Last official lecture of INF1-CG!

Social cognition final bits

- cultural ratchet effect
- social intelligence hypothesis
- linguistic relativity

Course wrap up bits

- exam info + advice
- other courses to take
- other cogsci to pursue

Why are humans different from other animals?

- Many theories...
- We will briefly mention two!
- Both have to do with social cognition

Theory #1: The Cultural Ratchet Effect

- What is a ratchet?

Annu. Rev. Anthropol. 1999. 28:509–29

THE HUMAN ADAPTATION FOR CULTURE

Michael Tomasello
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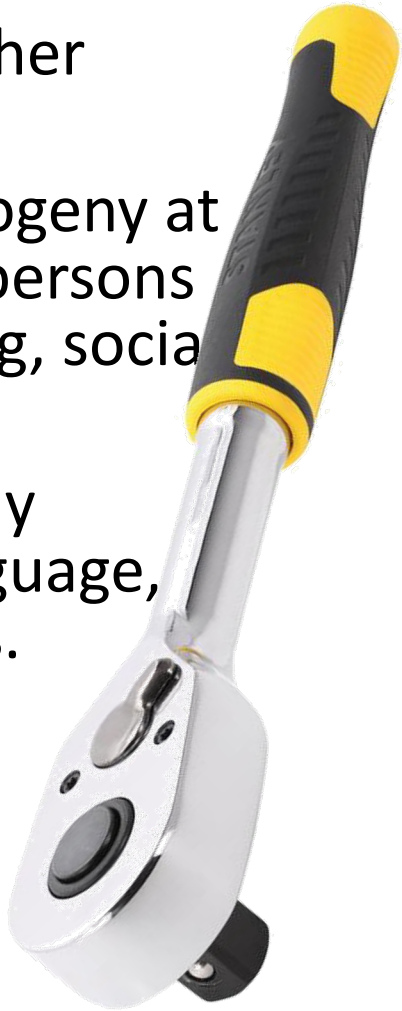
Key Words: culture, cognition, ontogeny, primates, language

- Human beings are biologically adapted for culture in ways that other primates are not, as evidenced most clearly by the fact that **only human cultural traditions accumulate modifications over historical time** (the ratchet effect).
- The key adaptation is one that enables individuals to understand other individuals as intentional agents like the self.
- This species-unique form of social cognition emerges in human ontogeny at approximately 1 year of age, as infants begin to engage with other persons in various kinds of joint attentional activities involving gaze following, social referencing, and gestural communication.
- Young children's joint attentional skills then engender some uniquely powerful forms of **cultural learning**, enabling the acquisition of language, discourse skills, tool-use practices, and other conventional activities.
- These novel forms of cultural learning allow human beings to, in effect, pool their cognitive resources both contemporaneously **and over historical time** in ways that are unique in the animal kingdom.



What does this mean?

- Imagine trying to solve a difficult problem.
- There is some probability **p** that you, as an individual, will solve it.
- If we never learn solutions from each other, then for all of time, our species will (collectively) always have probability **p** of solving the problem.

- BUT... what if we can learn the solution from another person who has solved it???
- suddenly the probability of our species having the solution at any given time goes way up!
- This is a lot of what we mean when we say “progress”

Article | Open access | Published: 06 March 2024

Bumblebees socially learn behaviour too complex to innovate alone

Alice D. Bridges, Amanda Royka, Tara Wilson, Charlotte Lockwood, Jasmin Richter, Mikko Juusola & Lars Chittka

Nature **627**, 572–578 (2024) | Cite this article

videos....

- from supplementary information here:

- https://www.nature.com/articles/s41586-024-07126-4

- Culture refers to behaviours that are socially learned and persist within a population over time.
- Increasing evidence suggests that animal culture can, like human culture, be cumulative: characterized by sequential innovations that build on previous ones[1].
- However, human cumulative culture involves behaviours so complex that they lie beyond the capacity of any individual to independently discover during their lifetime[1,2,3].
- To our knowledge, no study has so far demonstrated this phenomenon in an invertebrate.
- Here we show that bumblebees can learn from trained demonstrator bees to open a novel two-step puzzle box to obtain food rewards, even though they fail to do so independently.
- This suggests that social learning might permit the acquisition of behaviours too complex to ‘re-innovate’ through individual learning.
- This finding challenges a common opinion in the field: that the capacity to socially learn behaviours that cannot be innovated through individual trial and error is unique to humans.

Theory #2: Which are the smartest animals??

- Humans / primates
- Cetaceans
- Corvids
- Elephants

- All live in very complex social groups
- All are very smart!

Another theory… the Social Intelligence Hypothesis

REVIEW ARTICLE | 13 AUG 2018

An intraspecific appraisal of the social intelligence hypothesis

Benjamin J. Ashton; Alex Thornton; Amanda R. Ridley

- The prevailing hypotheses for the evolution of cognition focus on either **the demands associated with group living** (the social intelligence hypothesis (SIH)) **or ecological challenges such as finding food**.
- Comparative studies testing these hypotheses have generated highly conflicting results;
- consequently, our understanding of the drivers of cognitive evolution remains limited.

Example: Baboon social hierarchies

Received: 11 July 2016 | Revised: 18 October 2016 | Accepted: 21 October 2016
DOI 10.1002/ajpa.23144

AJPA YEARBOOK ARTICLE

WILEY American PHYS ANTHROPO

Charting the neglected West: The social system of Guinea baboons

Julia Fischer[1] | Gisela H. Kopp[1,2,3] | Federica Dal Pesco[1] | Adeelia Goffe[1] | Kurt Hammerschmidt[1] | Urs Kalbitzer[1,4] | Matthias Klapproth[1] | Peter Maciej[1] | Ibrahima Ndao[5] | Annika Patzelt[1] | Dietmar Zinner[1]

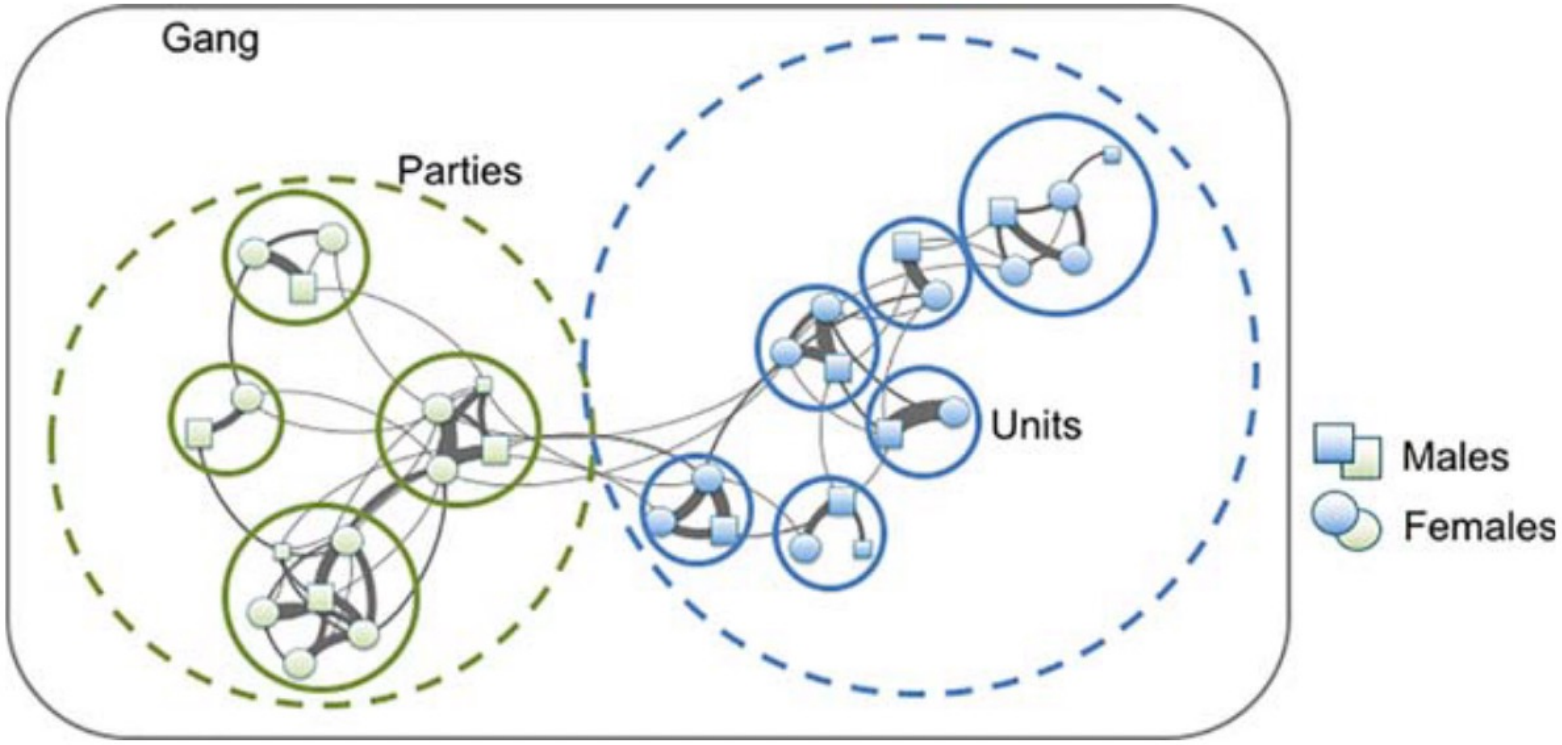


FIGURE 5 Social organization within a gang of Guinea baboons, based on proximity scans (unpublished data) collected during a 2-month period in 2013 from the Simenti gang. One-male-units, some with secondary males (small squares), team up to form "parties," which in turn form larger aggregations ("gangs"). The number of females per male varies considerably, as does female tenure length (Goffe et al., 2016). Females may maintain relations with females outside their own unit or party (Goffe et al. in preparation)

Which are the smartest animals??

- Humans / primates
- Cetaceans
- Corvids
- Elephants

- All live in very complex social groups
- All are very smart!

- **Counterexamples???**

The New York Times

https://www.nytimes.com/2018/11/30/science/animal-intelligence-octopus-cephalopods.html

MATTER

Yes, the Octopus Is Smart as Heck. But Why?

It has eight arms, three hearts — and a plan. Scientists aren't sure how the cephalopods got to be so intelligent.

By Carl Zimmer

Nov. 30, 2018

Final bit... back to language

Casasola, M., & Ahn, Y. A. (2018). What develops in infants' spatial categorization? Korean infants' categorization of containment and tight-fit relations. *Child Development*, *89*(4), e382-e396.

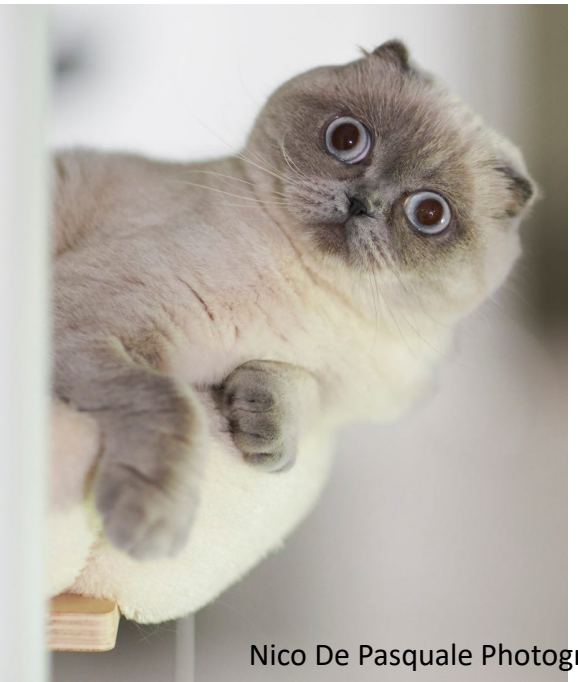
Loose-fit Containment	
Tight-fit Containment	

Choi, S. (2006). Influence of language-specific input on spatial cognition: Categories of containment. *First language*, *26*(2), 207-232.

- This study examines whether language-specific input influences children's nonlinguistic spatial cognition as they acquire their first language.
- Recent research on infant cognition has shown that **preverbal** infants **can** make a distinction between tight-fit and loose-fit containment relations.
- This distinction is systematically made in Korean (kkita 'fit tightly'), but not in English (in).
- Using a preferential-looking method, this study tested sensitivity to the distinction in English and Korean learners at different ages....
- Results showed that while English learners weaken their sensitivity to the distinction by 29 months of age, Korean learners maintain high sensitivity to the distinction throughout the age periods tested.
- Language surveys of the English learners indicate that **weakening of the sensitivity occurs as the children use the relevant spatial terms** and increase their vocabulary level.

Remember symbol grounding?

“cat”



Nico De Pasquale Photography//Getty Images

Conventional view:

- There are things running around in the world...
- And we can slap a label onto it: “cat”

- On the other hand.... does the **existence of the label in our lexicon** affect how we carve up the world into things that we want to label???

- A lexicon is a culturally accumulated way of carving up the world in some **useful** way.....
- **“Useful” may be context-specific!**

Linguistic relativity hypothesis

- Sometimes called the Sapir-Whorf hypothesis, named after linguists Edward Sapir (1884–1939) and Benjamin Lee Whorf (1897–1941)

- **Colloquially... the language that you speak influences how you think.**
- How much influence? Strong version of hypothesis vs. weak version...

- Several dramatic examples from rare languages, e.g., famous studies of color perception in the Tarahumara people of Mexico
- Who only have one word for “blue-green”
- But... some of these studies end up having interpretability issues...

- But also examples closer to home, especially if you are bilingual...
- “Opika” in Telugu.....

Final course wrap up bits!

Assessment

Reminder: The assessment for this course consists of:

- an assessed assignments, worth 20% of the overall mark;
- five quizzes to test your knowledge, each worth 4% of the overall mark;
- a final exam, worth 60% of the overall mark.

There is no "double hurdle" -- you don't need to get a certain mark in any of the components, you just need to get 40 or above overall to pass the course.

If you don't pass the course now, you will be able to take the resit exam in August.

Exam

The exam will be a **two-hour, in-person, paper-and-pencil, closed book exam**.

For exam date, time, and location see the Exam Timetable: https://exams.is.ed.ac.uk/

The exam paper will consist of two parts:

- Part A: 13 multiple choice questions
- Part B: 12 short-answer questions

Each question is worth 2 points, so you can get 50 points in total.

How to Prepare for the Exam?

AMERICAN PSYCHOLOGICAL ASSOCIATION

Psychological Bulletin

American Psychological Association
0033-2909

http://dx.doi.org/10.1037/bul0000309

Testing (Quizzing) Boosts Classroom Learning: A Systematic and Meta-Analytic Review

Chunliang Yang and Liang Luo
Beijing Normal University

Miguel A. Vadillo
Universidad Autónoma de Madrid

Rongjun Yu
onal University of Singapore, Hong Kong Baptist University

David R. Shanks
University College London

How to Prepare for the Exam

All the content covered in the lectures is examinable. To prepare:

- revise with the help of the lecture slides and recordings
- look at the tutorials
- study the readings (material in the readings is only examinable if it was also covered in the lectures)
- practice with the mock exam and past papers
- practice writing questions for each other!
- **Study together! More fun, and good for you on multiple dimensions.**

There will be no programming questions in the exam. You are not expected to memorize complex mathematical formulae. These will be given if needed.

You will be expected to understand some of the fundamental equations that we covered, i.e., be able to look at it and explain it, but you will not have to recall them from scratch.

Mock Exam, Past Papers

We have released a mock paper on the course web site. This paper is very close in form and content to the real exam.

There are past papers for this course in the Exam Paper Archive: https://exampapers.ed.ac.uk/

However, the content of the course has changed over the years. On the next pages, we list the parts of past papers that are useful for exam preparation.

Mock Exam, Past Papers

2018/19 main: B1, B2, B4, B5
2017/18 resit: B1, B2, B3, B4, B5
2017/18 main: B1, B2
2016/17 resit: B1, B2, B3, B5
2016/17 main: B3, B4, B5
2015/16 resit: A1, A3, A4, A7, A8, A9, A10
2015/16 main: A4, A6, A7, A10, B1
2014/15 main: A3, A4, A5, A6, A7, B1
2013/14 resit: A7, A8, A10, A12, A13, A14, B2
2013/14 main: A2, A3, A8, A12, A13, A15, B1
2012/13 resit: A1, B1
2012/13 main: A1, A2, A3

Exam Q&A session

We will hold an exam question and answer session about a week ahead of the exam (tbc). We will announce this on Learn.

This is an opportunity to ask anything that is unclear about the course material.

What's next? Some courses to consider in Informatics (+ other courses in PPLS)

Computational Cognitive Science (INFR10054, level 10)
Foundations of Natural Language Processing (INFR10078, level 10)
Machine Learning (INFR10086, level 10)

Computational Cognitive Neuroscience (INFR11036, level 11)
Computational Neuroscience (INFR11209, level 11)
Accelerated Natural Language Processing (INFR11125, level 11)
Advanced Topics in Natural Language Processing (UG) (INFR11288, level 11)
Advanced Topics in Machine Learning (UG) (INFR11289, level 11)
Robot and Reinforcement Learning (UG) (INFR11290, level 11)
Seminar in Cognitive Modelling (UG) (INFR11237, level 11?)

What else?

- **Read books!** So many good books about animal cognition, people cognition, creativity, technology and society.....

- **Look things up in papers on Google Scholar!** You have access to a very specialized source of knowledge. Take advantage of it!!

- Think about your own cognition. And things you see around you. **Be curious! Be concerned. Be aware. Be delighted. Be skeptical.**

- Cognitive science needs lots of people with lots of different backgrounds, interests, jobs.... Even if this is the last cogsci course you ever take, you now know more than a layperson does. **Help others understand. Use your powers for good.**