Making Sense of Experience *by* Jonathon Harlow

I want to look at how we acquire knowledge, how we learn. The sort of knowledge I am concerned with is mainly conceptual – knowing *that*, though this may be revealed or involved in knowing *how, who* or *what*. I am not concerned here with whether what we think we know is true or how our claims to know it are justified. I am concerned with how we come to know what we take to be knowledge.

Knowledge is generally reckoned to be either *a priori,* independent of actual experience, or empirical, derived from experience. What I propose to do is to look at how some great philosophers have viewed the roles of the *a priori* and the empirical in the acquisition of knowledge, and then compare this with recent work in cognitive science.

Four great philosophers have written about this question. In the *a priori* corner we have Plato and Kant; and in the empiricist corner there are Locke and Hume.

Plato is perhaps the purest champion of the *a priori*. His doctrine appears, in effect, to deny that we learn at all. Rather, we start with knowledge of ideas of which we are "re-minded", whether by experience or by questioning. In a well-known passage, Socrates acts as "midwife to knowledge" by helping a slave discover that to make a square twice as big as another square, you can use the diagonal of the smaller as the side of the larger. In fact for Plato, as for many others, geometry seemed to epitomise *a priori* knowledge. Pure reason – or Platonic recollection, gives us demonstrable truths about the shapes and figures possible in the three dimensional world we inhabit, and the properties of those figures. This type of knowledge is not derived from experience and does not require confirmation from experience. Yet what it tells us can be reliably applied to land surveying and engineering. No wonder Plato said, "Let no one ignorant of geometry enter my Academy."

John Locke is regarded as a champion of pure empiricism. He claims that we start with no ideas at all, with a *tabula rasa* or, in other words, a sheet of white paper. He sets out, in a monumental work, how primitive Perceptions like Whiteness and Hardness are combined into ideas like Reflection and Solidity.

"The senses at first let in particular ideas, and furnish the empty cabinet: and the mind by degrees growing familiar with some of them, they are lodged in the memory, and names got to them. Afterwards the mind proceeding farther abstracts them and by degrees learns the use of general names." (Locke I. ii, 15)

David Hume takes the primacy of experience even further. His view of space, for example, seems to be that because there are limits to the resolution of which our vision is capable, we can therefore have no idea of a point, only of a sort of pixel. He rejects, in this way, the pretensions of geometry to certain knowledge, proceeding as it does from the fiction of dimensionless points or one-dimensional lines.

"But I go farther, and maintain, that none of these demonstrations can have sufficient weight to establish such a principle, as this of infinite divisibility; and that because with regard to such minute objects, they are not properly demonstrations, being built on ideas, which are not exact, and maxims, which are not precisely true." (Hume *Treatise* I ii 4. ¶17)

Hume's treatment of cause is famous. Nothing in our experience can represent the idea of a cause, still less of the necessity of the link from cause to effect. Nor can any such relationship be demonstrated as a necessary truth.

"his understanding has no part in the operation . . . There is some other principle, which determines him to form such a conclusion. This principle is CUSTOM or HABIT." (Hume *Enquiry* V.1 ¶4-5)

Hume's argument, that cause and effect cannot be observed or demonstrated woke Immanuel Kant up. But he reversed the relationship that was posited by Hume. For Kant, we do not start from experience and then arrive at the concept of causality. On the contrary, we start with a concept of causality (a principle that every event must have a cause) such that events must follow causes. We bring this concept, or condition of experience, to whatever-the-world-is to produce our observation of events.

In a similar fashion, Kant re-invented Space and Time, not as absolute realities, nor as concepts which we discover from experience, but as categories which configure whatever-the-world-is to give rise to human experience: "all empirical laws are only particular determinations of the pure laws of the understanding, under which and in accordance with the norm of which they first become possible, and the appearances take on a lawful [regular & necessary] form." (Kant *Critique* A p127)

I hope you will excuse this superficial scamper over familiar ground. I would like now to comment on these men and their achievement, and their methods. They were not much concerned with evidence. This is rather surprising in the empiricists but it seems to be the case. Locke, in rejecting the theory that ideas may be innate, makes great play of what infants and children do or don't understand but there is no indication that he observed children in any systematic way. And, more generally, he sets out with great confidence that ideas clearly arise in us as the effects of perception the ideas without once submitting these claims to the test of evidence. His entire work on human understanding is a disquisition on the implications of a premise - that ideas can only come from experience - which happens to be *rationally* derived.

Hume says he means "to introduce the experimental method of reasoning into moral subjects" (Hume *Treatise* Subtitle) but there is little to suggest experiment and observation in his work. He sits in his study and thinks. Occasionally he tries introspection; what do I find in my mind when I think? But even then he does not seem to have *observed* the process of introspection. Rather he *recalls* it, and then reflects on the *content* rather than the process. Neither is there any sign that he ever attempted to observe the thought

processes of others. Like Locke's, his work is much more an exercise in working out the implications of his thesis than a study of how people actually understand things.

And it would not be unfair to say that both Locke and Hume seem to bypass problems about the sensory experience they take as a starting point. Locke for example reckons that we build up our notion of space by perceiving distances, including angular distances that we perceive in a perspective view which distorts their measurements, in ways that change as we move. Yet we make sense of spatial relationships without taking measurements or locating vanishing points.

For Hume, the entire process is: "a mere passive admission of the impressions through the organs of sensation." (Hume *Treatise* I.III.ii ¶2) Thus he bypasses attention and focus, and takes for granted (and uses) the idea of a 'simple impression' even though at any instant the *passive* sensor must be bombarded with a bewildering chaos of sensations, like a drunk in a disco.

They both start with a notion of perception which is more a definition than the product of investigation, and they explore the implications of the primacy of that notion without getting their hands dirty or stirring from their study chairs. Some empiricists!

Turning to Plato or Kant, what is supposed to be the status of their ideas in terms of *those ideas themselves*? If Plato's account of knowledge is correct, how does he know it? Has he been granted the memory of meta-ideal knowledge itself? There is a similar problem for Kant. His categories are *a priori,* but his theory about them does not seem to be. He has responded to Hume's challenge, but his response can hardly pass Hume's test: "Does it contain any abstract reasoning concerning quantity or number? . . . Does it contain any experimental reasoning concerning matter of fact and existence?" (Hume *Enquiry* XII. III ¶10) Does Hume pass it himself?

Looked at this way, all four seem alike in starting with a speculative idea from which they spin a complete theory rather than starting with reference to something which they can check. They will argue through the night but won't put Nature to the question.

The main point about all four is just how little they explain. Each of them has a theory about knowledge. But none of their theories, even if accepted, contributes much to our knowledge. Very little that they have to say is of use to people concerned with learning, such as parents and teachers, and very little of it constitutes a basis for investigation. It makes very little difference whether or in what sense they are right or wrong.

So I turn to some who have applied an experimental process to knowledge and its acquisition, or the process of learning, being cognitive scientists and especially those working in cognitive development. The giant and the pioneer here has to be Piaget. His contribution was an account of the development of children through a

series of chronological stages.

> In the Sensorimotor stage (from birth to age two) the children experience the world through movement and their five senses. In the Pre-operational stage (two years to seven) magical thinking predominates and motor skills are acquired. In the Concrete operational stage (from ages seven to eleven) children begin to think logically but are very concrete in their thinking. In the Formal operational stage (from age eleven to sixteen and onwards) children develop the beginnings of abstract reasoning.

Piaget's work is still cited frequently by cognitive scientists, though not all of it is accepted. Perhaps he put too much emphasis on speech and failed to look for certain other kinds of early understanding, and his emphasis on the age of the child may tend to suggest that different sorts of understanding develop in lock step. For me, however, his great achievement was to initiate the systematic study of early learning by experiment and observation.

The absence and the presence of speech do present problems for such research. On the one hand, language skills develop late and comprise listening as well as talking, so by the time children can answer our questions, they have already learned so much that we cannot tell where they started or how they did it. On the other hand, explanation of concepts may require a vocabulary which lags behind the practical understanding, and some early work with children seems to have underrated their knowledge for this reason.

The answer is to focus as much as possible on behaviour. "Research in certain domains, notably spatial and physical reasoning, has also highlighted the continuing importance of perception and action in cognitive development. In some domains, children "know" things in these modalities before they "know" them cognitively." (Goswami *Handbook* Introduction to Part III)

This means that we can work with infants even in the first few months of their lives. For infants are not the passive recipients of sensation which Locke and Hume say that we are. Infants are active.

From the earliest days they clasp their fingers around anything put into the hand. Those clutching fingers, struggling to hold and manipulate objects or make contacts with people are a paradigm of the infant's active engagement in grasping the physical and relating to the social world.

But of course the very young can touch little compared with what they can see. So a mainstay of research in infant learning is the attention of the infant. It seems to be generally accepted that infants direct their attention – no passive recipients they - but do not attend long to what they have become used to. They attend longer to the unusual or unexpected. So controlled experiments can show what they expect and what they regard (literally regard) as surprising.

The results are surprising. The most general finding is that newborns are not only active learners but they

are “equipped with certain innate expectations which, although quite primitive, enable them to benefit hugely from experience.” (Goswami *Handbook* Introduction to Part I). And those widened eyes or longer stares are taken as the signs of expectations being violated.

“When faced with events inconsistent with their rules, as in violation-of-expectation experiments, infants typically are surprised or puzzled, as evidenced by increased attention.” (Baillargeon ‘The Acquisition of Physical Knowledge in Infancy’ ch. 3 in Goswami *Handbook*)

And so we see the outlines of a learning process as “Experience of the physical and social worlds allows infants to enrich and revise these initial expectations, and even to replace them with new understandings.” (Goswami *Handbook* Introduction to Part I)

The next major finding seems to be that infants do not learn indiscriminately or omnivorously. Rather, it seems that they come ready equipped to tackle different domains with different expectations. Instead of Locke’s single empty cabinet, they have several, each already dedicated to a particular branch of knowledge. These have been described as “a set of innate, representational primitives’ that ‘get learning off the ground’ and ‘guide the infant’s expectations of which objects go together and how they are likely to behave.’

There is not complete agreement about these categories but here is a list which might not be widely disputed:

Objects and their movements
Agents and their intentions
Number and magnitude
Place and space
People and relationships

(from Spelke *et al* ‘Core Social Cognition’ Ch 1.3 in Banaji & Gelman *Navigating the Social World*)

In each domain there are key features which seem both to engage the attention and to establish what domain it belongs to, so setting up the relevant expectations. People for example seem to be recognised very early, with eyes being the focus and criterion of attention, and then the mouth and hands. Eye focus develops from engaging in eye-to-eye contact to following the direction of a person’s gaze. This progression may be viewed as a strand in the development of theory of mind. Faces are also the cue for distinguishing people and animals from objects; and animals and animated things will quite soon be credited with intentions where objects are not.

As for objects, “core principles of continuity (objects exist and move continuously in time and space) and solidity (two objects cannot exist in the same space at the same time) constrain *from birth* infants' interpretations of physical events.” (Baillargeon ‘The Acquisition of Physical Knowledge in Infancy’ ch. 3 in Goswami *Handbook.*)

The idea that these categories deal with different sorts of experience is reinforced by brain scanning, showing the activation of different areas according to the kind of phenomenon engaging the attention, and often corresponding with those which are implicated in adult mental processes over the same sorts of category.

Language comes later of course but the general model proposed seems to account for the observations about language learning in young children while avoiding some of the difficulties in Chomsky's Universal Grammar. But language learning reminds us that the child's mind is not simply developed by active interaction with its world. The astonishing proliferation of the neural network as well as new mental and physical features and abilities appear in due time and order. As Piaget had already told us, we won't get a one-year old child to think or behave like a three year old merely by enriching its experience.

At first sight, all this seems like a victory for Kant as against Hume and Locke. We do start with some categories as a way of making sense of our experience, even if Time and Cause are not amongst them (in fact, children seem to focus on agent and intention before they really get engaged by causation.) But it is not some absolute victory. So far from these initial categories being the absolutes that Kant would have them, with universal and undeniable validity, they are the merest working hypotheses. They generate expectations, but when the expectations are violated, learning takes place as original dispositions are revised. And even when the mind or Reason is mature, it seldom operates with those absolute categories that Kant has delineated. Our knowledge is not a unified domain of pure reason but works in sets of models and salient features which we deploy for different purposes and can integrate only with difficulty and constant practice. Regarding space, throughout our lives we work with different spatial registers, not one realm of Cartesian space. We orient by relating to ourselves what we can see. We navigate more readily by landmarks than by geometry. We can integrate these different approaches, but not readily. People typically get more confused between right and left turns when they try to navigate south while holding the road map with North on top. We seldom think in three dimensions at all. A bigger lake means a wider lake, not one with more water in it. The height of a glass leads to misjudgements about its capacity. "Few people think of a wire as a very, very skinny cylinder or of a CD as a very short one." (Pinker *Stuff* p 182) Regarding causation, most adults, even after learning Newton's laws of motion in school, still think as children do of a moving object as possessed by a force which is akin to an intention and which is eventually defeated or exhausted by opposing forces. And we retain the distinction between agency and causal mechanism and the priority we accord to the first. The very vocabulary in which we describe events typically ascribes or fails to ascribe agency -*Abraham Lincoln died*, or *Lincoln was shot*, *killed, assassinated*.

So my two main conclusions would be empiricist ones. First, we appear to acquire our working knowledge of the world in something like a scientific fashion, starting with the equivalent of a working hypothesis which leads to predictions, and then these are modified and developed (especially by falsification). That framework certainly includes the *a-priori* as a starter kit, but it is disposable. But my final point is that we

have learned more about learning and knowledge during a few decades of empirical cognitive science than centuries of epistemology. Even the disagreements of real empiricists are productive. When empiricists disagree they design more experiments and make more observations. When philosophers disagree they spin more words.

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