Causation

Lecture 2

Brief history – and then Hume

7 Brief history

- Aristotle

Four ‘causes’ (aitiai – types of explanation)

- (i) Formal (essence)
- (ii) Material (matter – composition)
- (iii) Final (goal, function, purpose)
- (iv) Efficient (intervention)

Formal and material ‘causes’ are ‘internal’ dispositions, powers

Final ‘cause’ – applies to teleological systems

Efficient ‘cause’: typically an external stimulus to change – most obviously causal.

Natural vs Violent Motion

- A characteristic case of Aristotle's approach is seen in his distinction between 'natural' and 'violent' motion:

  (i) 'Natural' motion – e.g. that physical objects fall towards the earth's surface – is of their essence; so it has a 'formal' cause.

  (ii) 'Violent' motion – e.g. the motion of a stone that has been thrown – is a case of efficient causation: the cause is external

- Some distinction of this kind is normal – e.g. between 'regular' motion and 'deflected' motion; connect too with inertia. But it's all more complicated than Aristotle supposed!

Theology

- Add: God as creator etc. – i.e. a ‘fifth’ cause: agency as cause:

- Medieval period: combine Aristotle’s approach with this agent-dependent theological approach.

  e.g. unified conception of natural laws as
  (i) observable general features of the world, &
  (ii) products of God’s benevolent creation

‘Modern’ – post-medieval – period:

- Scepticism about Aristotelian essences/powers
- Rise of atomism – hence emphasis on interaction and thus efficient causes

- But: coherent compromise positions remain available – e.g. Locke combines atomism with belief in ‘real essences’ and causal powers. But he doubts if we have much knowledge of them.

- Others retain a theological approach, and back this up with scepticism about efficient causes (Malebranche)
- Or one can try to combine the new ‘natural philosophy’ of efficient causation with the agent-causation of ‘natural theology’ (Reid).

Newton:

- (i) Inertia: causal power associated with persistence at rest or motion (a power of ‘natural motion’).
- (ii) But emphasis on direction of motion (esp. ‘straight line’); no circular ‘inertia’ – hence circular motion requires continuous application of force. Velocity: essentially in a direction.
- (iii) Mass: fundamental ‘essence’/power (?) of physical objects.
- (iv) Momentum: mass times velocity; momentum is conserved in interactions.
- (v) Force: mass times acceleration (rate of change of velocity – including direction). Gravity is a force: measure of the acceleration imparted to a mass by another one (inverse square law)

Force?

- Within Newtonian mechanics force, mass and acceleration are interdefinable. Which is fundamental?
- Assume acceleration is: do you go for mass or force? (or both)
- Intuitively: because of the variety of forces, think of these as fundamental types of cause. Then mass is measure of the acceleration induced by their application.

- But what is gravity? Newton ‘I refrain from any hypothesis

6. The Humean programme

- Hume's account of causation – whatever the detailed interpretation of it – introduces several themes:

(i) cause and effect are spatially contiguous – there is no 'action at a distance'

(ii) cause and effect belong to a temporally ordered process such that causes precede their effects

(iii) there is a necessary connection between causes and effects

(iv) singular causes are instances of regular connections between cause and effect.

The key question Hume raises is the relation between (iii) and (iv) here: in some way, Hume suggests, (iv) accounts for (iii). But how?

Come back to this – but set it aside for now.

Beyond Hume

- Kant:

  Causation is a ‘category’ and linked to substance: i.e. it’s a priori that substances – physical objects – are causally connected; though it’s an empirical matter just what the connections are (cf. Space).

- Mill:

  No a priori: so causation is empirical through and through – and scientific method involves determining causes of phenomena (Mill’s ‘methods’)

After Mill

- Mach, (early) Russell

  All serious work in science involves identifying and applying general laws, which are ‘descriptive’ and not ‘explanatory’.

  Causation is at best a pragmatic label for common-sense considerations
- Einstein

  Extension of this ‘descriptive-cum-mathematical’ approach
- But some doubts ….

  (i) Meyerson: Causal explanations are different from inquires based on general laws of nature.

  (ii) Russell (later): causal ‘lines’ fundamental in science and metaphysics.

- How to combine irreducibility of causal inquiries concerning particular cases with fundamental role of general laws of nature?