Psicologia dei Gruppi e delle Relazioni Sociali

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Course Outline

Theoretical Lessons (Part 1):

1- An introduction to the group dynamics (1)
2- An introduction to the group dynamics (2)
3- Studying Groups
4- Inclusion and Identity
5- Formation
6- Cohesion and Development
7- Structure
8- Influence
9- Power
10- Leadership
11- Performance
12- Decision Making
13- Teams
14- Conflict
15- Intergroup Relations
16- Groups in Context
17- Groups and Change

Experimental activity (Part 2):

18- From cognition to social simulation
19- Research in group dynamics
20- Community detection
21- Epidemic Modeling
22- The virtual settings
23- Reputation dynamics
24- Collective Intelligence
25- Group reasoning
26- Crowd dynamics
27- Social influence: new perspectives
28- Personality, Self and Identity (I)
29- Personality, Self and Identity (II)
30- Constructing the Self in a Digital World
31- Self Disclosure, Privacy and the Internet
32- Understanding the On-line behaviour

Lesson: 25 – (1/4)
Title: Group reasoning

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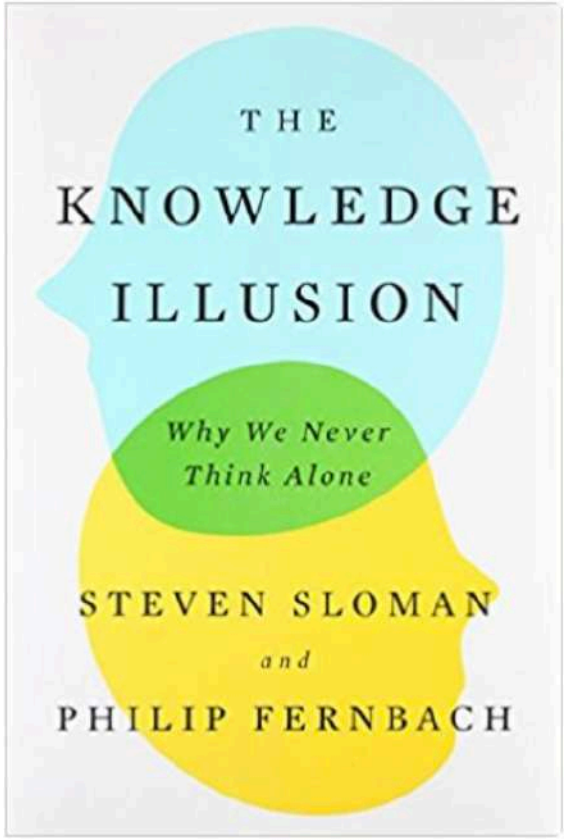
Lesson XX Outline

- ***Ignorance and the community of knowledge***
  - *Human mind is both genius and pathetic*
  - *The illusion of explanatory depth*
  - *The community of knowledge*

- ***Thinking alone and together***
  - *The curse of perfect memory*
  - *Human reasoning is causal*
  - *Reasoning forward and backward*
  - *Storytelling*
  - *Reasoning about physical events and mechanisms*
  - *Dual-process theory of reasoning*
  - *The hive mind*
  - *The evolution of human brain*
  - *Shared intentionality*
  - *The natural division of cognitive labor*
  - *Accessibility and sense of understanding*
  - *Internet as a participant in the community of knowledge*

- ***Applications***
  - *Crowdsourcing*
  - *Science*
  - *Politics*
  - *Some hints: Conclusions*

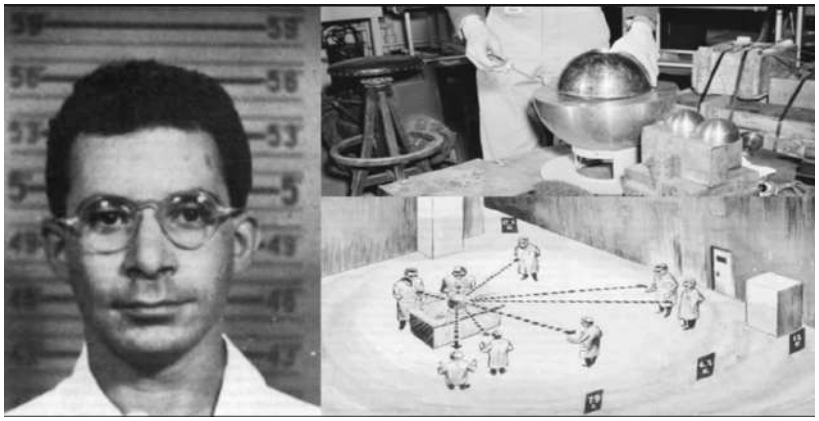


Main points:

- We don't know much at all (**ignorance**)
- We think we do (the **illusion**)
- Dependance from the **community of knowledge.**
- By being a member of that community, we have access, in some ways to that knowledge, but **access does not equal possession**. However, we think it does.

Ignorance and the Community of knowledge

Human mind is both genius and pathetic



Louis Slotin
(1910-1946)
Los Alamos, 1946. Died due to radiations while perfoming the "tickling the dragon's tail" (cit. Feynman) experiment with a screwdriver.

Alvin Graves
(1909-1965)
Director of several nuclear weapons tests (40s and 50s)

Castle Bravo (1954)
(Bikin atoll)
Scientists were off by a factor 3 due of misunderstanding of the properties of lithium-7

People are capale of the most remarkable feats and yet equally capable of the most remarkable demonstration of ignorance and foolhardiness. We are error-prone (**even smart people can be very dumb!**), irrational and ignorant but, at the same time, we are able to build thermonuclear bombs.

Ignorance and the Community of knowledge

Human mind is both genius and pathetic

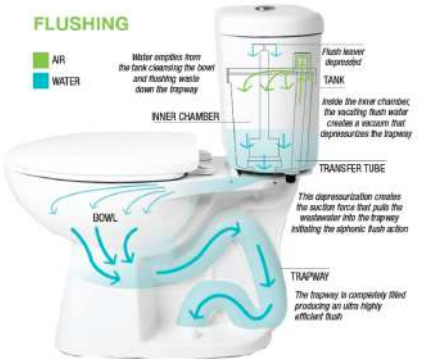
Why?

Even the smartest people experience the "illusion of knowledge": believing that we understand how things work, even when we don't.

Do you know how a toilet work?

What happens when you flush a toilet?

What You Think You Know



What You Actually Know

Ignorance and the Community of knowledge

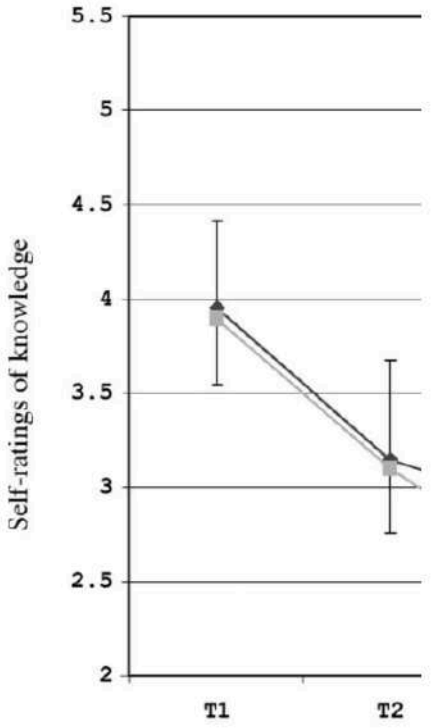
The illusion of explanatory depth

Rozenblit & Keil (2002)

1) On a scale from 1 to 7, how well do you understand how zippers work?
2) How does a zipper work? Describe in much detail as you can all the steps involved in a zipper's operation
3) Now, on the same 1 to 7 scale, rate your knowledge of how a zipper works again

Results: before trying to actually explain, participants (reasonably) rated their understanding. After an attempt of actually explaining, they discovered that they know little. **Very robust result**. Piano keys, toilets, locks, helicopters, watches, sewing machines, political issues, climate changes, finances. Everyone tested showed the illusion: elite and public universities students as well as random sample of people. **People live in an illusion.**

E.g., speedometer and sewing machine

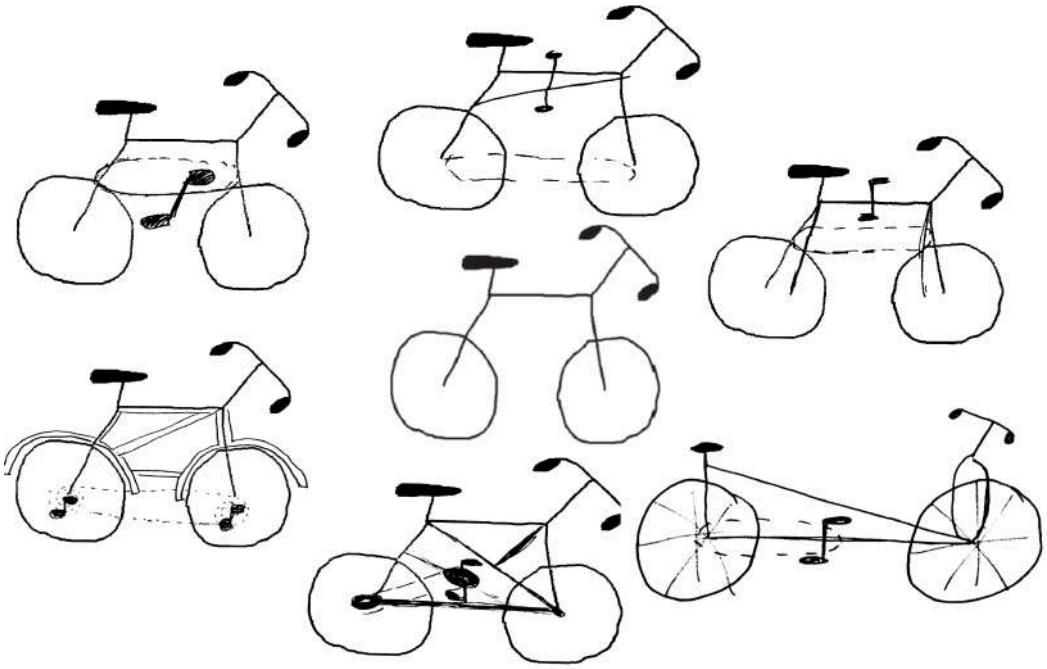


Ignorance and the Community of knowledge

The illusion of explanatory depth

Lawson (2006)

Schematic drawing of a bicycle (in the center). Fill the missing parts. Where do the chain and pedals go?



- 50% of participants were unable to complete the drawings correctly.
- The same happened in a recognition task
- Even expert cyclist did not perform better.

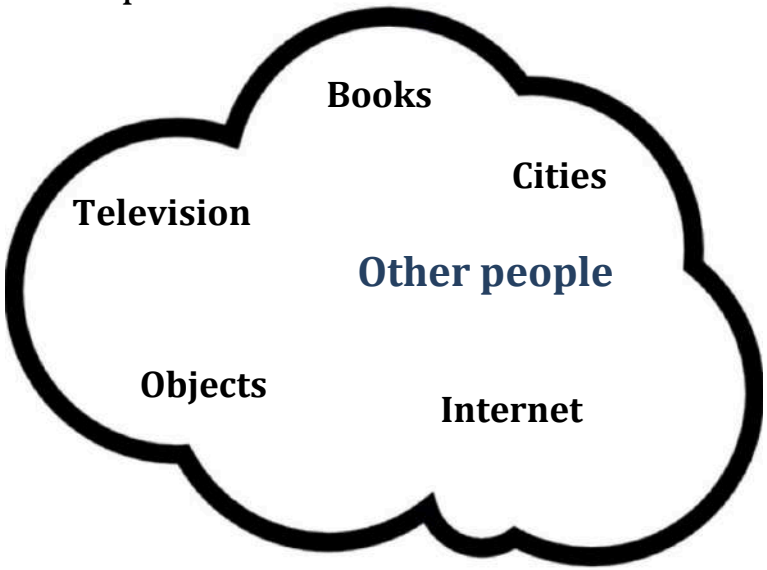
Ignorance and the Community of knowledge

The community of knowledge

We are **dumb** and **competent thinkers** at the same time. How can be possible?

We have access to huge amounts of knowledge that sit in other's people heads: we have friends and family and other members of the community (the **community of knowledge**) who each have their little domains of expertise.

The mind is outside our head



Thinking alone and together

The curse of perfect memory

The AJ case of hyperthymesia (Parker, Cahill, & McGaugh, 2006)

"I am thirty-four years old and since I was eleven I have had this unbelievableability to recall my past, but not just recollections. My first memoriesare of being a toddler in the crib (circa 1967) however I can take adate, between 1974 and today, and tell you what day it falls on, what I wasdoing that day and if anything of great importance... occurred on that day I can describe that to you as well. I do not look at calendars beforehandand I do not read twenty-four years of my journals either. WheneverI see a date flash on the television (or anywhere else for that matter)I automatically go back to that day and remember where I was, what Iwas doing, what day it fell on and on and on and on and on."

"It is nonstop, uncontrollable and totally exhausting. Some peoplecall me the human calendar while others run out of theroom in complete fear but the one reaction I get from everyonewho eventually finds out about this "gift" is total amazement.Then they start throwing dates at me to try to stump me... I haven't been stumped yet. Most have called it a gift but I call ita burden. I run my entire life through my head every day and itdrives me crazy!!!"

The "storage" problem: Amazon (2016) sells a 1-terabyte drive for $100 (200.000 songs or 310.000 photographs). Hyperthimesia indicates that the brain is able to store great amount of information. **Why don't we all have these abilities**? ***Evolution***

What good is a brain?

Being smart is about to extract deeper, more abstract information

Choose effective actions.

Thinking alone and together

The curse of perfect memory

Landauer (1986) tried to estimate **how much we know** (with different techniques/task, within the HIP framework). E.g.:

- Rate of acquisition of information (the same independently by the nature –visual, verbal or musical).
- How much they acquire (assuming that the rate is constant) in a 70-years life.

Response: about 1 gigabyte

Shocking response, if you assume the HIP framework!

The **human mind does not work like a computer**. Human mind has been shaped by the evolution for **action**.

16 gigabyte pen drive

= 38.000 photos of medium quality/size = 16 x

Thinking alone and together

Human reasoning is causal

- For each mechanism we are familiar with, it's easy for us to **reason causally** (how the world works); and we learn quickly how new mechanisms work.
- There are other reasonings that people generally do not find so natural (square root of 8.743, quantum mechanism and so on)

Modus ponens
If A, then B.
A.
Therefore, B.

Seems easy, Obvious.

Some arguments that aren't logical seem like they are.
If my underwear is blue, then my socks are guaranteed to be green.
My socks are in fact green.
Therefore, my underwear is blue.

People are usually fooled (affirmation of the consequent fallacy).

When arguments are about causes and effects people are seldom fooled.
If I fall into the sewer, then I'll need to take a shower.
I took a shower.
Therefore, I fell into the sewer.

When we reason causally, we are able to make correct inference.

Human causal reasoning

People are not logic machines (as computers), we make inferences based on the logic of causality, not on the propositional (textbook) logic.

Thinking alone and together

Reasoning forward and backward

- **Reasoning forward**: how causes produce effects (**predicting** the future, modus ponens, how things work)
- **Reasoning backward**: from effects to causes (**diagnostic** reasoning; explanations). *More difficult, but peculiar of humans!*

Ms. Y is a 32 years old female who has been diagnosed with depression. Please indicate the likelihood that she presents with lethargy.

> (should be)
= (observed)

If you don't know the relevant statistics, it's tough. But you know that the probability she is lethargic should be at least a little lower if there is no other reason to be leathergic.

Ms. Y is a 32 years old female who has been diagnosed with depression. **A complete diagnostic workup reveals that she has not been diagnosed with other medical or psychiatric disorder that would cause lethargy.** Please indicate the likelihood that she presents with lethargy.

Ms. Y is a 32 years old female who presented with lethargy. Please indicate the likelihood that she has been diagnosed with depression.

< (should be)
< (observed)

The absence of an alternative cause should increase people's judgments. When A is the cause of B and you know that B happened, then once you know that Bnothing else caused B, A must be very likely

Ms. Y is a 32 years old female who presented with lethargy. **Please indicate the likelihood that she has been diagnosed with depression given that a complete diagnostic workup revealead that she has not been diagnosed with other medical or psychiatric disorder that would cause lethargy.**

Diagnostic (backward) and predictive (forward) reasoning

We are better at predictive than diagnostic reasoning. However , the mental picture generated for predictive reasoning has no place for alternative causes. (and we are unable to run mental simulation backward in time, frome effect to cause.

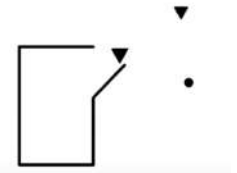
Thinking alone and together

Storytelling

As a society, we trade information about causal analysis in a variety of ways (YouTube, books, and so on).

Perhaps the most common way that people pass causal information to one another is by storytelling. Consider the old Yiddish story about the shopkeeper who arrived at his shop only to find abusive and derogatory graffiti spray-painted all over his store window. He cleaned the window, but the same thing happened again the next day. So he hatched a plan: On the third day, he waited until the local ruffians showed up and did their dirty work and then paid them $10 to thank them for their effort. The next day, he thanked them again but only paid them $5. He continued to pay them to deface his property but the amount kept decreasing so that soon they were only getting $1. They stopped coming. Why bother doing all that work to abuse the shopkeeper for so little money?

- Story that teaches how "motivation" works (what causes people to act and how modify their motivation to change their actions).
- Bible: Adam and Eve, Cain and Abel, and so on.
- Literature: e.g., Shakespeare.



- **Storytelling** is our natural way of making causal sense of sequence events (Heider & Simmel, 1944).
- Imagine how the world would be if something were different.
- Counterfactual reasoning
- Thought experiment (e.g., Galileo)
- Stories make up our identities (shared with communities), share experiences, organize community's collective memory, illustrate and announce an attitude.
- Stories tend to simplify/oversimplfy events (e.g., Henry VIII).
- Single characters become "superheroes".

Lesson: 25 – (2/4)
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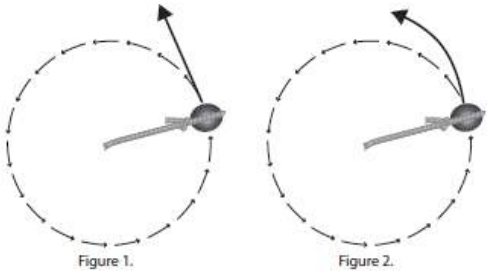
Thinking alone and together

Reasoning about physical events and mechanisms



What path is the rock going to take?
People believe Fig. 2, actually is figure 1 (according to Newton laws. This because everyday observations often don't appear to follow them (Kubricht, Holyoak, & Lu, 2017).

If the top coin is rolled around the edge of the bottom coin such that it comes to rest directly beneath, which way will the arrow be facing?
People believe the arrow will face down. In fact, it faces up (it's uncommon to see objects rolling curved surfaces (diSessa, 1983).

People employ a causal model of the heating system where the speed of a reaching the final temperature depends on a target temperature).

Causal reasoning about physical events and mechanisms

When mechanism are too small, abstract, inaccesible, people employ "intuitive" causal models taht we experience very frequently (people understand electricity via analogy with flowing water…). Causal structure is the vehicle for everyday thought, not logic, association, or (even) probability.

Thinking alone and together

Dual-process theory of reasoning

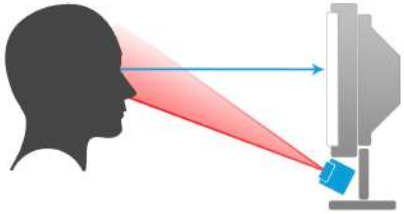
	Intuition	Deliberation
Principles of operation	Associative	Symbol manipulation
Nature of processing	(a) Memory retrieval (b) Similarity (c) Automatic (d) Effortless	(a) Rule application (b) Abstract (c) Strategic (d) Effortful
Source of knowledge	Personal experience	Language, culture, and formal systems
Illustrative cognitive functions	Imagination Visual recognition Associative memory	Explanation Formal analysis Verification

Sloman (1996; 2014)

Thinking alone and together

Dual-process theory of reasoning

- GOFAI robots (based on **deliberation**) require to optimize and plan everything before acting (doing impressive amount of computations).
- Think about to make a simple step!
- **Embodied intelligence**: **Brooks** (1986, 1991, 1996) emphasize the need of being inspired by *biological creatures* (**subsumption architectures**).
- Similar to **intuitive** system?
- How humans are designed: we store information (and we reason) outside our brain: in our **body**, in the **enviroment** and in other **people**.



Mobile-window reader (Churchland, Ramachandran, & Sejnowski, 1994)

Dual-process theory of reasoning

Dual-process theory distinguishes two processes: non-analytic (intuition) and analytic (deliberative) reasoning. The former, also called System 1, relates to fast and effortless unconscious thinking (e.g. pattern recognition). The latter, also called System 2, denotes the slow and effortful process of problem solving by conscious analysis..

Thinking alone and together

The hive mind

- Thinking evolved to **support complex action**; the mind process informatio so that individual can act (and transform the enviroment to their liking).
- Thought uses the body, enviroment and other people to do its processing: the **outside world serves as a memory** and is part of the **thought process**.
- However, a single individual can do far less things than multiple individuals: indeed, in nature we observe **complex behavior** arise from the **coordination of multiple thinkers**.
- When multiple cognitive systems work together, **group intelligence can emerge** (and it goes beyond what each individual is capable of).

The beehive solves many problems through cooperation. Workers collect and store food that supports the hive during the winter. Workers also protect the hive from intruders, safeguarding the food and the young. No individual bee could fend for itself. Each individual has a job to do and is an expert at that job.

Thinking alone and together

The hive mind

- Individual people are smarter than individual bees, but at another level group of people and group of bees harnes the power of multiple entities to generate massive intelligence (i.e., the hive mind).
- Humans are the most "powerful" species ever because how communities of brains work together.
- Ancient humans killed the biggest animals that populated their world: before humans, success at hunting depended from strenght, size, or speed. After humans, success at hunting depended by individual and collective intelligence (Speth, 1997).

The community hunt required:

- Great expertise
- Careful planning
- Coordination
- Specialized effort (also after the hunt!)
- Individual intelligence is useful, but no individual could do this alone.
- Division of cognitive labor.

The hive mind

The mind did not evolve in the context of individuals sitting alone solving problems but it evolved in the context of group collaboration, and our thinking evolved interdepdently, to operate in conjunction with the thinking of others. Like a beehive, where each individual is master of a domain, the group intelligence that emerges is more than the sum of its part.

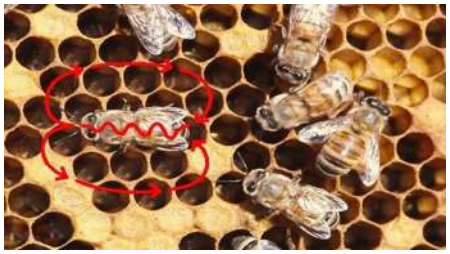
Thinking alone and together

The evolution of the human brain

From the emergence of the genus Homo (2-3 millions years ago) and the emergence of the modern humans (200.000 years ago), the great "leap" was cognitive: the brain mass increased about 3 times since the early hominids (encephalization).
Large brains are costly, why this rapid growth happened?

1) **Ecological theory**: it was driven individuals' increasing abilities to deal with the environment (extract fruit from shells and thus more calories, larger mental map for more food resources and so on).
2) **Social brain hypothesis** (Dunbar, 1992): it was driven by the need of the coordination of multiple cognitive systems to porsue complex, shared goals (need of communicate in complex ways, understanding the perspectives of other, share common goals, resulting in a snowball effect). Data on primates confirms this hypothesis.

Bee dance:
simple and limited communication



Human language:
mental states and shared intentionality

Thinking alone and together

Shared intentionality

Humans can share their attention with someone else

When humans interact with one another, they do not merely experience the same event; they also know ther are experiencing the same event

- **Sharing attention** is a crucial step for being a full collaborator in a group sharing cognitive labor and in a community of knowledge
- If we share attention, we can share **common ground** (knowing that thet know what we know) and then pursuing a **common goal** (Vygotsky, 1978)

Thinking alone and together

Shared intentionality

- An infant sees an adult pointing to an opaque bucket: if this happens out of the blue, the infants is confused (what are his/her intention?). If they are playing a game, (the adult hides something for the infant to find), infant > 14 months understand the adult's goal: to let him/her know where the hidden object is.
- Infants < 14 months, chimpanzees and other apes did not at any age.

Shared intentionality

Shared or collective intentionality is the ability and motivation to engage with others in collaborative, co-operative activities with joint goals and intentions (Tomasello et al. 2005).

Lesson: 25 – (3/4)
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Thinking alone and together

The natural division of cognitive labor

- ***Cognitive labor***: those faculties of labour that are defined by cognitive activity (cognitive labour), in other words principally through immaterial cerebral and relational activities.

- Wegner and Giuliano (Wegner, 1987) asked couples that had been seeing exclusively each other for at least three months to remeber a series of particular items. They found that each partner deferred to the other's expertise to store and recall the items relvant to that expertise.

Thinking alone and together

The natural division of cognitive labor

- A common occurrence in collaborative work is that participants get confused about who deserves credit for an idea.

  Alice: I've got a great idea. What if we did X?
  Bob: Wait a second, you hated X when I suggested it three months ago.
  Alice: Mmm, I guess it's actually a pretty good idea

- **Individual** and **group thinking** are **so intertwined** that it's hard to keep track of boundaries
- If we ask people to estimate the percentage of their contribution to a group project, they take advantage of the uncertainty by giving themselves more credit than they deserve. The total estimate reliably exceeds 100%

Thinking alone and together

Accessibility and sense of understanding

Merely telling people that someone understood a phenomenon increases their sense of understanding of the phenomenon IF this knowledge is accessible.

A May 19, 2014, study in the journal Geology reported the discoveryof a new rock that scientists have thoroughly explained.The rock is similar to calcite, yet it glows in the absence of alight source. The authors of the study, Rittenour, Clark, andXu, **fully/did not** understand how it works; they provided a descriptionof the remarkable appearance of the mineral and outlined futureexperiments.

If the scientists understand the phenomenon the rating of understanding of the reader is higher than the condition when the scientists did not understand

DARPA has classified as secret a May 2014 study about a newlydiscovered rock that the agency's scientists have thoroughly explained.The rock is similar to calcite, yet it glows in the absenceof a light source. The authors of the study fully understand howit works; they provided a description of the remarkable appearanceof the mineral and outlined future experiments. The futureexperiments are also being kept secret, so no people outsideof DARPA have access to information about the new rock.

If the scientists understand the phenomenon but it's a secret the rating of understanding of the reader become lower.

Confusion at the frontier phenomenon

Just as people fail to know where their activities end and those of other begin, people fail to clearly distinguish their knowledge from others. Merely knowing that knowledge is available in the community makes people feel knowledegeable.

Thinking alone and together

Internet as a participant in the community of knowledge

Technology as an extension of thought

- Internet has become a major player in all of our lives.
- The mastery of new technology has gone hand in hand with the evolution of our species: "cognitive capacity and technology reinforced each other as tcivilization developed" (Tattersall, 2015).
- Our bodies and brains are **designed to incorporate new tools** into our activities as if they were extensions of our bodies (e.g., from pen/pencil to cursor on a screen, touch screen, and so on).
- Just as we **store understanding in other people**, we store understanding in the internet.
- Having knowledge available in other people's heads lead us to overrate the individual understanding.
- The "**confusion at the frontier**" phenomenon lead to the illusion of the explanatory depth (people think to understand things better than actually they do because they incorporate other people's understanding into the assessment of their understanding).
- Two independent research group (Wegner & Ward, 2013; Fisher, Goddu, & Keil, 2015) discovered the same kind of "confusion at the frontier" phenomenon when people search the internet.
- Internet as a **player in the community of knowledge**.

Thinking alone and together

Internet as a participant in the community of knowledge

Internet and "confusion at the frontier"

- Engaging in internet searches **increased** people's **cognitive self-esteem**, their sense of their own ability to remember and process information (Wegner & Ward, 2013). Searching internet for unknown facts and later asked where they found the information, **people forgot to having conducted the search** (they gave themselves the credit instead of Google/Wikipedia).
- The Fisher, Goddu, & Keil (2015) study:

General causal knowledge questions (e.g., "how does a zipper work?"). Two groups:

Search the Internet to confirm the details of the explanation

Answer the questions without using any outside sources

Rate how well they are able to answer unrelated questions

Results: people that searched the internet rated their ability to answer unrelated question higher than the control group.

Thinking alone and together

Internet as a participant in the community of knowledge

Internet, "confusion at the frontier" and medicine/finance

- Medical professionals reported that patients don't actually know more than patients who haven't consulted the Internet. However, the former **are more confident** about their medical knowledge (Ward, 2015).

- People were asked to search the Internet for anwsers to simple finance questions (e.g., "what is a stock share?"). Next, participants played an investor game (unrelated to the questions) and they bet on their performance. People who searched the Internet bet a lot more than the control group but they were not better in the game. In sum, they lose more money (Ward, 2015).

Lesson: 25 – (4/4)
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Applications
Crowdsourcing

A real super intelligence

- The practice of obtaining information or input into a task or project by enlisting the services of a large number of people (typically via the Internet).
- Broader and more dynamic communities of knowledge (Amazon crowdsource reviews for products, Waze crowdsource mpas of traffic conditions, and so on).
- Experts are generally (but not always) more likely to offer their input (the trick is: to make use of expertise).
- The critical problem is of incentivize experts to contibute (Motivation? Money?)

- Galton (1907): making a guess about an ox's true weight to win a prize. The avreage guess was within 1% of the true weight. We may individually suffer from the knowledge illusion, but the expertise that's present in a crod can overcome individual biases.
- Open problem: **motivation**, choosing **the right set of experts** for a particular problems. **Cognitive labor needs to be divided up effectively**, distributuing fairly risks and rewards associated with each project.

Applications

Science

The public understanding of science

- Antiscientific rethoric about vaccines, climate change, genetic engineering
- The **Deficit Model** (Bodmer Report, 1985): science attitudes are determined by **understanding/knowledge**. Antiscientific thinking is due to a knowledge deficit and will disappear once the deficit is filled.
- There is indeed a relationship between knowledge and attitudes, but it is **fairly weak** (Sloman & Fernbach, 2017). In particular, vaccine opposition is a typical example where education is ineffective at chaning attitudes.
- Pre-post study asking for beliefs about the link between vaccines and autism, likelihood of bad consequences of vaccines, if they are going to vaccinate their children (Nyhan, Reifler, Richey, & Freed, 2014). Four conditions:

  a) Negative outcomes of failing to vaccinate
  b) Images of children with measles, mumps and rubella
  c) Emotional story with a child contracted measles
  d) Information debunking the link between vaccines and autism

Results: No differences, in some cases a backfire!

Applications

Science

Committing to the Community

- The deficit model is (in the best case) incomplete: Scientific attitudes are not based on **rational evaluation of evidence**, and therefore providing information does not change them.
- Attitudes are determined instead by a host of **contextual and cultural factors** that make them largely immune to change.

"Do I have advice on how to live when you're at odds with your community? Absolutely. Do not live at odds with your community... You are a time bomb right now. Because at somepoint you won't be able to pretend anymore and you will speak honestly, and there will be massive collateral damage and fallout iin your church. It's time to move on. It's time to find a faith community that believes as you believe... When that happens,you're going to lose relationships. Some people cannot agree to disagree and those relationships can become abusive... There'sa lot of pain because there are some people who are dear to me that I can't talk to anymore... It is not possible for us to have the relationship we once had, and it's rough. I'm not gonna lie. It's rough."

The power of culture over cognition is greater than "pure" information

We don't know enough individually to form knowledgeable views about the world. We simply have no choice but to adopt the positions of those we trust (the knowledge illusion may based on this).

Applications

Science

Causal models and science understanding

- Science literacy research limitation: reliance on **fact-based assessment**.
- Fact-based science questions are not able to determine **people's attitudes** about science.
- Facts are hard to remember (in particular when unsopported by deeper understanding as it happens in the case of scientific topics).

Antibiotics kill viruses as well as bacteria: **TRUE** or **FALSE?**

WRONG

How we can help them?
What the heck is wrong with this people?
No right to vote for those people!

RIGHT

People who know that antibiotics kills only bacteria are really different?
They know this as an isolated fact (no much detail).
Difference between bacteria vs viruses?
Why?
Necessity of the community of knowledge

Possible solution: given that human cognitive system is based on **causal models** (i.e., the humanity's way of thinking and reasoning about the world), our **causal models** (often wrong and inaccurate) contribute to form our attitudes. **Hint: We can manipulate them in order to change attitudes**!

Applications

Science

Causal models and science understanding

- People believe that pharmacological products wear off faster when a person is engaged in a difficult task (Ilyuk, Block, & Faro, 2014). **False causal models**: car going uphill uses more gas compared to a flat ground.
- Other examples: GMO (apparently, people think about GMO in the same way they think about germs).
- Using **different labels** and **good metaphors** can **fix** people's causal models (Zheng, Bolton, & Alba, 2015).
- Deficit-model based interventions can be effective if there is a preliminary step to correct false beliefs (Ranney & Clark, 2016).

Pairing the deficit model with causal models manipulation in order to influence science understanding

To influence science understanding and attitudes we need to understand the driving forces behind the deficits.

Applications

Politics

Causal models and political issues understanding

- The knowledge illusion combined with community support ("sacred values") enhances our feelings of expertise about something that noone understand (groupthink/herd mentality).
- This is how a community of knowledge can **become dangerous**: we live inside a house of mirrors, and this makes us even more ignorant.
- **Attempting to explain** policy worked not only reduced people's sense of understanding, it also reduced the extremity of their position (confirmed even with donation to advocacy group).
- By means of causal explanations, it is possible to shattering people's illusion of understanding (that leads people to have strong position on issues).
- Representative democracy vs partecipative democracy.

Causal explanation allows to reduce polarization
Groupthink polarization effects can be mitigated by means of causal explanation.

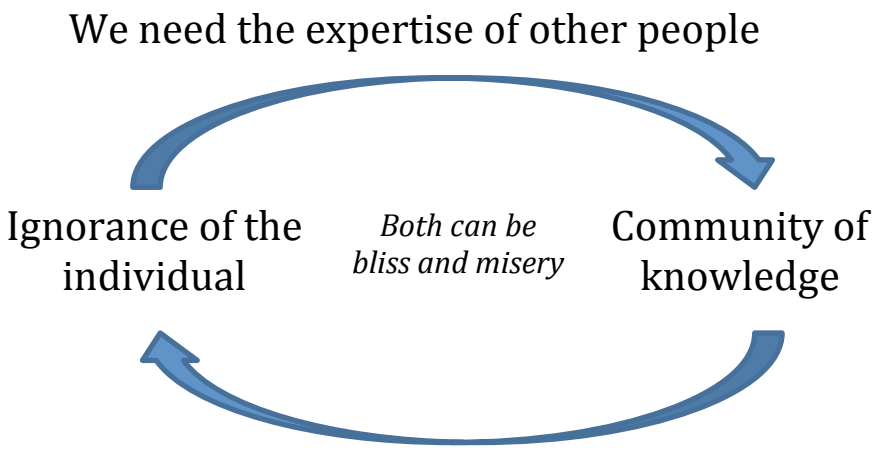
Applications

Some hints: Conclusions

Some lessons for the individual

- Reduce complexity
- Simple decision rules
- Just-in-time education
- Check your understanding

1) "There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know" (D. Rumsfeld).
2) Ignorance class (Columbia University).



... and many thanks for the attention!