Scientific Realism Arguments for and Against

Logical view of science vs. Ontological view of science

*Recap I*f we ask why a phenomena occurs the way it does, we use a general statement to say there is a regular pattern, and its explanation amounts to say that it is an instance

We explain a phenomena by fitting it into the pattern of regularity which is made of scientific laws

* Observation
* Regularity
* General Statement “if X then Y”
* Regularity expressed by the statement explains the observation

*Format of the inference*

If X the Y (under circumstances C)

A is an X

———

A will do Y

*Asking why according to the N-D model -What ND tells us*

* Theories are consistent and systematic structures of laws. So their explanatory power derives from the amount the empirically informative correlations provided by the law.
* Explanations: asking according to what general law such and such phenomenon has occurred

But we want an alternative picture of the explanation

*Asking why in an alternative picture*

* How an underlying mechanism, entity or microstructure (often unobservable) accounts for the occurrence of observable regular behaviours as described by general laws
* Asking why in science is to question how some entity is able to account for the occurrent regularities (without other explanations)
* Often we are not able to observe them, not because they are not observable even in principle (beyond that).
* This particular part of argument is taken on by Scientific Realism

*Alternative picture of science - Scientific Realism*

* First: What we mean by **REALISM**: view that there is an objective, real world, which exists independently of us. Furthermore it is a type of world that is knowable by us. This is also known as the common sense view of realism (the most used)
* Then we can talk about realism applied in science. In here we are not following the common sense realism, we are actually looking for a significant contrast between what is real and what we believe to be real.
* They are trying to figure out how we can well argue vis-à-vis the existence of this explanatory level of reality

*Eddington’s two tables*

* No. 1 is the table Eddington has gotten used to (belongs to the world that spontaneously appears when I open my eyes)
* No. 2 is a new table that is pretty different from the first. It is part of another world and it represents emptiness.
* The second scientific table is the only one which is really there (wherever “there” may be) while the first is part of my mental imaginary
* World of common sense vs World of science: are both tables real? This is a question often raised by philosophers (like Locke, who made precisely this distinction… primary and secondary qualities)

**A philosophical distinction: primary and secondary qualities - Locke**

1. Solidity, Figure, Extension, Motion They are **real properties** of physical objects
2. Colour, Taste, Smell They are merely the **effects of such real properties on the mind**  They exist as a consequence of the existence of primary qualities

*Ingredients of realism - Distinguish what is real as an appearance and what is real.*

There is a gap that is not an unbridgeable gap, we can go what is behind appearance. In any type of realism there are two ingredients:

* **Ontological Ingredient** (there is a world existing independently of us) i.e. Hume
* **Epistemological Ingredient** (there is a world which can be known by us)

*Split-Realists*

Not all realist are realist about the same ingredients (they can be realist vis-a-vis the former ingredient and not about the second) - E.g. Locke believed the existence of primary qualities but he was not sure science could give any true knowledge of those qualities.

Even trickier when we take the same idea and try to look from the POV of reality itself. Are we ready to claim that something exists only if we can observe it? Or does it exist more to the universe than we can observe?

*Realism in Science*

* Not simply amounts to… There is a world which exists independently from us
* But also…(and more specifically) This independent world is also unobservable by us (beyond our capacity of observing), though it is a world we have means (theories, tools, experiments, tests, laws…) to gain access to. It is important because that is what the world consists of.

Electrons is beyond human capacity of observing but we would still believe their existence.

**Arguments used to justify the existence of a world that cannot be observed**

How can we believe that something we cannot observe actually exists?

1. Are we willing to believe in what we can observe not via the unaided eye but **via instruments** (e.g. molecules)? First Distinction: - Things which can be observed relatively to us (not directly observable). - Those which cannot be observed at all  Some accept the first and not the second. Accepting the existence of a star (1) and not the one of electrons (2)

* Are we willing to believe in the existence of what we cannot observe at all (with or without instruments)?  - Things unobservable in principle.

*Do Plate Tectonics exist?*

1. They make up the inner constitutions of the earth (which cannot be observed), they were conjectures about a whole series of phenomena happening on the surface of the earth (which is observable)
2. Should we rule out completely the possibility of their existence even if they seem to explain a pretty neat explanation of what happen?
3. Implication behind this idea: our theories are not only able to conjecture the way things are and sometimes they might be right about the way the world actually is (not right in itself)
4. However, What do they rely on to convince us that what they describe exist? What do we expect from our theories and what do they require to be one step ahead?
5. Do we need theories in order to explain these mechanisms? Are there any other theories that are able to describe something beyond human comprehension?

**Realism about theories vs Realism about entities - I. Hacking**

There can be a realism about theories, but also a realism about the entities themselves without using a theory to include them?

First of all we need to clarify what: Meanings of real/existent

* Materialism: everything is built up out of tiny materials building blocks (electrons, can be real …) Taking this rule would rule out things we cannot count, i.e. lines of force (traces followed by electrical magnetic forces in electrical magnetic fields)
* Causalism: postulated entities have causal powers which produce effects at the observational level. They have powers to produce effects at the observable level. If we embrace this, we can bypass the problem of faith in theories.  Some scientific elements cannot be observed, by they have the power to bring about other events that we can observe, we can observe this by an experiment that let us see this.

*If I can spray them, they are real*

* The general idea, We can use events of one kind to be produce events of other kinds and they are the evidence that i.e. electrons exist
* The advantage is we do not need a theory, because it might describe them wrongly. Is it not again quite restrictive?

*Restrictive view?*

* Why would we admit as being real only those entities which we can manipulate, that is only entities which can be connected with our measurements and experimental apparata?
* And what about all those entities which astrophysicists, palaeontologists and geologists talk about? They are beyond human capacities of observations
* If we want to include them, we are back to theories, we have to find a way to justify that theories are getting it right. We need to find theories that can explain what is really real in our world. But if we believe this, we should prepare to say that some of them are true? (this might be problematic)

**Are there “true theories”?**

We need to find a good argument to justify their truth (in the scientific realist sense)

True for a scientific realist:

A theory is true if it represents the world as it really is, and the way the world really goes beyond what we observe empirically

* Strong claim of truth. Can they be true in this much stronger sense?
* If we say they are true, we immediately think they are literally true and correspond completely to what is out there.
* *Literally true*
* True Theories correspond to the world

What is the meaning of “correspondence”?

It is a quite difficult to account for. Theories are languistical contract while the world is much more, how they correspond?

It is a bit dodgy to follow up. Well, we can be happy enough with saying they are approximately true

* *Approximately True*
* A theory is **not definitive** about the entities which it still allowed to bring out. Back to what Hacking said, we might have a partial or incorrect description of our entities and these entities might still find way to push up their existence.
* No real centrality to theories. Theories get sideline here, because they are not central
* Only entities postulated by theories

So what about trying to take a different strategy together? Do we have a measure for the truth of a theory?

*Measuring truth - How do we measure the truth?*

* Predictions —> Theories are True = Good Predictions It was actually a bad move throughout science
* Explanatory success —> T.T. = if it has afforded explanation that have been successful during a long period of time. But success is a pragmatic method, plus we need to define the meaning of “long period of time” and many other problems raise.

Disputable measures

*Outcome of discussion:*

1. Truth of theories: over-demanding criterion
2. Reality of entities (independently of the way theories represent them): restrictive criterion

A strong temptation is to go all the other way…

…Perhaps…There are no such things as “electrons” - Anti-Realism

* Electrons are fictions, they are invented. Of course there are phenomena of electricity, but we construct these little figures only for comodity.
* Theories about them are just tool for thinking, they are aids for the scientits. They might be predictive even, but never explanatory or true.

*Realism/Anti-Realism Debates*

They are either Real/Discovery or Constructed/Invention (Origin of the debate). Either they discovered or they invented, theories cannot do both.

Balance in this debate, what we can retain from the anti-realist view that might be useful even for scientific realist. A middle way to make use of ideas from both sides

One particular category of anti-realist: Social Constructivists Reconstruct the Constructivist Argument:

**Constructivist Argument [Mixture of Hacking and Kukla] - Format of C-Argument**

* (An object) X, or X as it is at present, is not determined by the nature of things
* X is the product of intentional human activity
* Human activity, although necessary for the existence of X, is not itself necessary

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* X need not have existed, or need not be at all as it is (the non-inevitability of intentional human activity is responsible for the non-inevitability/eitherwise of X).  Non-inevitability, is not inevitable if it is the way it is.

We are told that if x is constructed, x is what it is because x is the product of a contingent activity (human activity which is not necessary), rather than being as it is because it is determined by an objectively existing state of affairs determined by nature of things.

What we need to add at this point: although the first assumption is a necessary condition for the truth value of Xs constructed, the assumption itself is not sufficient to say x is not determined by the nature of things in order to conclude the truth of X is constructed.

We need to specify something extra: for x to be non-inevitable or constructed, we should admit for example that, say a scientist is able to make a whole series of different choices following one theory or another (one path or another).

We need to specify what is said in the second assumption: the constructiveness/ non-inevitability of x is due to the fact that x is specifically the effect of the product of intentional human activity.

We are assuming that it is our theories, actions, enquiries and our history which make x what it is. It has nothing to do with the nature of things of a given world, but these actions…they all make x exist the way it does; although they necessary for the existence of x, they are not themselves necessary (we can follow different theories).

Ultimately, it is the non inevitability of intentional human activity that is responsible for the non-inevitability of x. There is no determination between a given state of affairs and the existence of a certain X. X exists because we make it exist, and the fact we make it exist the way it does, shows us that our X can be either wise since we can follow the different paths.

This argument can be interpreted at different levels…

*Levels of interpretation of the C- Argument*

* **Metaphysical level**: This arguments works at the level of the facts of the world we live in This arguments works
* **Epistemological level**: The level of what we can know of those facts (our knowledge)
* **Semantic Level**: The level of what can be said about those facts and about what we know about them (linguistic apparatus)

“X is constructed” = X depends on human actions - What is the X we are referring to?

*When we say that “X is constructed” we might mean:*

* X is the Object (something in the world) [General Sense: something that is in the world]
* X is an Idea (a conception, a belief, a theory, a classification or a kind)

**Depending of what we think of X we have different interpretations**:

* *Strong Interpretation [goes with the first level]* because by saying that X is constructed and X is the object, we are saying there is nothing above and beyond the very construction of this object.
* Weaker Interpretation
* X is the idea (we construct the idea, not the object). X is the nothing but the idea we construct of of the object
* The other idea is that reality itself is constructed.
* The idea is constructed; X is an idea and it is the idea that is constructed and not the object. We can say that X is in the world and then we construct an idea to talk about the object.
* X is the idea because the object keeps existing in the world and the world cannot be constructed (what we construct it’s our classifications…)

In both cases we can argue that X is an idea, but in the former sense we are saying this in a much stronger sense: X is an idea because there are more objects vis-a-vis the idea. All we have is the idea that we have constructed of something: e.g. we construct the idea of electron and there is no electron outside our idea (we can say electrons are fiction, nothing exists beyond that idea of electron).

In the second interpretation, the weaker interpretation, X is again an idea but in a weaker sense because we can make a distinction between the objects that are outside and the ideas of those objects that are what we actually constructed. Here X is the idea, because the object keeps on existing in the world and the world cannot be constructed; what we construct is our ideas. Saying “X is the idea” has different consequences depending on what route we take (stronger or weaker).

Looking at these possible interpretations we come to realise how a constructivist argument might be perceived as a real threat to the objectivity of science:

* First Interpretation: What we take to be real is actually “only a construction” (a way of looking at the world via our ideas). What we take to be real is actually only an idea of real, from here we can say reality is fiction etc… We might hesitate…

 The first interpretation has at least one merit:  It makes us reflect on the fact that the world of objects (that science refers to) is not simply given to us (ready to be discovered as such), the objects questioned by science somehow are always at least partially constructed, we look at these object via our views etc…

By saying this, we should not follow the constructivist all the way, if that’s the case then the object constructed in this way are not real. All we can say perhaps, in a more prudent way, is that their reality can be argued for via constructing ways to get access to these object; therefore constructing ideas for these objects.

It is a charitable way to look at this constructivist argument. If we instead look at the first season of debates (constructivist vs realists) there is a conciliatory view that is not part of the picture. Scientific objects of enquiry are either discovered or totally invented (why? Because they do not exist or at least this is what the constructivist argument tells us)

**Hacking** is important here for some reasons:  He tells us we should not confuse objects and ideas of objects within the constructivist part and, as a consequence of this, claiming that objects in science can be at the same time real and invented, and at the same time formulate this without contradictions.

So in a sense Hacking opened up the debated to a more profitable season, trying to see what we can retain from the constructivist ideas and make use of this idea within an argument that doesn’t bypass the possibility of reality for the objects.

* Object always partly constructed by our theories (not just given in the world, and ready to be discovered)

Let’s take a different view along the same path of Hacking:

- We balance the divide between real and constructed that did so much damage within this context

Both invented and real - **Daston**’s **“applied metaphysics” view**

What does she mean?

The world of science is not a static reservoir of given objects (constructivist idea), it’s a very dynamic world made up of objects that can become objects of enquiry for a science depending on scientists’ interests, techniques etc.. This is how the object of the world make and entrance in the world of science. This does not mean scientific objects are entirely a creation of the scientist and therefore that they are not real.

*For her infact: Reality is a matter of degrees*

* Phenomena become more or less real depending on how much and how deeply they are embedded with scientific practice.

*Preternatural Philosophy - Daston’s example*

* It is the type of philosophy practiced before natural philosophy (before Galileo, Newton). It thinks at Preternato Objects (beyond nature), they are natural and yet they are fairly irregular and extraordinary objects (they deviate from the norm)
* They impose themselves at the attention of the scientist and became scientific objects of investigation. Later when Preternatural Philosophy was replaced by Natural Philosophy, all these objects ceased to be scientific objects and nobody cared about. But these objects stayed exactly where they were, they just gave away their reality as scientific objects.
* How can we claim that vis-a-vis objects of that sort, have a counterpart that stays there even if the scientific view changes completely? Ex: if electrons are not “electrons" anymore.

For Daston there is no different between objects of any science, they all belong in this metaphysics and they are all partly real and partly constructed.

There is no doubt the debate between Realists and Constructivists becomes harsh when what is astray is the constructive part of natural objects

*Many objects - One Metaphysics*

Any difference between natural and social objects?

**Socially constructed and social objects** - Kukla

* “It’s almost universally believed that certain social facts are what they are by virtue of our own actions, beliefs and intentions”

**Socially constructed natural objects (?)**

The story is different with natural facts. It is difficult to claim that the fact that science deals with are entirely a human product, our intuitions almost go against this. There are a number of reasons why the idea that socially constructed natural facts is harder to accept than that of constructed social facts:

* **Role of human agency**, which is predominant arguably in the case of social facts but less arguably in the case of natural facts.
* **Role of Social Factors**: the existence of social facts is due to a whole serie of social factors, and it’s not so controversial to accept than say the existence of natural facts is crucial to the determination on some social fact
* **Man Made vs Naturally Given**: It appears all in all a bit counterintuitive, to say that in the case of natural facts there is no relevant distinction to be made between what belongs to a man-made type of reality and what belongs to another type of reality which is independent of any human intervention.

What seems more difficult to accept is that some kind of constructivism ontology of metaphysics applied to scientific natural fact, would ultimately get rid of the idea of an objectively distinct independent world of natural objects. If we go all the way along the constructivist argument and we apply it to natural objects, there seem to be something extra

On the other hand we might find Daston’s ideas slightly appealing. Talking about an electron what we think is of a set of theories that help us understand what it is etc…It is not an object that is completely away from our line of questioning etc.. So we might be inclined to think that there is it make sense to say that scientific reasoning of all type are partly real and partly invented.

**Partly real and Partly invented - But in what sense? - Hacking**

* Same combination for natural and social objects?

Back to Hacking

There is a big difference:

* Quarks —> are not aware, a few of them might be affected but not because they become aware and act accordingly
* Refugees —> aware, interactive

**Natural Kinds - They are indifferent**

* Our knowledge about a particular natural object does not affect that particular object’s behavior at all
* Indifferent Classifications of Objects identify objects as Stationary Targets (not passive)
* They do not do what they do because of the ways we classify them

This is different when we come to the human world

**Human Kinds - They are interactive**

* People are agent
* Interactive Kinds
* “The courses of action they choose […] are by no means independent of the available descriptions under which they may act.
* Moving targets , I.e. we define somebody as a refugee and he starts identifying himself with that title.
* They interact with the ways they are classified, and rethink themselves accordingly (looping effect). From the classification to the effect on society and back to classification that might change as a consequence of this.

Social scientist often try to involve natural objects to be qualified to be real sciences. But for this to be possible, social sciences should indorse a particular type of picture that does not belong there. The objects social sciences are dealing with are interactive objects. This does not mean the objects cannot be both things.

e.g Autistic child is interactive (child) but has a pathology (indifferent)

*To conclude: does constructivism have any merits? Some merits, yes*

* What we cal reality is not a given, it is not just something out there that just comes to us.
* Even the world world described by science is partly constructed
* Above all, Claiming (partly constructed nature of reality) this is not necessarily an anti-realist move, is more mature