

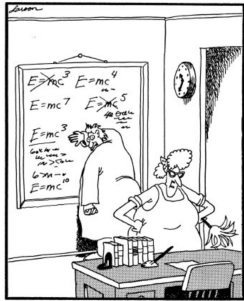
INFI-CG 2015
Lecture 28

Some philosophical choices
within cognitive modelling (2)

Richard Shillcock

1/17

Today's goals



To look at some of the
choices that are made
in cognitive modelling
and the implications
that flow from them.

2/17

Today's reading

Shillcock, R. (2013). The concrete universal and
cognitive science. *Axiomathes*. DOI 10.1007/
s10516-013-9210-y.
available at:
<https://sites.google.com/site/rcspplsinf/publications>

[Not in the exam ... just if you're interested in
what I do ...]

3/17

A concrete universal ...

... provides a *conceptual* understanding of the domain in question.

... is a material thing, reached by a far abstraction within the domain.

... still has content, itself.

... has all the richness of the particular.

4 / 32

Completeness and explanation

We can *analyze* down to the concrete universal.

We can *synthesize* other aspects of the real world around it, in *necessary* ways.

Explanation resides in this dialectical view of analysis \rightleftharpoons synthesis.

The goal is *completeness*, not simplicity.

Parsimony increases with each move towards completeness.

5 / 17

A concrete approach

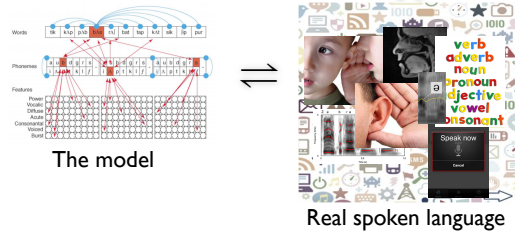
Some models in science contain a *fictional entity* that seems to play a useful role; many cognitive models contain *exclusively* fictional entities.

A concrete universal is the point in the model at which we can pour in new, material detail.



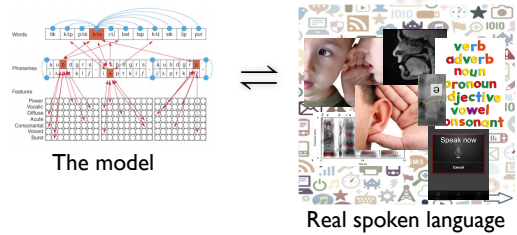
6 / 17

A fictionalist approach



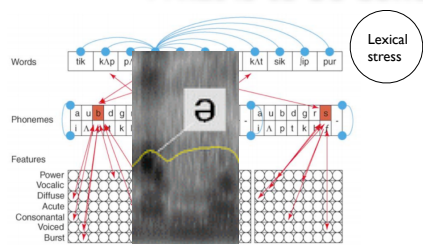
In a fictionalist approach, things start with the model and tend to end up with the model. Entities in the model map to entities in the world, but the latter are just destinations of these mappings. 7 / 17

A materialist approach



In a materialist approach, things start with the real world and end up there too. An understanding of the domain suggests one entity – the concrete universal – that is the essence of the domain. 8 / 17

What is to be done?



We can think of the simple schwa sound as a piece of real speech that, one way or another, *mediates* everything else in the domain of spoken language. 9 / 17

A concrete approach

A new version of TRACE – *concrete-TRACE*:

The diagram illustrates the 'concrete-TRACE' model. It features four main components: 'Lexical level' at the top, 'Lexical stress level' on the right, 'Phonemic level' at the bottom, and 'Phonemic input' on the left. These components are interconnected by arrows, forming a diamond shape. In the center of this diamond is a circle labeled 'schwa sound'. To the left of the main diagram is a smaller, more detailed diagram showing a network of nodes and connections, with labels for 'Lexical level', 'Phonemic level', and 'Phonemic input'.

10/17

Neurophysiology and universals

The *orienting reflex* (Pavlov, 1947; Sokolov, 1963), in which the animal orients to novelty, is perhaps a candidate for a concrete universal in the domain of neurophysiology.

11/17

A concrete approach

The diagram shows the visual pathway from the eyes to the brain. It labels the 'LEFT' and 'RIGHT' visual fields, 'NASAL HEMI-RETINA', 'TEMPORAL HEMI-RETINA', 'OPTIC NERVE', 'OPTIC CHIASMA', and 'OPTIC TRACT'. The diagram illustrates how visual information from the nasal and temporal hemiretinas is processed through the optic chiasm and optic tracts to reach the brain.

The division of the visual projection to the cortex and sub-cortex is an attractive candidate for a concrete universal in reading.

12/17

A concrete approach

Fixed Effects					
Parameter	Predict	Mid Coeff	Std Err	z value	
0 Constant: Male_Syl.Bln+Mid_Singular	3.6609	3.6609	0.0073	41.9942	
1 Ipsilateral	3.6500	-0.0169	0.0041	-4.1583	***
2 Male HQ	4.2047	0.5378	0.2611	2.0598	*
3 Constant: Female	3.6330	-0.0339	0.1101	-0.2848	(n.s.)
4 Male BeginScore	4.0951	0.4282	0.0774	5.5301	***
5 Male EndScore	3.3783	-0.2886	0.0044	-6.5037	***
6 Syl.Bln+Mid	3.6528	-0.0141	0.0049	-2.8517	**
7 Plural	3.6403	-0.0266	0.0057	-3.9910	***
8 Inq (RVCfreq)	3.7047	0.0378	0.0012	31.4008	***
9 mEq(Syllfreq)	3.7021	0.0352	0.0017	20.3770	***
10 Female HQ	4.0271	-0.1437	0.2943	-0.4882	(n.s.)
11 Male HQ BeginScore	3.3902	-1.3247	0.2276	-5.9548	***
12 Male HQ EndScore	4.0284	0.8174	0.1108	7.3774	***
13 Female BeginScore	4.3528	0.2916	0.1045	2.7888	**
14 Female EndScore	3.5643	0.2199	0.0520	4.2327	***
15 Female HQ BeginScore	4.0558	1.1837	0.2714	4.3612	***
16 Female HQ EndScore	4.1308	-0.7360	0.1159	-5.4156	***

0 Intercept case Significance levels: * < 0.05, ** < 0.01, *** < 0.001

Random Effects

Group N Variance StdDev

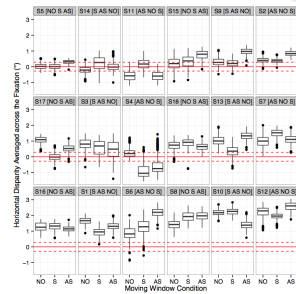
Participant 37 0.2202 0.4698

NestOfId/Ps 0.0005 0.0221

Experimental manipulations that play with the relevant concrete universal really do feel like “carving nature at its joints”, as above.

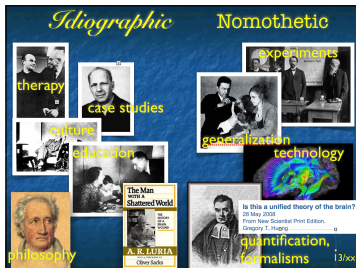
13/17

A concrete approach



Developments in statistics reveal pervasive individual differences ...

14/17



Philosophical advances (the concrete universal) and data-analytical advances (regression-type statistics) hold out the promise that we can move between the idiographic and nomothetic in revealing ways.

15/17

Overall challenges

Cognitive Science seems to be moving towards integrating the idiographic and nomothetic.

We may be approaching valuing complexity as much as simplicity.

More is beginning to be understood about the domains we have looked at – vision, attention and memory.

The research paradigms we have looked at – laboratory experiments, computational modelling, impaired processing, imaging – all have something to offer to a richer, more integrated Cognitive Science.

16/17

How to revise

Short-answer questions, and a longer (sub-divided question).

Perhaps with one or more partners, look at the slides and your notes.

Be able to say something about the major topics in the slides.

Have a look at the films we watched (all on the www, see References). (Lectures were also filmed.)

Understand the overall points made in the readings listed at the beginning of each lecture.

The References at the end of each lecture are for if you need to check out the meaning of a lecture slide.

17/17
