4 Teleological concepts in biology

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Post-darwinian teleology: **Three main views**:

1: teleological way of thinking needs to be **eliminated**

2: teleology, but **Natural Selection** in place of intelligent designer (Wright)

3: teleological way of thinking as a useful **stance** that we adopt (Dennett)

4: more radical view: teleology **necessary**

-functional talk is ubiquitous in biology
-in physiology, anatomy, cell biology, genetics, behavioural ecology

e.g. 'the function of the heart is to pump blood'
'the function of the kidneys is to remove waste products from the blood'
'the function of the honey bees' dance is to communicate information about the source of food'
'the function of mitochondria is to create energy for cellular activity'

-also: we talk of 'malfunctioning' organs, genes, proteins etc.
-implies that there's a function

-also: 'design' talk common in biology
e.g. 'pale skin is not designed for exposure to sun'
'the crab's skeleton is designed to protect its internal organs'

how should function and design talk be understood?
-it seems unique to the biosciences
-no reference to function in e.g. physics or astronomy
-we don't talk about the 'function' of earthquakes, lightning strike etc.

-> function and design talk is sometimes called *teleological*
i.e. involves reference to a purpose, or goal

-debate between 'teleologists' and 'naturalists' very old

-teleological talk stems from pre-Darwinian, creationist world view
-organisms designed by a conscious intelligence
-function talk makes good sense, on such a world-view

-analogy with artifacts
-function and design talk makes clear sense in relation to artefacts
e.g. 'function of thermostat is to keep the room temperature constant'

-what becomes of function talk in the Darwinian world view?

Options:

i) eliminate function talk
BUT it's ubiquitous in modern biology

ii) function talk is metaphorical, so not strictly necessary
BUT not very plausible

iii) function talk reflects human values
i.e. function/malfunction distinction depends on what we find valuable
BUT the science *appears* value-free

iv) give a 'naturalistic' account of function
i.e. give truth conditions of function-ascriptions in some other terms

Best-known naturalistic approach:

'etiological account of function'
or: 'selected effect' account of function
or: 'historical' account of function
or: 'Wright functions' (after Larry Wright 1973)
or: 'teleofunctions'

key idea:
a trait's function is what it has been selected for
=what explains why it's there

i.e. evolution by natural selection licenses talk of function

-link between function and design is retained
-but natural selection, not God, is the designer
-explains why function talk is unique to biology

-captures many central usages in biology
-especially in evolutionary biology
-cf. adaptationist research programme

-notion of function closely linked to notion of adaptation

-related issue:
-does Darwinism eliminate teleology from biology?
-some say yes, others say no
-yes: Darwin explains the *appearance* of teleology
but there's no real goal-directedness in nature
-no: Darwin naturalises, rather than banishes, teleology

problems with etiological account of function:

i) individuation of traits
ii) indeterminacy of functional ascription
iii) co-opting of trait for new uses
iv) makes functions hard to discover
v) true to all areas of biology?

Interesting application of etiological account:

'teleosemantics' programme in philosophy of language/mind
-cf. Ruth Millikan
-aim: provide a solution of the philosophical problem of
intentionality by using etiological theory of function

alternative approach:

'causal role' account of function
'Cummins functions' (after Robert Cummins 1975)

-intuition: 'etiological' approach not true to certain areas of biology
e.g. physiology, anatomy, cell biology
-aim isn't to discover selective history
-but rather, to discover how a complex system works

-basic idea:
the function of something is an effect which contributes to the operation of a more complex system
-so function applies, primarily, to parts of a complex system
e.g. function of sweating is to regulate body temperature
e.g. function of piston in an engine is to exert a force on the fluid in the cylinder

key question:
-can the two sorts of 'function' be unified?
-or should we recognise a plurality of functional ascriptions in biology?

Philosophical accounts of function:

1) functions as selected effects

  -> **etiological** theory

(Wright, Millikan, Neander)

    -> Godfrey-Smith -> 'modern history' theory

  2) functions as propensity/dispositions -<u>adaptive</u> effect

  -> propensity theory

  (Bigelow & Pargetter)

    3) function as ως causal role

    -> functional analysis

    (Cummins, Amundson & Lauder, 'Function without purpose')

      4) organisational account -> biological organisation

      -> biological **autonomy** -> Moreno

-> Amundson & Lauder, Godfrey-Smith -> pluralism about functions

Wright's analysis

-> Wright (1973) 'Functions'

-> Wright criticises function as **utility**

Example: '(In vertebrates) a function of the liver is to secrete bile' <u>means</u> 'the liver secretes bile, and that bile is secreted in vertebrates is useful to them'

-> **difficulty** to apply this in the case of conscious functions (second hand example -> not useful for the watch, but for us)
-> utility not **necessary** in clock example

-> modification of example: utility **usually** exists -but: <u>useless machines</u>
—> so: what matters is what a machine was designed to do (even if it doesn't do it)

-> but the utility criterion is not **sufficient** either: examples where we have utility <u>without</u> function

-> conclusion: such an analysis does not take into account the **distinction between function and accident**

-problematic also regarding <u>natural functions</u>: 'it is absurd to say with Pangloss that the function of the human nose is to support eyeglasses'.

-> accident vs function distinction exactly as in the case of conscious functions

Wright's analysis

Two main goals of Wright's analysis:

-> explain the distinction between **function** and **accident** ('accidents' are things something does, but which are not its functions)

-> develop a **unified** theory of <u>conscious</u> functions (i.e. functions of artifacts) and <u>natural</u> functions

'it seems to me consistent, appropriate, and even common <u>for an atheist</u> to say that <u>the function of the kidney</u> is elimination of metabolic wastes'.

Wright's analysis

-Main point by Wright:

-> ascriptions of function are **inherently explanatory**:

'Merely saying of something, X, that it has a certain function, **is to offer an important kind of explanation of X**. The **failure** to consider this, or at least take it seriously, is, I think, responsible for the systematic **failure** of these analyses to provide an accurate account of functions.

Wright's analysis

-> why explanatory ;

   -> **functional** and **teleological** (i.e. in <u>explanations by means of purposes</u>) 'in order to' - they have the same role (and so they explain)

   -> equivalent questions:

1. What is the function of X?

2. Why do C's have X's?

3. Why do X's do Y?

Why-form function requests: Why do porcupines have sharp quills?

                          Why do (some) watches have a sweep-second hand?

                          Why do ducks have webbed feet?

-> these questions do not simply ask 'What's it good for?', but **why something exists**.

Wright's analysis

'**functional ascription-explanations** are in some sense **etiological**, concern the **causal background** of the phenomenon under consideration. And this is indeed what I wish to argue: **functional explanations**, although plainly <u>not causal in the usual, restricted sense, do concern how the thing with the function got there. Hence they are etiological, which is to say "causal" in an extended sense</u>'.

-W's argument for etiological theory: **only such an account can distinguish between function and accident**

'all of the accident counterexamples can be avoided if we include as part of the analysis something about how X came to be there (wherever): namely, that it is there because it does Z-with **an etiological "because"'**.

Wright's analysis

Saying that the function of X is Z is saying at least that

(I) X is there *because* it does Z.
or
Doing Z is the *reason* X is there.
or
That X does Z is *why* X is there.
where "because," "reason," and "why" have an **etiological force**.

clarifications:
-**explanatory 'because'** as in "It exploded because it got too hot" [not evidential "It is hot because it is red."
-all that is required is that X ***be able to do Z*** (perhaps X never does Z)

-> in the case of natural functions:
'We can say that the <u>natural function</u> of something -say, an organ in an organism- is the **reason** the organ is there **by invoking natural selection**'.

Wright's analysis

-But (I) **is not sufficient** for something to be a function.

W's example:
oxygen combines readily with hemoglobin, and that is the (etiological) reason it is found in human bloodstreams. But there is something colossally fatuous in maintaining that the function of that oxygen is to combine with hemoglobin, even though it is there because it does that.

-> W:
the "because" in "It is there because it produces energy" is importantly different from the "because" in "It is there because it combines with hemoglobin".

-> W: only some etiologies are allowed (<u>functional etiologies</u>)
-Z must be **a consequence** of X's being there!

Wright's analysis

Final analysis of:

The function of X is Z means
  (a) X is there because it does Z
  (b) Z is a consequence (or result) of X's being there.

'The first part, (a), displays the **etiological form** of functional ascription-explanations, and the second part, (b), distinguishes **functional etiologies** from the rest'.

Wright's analysis

-General characteristics of W's analysis:

-> **unifies** physical and 'conscious' functions

-> **distinguishes** between function and accidents (accidents can eventually lead to new functions)

> shows the importance of **natural selection** for natural functions

'When we explain the **presence or existence** of **X** by appeal to a **consequence Z**, the overriding consideration is that <u>Z must be or create conditions conducive to the survival or maintenance of X</u>. The **exact nature** of the conditions is **inessential** to the possibility of this form of explanation: it can be looked upon as a matter of **mere etiological detail**, **nothing in the essential form of the explanation**'.

William Harvey (1578 – 1657)
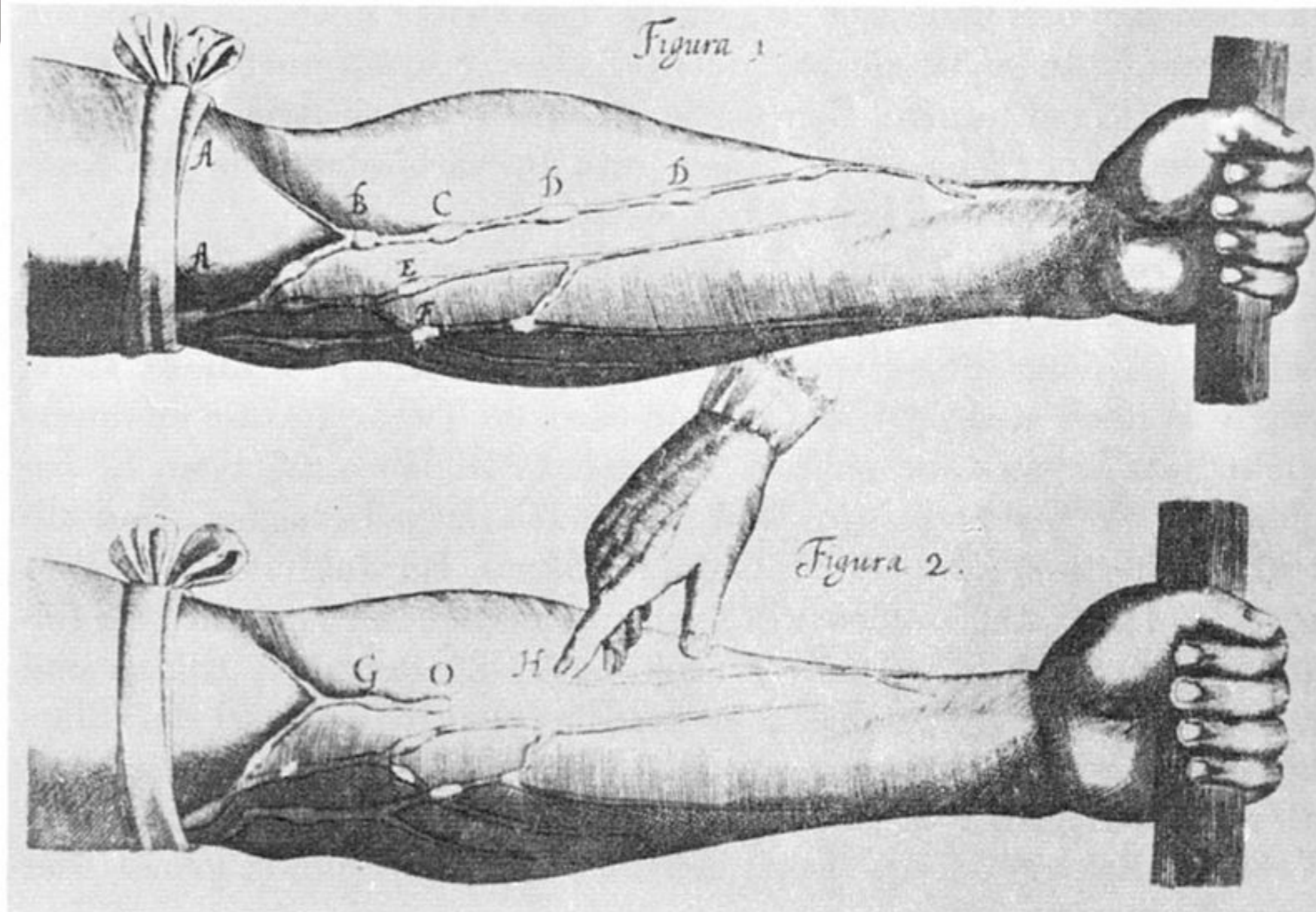
Cummins's analysis

-> Cummins (1975) 'Functional analysis'

-functional explanation as a **distinctive** kind of explanation

-fuctions and **dispositions**:

'Something may be **capable of pumping** even though **it does not function as a pump** (ever) and even though **pumping is not its function**. On the other hand, if something functions as a pump in a system s or if the function of something in a system s is to pump, then it must be capable of pumping in s'.

-> function-ascribing statements imply disposition statements

Cummins's analysis

-dispositions require explanation: how manifestations are brought about (given certain conditions)
-> 2 strategies to explain this:

-> the **subsumption strategy**
subsuming of a 'dispositional regularity' under a **general law** (which does not concern only the specific kind of object)

-> the **analytical strategy**
the analytical strategy proceeds by analyzing a disposition d of a into a number of other dispositions $d_1 \ldots d_n$, had by a or components of a such that **programmed manifestation** of the d_i results in or amounts to a manifestation of d.

Cummins's analysis

-example: **assembly-line production**

Production is broken down into a number of **distinct tasks**. Each point on the line is responsible for a certain task, and **it is the function of the workers/machines at that point to complete that task**. If the **line** has **the capacity to produce the product**, it has it **in virtue of the fact that the workers/machines have the capacities to perform their designated tasks**, and in virtue of the fact that when these tasks are performed in a certain **organized** way -according to a certain program- the finished product results. Here we can **explain the line's capacity to produce the product** - i.e., explain how it is able to produce the product- by **appeal to certain capacities of the workers/machines** and their **organization** into an assembly line. [The function of an individual] on the line **is doing whatever it is that we appeal to in explaining the capacity of the line as a whole**.
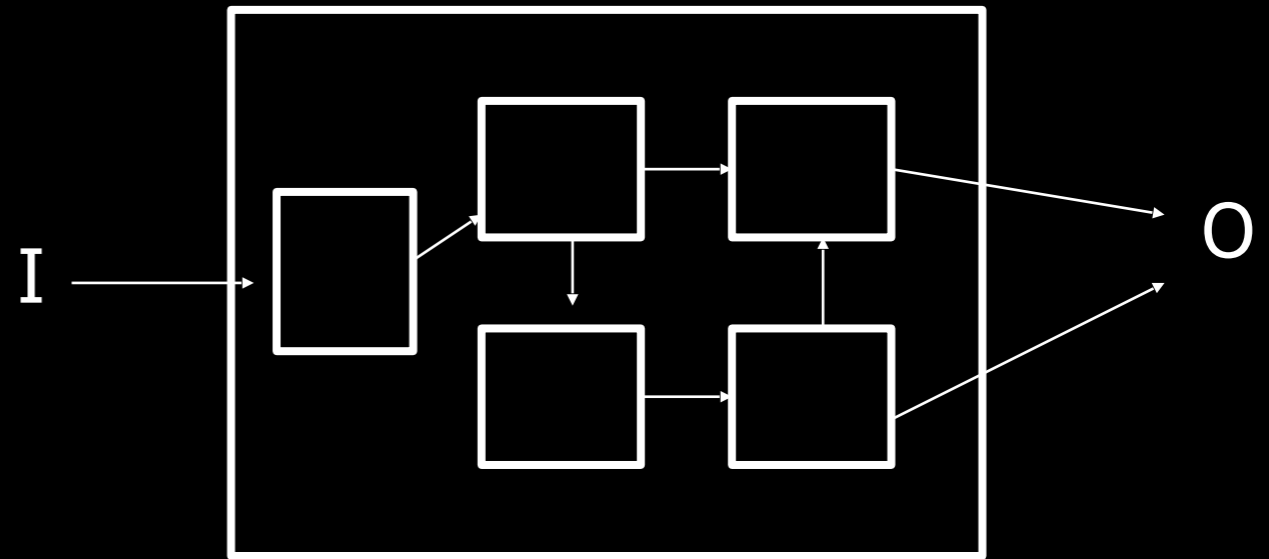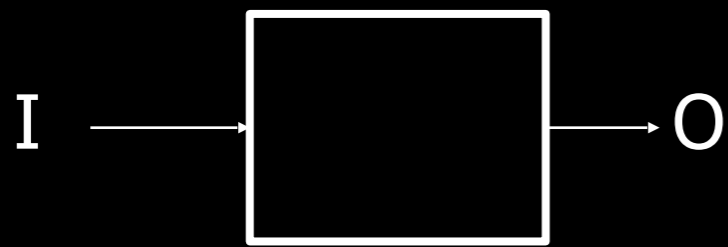
[Menzies 2012]

Cummins's analysis

-another example: diagrams of electronic devices
-> functional analysis in biology is similar
(especially in **psychology**, widespread use of this strategy)

-analysis of functional claims by Cummins:

(9) x functions as a φ in s (or: the function of x in s is to φ) **relative to an analytical account A** of s's capacity to ψ just in case x is capable of φ-ing in s and A appropriately and adequately accounts for s's capacity to ψ by, in part, appealing to the capacity of x to φ in s.

'To **ascribe a function** to something is to ascribe a **capacity** to it which is **singled out** by its role in an analysis of some capacity of a **containing system**'.

Cummins's analysis

-> a seemingly **trivial** application of the analytical strategy: the example of noise of circulatory system in mammals

-to apply the analytical strategy:
(i) analyzing capacities [must be] **less sophisticated** than the analyzed capacities
(ii) analyzing capacities [must be] **different in type** from the analyzed capacities
(iii) **relative complexity** of the organization of component parts/ processes that is attributed to the system.

'As the role of **organization** becomes **less and less significant**, the analytical strategy becomes **less and less appropriate**, and talk of functions **makes less and less sense**. This may be philosophically disappointing, but there is no help for it'.

Philosophical theories of function:

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 -> **etiological** theory

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   -> Godfrey-Smith -> 'modern history' theory

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 -> Amundson & Lauder, Godfrey-Smith -> pluralism about functions

'Function' in biology

-> Godfrey-Smith (1993), 'Functions, Consensus without Unity'

'On the view I am presenting, the functions literature is heading towards a view in which the analysis of functional discourse is **bifurcated**, and **Wright-functions** and **Cummins-functions** are **both** recognized. The recognition of this **disunity** is itself progressive. The concept of function bequeathed to post-Darwinian science, from an earlier conceptual scheme. The original concept of function probably did have a close connection to the concept of **design**, and was (for all I know), a fairly unified concept'.

Wright functions vs **Cummins functions** → 'two *different* explanatory modes within science. There is not some single explanatory project, distinct from others, which encompasses these two modes. They are two different kinds of understanding we can have of a system'.

'there is nothing scientifically special about contributions to capacities, *qua* contributions to capacities, in **systems** which are **the product of design** – as opposed to contributions to capacities in **systems** which are **not the product of design**'

For further study:

-Godfrey-Smith, *Philosophy of Biology*, ch. 4.3

-Sterelny & Griffiths, *Sex & Death*, ch. 10.2

-Hull & Ruse, ch. 9

- immanent vs transcendent