Causation Doesn't Exist

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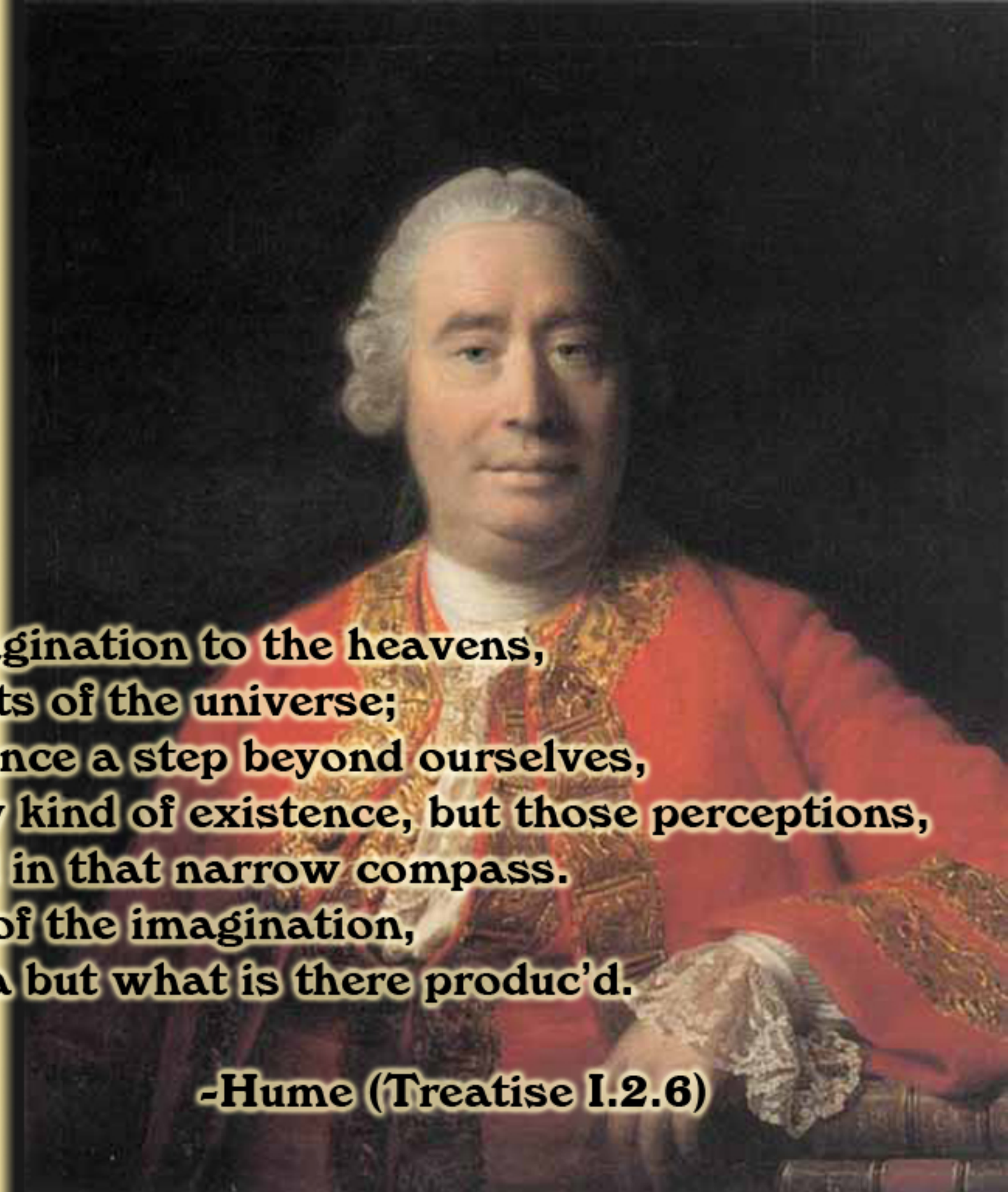


Let us chace our imagination to the heavens,
or to the utmost limits of the universe;
we never really advance a step beyond ourselves,
nor can conceive any kind of existence, but those perceptions,
which have appear'd in that narrow compass.
This is the universe of the imagination,
nor have we any idea but what is there produc'd.

-Hume (Treatise I.2.6)

Definitions and Core Concepts

Model: any categorically structured representation of "the world"

Domain: set of fundamental object types that may appear in the model and their possible attributes (including behavior rules) in conjunction with the possible aspects of the space involved.

Specification: set of token elements from the domain and is strongly related to my definition of …

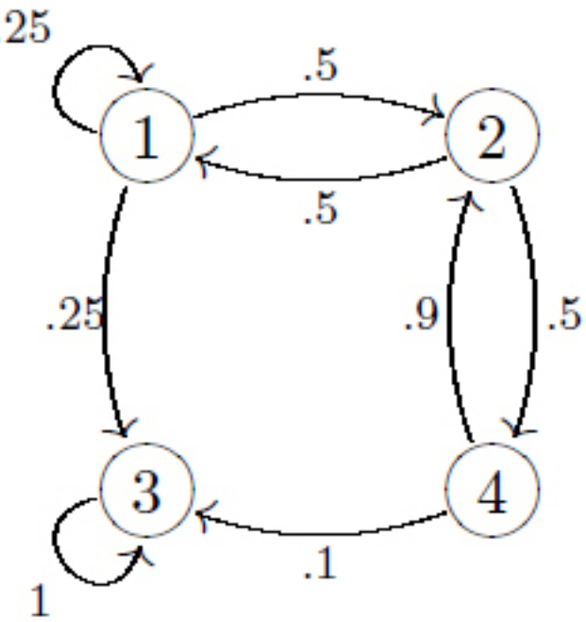
System: A fully specified and configured specification.

A *Markov model* is a graph (aka network diagram) in which each vertex (node) represents a complete specification of a single state of the system and a weighted directed edge (arrow) represents the probability of the system changing from the tail-end vertex to the head-end vertex (along the arrow).

	1	2	3	4
1	.25	.5	.25	0
2	.5	0	0	.5
3	0	0	1	0
4	0	.9	.1	0

Transition Matrix

Markov models represent the entire "space-time" of a specification but do not explicitly model processes: only their effects (i.e. the changing from one state to another).



Transition Diagram

So they are useful for tracking what the model will or can do, but not particularly useful for explaining or even describing why the changes happen.

To understand the processes that the elements of a model undergo a model needs to be able to capture dependencies, forces, relations, and all the other things indicated by the terms ‘laws’ and ‘causes’.

To do that, we
1) specify the relevant parts of the domain,
2) specify their relations,
3) specify the environmental factors, and
4) specify how the parts change (behavior)

These parts are referred to as *agents* and are (or at least ought to be) chosen from among the domain’s fundamental objects.

ABMs can represent the mereological relations among model components and between the components and their aggregates.

These are discussed because they are formal models with a representation that is closest to our mental models

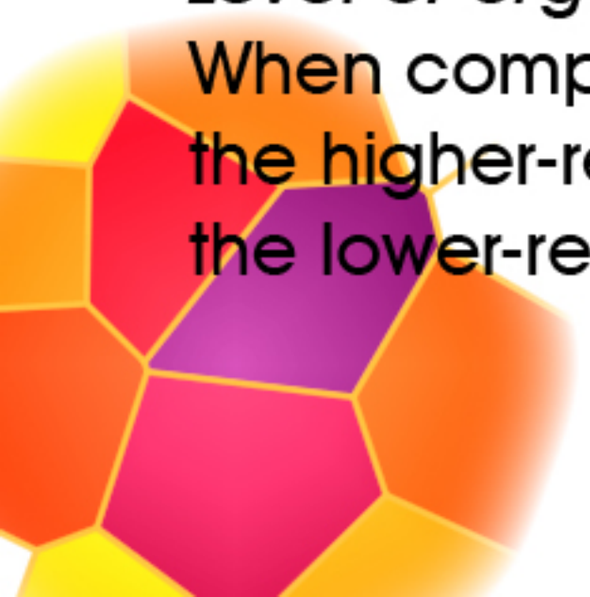
Definitions and Core Concepts

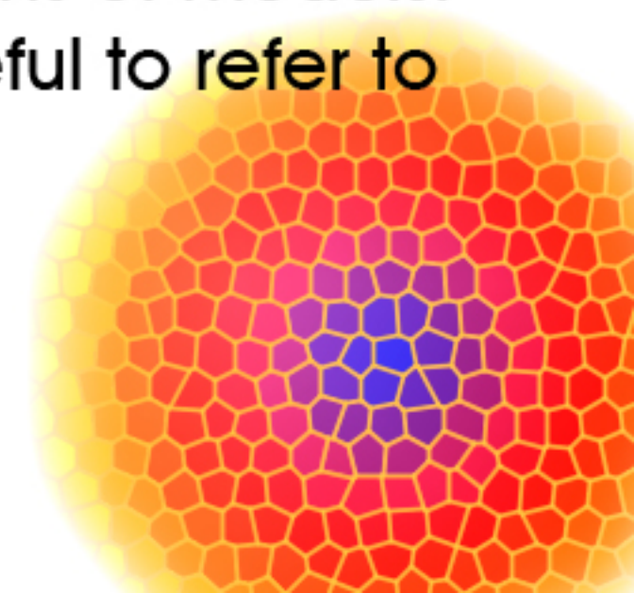
Patterns: aggregates of objects that exhibit a distinguishable attribute (such as coherent behavior or a higher-order property).

Scope (or *scale*): refers to both the set and the cardinality of the set of fundamental element tokens comprising the aggregate.

Resolution: the quotient of two scopes when modeling the same phenomenon.

Level of organization: refers to the varying resolutions of models. When comparing two levels of organization it is useful to refer to the higher-resolution level as the *microlevel* and the lower-resolution level as the *macrolevel*.





Definitions and Core Concepts

The information in a model can be compressed into a *description* (also called a *presentation*) in one of two kinds of ways:

Lossless compressions (or *lossless descriptions*): descriptions that preserve all the information in the system such that the original domain can be unambiguously recovered from the description.

Lossy compressions (or *lossy descriptions*): descriptions that fail to preserve all of the information in the domain.

Definitions and Core Concepts

The world sometimes changes in what we recognize as recurrent patterns. We can often describe these patterns as conditional statements. If the regularities are consistent enough then they may be accepted as *laws* in our folk models of the world.

Two distinct types of laws:

bridge laws: relate phenomena at different levels of organization or across different domains.

systemic laws: relate elements of systems.

Definitions and Core Concepts

Theories: a subclass of models that have the further qualities of (1) making sufficiently accurate predictions about "the world" and (2) purporting to provide an explanation of the phenomena.

Alternative refinements of 'explanation' that could distinguish between models with and without it is to (a) employ an empirical requirement on the observability of the states and laws or (b) tie it to causation.

Claim: the rules governing a model's behavior must track the causal apparatuses of the system and laws do this.

The obvious response is that the claim that laws track the causal apparatus seems to hinge on the accuracy of their predictions.

Physicalism and Reductionism

Principle of Reduction: descriptions at one level of organization can be translated into descriptions at a lower level of organization.

Bridge laws are reliable conditionals that state if X is the case at some level then Y is the case at some other level. Thus bridge relations, once discovered, are definitions of equivalence classes and hence are true in all possible worlds.

Bridge laws may not be symmetric. Bridge laws that "go down" are *reduction relations* and bridge laws that "go up" we call *emergence relations*.

We can see that reduction relations are (generally) one-to-many and emergence relations are one-to-one.

Physicalism and Reductionism

Physicalism: there exists a lowest level of organization which properly and accurately describes "the world" and that this level of organization is the domain of physics.

Reductionism: physicalism plus the requirement that "kinds" within the higher level are also kinds of foundational physics. The kinds include the entities, laws, behaviors, properties, states, events, relations, and anything else that one could include in a model.

It is conceivable for there to be a level of organization with
(1) a domain that is different enough from the domain of physics to be considered a different kind of science and also
(2) lower than the lowest level of physics.

Three Kinds of Plurality

Phenomenological plurality is that we, as humans, can naturally recognize and differentiate objects at different categorical levels.

Ontological plurality picks out the notion that there exists objects in multiple categorical levels, i.e. that parts and their wholes both exist "in the world" with the same ontological status.

Methodological plurality is the position that techniques for measuring and analyzing the world will naturally imply or require the existence of certain objects and relations and these differ for different techniques.

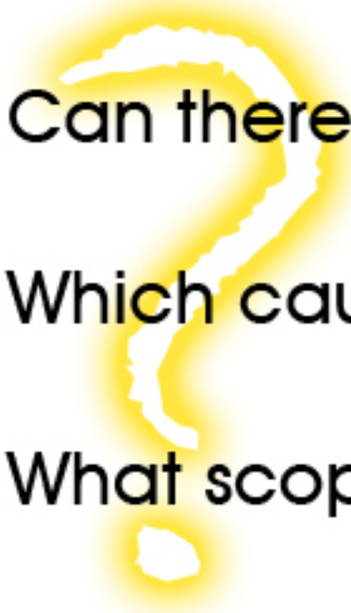
My thesis: phenomenological pluralism produces methodological pluralism within our folk theories which we confuse for ontological pluralism in the world.

The Case against Causation

Two concepts that share the name ‘cause’:

Singular causation: the former identifies particular actual precursor states of an instance (i.e. history).

Systemic causation: identifies all the possible precursor/successor relations for states.



Can there be multiple causes of a single event?

Which causal story is better?

What scope do causal descriptions need to have?

The Case against Causation

Using the current notion of causation...

Q: Can there be multiple causes of a single event?
A: Given any event, there is a description at each of multiple levels of organization.

Q: Which causal story is better?
A: Given two levels of description, the lower level is closer to being causally accurate.

Q: What scope do causal descriptions need to have?
A: Explanations at different levels include different scopes.

The Case against Causation

There may not be a lowest level!!!

If there is no lowest level then that leaves a few options:

1) there is no causation in the world

2) causation happens at each level

3) causation is theory-dependent or otherwise essentially subjective so that it can happen at any level but only one at a time.

I argue that (1) and (3), taken together, are the best option.

The Case against Causation

Reduction is Easier than Emergence.

Prediction Does Not Imply Understanding Causes (e.g. Kepler)

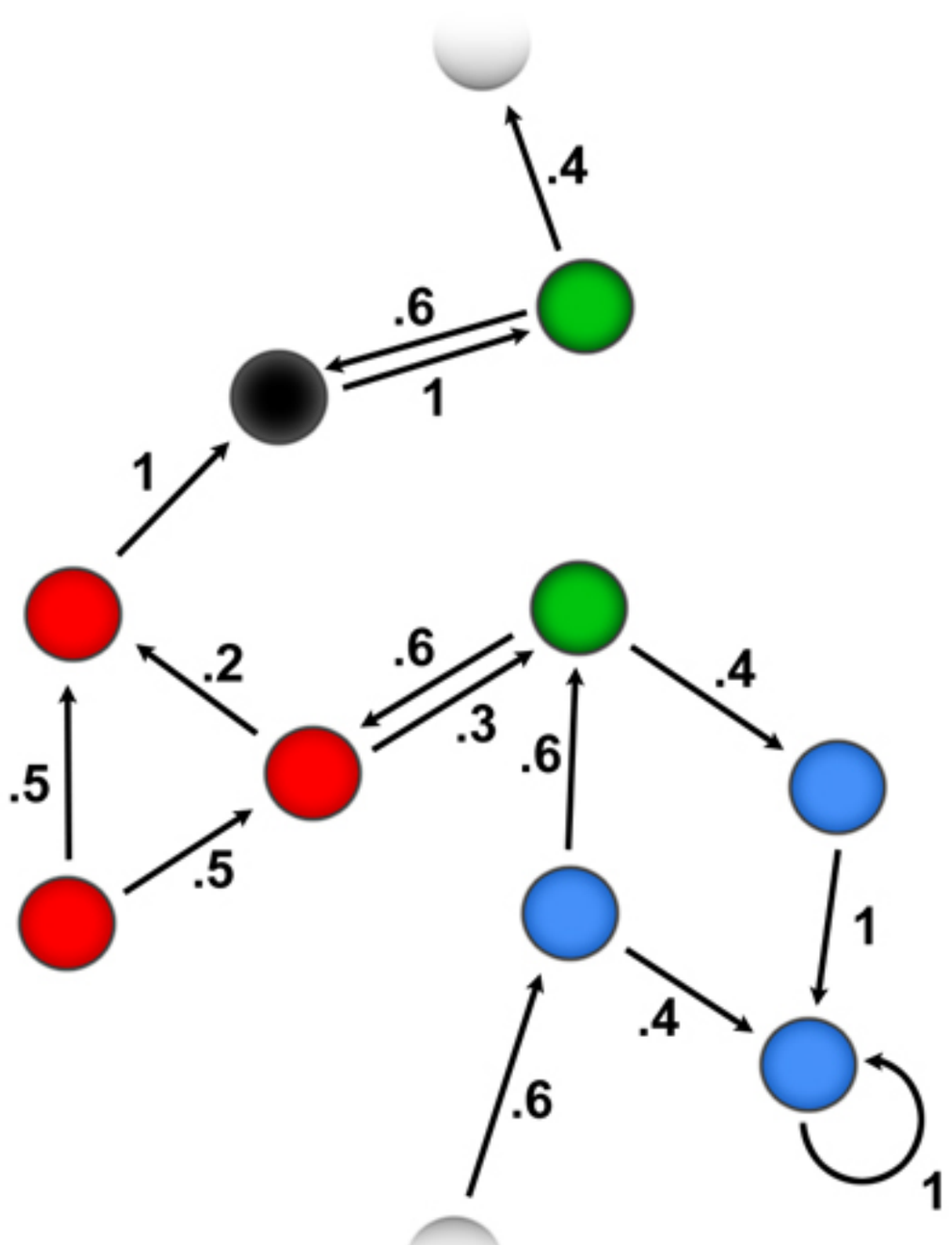
No Causes across Levels of Organization

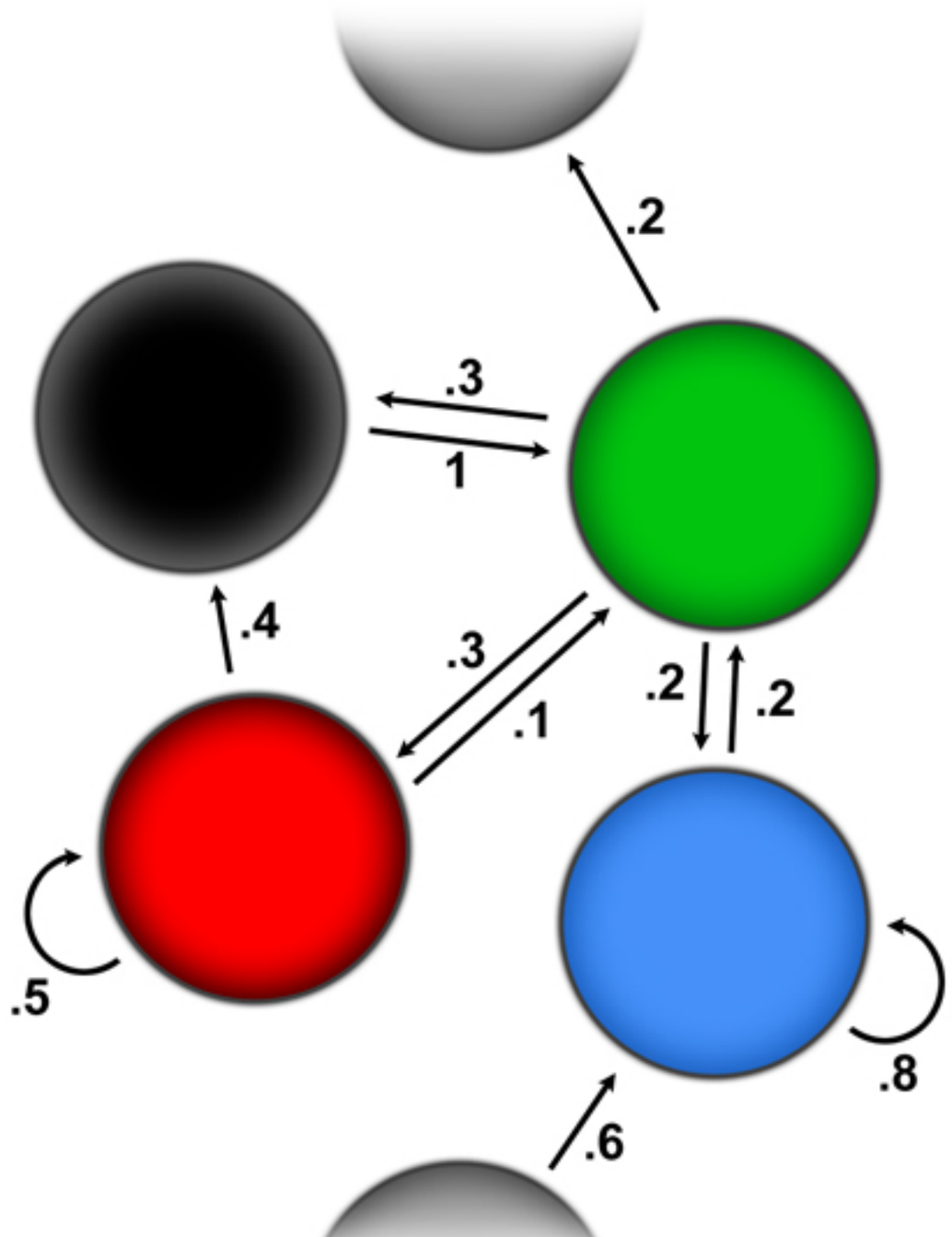
Some *Concepts* Cannot Be Reduced

Physics is a Special Science

The Case against Causation

Macrostates Supervene on Microstates





The Case against Causation

Since a state description in a Markov diagram includes a specification of all the aspects of a system at that point in time we can isolate those aspects that describe the properties of interest.

Then we can identify similarities and differences of states with respect to these aspects.

Revealed patterns in the relationships are precisely those relationships that can be encoded as causal laws.

A relation is considered *causal* if the degree to which the two sets of aspects are correlated is sufficiently high.

The Case against Causation

Q: What ought to be the bearer of causation?
events, properties, states, nothing, etc.

A: What element(s) of a model we chose to be a bearer of causation will be decided by the same pragmatic considerations that influence all the other decisions about model construction.

In consideration of the pragmatic justification for the inclusion of elements and relations in models this concept of causation can do most of the same work as the old one. But when we want to be careful (as scientists do) then having restrictions that keep the concept internally coherent and consistent with the other aspects of our conceptual apparatuses is an improvement.

The Bottom Line

It's people who observe the world's regularities,
encode them as laws, incorporate them into models,
and test the models' predictions against our perceptions.

The point here is the Humean point; all our thoughts supposedly about the world, including about causation in it, are all just in our minds.

Whether there is a physical world that makes our perceptions consistent or not is irrelevant, and it need be irrelevant to our concepts if we wish these concepts to be coherent and resting on a strong conceptual foundation. Causation is in our models and nobody is claiming that our models need be in (or about) any actual world.