Who can be trusted on an Internet full of fake news, alternative facts, tweets, sound bites, and trolls?

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Access my research papers from Google Citations

The Internet gives us the world of human knowledge, foolishness and lies: how can we tell the difference?

- Internet tools can find and deliver in seconds virtually any information published anywhere in the world.
  - How much is there?
  - A lot is useless, fantastical, or malicious crap
- How can you tell knowledge claims are safe to use?
  - What is knowledge?
  - How is it generated and tested?
- What's actually in the 'net: type, content, & quality?
  - Documents: scientific reports and theories, news & observations, opinions, adverts, cons, memes, chitchat
  - Images and videos
- Social networking and search tools
- Sharing, publishing and presenting tools

Thoughts about thinking, decisions and rational choices

- As sentient individuals, we unavoidably make decisions about what to do next as we progres into the future…
  - Deciding is choosing among available alternatives
  - Deciding is an organic process having physical consequences for the individual's life and its world
  - **Even not deciding is deciding to make no decision… The future still happens** (or should I say shit happens?)
- Each decision shapes our futures for good or ill
  - The progress of time is inexorable – it cannot be reversed
- **Do we choose to make our own decisions on the *best available evidence*?** or
- **Do we choose to let the decisions of others or blind chance determine our own futures?**

Our lives and futures depend on decisions we make today and every day

- We are living in an increasingly dangerous world
  - increasing populations compete for increasingly limited resources provided by fragile ecosystems on a finite and warming planet
  - increasingly demented leaders create disorder and chaos
- As living individuals we absolutely depend on reality for:
  - consuming food, water, and breathable air
  - finding shelter from adversity that suits our physiological limits
  - being able to respond to threats and dangers we encounter
  - doing all of this in competition with a lot of other people
- To satisfy these imperatives we must make many decisions every day
  - Good decisions need to be based on reliable knowledge
  - We are increasingly surrounded by "fake news", "alternative facts", fundamentalist dogma, lies, and censorship of reality
- **How can we determine which claims to knowledge are sufficiently trustworthy to support our decision making.**

How much knowledge held in the Web?

- My primary interest is meaningful "content" (web pages, documents, books), not data
- Three Webs
  - Surface web –freely accessible to a browser
    - Inktomi — Jan 2000 — 1,000,000,000 pages
    - Notess (2006) — Dec 2000 — 600,000,000
      Dec 2001 — 1,500,000,000
      Nov 2002 — 3,000,000,000
      Feb 2004 — 4,000,000,000
      2006 — 20,000,000,000
    - Wikipedia — current — 36,607, 000 (~4 M for content)
    - Google (2008) — Jul 2008 — 1,000,000,000,000 (w/o duplicates)
    - *Indexed Web* — current — ~47,000,000,000 (Google)
    - Web Archive — current — 8,083,803 (books & texts)
  - Deep/hidden Web – requires subscription or password to access, e.g.
    - e-Journals: University of Melbourne Library accesses 116,279
      - Some are available free to the web, most are not (Scholar indexes)
    - e-Book titles on Amazon: 6,911,733; (437,674 are free, rest are not)
    - Subscription news, financial reports, other databases, etc.
  - Dark Web – encrypted & deeply hidden content (TOR, privacy, hacking, …)
    - See Dr Gareth Owen 2015 Tor: Hidden Services and Deanonymisation
    - Quantification difficult (~80% of access seems to be child abuse porn)

Who uses the Internet?

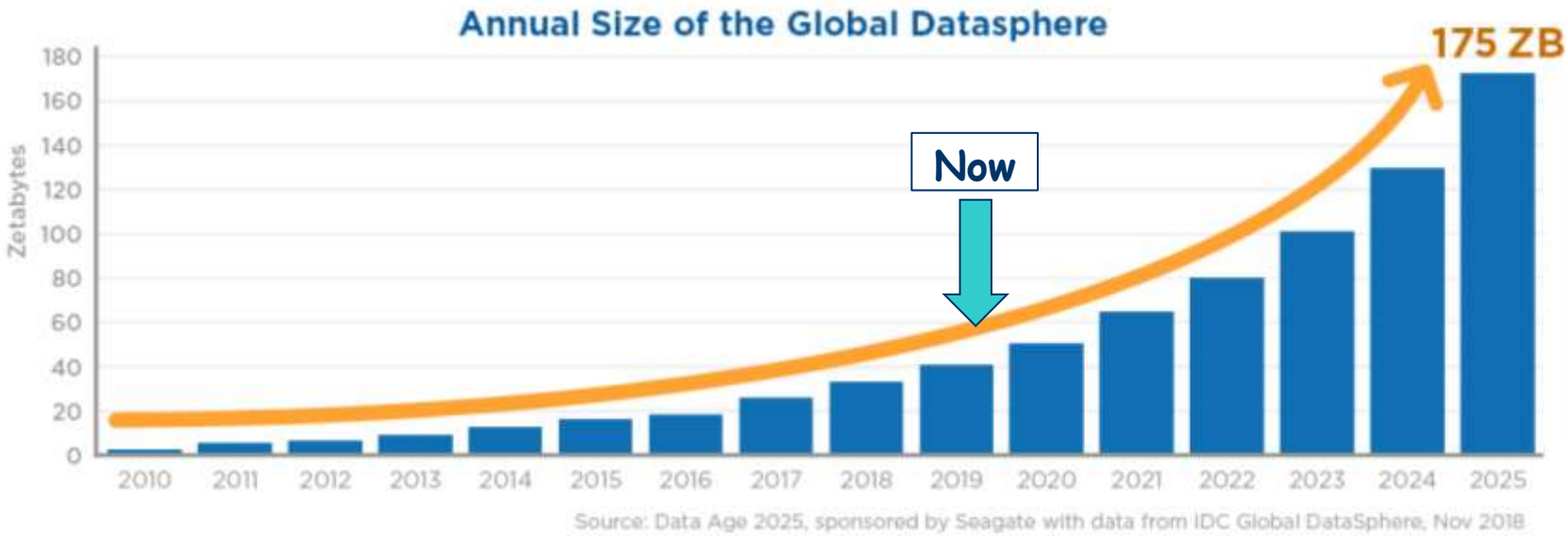
OCEANIA	Population (2019 Est.)	Users, in Dec/2000	Internet Usage, 30-June-2019	% Population (Penetration)	Internet % users	Facebook 31-Dec-2018
Australia	25,088,636	6,600,000	**21,711,706**	86.5 %	75.8 %	15,000,000

World Regions	Population (2019 Est.)	Population % of World	Internet Users 30 June 2019	Penetration Rate (% Pop.)	Growth 2000-2019	Internet World %
Africa	**1,320,038,716**	17.1 %	**522,809,480**	39.6 %	11,481 %	11.5 %
Asia	**4,241,972,790**	55.0 %	**2,300,469,859**	54.2 %	1,913 %	50.7 %
Europe	**829,173,007**	10.7 %	**727,559,682**	87.7 %	592 %	16.0 %
Latin America / Caribbean	**658,345,826**	8.5 %	**453,702,292**	68.9 %	2,411 %	10.0 %
Middle East	**258,356,867**	3.3 %	**175,502,589**	67.9 %	5,243 %	3.9 %
North America	**366,496,802**	4.7 %	**327,568,628**	89.4 %	203 %	7.2 %
Oceania / Australia	**41,839,201**	0.5 %	**28,636,278**	68.4 %	276 %	0.6 %
WORLD TOTAL	**7,716,223,209**	**100.0 %**	**4,536,248,808**	**58.8 %**	**1,157 %**	**100.0 %**

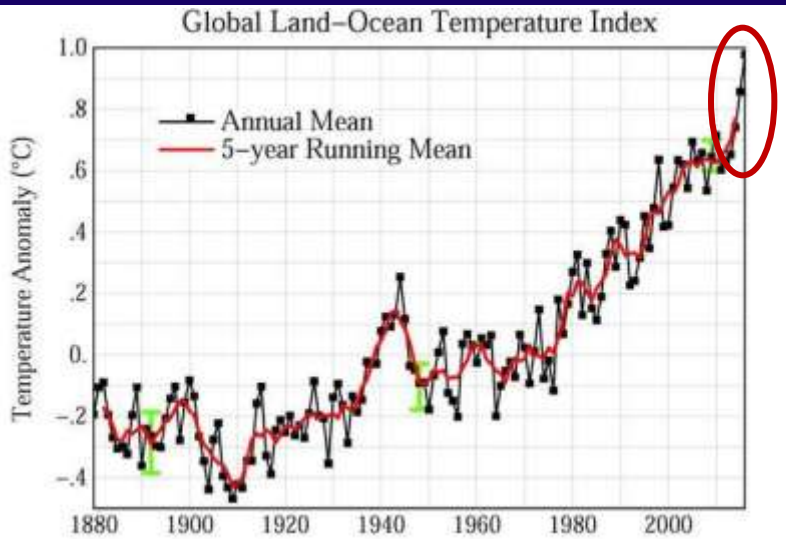
NOTES: (1) Internet Usage and World Population Statistics estimates for June 30, 2019, as of Sept 20, 2019. (2) CLICK on each world region name for detailed regional usage information. (3) Demographic (Population) numbers are based on data from the United Nations Population Division. (4) Internet usage information comes from data published by Nielsen Online, by the International Telecommunications Union, by GfK, by local ICT Regulators and other reliable sources. (5) For definitions, navigation help and disclaimers, please refer to the Website Surfing Guide. (6) The information from this website may be cited, giving the due credit and placing a link back to www.internetworldstats.com.

How much data is there? (Moore's law – it is growing exponentially)

- Google Search indexes 25-30 billion web pages



Global warming is real, dangerous, and as a society we need to do something about it



- Extent of global sea ice at or near record lows
- Hottest January ever this year 2020; unprecedented weather extremes
- Volume of Arctic ice rapidly shrinking year on year so we will soon see an ice-free September
- Open ocean exposed to 24 hour sun will get hotter faster
- Melting permafrost and warming and burning peat bogs releasing increasing amounts of CO_2 and methane from frozen hydrates
- Coral bleaching & collapsing Great Barrier Reef ecosystem a portent

If global warming is real, a "war effort" is urgently needed to help humanity survive a likely collapse of agricultural systems

- Global warming is the consequence of exponentially growing human population and hyperexponential growth of our technologies all based on the burning of hydrocarbon fuels
- We are running low on irreplaceable material resources and have exceeded the capacity of the planetary carbon cycle and ecosystem to absorb and process the entropic consequences of our activities
- We have overshot the carrying capacity of our planet and population and technological collapse is inevitable if we fail to rein in our excesses to what the planet can support
- *Rational* discourse, research, planning and action on a global scale are all needed
- **Rational discussion and action of these critical issues is overwhelmed by spin, blizzards of fake news, alternative facts, lies, obfuscation, ad hominem attacks, scientific fraud, etc**

What drives climate science denial?

- Fossil fuel industry assets and reserves may become worthless
  - if burning carbon becomes uneconomic because alternative energy resources cost less
  - if scientifically demonstrated risks to humanity's future from burning fossil fuel are too great to allow it be used.
- The case of ExxonMobil
  - 9th largest company according to Forbes, worth $363 billion
  - Its proven oil reserves worth close to $800 billion at an equivalent value of $31.84 for a barrel of West Texas Crude. At a price of ~$100 per barrel it would be worth $2.84 trillion!
  - If this carbon could not be sold for burning, Exxon Mobil and its reserves would be rendered close to valueless.
- Fossil fuel industry as a whole capitalized at around $5 trillion
- Assets and proven reserves worth $20-100 trillion at present values
- Ample reason for ExxonMobil, and others like it in the fossil fuel industry, to do whatever they can to blind the world to the risks of burning fossil fuel in order to preserve their $trillions while the rest of the world cooks.

Using fake news and alternative facts to obfuscate knowledge about damaging activities

- **Methods developed by tobacco industry adopted by other industries**
  - **Manufacture uncertainty** to raise doubts about even the most indisputable scientific evidence.
  - **Launder (and even fake) information** to make the industry's own case and confuse the public by using and covertly establishing seemingly independent front organizations.
  - **Promote scientific spokespeople** and invest in "scientific" research to lend legitimacy to their public relations efforts.
  - **Recast the debate** to claim that completely legitimate concerns about health impacts of smoking/global warming were not based on "sound" science.
  - **Cultivate close ties to influence government members and officials** to block support for and/or censor government instrumentalities and research organizations whose work is unfavourable to the industry's interests.
- References: ExxonMobil Report: Smoke Mirrors & Hot Air; Corporate manipulation of research: strategies are similar across five industries; How Does ExxonMobil Attack Climate Science? Let Me Count the Ways

How can you decide what claims to 'know' are 'safe to use'?

What is scientific knowledge?

Simon, H.A. (1979). Rational decision-making in business organizations. American Economic Review, 69, 493-513. [Nobel Memorial Lecture Economic Sciences, Dec. 8, 1978] - http://tinyurl.com/26bhflq

Osinga (2005) Science, strategy and war: the strategic theory of John Boyd - http://tinyurl.com/26eqduv

What what are "knowledge", truth and belief

- Greek philosophy: "justified true belief"
- Gettier's Problem
  - Gettier (1963), Is justified true belief knowledge?
- Some working definitions:
  - Truth (Tarsky): "correspondence with reality"
    - Assumes that the world exists independently from our perceptions and that we can identify mismatches between claims and reality
  - Belief: a neurologically developed state of mind
    - Thinking is a physiological process of living entities
  - Knowledge: a trustworthy belief about reality
- Karl Popper provides a biological understanding of knowledge

Knowledge is a problematic concept

"Knowledge" is a problematic concept. Here, we are concerned with effective action. To be safe and effective, action must be based on reliable knowledge. To be judged reliable, claims to know must be connected to external reality. The concept of knowledge used here comes from Karl Popper's (1972) Objective Knowledge. He argues that no claim to know can be proved to be "true", but that a well tested claim is more likely to be close to the truth, or be more reliable than claims that are simply asserted. Our constructed knowledge can be improved through trial and error. Reliability is best achieved in an iterated cyclic process of observing a problem of existence, proposing tentative solutions or theories, and criticising or testing the tentative solutions against the real world to eliminate those failing to give the expected results.

For insightful reviews of Popper's book, see AMAZON.

Creating and building knowledge is cyclical

- Extending Popper's ideas, again
  - Living knowledge is mentally constructed
  - Knowledge is solutions to problems
  - Solutions are tested and selected knowledge claims that have been shown work (at least most of the time)
    - Accept tested claims until they are replaced by something that works better
  - Cannot logically prove the absolute truth of any claimed solution
    - All claims to know are potentially fallible
    - Test your claims against the external world
    - **Discard beliefs that do not conform to reality**
    - **If it sounds too good to be true – it almost certainly isn't true**

Popper's evolutionary theory of knowledge

Natural selection builds knowledge (= solutions to problems)

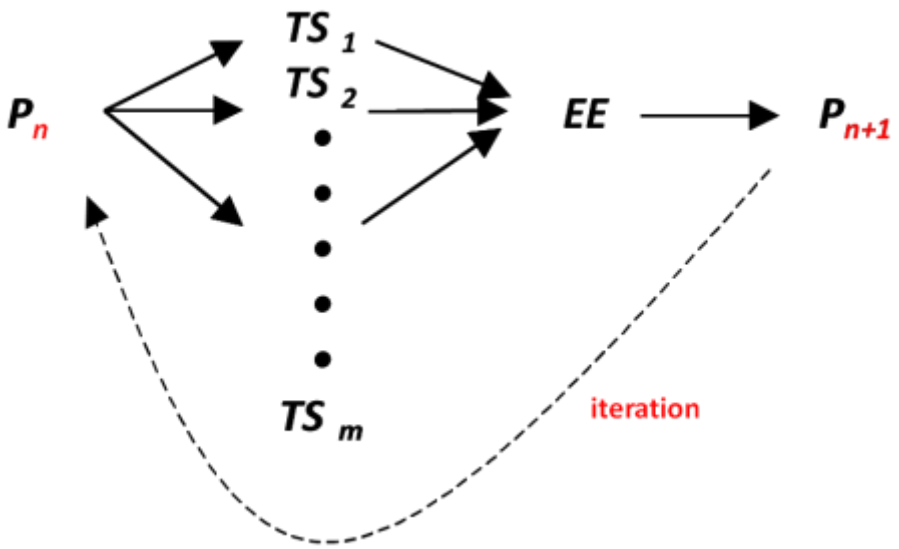
P_n *a real-world problem faced by a living entity*

TS *a tentative solution/theory. Tentative solutions are varied through serial/parallel iteration*

EE *a test or process of error elimination*

P_{n+1} *changed problem as faced by an entity incorporating a surviving solution*

The whole process is iterated

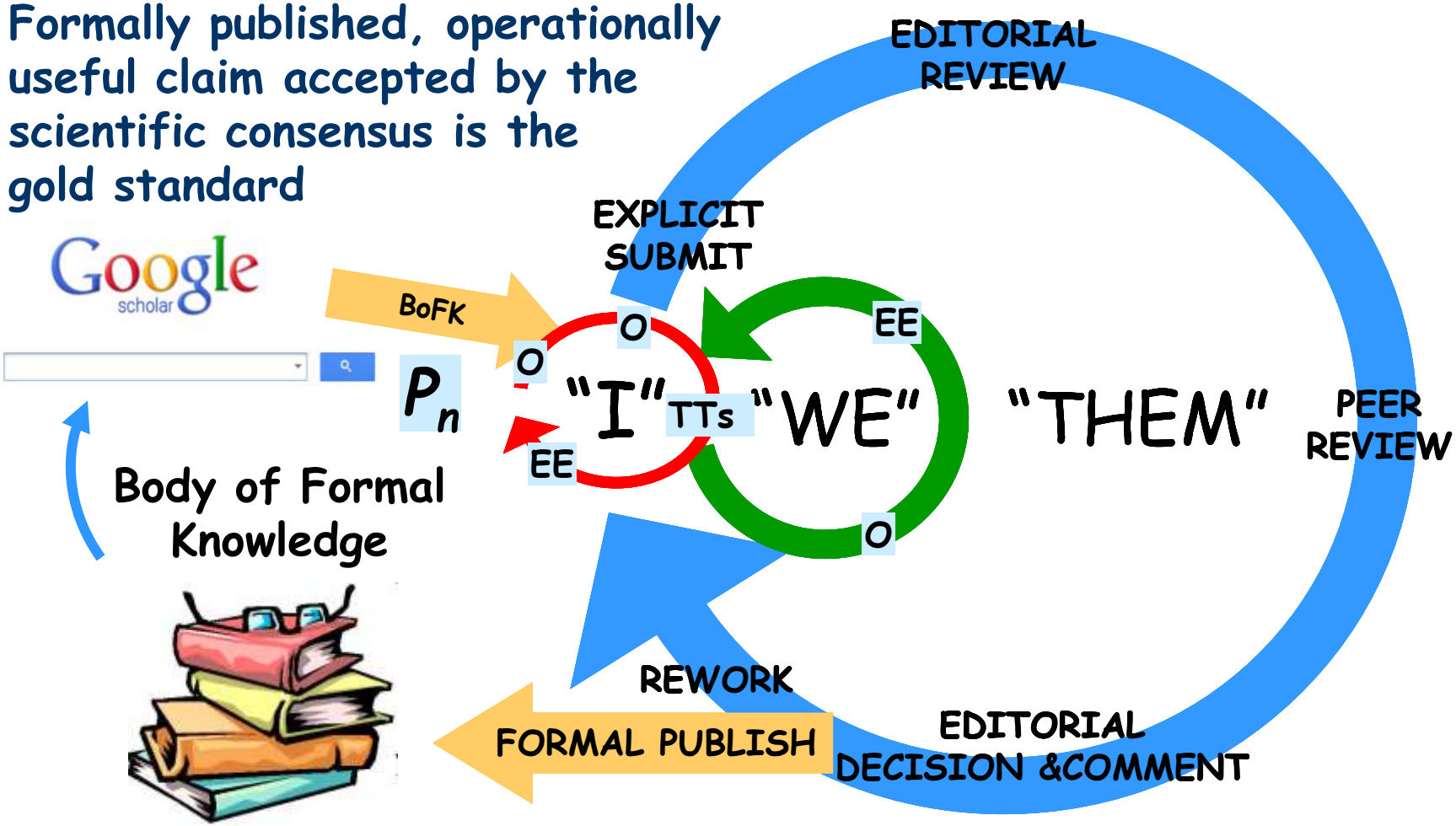


Karl Popper, Objective Knowledge – An Evolutionary Approach (1972), pp. 241-244

- All knowledge claims are constructed, cannot be proven to be true
- **TS**s may be embodied as "living structure" in the "knowing" entity, or
- **TS**s may be expressed in words as hypotheses, subject to objective criticism; or as genetic codes in DNA, subject to natural selection
- **Objective expression and *criticism* lets our theories die in our stead**
- Through cyclic iteration, sources of errors are found and eliminated
- Solutions/theories become more reliable as they survive repetitive testing
- Surviving TSs are the source of all knowledge!

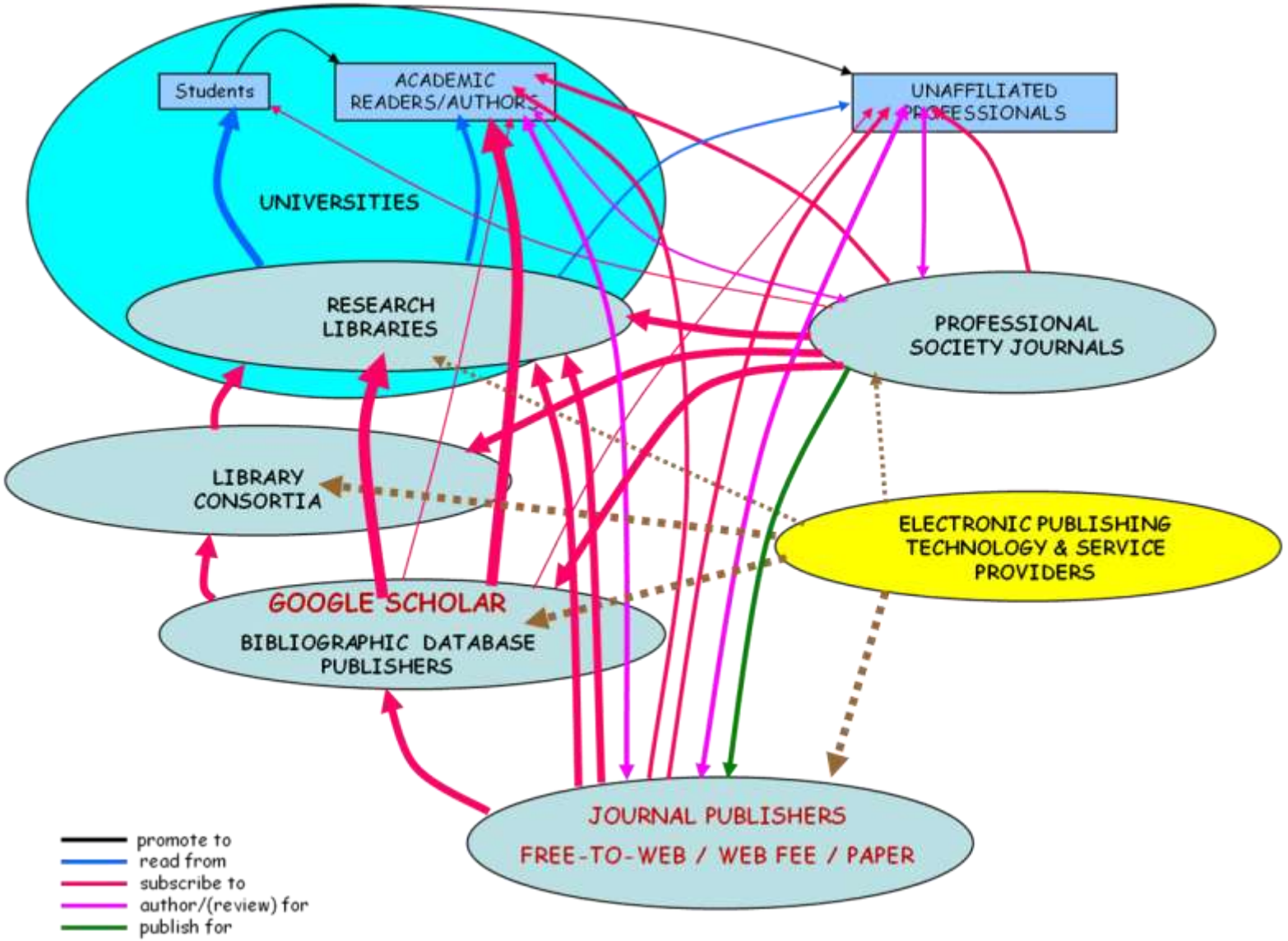
How is this reflected in scientific publishing? Constructing formal knowledge

Formally published, operationally useful claim accepted by the scientific consensus is the gold standard



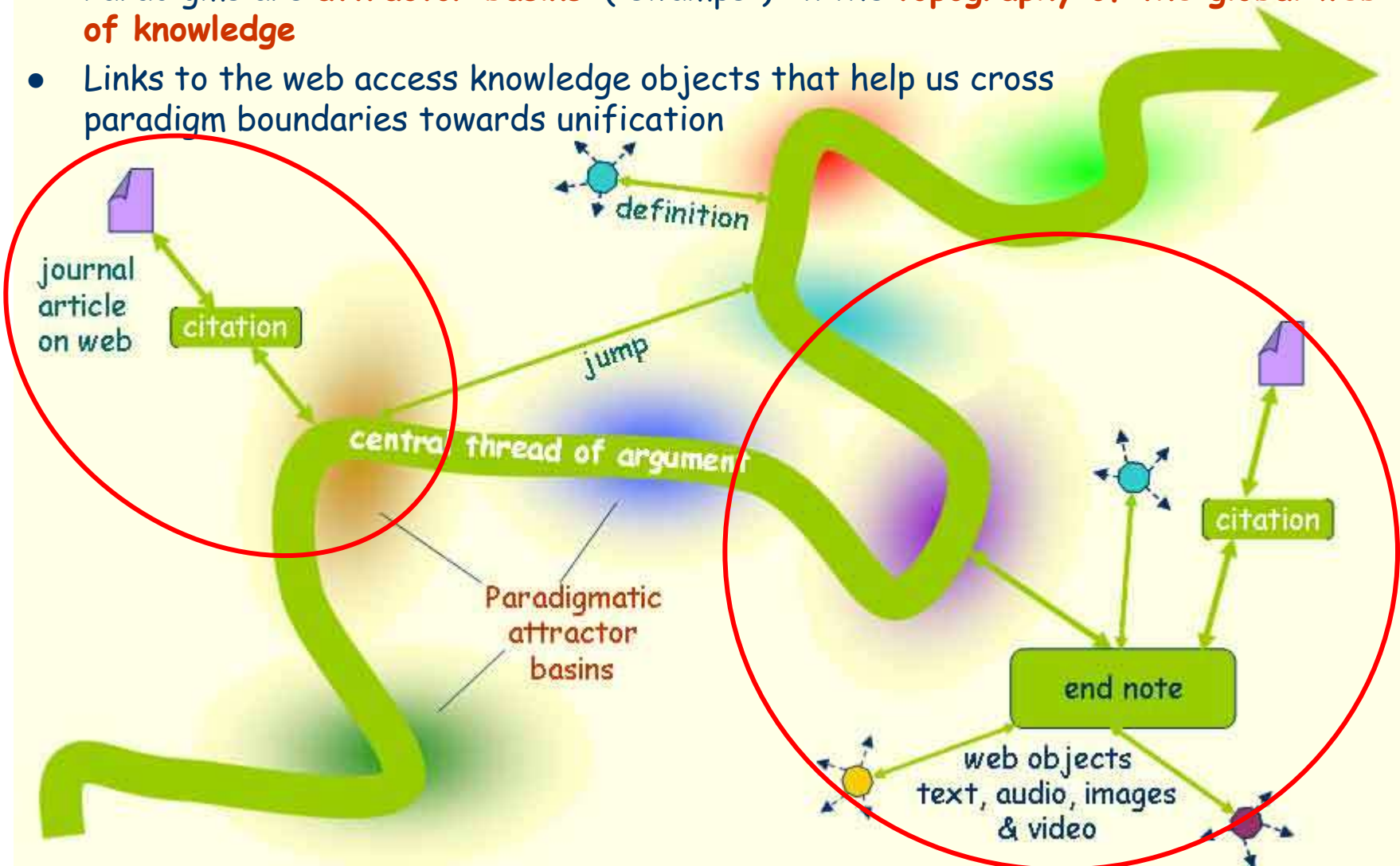
- Formal knowledge should be considered "safe to use"

Building the web of scientific knowedge



Hypertextually navigating the landscape of the web of knowledge

- Paradigms are **attractor basins** ("swamps") in the **topography of the global web of knowledge**
- Links to the web access knowledge objects that help us cross paradigm boundaries towards unification



Bibliographic citations demonstrate this web of connections

Although *Homo* most probably evolved in Africa, paleoarcheological, fossil and genomic evidence shows that several different *Homo* colonized Eurasia at different times, presumably via Asia Minor and the "Levant" (Ronen 2006 - for details see below on Fossils, tools, genomics and human migrations). The earliest evidence for any *Homo* found outside Africa was for the small-brained (cerebral volumes from 546 to 730 cc) species recovered from 1.8 million year old sediments in the Georgian town of Dmanisi, Georgia (Gabunia & Vekua 1995; Lordkipanidze et al. 2013)[336]. Except for brain size, the Dmanisi fossils are close to if not the same as the generally larger-sized and larger-brained (725 to more than 1100 cc) *Homo erectus*[337] (Rightmire 2004, Rightmire et al. 2006) that crossed Asia to Indonesia and China earlier than 1.5 mya, and possibly as early as 1.8 mya (Swisher et al. 1994; Larick et al. 2001; Zhu et al. 2008; Ao et al. 2013).

Lottor, M. 1992. Internet growth (1981-1991). Network Information Systems Center, SRI International No. 1296 - http://tinyurl.com/mowhek7.

Lordkipanidze, D., Jashashvili, T., Vekua, A., Ponce de León, M.S., Zollikofer, C.P.E., Rightmire, G.P., Pontzer, H., Ferring, R., Oms, O., Tappen, M., et al. 2007. Postcranial evidence from early *Homo* from Dmanisi, Georgia. Nature 449, 305-310 + suppl. 20 pp. - http://tinyurl.com/k6zkzjn

Lordkipanidze, D., Ponce de Leon, M.S., Margvelashvili, A., Rak, Y., Rightmire, G.P., Vekua, A., Zollikofer, C.P.E. 2013. A complete skull from Dmanisi, Georgia, and the evolutionary biology of early *Homo*. Science 342, 326-331 - http://tinyurl.com/kbnwxnn + Supplementary Materials - http://tinyurl.com/m7cbz4z.

Lordkipanidze, D., Vekua, A., Ferring, R., Rightmire, G.P., Agustí, J., Kiladze, G., Mouskhelishvili, A., Nioradze, M., Ponce de León, M.S., Tappen, M., Zollikofer, C.P.E. 2005. The earliest toothless hominin skull. Nature 434, 717-718 – http://tinyurl.com/nc6z6zj.

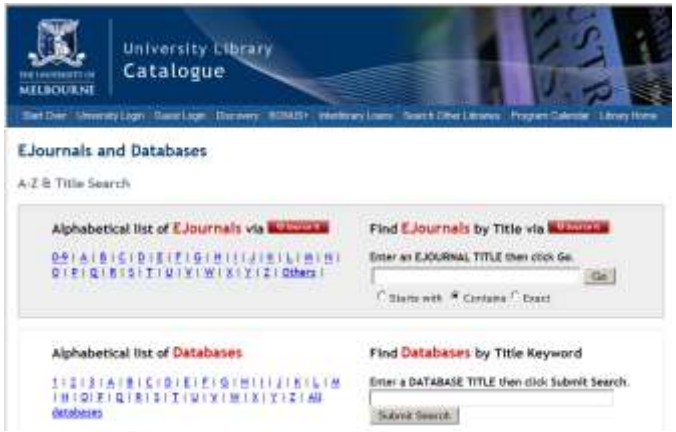
Footnotes

336. As has been the case for *Ardipithecus ramidus*[330] and *Australopithecus sediba*[332] for early hominins, the remarkable collection of fossils found by Lordkipanidze and colleagues at Dmanisi have generated a number of excellent publications by Gabunia, Lordkipanidze, and their colleagues regarding the early speciation and evolution of *Homo*: Gabunia & Vekua (1995); Gabunia et al. (2000) – considered to have affinities with *H. ergaster*; Gabunia et al. (2001); Gabunia et al. (2002) – named a new species, *H. georgicus*; Gabunia et al. (2002a); Vekua et al. (2002) - assigned to *erectus=ergaster*; Lordkipanidze et al. (2005); Lordkipanidze et al. (2006); Rightmire et al. (2006) – Close to stem from which *H. erectus* evolved; Lordkipanidze et al. (2007); Rightmire & Lordkipanidze (2009, 2010) – equivocal as to whether *habilis* and *rudolfensis* are *Homo* or *Australopithecus*, Dmanisi specimens may represent early *erectus* evolved in Asia; Baena et al. (2010); Garcia et al. (2010); Messager et al. (2010); Messager et al. (2010a); Pontzer et al. (2010); Vekua & Lordkipanidze 2010; Agusti & Lordkipanidze (2011); Vekua & Lordkipanidze (2011); Ferring et al. (2011) – Mode 1 artifacts dated to ≤ 1.85 my show tool-using hominins in Dmanisi before *erectus* appeared in Africa; Mgladze et al. (2011); Pontzer et al. (2011); Messager et al. (2011); Hemmer et al. (2011); van Arsdale & Lordkipanidze (2012); Lordkipanidze et al. (2013) – degree of variation in Dmanisi hominins compared to overall variation suggests they belong to a single *erectus* chronospecies; Martin-Francés et. al 2013. Skinner et al. (2006) and Bermúdez de Castro et al. (2014) – argues that size, shape, developmental pattern, and wear pattern of the large jaw D2600 is sufficiently different from the other Dmanisi jaws to support the idea that Dmanisi was occupied by two different hominin species[335].

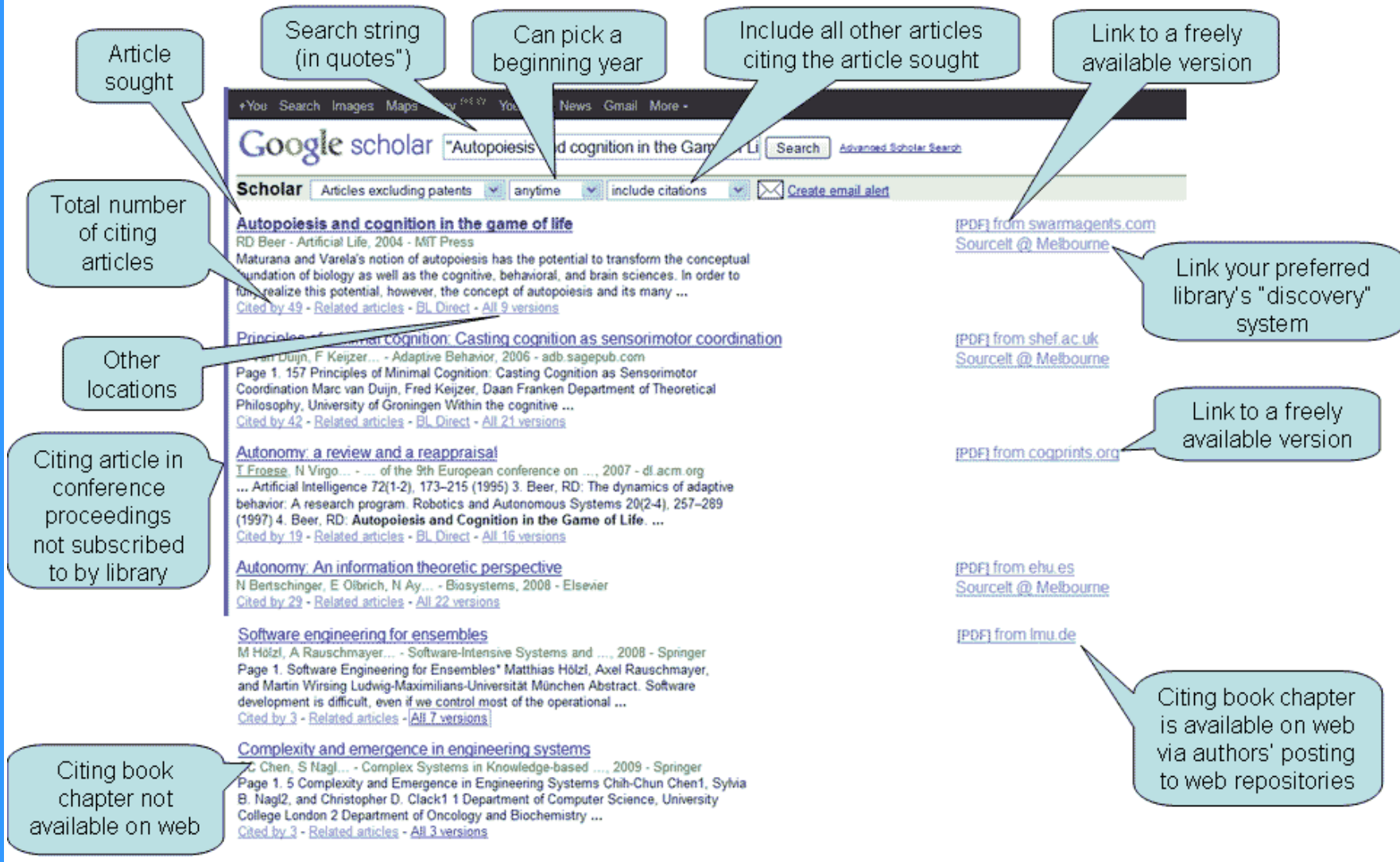
My tool kit

Nothing very special

- General idea
- Body of Formal Knowledge
  - Web browser
  - Access to eJourna
  - Google / Google Scholar
- Microsoft Word
- Microsoft PowerPoint
- WayBackMachine
- TinyURL
- Understand so HTML
- Adobe Acrobat



There is a lot more to Scholar than meets the eye



Google

- Google indexes 25 to 30 billion web pages!
- Google Scholar indexes ~390 million documents.
- Facebook claims 2.50 billion monthly active users (MAU) for December 2019
- 1.66 billion people on average log onto Facebook daily and are considered daily active users (Facebook DAU) for December 2019
- There are 83 million fake profiles on Facebook
- Every 60 seconds on Facebook: 510,000 comments are posted, 293,000 statuses are updated, and 136,000 photos are uploaded.

CONCLUSIONS

Fake news, alternative facts vs trustworthy, actionable knowledge

- Consider the claim
  - Would the reliability of the claim affect your decisions in any way?
  - Is the claim physically plausible?
  - Is the claim based on a chain of evidence logically connected with reality?
  - Has the claim been tested and intersubjectively validated (e.g., independently observed and reported, peer reviewed)?
  - Accepted by a consensus of peers
  - Successfully applied in practice by others?
- Consider the source(s)
  - Does the source have any qualifications to make the claim?
  - Does the source have a track record of reliability?
  - Who benefits if the claim is valid? i.g., does the source have particular vested interests?
- **Would you bet your life on the claim's accuracy?**

END