NOTES ON THE PROBLEM OF INDUCTION

INDUCTION

Reasoning from empirical premises to generalised empirical conclusions, without pure deduction. Commonly done by *enumeration* $[Rx, Rx, Rx, Rx \ldots \rightarrow (x)(Rx)]$ or *elimination* $[Px \lor Qx;\ \neg Px, \neg Px, \neg Px, \neg Px \ldots \rightarrow (x)(Qx)]$.

THE PROBLEM OF INDUCTION

Induction seems like a rational process, and is at the heart of science, but it is very difficult to show how reason or logic are involved.

MILL'S VIEW

Mill felt that while generalisation is not possible, it is possible to reach further particular conclusions from a series of particular observations ("*All ravens so far have been black, so the next one will be*"). Critics suggest that Mill has suppressed the intervening generalisation ("*...because they're all black!*").

DAVID HUME OBJECTION

[Enquiries, Sections 29-33]. Induction is normal and acceptable, but it is not rational. It makes the irrational assumption that nature is uniform throughout time and space. Induction is simply a habit of expectation built up when events repeat themselves - an extended judgement of causation from *constant conjunction*.
Hume's arguments: If induction was rational, then *one* observation would prove the conclusion (just as we only need to do a sum once). He also points out that animals and small children, who are apparently incapable of reasoning, draw inductive conclusions all the time. Reason is too slow and unreliable for our immediate needs.

GOODMAN'S PARADOX

Induction is not reliable, even if we assume nature *is* uniform, because the uniformity depends on how we describe it. If we invent a new predicate ("*grue*"), which means "*green before some future time T, and blue thereafter*", no reasoning could tell us whether current emeralds should be called *green* or *grue*. The example is disputed, but it suggests that induction is relative to our language, and that some inductions are more intuitively acceptable than others.

HEMPEL'S PARADOX

We would expect a generalisation to only be supported by observations which are relevant. But the generalisation *all ravens are black* is logically equivalent to *all non-black things are non-ravens*. $(x)(Rx \rightarrow Bx) \equiv (x)(\neg Bx \rightarrow \neg Rx)$. Therefore anything which confirms the second generalisation should also confirm the first. So *this shoe is white* should confirm that *all ravens are black*, and yet it seems completely irrelevant. Hempel shows that the *relevance* of observations in induction is a more difficult concept than appears at first.

POPPER'S FALSIFICATION THEORY

Popper concedes that there is no reason in induction, but there are straight contradictions in falsification. Good science therefore proceeds by *conjectures and refutations* - proposing theories which can be falsified. While unfalsified theories cannot be held to be *true*, they can increase in *verisimilitude* as possible ways of falsifying them are gradually eliminated. However the traditional problem of why we should believe enumerative generalisations remains, despite Popper's alternative.

REGULARITIES AND LAWS

Some enumerated observations only suggest a regularity, but others lead to claims about *laws of nature*. The latter are held to support *counterfactual* claims ("*If this mass is subjected to force F, it will accelerate with A*"). It sometimes seems rational to make the big claim (that it is a *law*), and see some necessity is what is being claimed, but then Hume's scepticism reappears.

REMAINING PROBLEM

If you deny that induction contains any reason, then it is not rational to offer evidence in support of any broad claims. At best it would merely be re-enforcing the mental habits of your listeners. It is hard to claim, for example, that the laws of particle physics have any rational basis, as they generalise about things which have never even been observed.

POSSIBLE DEFENCES OF INDUCTION

1. It must be rational, because mathematics and probability are involved.
2. It is completely rational, as long as you accept some axiom such as '*nature is uniform*'.
3. Perhaps induction can justify itself in a benignly circular way ('*induction has always worked so far*'). After all, even *de*duction can only be justified deductively.
4. Induction is rational because no other approach could ever be more successful (the *pragmatic* solution).
5. Justifying induction is interesting but unnecessary, since it is a going concern with accepted criteria.

Symbols:

(x) *For all x's*		**v** *or ('vel')*		**Rx** *x is a raven*		$\rightarrow$ *it logically follows that (implication)*
$\neg$ *not*		$\equiv$ *is identical to*		**Bx** *x is black*		