How to deal with uncertainty?

An attempt to stock the toolbox

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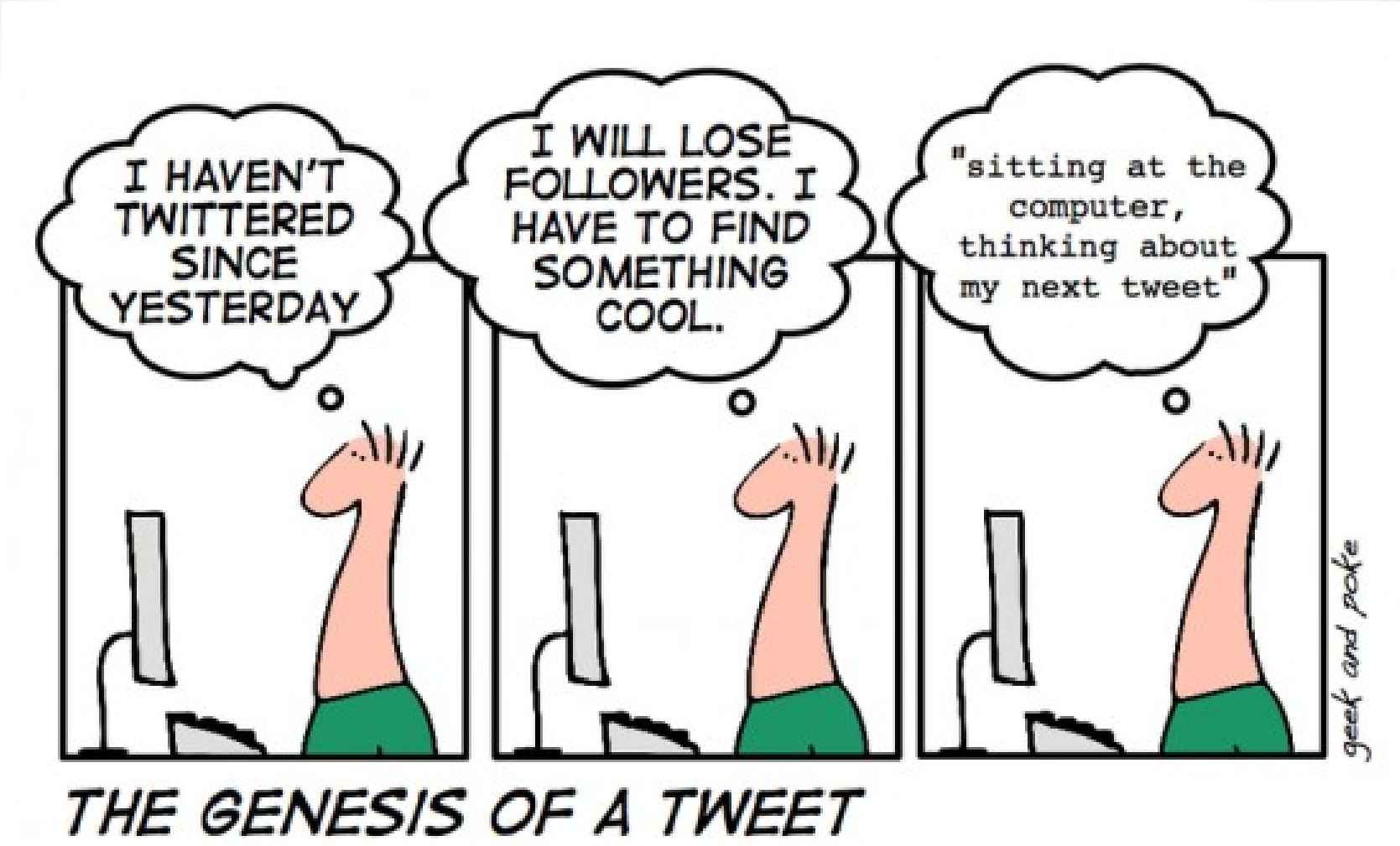
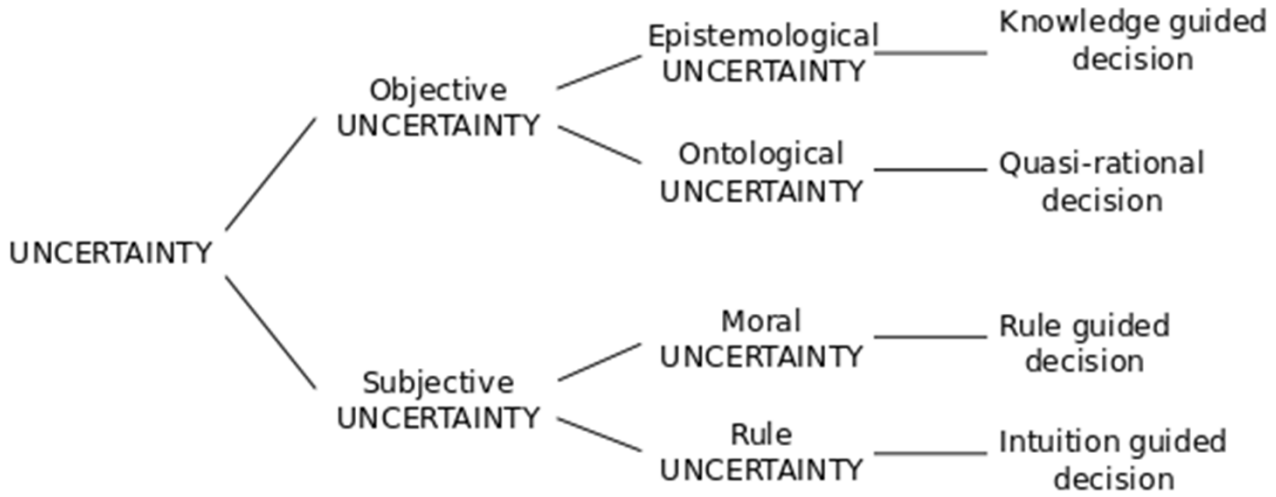

I HAVEN'T TWITTERED SINCE YESTERDAY
I WILL LOSE FOLLOWERS. I HAVE TO FIND SOMETHING COOL.
"sitting at the computer, thinking about my next tweet"
geek and poke
THE GENESIS OF A TWEET

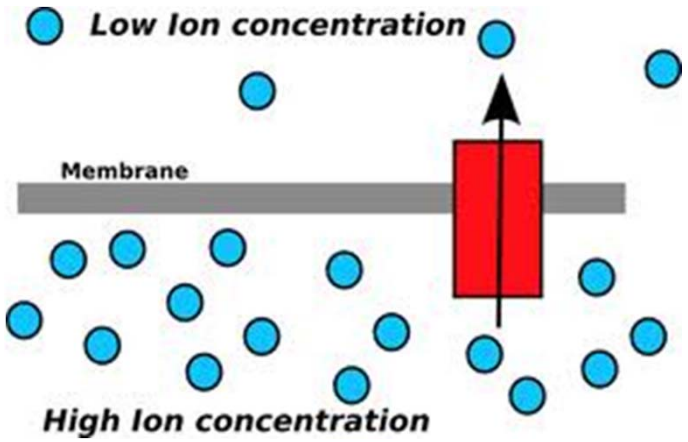
But first …

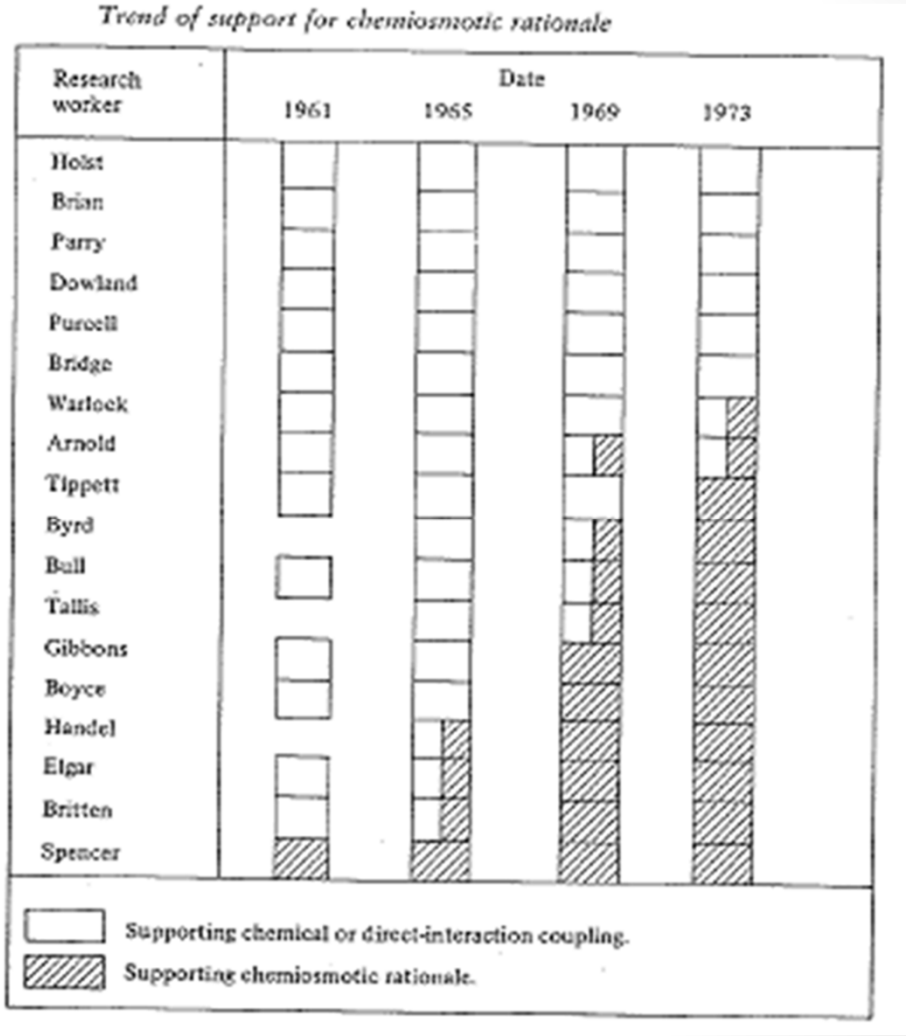
- What is uncertainty?

  $=_{df}$ Position of limitation on description, outcome, knowledge, possibilities, etc.



Example 1. How to define a field and reach consensus under uncertainty?





Lessons from example 1

- 3 mistakes:
  1) All members were not identified
  2) Ascribing a wrong position
  3) Omits to specify cognitive content of consensus fully and forgets to show how it coincides with the views of scientists

- It shows that …
  - Difficult to delineate a scientific field
  - Difficult to capture the position of colleagues (often not observable, but induced through publications, discussions, etc.)

Example 2. How to deal appropriately with disagreement within a discipline/group? Is unanimity required to reach decisions?

- Beatty (2006)
- Group of geneticists 1950s

- Estimating minimum treshold of radiation that humans could safely be exposed to before undergoing genetic mutation.
- Disagreement: group geneticists >< Atomic Energy Commission
- AEC chose to rebut worries about mutation by emphasizing the lack of consensus among geneticists
- Settle: National Academy of Sciences (NAS) panel of geneticists to develop guidance on acceptable radiation level
- Result: disagreement by over three orders of magnitude on estimates of radiation danger
- But: “no disagreement as to fundamental conclusions” (NYTimes)

Lessons from example 2

- Should we question the ideal of consensus? If so, why do we still strive to achieve it?

- Plurality:
  - Craving consensus widens the gap between expert and novice (Beatty, 2006), through:
    - Simplification
    - Intentional withholding of information

  - Dissent is (epistemically) valuable, because
    - Dissenting views carry certain insights that would otherwise get lost in the process (Solomon, 2006)

- The requirement of unanimity is pernicious, because

  1) it could have a detrimental effect on scientific deliberation, encouraging agreement where there is none in order to protect the authority of the group,
  2) it could encourage misleading reports of the state of scientific agreement to the public
  3) it could undermine the epistemic quality of the deliberators and
  4) it could unfairly privilege the status quo with regard to any decisions that hinge on the outcome of the contest

- Possible solution: a social account of consensus focusing on meta-consensus can capture the tension and avoid impasse (Kosolosky & Van Bouwel, 2014 / Baartmans & Kosolosky, 2015)

Example 3. How can we secure integrity when dealing with uncertainty?

- In academic research:
  - Fraud at medical university faculties in Flanders (Belgium)
- In scientific research:
  - Biddle (2007)

  - Painkiller Vioxx compared to Naproxen (study on advantage)
  - Written by Merck and published in Annals of Medicine
  - Reported no statistical significance (Vioxx: 5 cardiac deaths + naproxen: one death)
  - But: misrepresentation (3 more deaths Vioxx), hence difference was significant
  - Uninteger due to short-term financial interests.

Lessons from example 3

- For academic research:
  - University policies to strengthen capacity to detect offenders (such as data audits) / find a system to remove the pressure all together (De Winter & Kosolosky, 2013a)
- For scientific research:
  - $_{df}$ **Epistemic integrity of the research process is the degree to which the research lives up to the epistemic standards that the audience can legitimately assume to be met in the research process.** De Winter & Kosolosky, 2012 / De Winter & Kosolosky, 2013b) / De Winter (2014) / Kosolosky & De Winter (forthcoming)
  - *Legitimately assume: (1)The assumption should be common and obvious for the relevant audience, in the sense that the agents involved in the research process could have expected that most members of this audience would make the assumption on the basis of what is reported to them. (2) The assumption should not conflict with what the agents involved in the research process have communicated to the relevant audience. (3) The assumption should respect the spirit of the times of the research process.*

- When results are reported to an audience, this causes the audience to make certain assumptions about the epistemic standards that the research meets. These assumptions can be vague or specific.

- Example: scientist reports drug d1 is more effective than drug d2 for treating a certain health condition c.

- General audience: (1) scientific research has been performed, and (2) research delivers good, scientific reasons to believe d1 is more effective than d2 for treating c.

- Specific audience: biomedical scientists would be able to know what kind of empirical evidence would be required to make this claim

Tools to deal with uncertainty

1. (Re)imagine concepts/divisions:
   - Ethics of expertise (Elliott, 2011)
     - 1) ethics principle 2) uncertainty principle 3) no-passing-the-buck-principle
   - Rolin's (2009) contextual theory of epistemic justification for outsider participation
   - Academic and interface consensus: shift among scientists + moment of dissemination and justification towards society
     - To: elaborate positions / dissolve misconceiving / inform public on consensus making / capture tension consensus and plurality
   - Epistemic and moral integrity of researchers/research practices/disciplines
     - "Integrity is to the uncertainty monster as garlic is to a vampire" (Curry & Webster, 2011: 1679).

2. Live up to our responsibilities
   - For organizations:
     - Transparency / improvements (implementing communication strategies such as booklets, executive committees, etc) / strengthening procedures for dealing with gray literature (Kosolosky, in press)
   - For scientists:
     - Break-out of the silence / decipher, summarize and communicate / ethics of expertise / outsider participation (Rolin) / ethics of reflexivity (Meskens)
   - For laypeople:
     - Science and certainty / who do we listen to? / understand science as a collective endeavour / contribute to science communication? interactional expertise (Collins & Evans) / sensible decision making based on trust (Primiero & Kosolosky, 2014)

To conclude …

- Although fruitful, a scientific process itself will, in the end, remain a social process, prone to mistakes and errors. Although fallible, it is our best alternative.
- Research should ideally be done in an open and transparent manner and the expectations of the public are ideally aligned with science's abilities.
- Take on science: In a scientific community, different individuals can weigh evidence in different manners through the use of different standards (as no logically indisputable proofs can be attained). In the best case, science puts forward a robust consensus amongst its members based on a process of inquiry that allows for continued scrutiny, re-examination, and revision (Oreskes, 2004).

Who knows but the world may end tonight?

True, but on available evidence most of us make ready to commute on the 8:30 next day.

Thanks for your undivided attention

Questions and/or references: laszlo.kosolosky@ugent.be

Discussion

1. Quis custodiet ipsos custodes? Who guards the guardians?

2. What measures can we implement to ensure the safeguard of science against skeptic attacks, warranted or not?

2. How do we / can we / should we conceive the (public) understanding of science?

3. Is it appropriate to include outsiders in the process of consensus making? And if so, on what grounds?

4. . . .

IPCC

- **Treatment of uncertainty**: 3 different approaches
  - Qualitatively: provides a relative sense of the amount and quality of evidence and the degree of agreement (*language*: high agreement, much evidence; high agreement, medium evidence; etc.) (*use*: WG III)
  - Quantitatively:
    - Expert judgment of the correctness of underlying data, models or analyses (*language*: very high confidence at least 9 out of 10; high confidence about 8 out of 10; medium confidence about 5 out of 10; low confidence about 2 out of 10; and very low confidence less than 1 out of 10) (*use*: WG II partly)
    - Expert judgment and statistical analysis of a body of evidence (e.g. observations or model results) (*language*: likelihood ranges used to express the assessed probability of occurrence: virtually certain >99%; extremely likely >95%; very likely >90%; likely >66%; more likely than not > 50%; about as likely as not 33% to 66%; unlikely <33%; etc.) (*use*: WG II partly, WG I)
- **AGW: "**Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since AR4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century." (taken from WGI AR5 report, summary for policymakers)

Publications

- Kosolosky, L. & De Winter, J. (forthcoming) 'Appealing to (climate) science: The epistemic integrity of IPCC practices
- Kosolosky, L. (in press) 'Peer review is melting our glaciers: Exploring how and why the Intergovernmental Panel on Climate Change (IPCC) went astray', **Journal for General Philosophy of Science**
- Baartmans, T. & Kosolosky, L. (2015) 'Groepsbeslissingen: kwaliteit, autoriteit en vertrouwen', **Tijdschrift voor Filosofie** (DUTCH)
- Kosolosky & Van Bouwel (2014) 'Explicating ways of consensus making in science and society: a social account of consensus formation', **Springer** book 'Experts and consensus in social science', edited by Carlo Martini and Marcel Boumans, Ethical Economy Volume 50, pp. 71-92
- Primiero, G. & Kosolosky, L. (2013) 'The semantics of untrustworthiness', **Topoi** , TOPO-D-13-00035R2
- De Winter, J. & Kosolosky, L. (2013a) 'Fraud in academic medical research: Lessons from Flanders, Belgium', **The Reasoner**, 7(7)
- De Winter, J. & Kosolosky, L. (2013b) 'The epistemic integrity of NASA practices in the Space Shuttle Program', **Accountability in Research**, 20:2, 72-92
- De Winter, J. & Kosolosky, L. (2012) 'The epistemic integrity of scientific research', **Science and Engineering Ethics**, DOI 10.1007/s11948-012-9394-3