2016 and Berto & Jago 2019 take this approach).

A problem with many versions of this is that the assignment of values to many classes of propositions at impossible worlds is given atomically (so, for example, in impossible world $n_1$, $p$ could be true, $\neg p$ could be true, and $\neg\neg p$ could be false). These worlds are *anarchic*.

This is in conflict with the idea that there could be explanations of what goes on at impossible worlds: the relations between facts (including explanatory relations) at impossible worlds are not modally robust.

So, against our desire, impossible worlds contain no answers to why or how questions.

## A way out?

Fine's (2021) approach to counterpossibles (the true consequent of counterpossibles are a function of the fusion of the states that compose the antecedents) might do a better job, but it also faces several issues. There is no good sense of how facts about arbitrary fusions of states ground explanatory relations.

What we really want are impossible worlds construed as violations of laws of different kinds (cf. Tanaka & Sandgren 2024), where those violations do not make worlds fully open (that is, where logical behavior is not entirely anarchic).

We also need worlds of this sort to deal with subject matter in counterpossibles. Saying that a counterpossible is about some X requires that certain facts about X can be kept stable.*

## The upshot

No matter how we do this, there would be a class of truths such that they would explain facts about impossibilities, which would ground both impossible models and potential how-possible-like explanations.*

Now, the explanatory potential of these HPLEs is limited. We do not usually make questions about what makes something impossible.

Except: when we are trying to account for hyperintensional phenomena. Then, the upshot is that accounting for HPLEs and counterpossibles is, at the root, the same problem. It remains open for now.

*fin*

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