CHIP-7
Concepts and history in psychology

Reductionism
Drawing it together

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Systems and levels of explanation

(Reductionism)

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The feeling of explanation

Humans seem to like the feeling that something is explained. However there is reason to think we are poor judges of the quality of an explanation (Kieras & Bovair, 1984)

Generally speaking, explanations are deductions, where some general rule is used to deduce (post hoc) some specific (observed) case.

One kind is a set of axioms e.g. in geometry; or the rules of chess.

Such examples show how a very small number of simple rules can give rise to complexities that can occupy clever people for generations.

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Types of (deductive) explanation

A. Axioms or game rules: explanation in a closed system, at one level.

B. Reduction: explaining one level by a lower level that implements it e.g. atoms explain molecules, which are all made up of combinations of atoms; DNA "explains" genes, which are all expressed and transmitted in DNA code.

C. The pure ➔ applied cascade of research.
The notion is that if we have the theory, then we can deduce applications, which are particular uses of the theory in particular cases. The cascade is logical, but often not how it happened historically.
Logic = a justification of the idea.
Logic ≠ Causation of the idea in a person or scientific field.

A,B,C all use and exalt deduction, though they use it differently.

Examples of levels, hierarchies

Reductionism requires the existence of a hierarchy of levels. E.g.

Disciplines: Politics ➔ Sociology ➔ **Psychology** ➔ Neurology ➔ Biology ➔ Chemistry ➔ Physics

Biological groups: Population ➔ Clan or group ➔ **Organism** ➔ Cells ➔ Organelles ....

Psychological systems: All humans ➔ Nation state ➔ Groups of acquaintance ➔ Family ➔ Dyad interacting ➔ **Individual** ➔ Parts of one person's mind? ....

Evolution: Natural selection ➔ Genes ➔ DNA

Matter: Materials ➔ Phases of matter (solid, gas, ...) ➔ Molecules ➔ Atoms ➔ Particles (e.g. protons) ➔ Quarks ...

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Reductionism

Many feel instinctively that reductionism (type B above) is the best kind of explanation. This is not a rational feeling because:

a) Each level of explanation can be independent, with its own rules (just like chess is).

b) A level can sometimes be reduced to more than one alternative lower level e.g. the wave equation (physics) explains sound waves, light, ocean waves, the jet stream (a special kind of waves keep it intact), and quantum mechanics.

c) Some levels just do NOT reduce to another e.g. especially when they have self-correcting mechanisms (homeostasis).

d) Above all: whether as individuals or societies, we are born into the middle of things. We can't wait until a theory for a lower level arrives.

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Reductionism (2)

Some things that currently (2012) don't seem to fit into levels very well:

a) Lamarkian inheritance, "epigenetic" factors. [cf. start address]

b) Prions. Is infection a phenomenon independent of organisms as infectious agents?

c) Migraine [Sacks]. Physiology doesn't precede "psychological" / psychosomatic causes in any clean way.

d) Genes and learning as causes of behaviour [Hailman]

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Behaviour as an independent subject?

Genes do not directly control behaviour: they control only proteins and RNA molecules: they don't even control sugars or bones directly. Behaviour is, and must be, shaped mainly by other mechanisms.

So one view of psychology is that it is a level of explanation with a logic mainly independent of the mechanism of natural selection (and genes, and DNA). And probably in the end that is why brains evolved: to get that independence.

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Evolutionary psychology:
A contradiction in terms?

Thinking about scope again: one might almost say that psychology is defined as exactly those aspects of being human that are NOT controlled by evolution.

The whole point of perception and learning is so an organism can adapt its behaviour faster than the genome can.
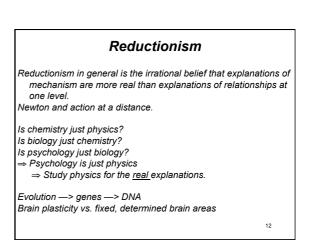
Human behaviour is not inherited, at least not through genes. And that is, presumably, precisely its adaptive evolutionary advantage.
[Jack Hailman]

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Reductionism (3)

We individually as critical thinkers, or a discipline as a whole, has to consider whether and when a reductionist approach is useful and can be made to work. And whether it adds anything. Most often, a discipline is defined by looking at a particular level because the lower levels do not seem likely to help in detail.

In psychology, there are some impulses to try to reduce the 3 types of data to each other e.g. explain behaviour by physiology, the social by individual attitudes. This may work in some cases, but in general the job is to relate them. This probably means finding how the causal links run in both directions, not just in one.
More work on this is probably a good heuristic;
As is looking for self-stabilising systems / feedback loops that make a level relatively self-contained.
 E.g. Brain plasticity vs. fixed, determined brain areas   10

Psychology ?

Where does Psy fit in the levels of explanation?

Why is it a separate autonomous level?

Politics ➔

Sociology ➔

Psychology ➔

Neurology ➔

Biology ➔

Chemistry ➔

Physics

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Reductionism

Reductionism in general is the irrational belief that explanations of mechanism are more real than explanations of relationships at one level.
Newton and action at a distance.

Is chemistry just physics?
Is biology just chemistry?
Is psychology just biology?
⇒ Psychology is just physics
     ⇒ Study physics for the <u>real</u> explanations.

Evolution —> genes —> DNA
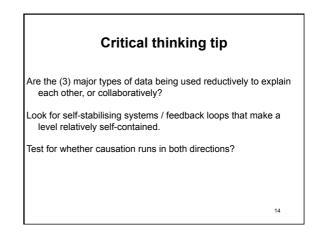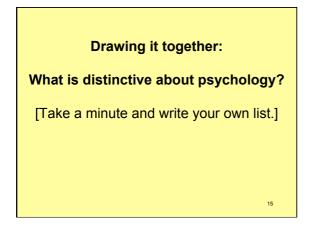*Brain plasticity vs. fixed, determined brain areas*

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What is my real point about reductionism?

- We each need a reason for seeing psychology as a discipline, not some lower level as holding the real explanations.

- Appreciation of rules at one level, not just reductively

- Keller: even at one level: emergent systems thinking, self-organising systems show patterns that produce patterns and complexity spontaneously.
  Getting away from thinking that there is just one cause that "explains".

Emergent phenomena.

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Critical thinking tip

Are the (3) major types of data being used reductively to explain each other, or collaboratively?

Look for self-stabilising systems / feedback loops that make a level relatively self-contained.

Test for whether causation runs in both directions?

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Drawing it together:

What is distinctive about psychology?

[Take a minute and write your own list.]

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What is distinctive about psychology?

General style of argument is critical thinking, backed by empirical data

Broader than most in content area

It has approx. equal emphasis on pure and applied (unlike medicine which is mostly applied, or physics which is mostly "pure")

It could be seen as also at the centre point between arts and science, in that it strives for a 3rd person objective stance, yet addresses human meanings and goals: and so how the same material event can mean quite different things to different people.

It is one of the "reflexive" disciplines whose subject matter is us humans (others include medicine that tells us about our bodies and illnesses, politics, ...)

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What is distinctive? (2)

It generally built on not one type of data, but on trying to relate at least 3 main types, perhaps 4:

- Behavioural

- Physiological

- Introspection (asking people to tell you the contents of their attitudes, thoughts, intentions) [Also: 1st, 2nd, 3rd person views.]

- "Functional": working out the function, the reason, we think and act in the ways we do e.g. why do we get angry? why don't we all have the same personality traits (surely evolution should make us converge on the one optimum?), why are we so prone to social comparison? ....

- Structural: there is still some legacy of structuralism in brain science: the idea that one area of the brain performs one function, the same in everyone. Size of STM / WM.
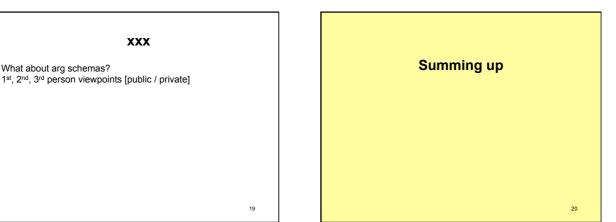
What is distinctive? (3)

[Effect size: its meaning for pure, for applied.]

Not just the mean, but the variation is often the message.

In most science and engineering, variance is only a measure of noise obscuring the signal in the data.
But in Psychology and Botany (for example), variation is often measuring individual differences that are part of the signal, to be discovered and reported.

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What about arg schemas?
1st, 2nd, 3rd person viewpoints [public / private]
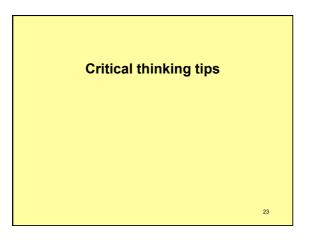
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Summing up

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Learning objectives

The learning objectives for my part of CHIP are pretty much what the handbook says. More generally, the overall learning aims are something like:

To equip students with the ability to review psychology as a whole by taking a step back (as opposed to the view from the heart of the discipline): by considering what philosophy of science might say about it, how it compares to other disciplines, how it measures up to what people would like psychology to be able to explain.

Another way of saying this, is that the aim is to equip students with more and wider strands of <u>critical thinking</u>, including being able to critique both specific bits of research and the whole discipline.

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Exams

I have, on my web page for these lectures, a link to a page with sample exam questions and outline answers. (I'll further update this page soon.)

Obviously, my material in CHIP is not about facts supported by citing experimental studies. It is about arguments that may apply to some degree. Your exam answers need to exhibit critical thinking: a reasonable argument, that discusses both the points that support it and points that undermine you conclusion. Illustrating them with examples is definitely good (e.g. in discussing how psychology tends to try to relate the 3 main types of data, an example of work that fails to do that, and another example of work that does do that would show you had thought about the issue. Extra marks if they are not examples given by me.)

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Critical thinking tips

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Critical thinking tip (L 3):

[*causation*]

Is a given paper assuming causation is 1-way, not testing the reverse direction?

Is it assuming there is only 1 cause, not discussing others

Has it considered a self-regulating system (cf. homeostasis)?

Is it using the right line of argument for a pure paper?

for an applied paper? Or confusing the 2?

(Pure: one cause, all contexts; Applied: all causes, one context)

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Critical thinking tip (L 4):

[*Relating the 3+ main types of data*]

A lot of psychology can be criticised for ignoring or covering up shortfalls of this kind i.e. dealing only with one or two of these types, rather than scrupulously reporting and discussing what is lacking (so far) in "theories" of a given area. *[e.g. emotion]*

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Critical thinking tip (L 5):

(arg. schemas)

Is the argument schema in a given published paper valid? or is it an unnatural shape for the real nature of the argument? Is it iontroducing more than one new thing simultaneously? (new theory, new prediction/hypothesis, new data?)

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Critical thinking tip (L 7)

[*Reductionism*]

Are the (3) major types of data being used reductively to explain each other, or collaboratively?

Look for self-stabilising systems / feedback loops that make a level relatively self-contained.

Test for whether causation runs in both directions?

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A place to stop

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