Inevitability of Complete Knowledge in Kuhnian Framework of Science

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Kartik Tiwari
Department of Physics
Ashoka University

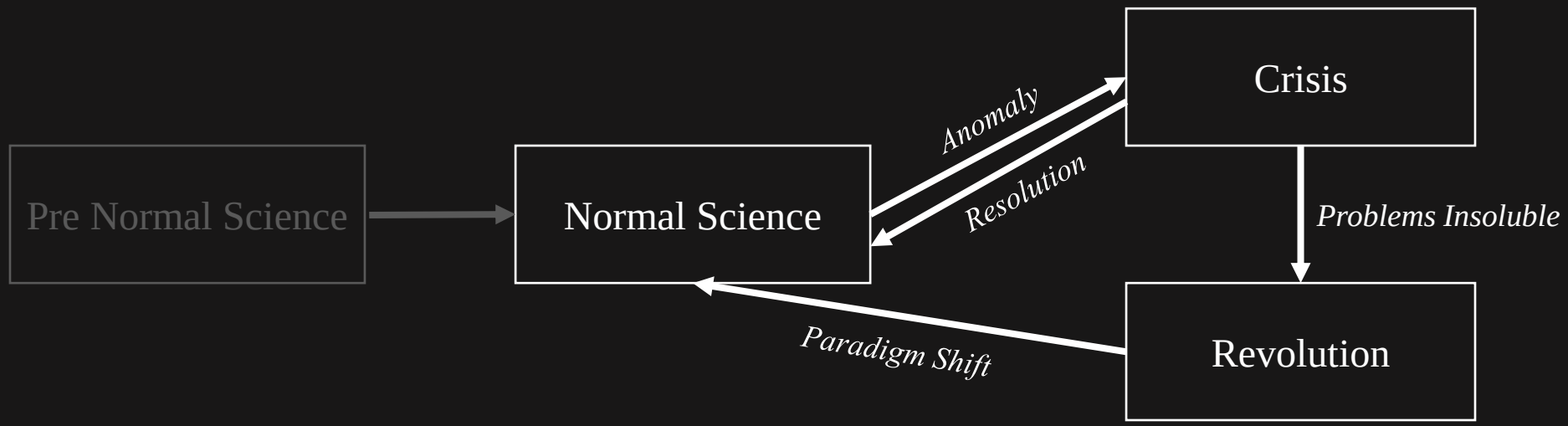
www.kartiktiwari.in

Thesis

I argue that Kuhnian structure of scientific progress, in a finite and discrete universe, entails the tendency of science to drift towards complete knowledge of the world.

Kuhnian Framework of Science

Structure



Unlike Popper who considered science to be an alternation of ‘conjectures and refutations’, Kuhn claimed that normal science (which is what scientists engage with most of the times) involves consensus building and not refutations.

Kuhnian Framework of Science

Cumulative Science

‘Normal Science’ involves puzzle solving. Scientists work with soluble problems and develop a growing stack of solutions for scientific puzzles.

Thus, Normal Science is cumulative (at least on the surface).

‘Revolutionary Science’ involves examining philosophical baggage of the existing paradigm and dismantling claims which normally would have unanimous consensus amongst scientists.

Newer paradigm may indeed find itself incapable of explaining phenomena which older paradigm could.

Thus, Revolutionary Science is *not* cumulative.

Kuhnian Framework of Science

Problem

> We may … have to relinquish the notion, explicit or implicit, that changes of paradigm carry scientists and those who learn from them closer and closer to the truth.
>
> *- Thomas Kuhn*

Kuhnian Framework of Science

Scientist Centric Philosophy of Science

“Revolutions close with a total victory for one of the two opposing camps. Will that group ever say that the result of its victory has been something less than progress? That would be rather like admitting that they had been wrong and their opponents right. To them, at least, the outcome of revolution must be progress, and they are in an excellent position to make certain that future members of their community will see past history in the same way.”

- *Structure of Scientific Revolutions (Second Edition, Chap XII)*, Thomas Kuhn

Some Definitions

1. Observations : Descriptive claims about the world
2. **{P}** : Set of all true descriptive claims required for a complete description of the world
3. **{Q}** : Set of all true descriptive claims about the world that we believe

(We may be – even in principle - incapable of achieving certainty about the truth value of a claim, but as long as the semantic content of a claim corresponds to how the world is, the statement is true, or so I will assume)

4. Complete Knowledge : One-to-One mapping between sets {P} and {Q}

Assumption

“It is not only the scientific community that must be special. The world of which that community is a part must also possess quite special characteristics … What must the world be like in order that man may know it?” (Kuhn, 1969)

I assume the world is *Finite* and *Discrete*.

Premise 1

World is
Finite and *Discrete*

A complete description of the
world requires *finite information*

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A complete description of the world requires *finite information*

We have assumed the antecedent of the conditional.

The consequent of the conditional implies, at all times, **{P} is - though enormous - a finite set.**

Premise 2

At each time *t,* there exists a set of all *true* descriptive claims that we believe (which can even be a null set). I call it $\{\mathbf{Q}\}_t$

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{P} is the set of all true descriptive claims about the world.

Therefore, for all *t*, $\{Q\}_t \subseteq \{P\}$ (even if $\{Q\}_t = \emptyset$ because null set is subset of all sets)

Premise 3

A crisis occurs when there are inconsistencies between scientific knowledge (which$\{\mathbf{Q}\}_t$ is a part of) and observations.

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After a paradigm shift, the new science must not only explain observations at time *t* but also the observations before time *t*.

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After a paradigm shift, the new science must not only explain observations at time *t* but also the observations before time *t*.

Therefore, Card$\{Q\}_{t+dt} \geq$ Card$\{Q\}_t$

Conclusion

Assumption : World is *Finite* and *Discrete*.

P1 : {P} is a finite set.
P2 : For all *t*, $\{Q\}_t \subseteq \{P\}$
P3 : $Card\{Q\}_{t+dt} \geq Card\{Q\}_t$

C : For some finite k, $\{Q\}_k = \{P\}$

$\{Q\}_t$ keeps growing in size with time and $\{Q\}_t$ is also a subset of {P} at all times. Every element that is added to $\{Q\}_t$ must also be a member of {P}. {P} is a finite set. Therefore, after finitely many additions to $\{Q\}_t$, $\{Q\}_t$ becomes equal to {P}.

Objection 1

Kuhn Loss

Premise 3: $\mathbf{Card\{Q\}_{t+dt} \geq Card\{Q\}_t}$

A Kuhn Loss is a success, empirical or theoretical, of an earlier theory – or paradigm as Kuhn would have preferred – that does not carry over to the theory or paradigm that replaced it (Midwinter and Janssen 2012).

If science through paradigm shifts is not cumulative, Premise 3 of my argument does not hold.

Objection 1: Response

Kuhn Loss

“Even when new a candidate for paradigm has been evoked, scientists will be reluctant to embrace it unless convinced that two all-important conditions are being met. First, the new candidate must seem to resolve some outstanding and generally recognized problem that can be met in no other way. Second, the new paradigm must promise to preserve a relatively large part of the concrete problem-solving ability that has accrued to science through its predecessors. Novelty for its own sake is not a desideratum in the sciences as it is in so many other creative fields. As a result, though new paradigms seldom or never possess all the capabilities of their predecessors, *they usually preserve a great deal of the most concrete parts of past achievement and they always permit additional concrete problem-solutions besides.” (Kuhn 1970)* [Emphasis mine]

Kuhn claimed that even after accounting for Kuhn losses, revolutionary science retains most of the problem solving capacity of the older science. In the worst scenario, the capacity gained is cancelled out by the capacity lost (which is not a problem for P3). Scientists would not move towards a new paradigm, in Kuhn’s own words, if second ‘all-important’ condition was not met.

Yet, he refused that such increases have any correspondence with closeness to the truth, which I demonstrated is not the case.

Objection 2

Incommensurability

Premise 3: $\mathbf{Card\{Q\}_{t+dt} \geq Card\{Q\}_t}$

Different paradigms are incommensurable. Thus, the {Q} cannot be compared across paradigm shifts.

Objection 2: Response

Incommensurability

Premise 3: $\mathbf{Card\{Q\}_{t+dt} \geq Card\{Q\}_t}$

Different paradigms are incommensurable. Thus, cardinality of{Q} cannot be compared across paradigm shifts.

Unless someone is a relativist - Kuhn was not (Kuhn 1965) - the incompetence of the scientific community to compare claims across paradigms does not entail rejection of the idea that descriptive claims constituting a theory either correctly correspond to how the world is or not.

The intrinsic characteristic of set {Q} which makes it grow with time is not influenced by the scientific community's inability to compare its size at different times.

Incommensurability is, hence, irrelevant to my argument.

Thank You.