# CHIP-3
## Concepts and history in psychology

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## This lecture topic

This set of slides is about argument structures.

There is not one single structure for scientific arguments;

Disciplines often focus on one or two formats: but is this a weakness?

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## Argument structures

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## Reminder:  the Newtonian triad

1) A theory

2) Calculation / prediction: generate testable consequences from the theory.  (A theory that can explain anything implies we shouldn't think any more, or learn any more.)

3) Observation, experiment

Some schemas:
- Falsifiability —>  must be able to do 2, then 3
- Induction —> take existing 3 and generate 1.
- Similarly the method of examples and counterexamples uses existing 3 to check 1: allows tests of theories without new 3. E.g. my arguments about emotion.

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## Argument schemas

Kuhn focussed on non-rational aspects of actual scientific research communities.

Ted Nield pointed out (for geology) how a discipline at a particular time may only allow one of the possible argument types to be published, and this sometimes obstructs the publication of vital arguments.  This kind of restriction is, say, semi-rational: a convention based on methodological problems but perhaps adhered to too rigidly.

E.g.  Darwin's book "Origin of species"
- Proposed one theory, discussed all the supporting evidence
- But surely that had no experimental support?

1) Later biologists do do evolutionary experimental work e.g. given a hypothesis that urban moths are soot-coloured, they might artificially colour moths and look at differential predation.
2) We need to recognise that disciplines may publish more than one kind of argument schema.

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## Argument schemas (2)

E.g.  Darwin's book "Origin of species"
- Proposed one theory, discussed all the supporting evidence
- But surely it had no experimental support, testing?

1) Later biologists do do evolutionary experimental work e.g. given a hypothesis that urban moths are soot-coloured, they might artificially colour moths and look at differential predation.

2) We need to recognise that disciplines may publish more than one kind of argument schema. E.g. a grand theory, then experimental tests of its predictions.

3) The importance of grand theories is that they look at large collections of evidence as a whole, and seek to find a single synthesis that accommodates it all.
Paul Nurse's point that many "cranks" e.g. climate change deniers are essentially selecting just a few observations that suit their view.  This is legitimate from the viewpoint of counterexample arguments; but ....

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## Some argument schemas (3)

- Propose one grand theory, discuss all the supporting evidence (Darwin) [1 th., N obs.]

- Theory vs. theory (Popper). Decisive experiments. Two theories, one observation. [2 th. 1 obs.]
- Report one set of observations, discuss multiple alternative theories to explain them. [N th. 1 obs.]
- Publish observations without theory? [0 th. 1 obs.]

    (LT seating DOI: 10.1119/1.1845987) E.g. lecture theatre seating

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## Lecture theatre seating

Students were randomly assigned seating for a course (reversed at mid-semester)

Significant effect on eventual course grade of whether in front quarter vs. back quarter in the first half of term.

This is a case, rare in psych., of an observation with NO theory or hypothesis. The authors are physicists: perhaps with an appreciation of the difference between a fact and a theory.

Perkins,K.K. and Wieman,C.E. (2005) "The Surprising Impact of Seat Location on Student Performance" *The Physics Teacher* vol.43 January pp.30-33

    Attendance:—>

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## Lecture theatre seating:  Course grades

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## Some argument schemas (4)

- Propose one hypothesis, discuss evidence for and against (CT) [ 1 hyp, N obs.]

- Pure deduction (theory extension) (a lot of theoretical physics) e.g. Hawkins, black holes.  [ 1 hyp.  1 th.]

- Explanation of an old phenomenon (old puzzle), showing which deduction from an existing theory explains it.  (Feynman, UFOs)  [1 obs, 1 hyp, 1 th.]

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## Argument schemas (5)

Veyne suggests that History and (Weberian) Sociology are almost identical, but that:

- History centres on events, uses theories to explain the observations
    Take event (an obs.), select one theory, then explain (like Feynman)
        [ 1obs, 1 hyp, 1 theory]
    Or perhaps contrast 2 theories, like Popper    [1 obs,  2 th. ]

- Sociology centres on a theory, uses /selects events to illustrate or prove it.
    [cf. Darwin:  1 th.  N obs.]

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## Argument schemas (6)

### What of psychology?

It tends to do theory in literature review articles
It does do a few decisive experiments, choosing between 2 theories.
It is bad at publishing unexplained phenomena (but: visual illusions)
It doesn't do much of any of the schemas above.

It most often seems to publish lab reports:  assert a theory, assert the experiment tests it, assert the results confirm the theory.

Weak point, it seems to me, is "prediction": establishing a reliable link between the theory and how it is operationalised in the experiment.  The giant leaps from the actual expt. manipulation to the theoretical description of what matters about the difference in the treatments.

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## Applied vs. pure science

All the above, and the Newtonian triad, apply to pure science; where the aim is to uncover universal laws that are true everywhere for all time, but many be negligibly small in their effects in some contexts. The approach is to isolate the one law you are interested in ("control" away all other causal effects). Truth not effect size.

Applied science is fundamentally different in its characteristic logic.
The measure of success is benefit to real people in real contexts.
Success depends not on one law/factor, but on all the factors with significant effects in the context: just like running a business.
On the other hand, you can ignore true things if they are small: Effect size not universal truth is what matters.

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## Applied science

Applied science, engineering, …. Medicine, education, ….

The first step in any problem is to find out what the biggest factors are; or the biggest factors you could possibly influence.

The measure of success is not discovering truth but helping people (patients cured, learners attaining more, bridges that carry traffic).

A major class of evidence is the construction of a new artifact (or process). This is an existence proof. If it exists then it is possible and can be built. (In pure science, you must stay with what nature happens to have provided.)

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## Petroski's argument

Engineers learn mostly from disasters because we do not, and cannot, know all the factors that matter in advance. When we stray beyond the region where some unknown factor was small then a disaster tells us there is a new factor in town. Because there are literally an infinite number of factors, we can't in general discover them in advance.

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## Research questions for homework

What argument structures are mostly used in psychology?

Are important ones missing? Is this a significant criticism of the discipline?

Or of the state of some topics?

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## A place to stop

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