

PHILOSOPHICAL RAMIFICATIONS: THEORY, EXPERIMENT, & EMPIRICAL TRUTH

Even before Newton published his revolutionary work, philosophers had already been trying to come to grips with the questions raised by the new experimental philosophy. The work of Bacon, and most of all of Descartes, had forced the issue of empirical truth onto centre stage. There were several key questions:

- (i) Of what are we sure (is any of our knowledge certain)? This question was very old but the onslaught of empirical science meant that rationalist (Greek-style or otherwise) or scholastic arguments were now widely rejected.**
- (ii) What is the stuff of experience (Sense data/mental 'impressions'). So the empiricist philosophers turned instead to sense data, or more generally the stuff of direct human experience, as their touchstone. This eventually led to quite fantastic arguments by the British empiricist school (and later on by positivist philosophers on the continent, and eventually in the UK). These ideas were very influential in physics, where they were assimilated to the 'experimental philosophy'**
- (iii) What are the influences & constraints imposed by human faculties? Eventually the obvious point, that human experience was dependent on and indeed constrained by our own sensory and mental faculties, was re-integrated into the discussion, notably by Kant. This almost inevitably led to a re-introduction of an extra-sensory world, beyond our faculties, which constituted a deeper or underlying 'reality'. The success of new physical ideas inevitably helped this process.**

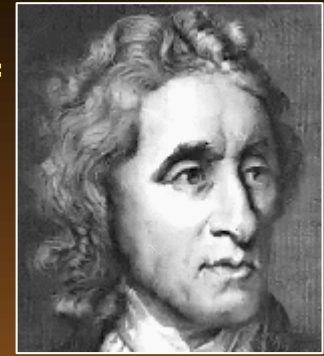
BRITISH EMPIRICISM I: Locke & "Sensations"



Locke's Magnum Opus

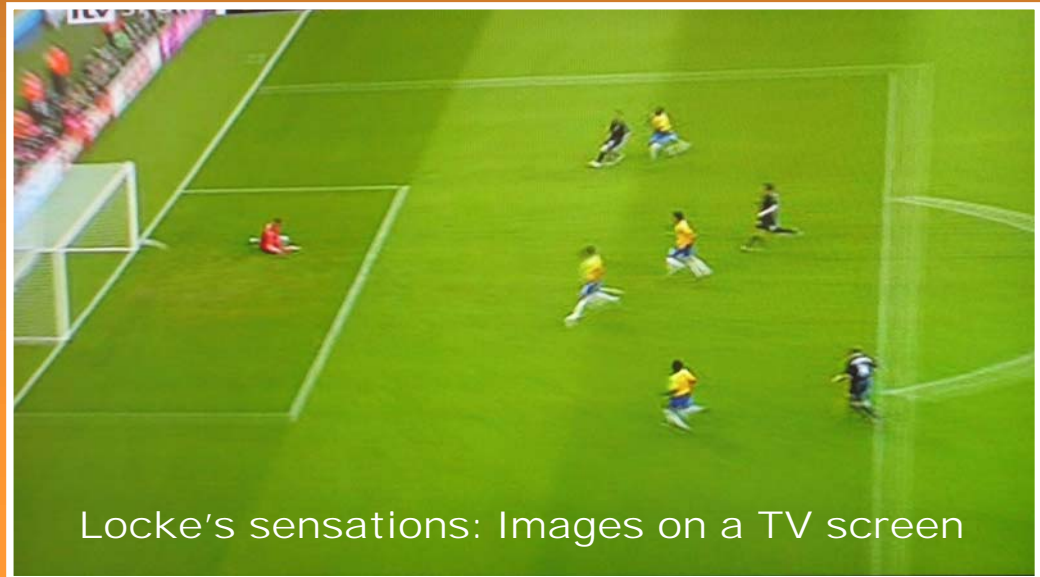
Locke was the first British philosopher of note after Bacon; his work is a reaction to the European rationalists, and continues to elaborate 'experimental philosophy'.

In Locke's work, all human knowledge is based on experience – the mind is filled with 'ideas' which are entirely derived from experience. There are Ideas of 'sensation', coming via our senses, and of 'reflection', where the mind observes itself and its contents. Our understanding of relations like 'causality' comes from the mental operation of comparing ideas (in the case of causality, of changes in sensations). Knowledge of ideas is CERTAIN.



John Locke (1632-1704)

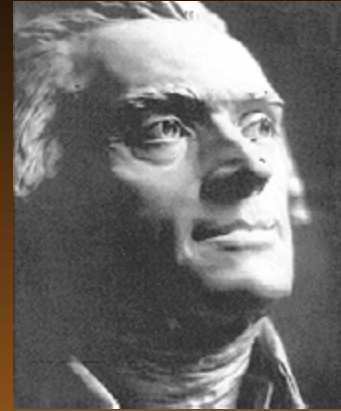
We can compare Locke's 'mind' to a TV screen, upon which ideas play in rapid succession. Locke imagined that there were things in the real world (the 'primary qualities', independent of us) but we cannot ever know these 'real things', only the 'secondary qualities' from our senses. Locke's theory this can say nothing about the relation between the 'ideas' & the things they represent. It makes, eg., hallucinations just as certain as any other experience.



Locke's sensations: Images on a TV screen

NOTE on LOCKE'S POLITICAL PHILOSOPHY

British Empiricism was strongly influenced by the political schisms of the time, Locke particularly so. His political philosophy (largely conceived in the Netherlands when taking refuge from a brief spurt of Catholicism under James II) reflects the belief in individual liberty, personal responsibility to God, and a suspicion of state control, current in Britain & the Netherlands. This philosophy was enormously influential in the drafting of legal & political frameworks in the UK and its colonies (parts of the American Declaration of Independence, written by Jefferson & Franklin, are taken almost directly from Locke). Lawyers in these countries still read Locke while training. And in this way the ideals of empirical science came to be associated with political liberalism, justified by the success of Newtonian physics, and of the future British & American empires.



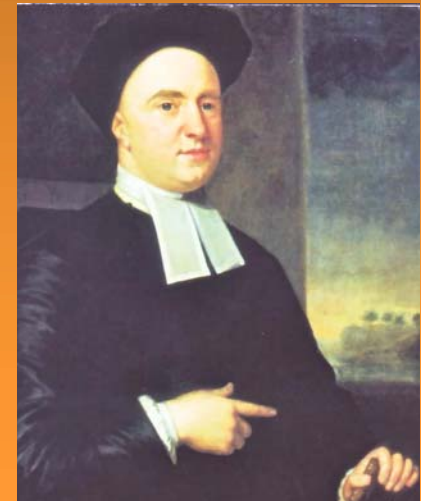
T Jefferson
(1743-1826)

BRITISH EMPIRICISM II: Berkeley

Berkeley's ideas are sometimes summarized in a limerick according to which a 'tree only continues to be' while being observed. Berkeley went much further than Locke, deying any distinction between primary & secondary qualities, & arguing that no object is possible unless it is conceived by the mind:

"No object exists apart from the mind; mind is therefore the deepest reality"

Thus nothing exists apart from what is on the TV screen. According to this view we have no evidence for anything except the sensations & ideas of the mind. To the argument that there must be some independent 'reality' or sub-stratum, which 'supports' or causes the qualities or sensations, Berkeley responds that this supporting reality is just the percipient mind.



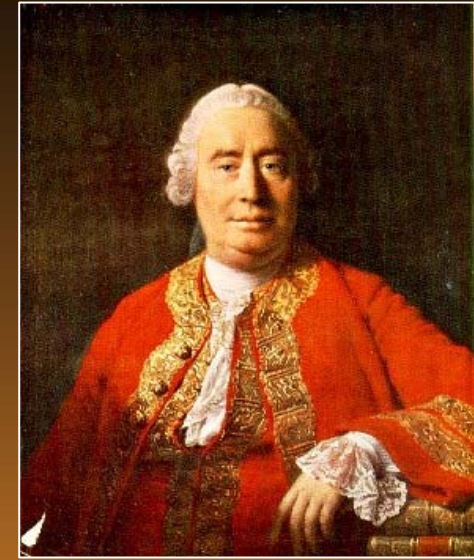
George Berkeley (1685-1753)

BRITISH EMPIRICISM III: Hume

This Scottish philosopher & historian wrote his most important work, the 'Treatise of Human Nature' at the age of 26; however it was largely unnoticed, falling "deadborn from the press". Luckily Kant noticed it – it 'woke him from his dogmatic slumbers'. Hume later became well known as a popular historian.

Hume's book advanced very important arguments which in some ways took empiricism to a logical extreme. His most important points were:

(i) The Self: Berkeley, while rejecting the external world, had still argued for a mind or soul, in which sensations and ideas resided. Hume had little

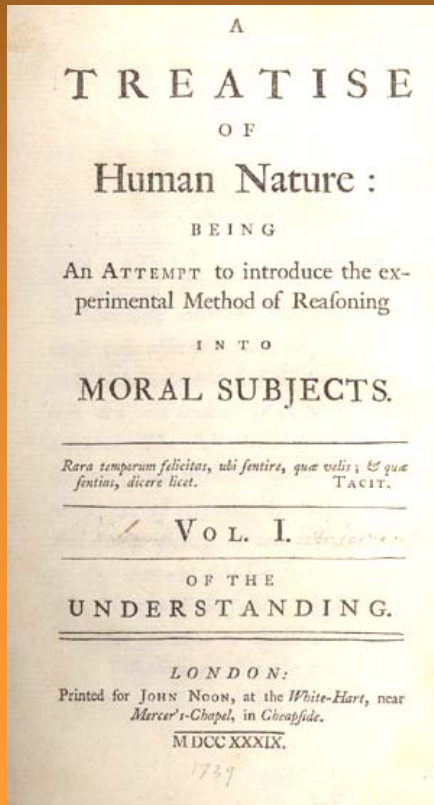


David Hume (1711-1776)

difficulty in disposing of this – just as we have no direct experience of any external world, we have none of the 'self'. All we know is a disconnected set of impressions.

(ii) Causality: In the same way Hume argues that relations like causality, or the identity of a given object, or relations in space & time, are also just 'associations of impressions'. We believe that **A** is caused by **B** because we frequently (or perhaps always) see them together.

These arguments were v. influential – they showed that many things we take for granted cannot be justified, and led to a sceptical, anti-metaphysical view. They are not perfect (for example, one can ask what is associating impressions, if the mind is nothing but these impressions).



ABOVE: Hume's "History of England"

LEFT: 1st volume of the famous "Treatise"

Immanuel KANT: Categories of Understanding



I Kant (1724-1804)

KANT'S CATEGORIES

QUANTITY

UNITY, PLURALITY, TOTALITY

QUALITY

REALITY, NEGATION, LIMITATION

RELATION

SUBSTANCE & ACCIDENT
CAUSALITY & DEPENDENCE
INTERACTION

MODALITY

POSSIBILITY - IMPOSSIBILITY
EXISTENCE - NON-EXISTENCE
NECESSITY - CONTINGENCY

1. Kant wished to derive from 1st principles the way in which the form & content of experience is molded by the observer. To do this he fell back on Aristotelian ideas, assuming that one could derive 'categories' of understanding from the structure of propositions in language. These categories correspond to formal features of propositions in language – the idea is that inchoate experience is formless until organised by the categories. Experience here includes all the contents of and processes occurring in our minds. Kant was making a very bold claim – that he could deduce all those features of our experience that came from our own sensory & mental apparatus, and that these features were pre-conditions of any kind of experience or thought whatsoever.

2. Kant distinguishes between **ANALYTIC** propositions, which are tautological, and **SYNTHETIC** propositions, where the conclusion is not contained in the premises. He also distinguishes between *a priori* knowledge (true independent of experience) & *a posteriori* knowledge (derived from experience). However, he asserts that there exist some synthetic *a priori* propositions (eg., mathematical truths like $3+4 = 7$), which apply to the world of experience (in sharp contrast to Hume or Plato, for whom no certain/general propositions can apply to the world of experience).

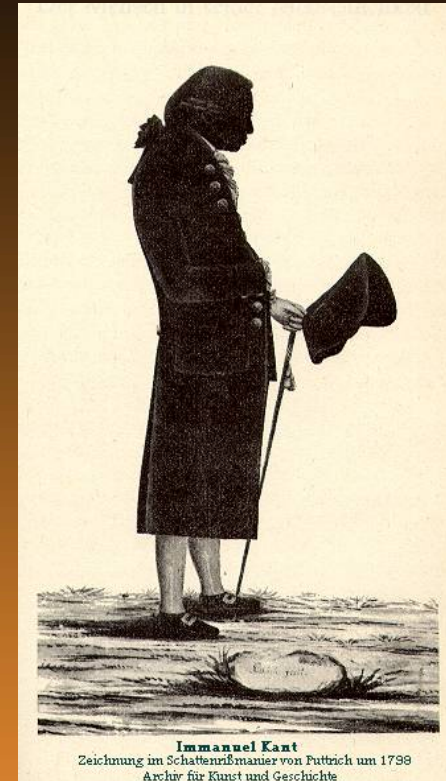
Immanuel Kant: Phenomena & Noumena

If we accept that the organised contents of our minds are now 'phenomena', ie., appearances whose source is both the real world and the categories imposed by our own faculties, it then remains to explain what we are allowed to know about the real world. Kant then argued that there existed a real world of 'Noumena', or "things in themselves", beyond the world of appearances (and beyond our ken as well). Kant was not clear on the ontological status of the phenomena, nor on their exact relationship to the Noumena (and confused things by changing his mind between the 1781 and 1787 editions of his book). But it is logically obvious that the Noumena are themselves unknowable, since we have no direct access to them. A common (but problematic – see below) interpretation of Kant makes them one of the 'causes' of the phenomena (the other being our own faculties, as embodied in the categories).

KANT: Space, Time & Causality

Kant give a special discussion of the ideas of space, time, and causality – this in direct response to Hume. Kant's rather curious view was that these 3 notions were 'pure intuitions', which were not objective or real, but 'subjective and ideal', required for the 'coordinating of all outer sensa'. In other words, they were rather like the categories, necessary for experience. Space was an intuition, necessary for the very notion of geometry. Likewise, causation is an 'a priori synthetic principle', without which knowledge of anything is considered to be impossible. Thus Kant's answer to Hume – that there are general concepts like causation, not derived from experience, yet acting within the world of experience.

One difficulty here is that the noumena must stand outside these 3 intuitions, so it is hard to see how they can 'cause' phenomena.



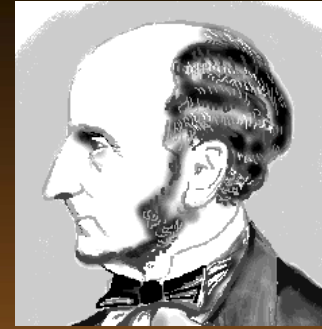
19TH CENTURY: Empiricism & Positivism

The 19th century saw very important advances in classical physics, notably the understanding of electromagnetism & heat; the latter was crucial for new industrial techniques. This led to great confidence in the largely empirical methodology behind these advances.

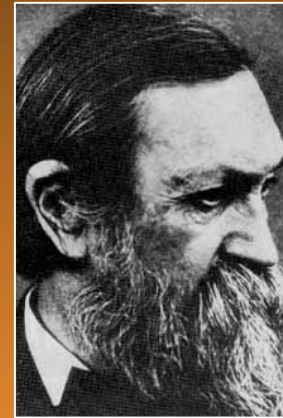
British philosophy continued to analyse the reasoning underlying empiricism. The social activist JS Mill attempted to give rules of induction in science, which were designed to explicate & justify the use of ideas like causation. Some of these rules were not original, but the idea of formulating rules for 'scientific method' beyond simple induction, and to tie this in with a theory of knowledge, was important.

A new philosophical movement, called 'positivism', partly inspired by empiricism, grew up in the 2nd half of the 19th century. In its application to the sciences, one of its foremost exponents was E Mach, also an accomplished physicist (known principally for his studies of supersonic flow & for 'Mach's principle').

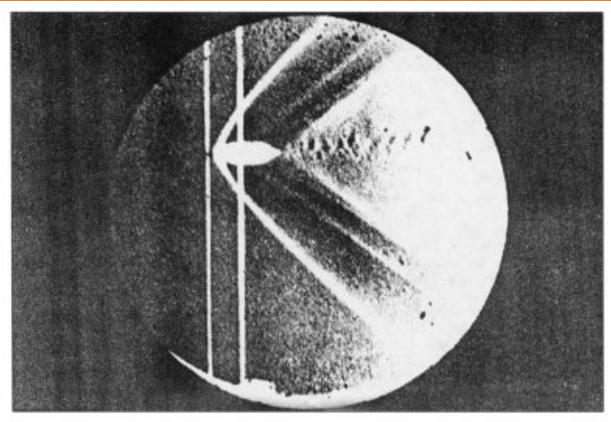
Mach's ideas were peculiar but quite influential, even amongst some experimental physicists. He followed the British empiricists in holding that sensations were primitive (remarking that "the world consists only of our sensations"). Scientific Laws simply linked sensations, and the only purpose of a theory was to provide quantitative links. Scientific explanation was then merely descriptive – in terms of sensations.



John Stuart Mill
(1806 – 1873)



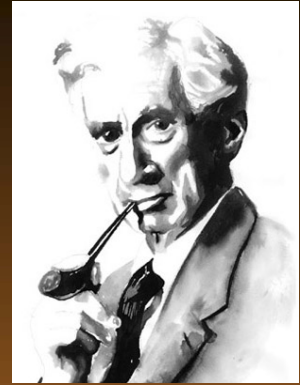
Ernst Mach
(1838-1916)



First photo of a sonic shock wave
(E Mach, 1877)

EARLY 20TH CENTURY: Verification & Falsification

The 20th century saw very important developments in logic, discussed elsewhere in this course. These naturally spilled over into the philosophy of science, and led some of the logicians to new ideas on the logical underpinnings of science and of empiricism. Early developments tried to incorporate these ideas directly (as in Russell's 'logical atomism', according to which mathematical logic mirrors the structure of reality). But the debate quickly returned to the role of experiment.



B Russell (1872-1970)



M Schlick
(1882-1936)



R Carnap
(1891-1970)

The 'Vienna circle', started by a group of philosophers & logicians surrounding M. Schlick, argued that the meaning of any statement in language was found in the means used to empirically verify it – without such means, the statement was held to be literally meaningless. Hence all of metaphysics was held to be meaningless – the view of 'logical positivism'.

There are some obvious problems with this. First, how is the criterion of verifiability itself meaningful (how is it to be verified)? Second, how is a scientific law itself verifiable – experiments can never guarantee its truth, only confirm it.

These problems led Karl Popper to the idea that scientific statements were defined by a criterion of 'falsifiability' - scientists invent hypotheses about Nature, which can't be verified by experiment (this is merely inductive & cannot prove hypotheses), but can be falsified by a single experiment. This means that all scientific laws are provisional – we can never be sure of them. The most important laws have maximum simplicity, generality, & also extensive confirmation. Popper's ideas have been very influential, even though in practise falsification does not always kill theories, because the formulation & interpretation of experiments itself involves a lot of theory.



K Popper (1902-1994)